# Little Missouri Gas Plant



# Application for Certificate of Site Compatibility

***December 2014***

***Prepared for:***

TARGA

**Targa Badlands LLC**

**1000 Louisiana Street**

**Houston, TX 77002**

***Prepared by:***

LOWHAM WALSH LLC

**Lowham Walsh LLC**

**107 West Main Avenue, Suite 325**

**Bismarck, ND 58501**

22 PU-14-853 Filed 04/20/2015 Pages: 862
Exhibit 1
Targa Badlands LLC

# CERTIFICATE OF SITE COMPATIBILITY APPLICATION CHECKLIST

The following table provides the North Dakota Public Service Commission with a guide to locate sections in the application that pertain to specific application requirements for the Certificate of Site Compatibility Application under the North Dakota Century & Administrative Codes.

| State Authority | Description | Relevant Section |
|---|---|---|
| **CENTURY CODE – Title 49** | | |
| Chapter 49-22 | Energy Conversion and Transmission Facility Siting Act | -- |
| **49-22-05.1** | Exclusion and avoidance areas – Criteria | 7.1,7.2 |
| **49-22-07** | Certificate of Site Compatibility required | 1.0 |
| **49-22-08** | **Application for a Certificate of Site Compatibility** | -- |
| 1.a | Description of size and type of facility | 1.0 |
| 1.b | Summary of environmental impacts | 6.3 |
| 1.c | Need for facility | 3.1 |
| 1.d | Preferred site for the energy conversion facility | 2.13 |
| 1.e | Preferred transmission corridor | N/A |
| 1.f | Analysis of merits and detriments of facility location | 2.14 |
| 1.g | Mitigative measures | 8.0 |
| 1.h | Site evaluation pursuant to 49-22-09 and 49-22-05.1 | 7.1, 7.2, 11.0, Appendix F |
| 1.i | Other relevant information | 11.0 |
| **49-22-09** | Factors to be considered in evaluating applications and designation of sites, corridors, and routes | 11.0 |
| 1. | Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment | 11.1 |
| 2. | Effects of new energy conversion technologies and systems designed to minimize adverse environmental effects | 11.2 |
| 3. | Potential beneficial uses of waste energy from energy conversion facility | 11.3 |
| 4. | Unavoidable adverse direct and indirect environmental effects | 11.4 |
| 5. | Site alternatives developed during the hearing process and which minimize adverse effects | 11.5 |
| 6. | Irreversible and irretrievable commitments of natural resources if proposed site is designated | 11.6 |
| 7. | Direct and indirect economic impacts of the proposed facility | 11.7 |
| 8. | Existing plans of state, local, and private entities for other developments at or in the vicinity | 11.8 |
| 9. | Effect on existing scenic areas, historic sites and structures, and paleontological or archaeological sites | 11.9 |
| 10. | Effect on unique biological areas or habitat for rare and endangered species | 11.10 |
| 11. | Problems raised by federal, state, and local entities | 11.11 |
| **ADMINISTRATIVE CODE – Title 69** | | |
| Chapter 69-06-04 | Certificate of site compatibility | -- |
| **69-06-04-01** | **Application for a Certificate of Site Compatibility** | -- |

| State Authority | Description | Relevant Section |
|---|---|---|
| 2.a. (1) | Type of facility proposed | 1 |
| 2.a. (2) | Gross design capacity | 2.4 |
| 2.a. (3) | Net design capacity | 2.4 |
| 2.a. (4) | Estimated thermal efficiency | 2.9 |
| 2.a. (5) | Number of acres the proposed facility will occupy | 2.13 |
| 2.a. (6) | Anticipated time schedule | 4.0 |
| 2.a. (6)(a) | Obtaining Certificate of Site Compatibility | 4.1 |
| 2.a. (6)(b) | Completing land acquisition | 4.2 |
| 2.a. (6)(c) | Starting construction | 4.3 |
| 2.a. (6)(d) | Completing construction | 4.4 |
| 2.a. (6)(e) | Testing operations | 4.5 |
| 2.a. (6)(f) | Commencing commercial production | 4.6 |
| 2.a. (6)(g) | Beginning any expansions or additions | 4.7 |
| 2.b. | Copies of evaluative studies or assessments | Appendix B, D |
| 2.c. | Analysis of the need for the proposed facility | 3.0,3.1 |
| 2.d. | Description of feasible alternatives | 3.2, 3.3 |
| 2.e. | Size of study area (N.D.C.C. § 49-22-09) | 6.1, 6.2 |
| 2.f. | Discussion of utility policies and commitments to limit environmental impacts | 5.1 |
| 2.g. | Map identifying the criteria that provides a basis for the specific location of the proposed facility within the study area | 2.0 Fig.4 |
| 2.h. | Discussion of the criteria evaluated in the study area, including exclusion areas, avoidance areas, selection criteria, policy criteria, design and construction limitations, and economic considerations | 7.1, 7.2, 7.3, 7.4 |
| 2.i. | Discussion of mitigative measures that the applicant will take to minimize adverse impacts which result from the location, construction, and operation of the proposed facility | 2.15, 5.1 |
| 2.j. | Qualifications of each person involved in the site location study | 9.0 |
| 2.k. | Map of the study area showing the location of the proposed facility and the criteria evaluated | Appendix F |
| 2.l. | Eight and one-half-inch by eleven-inch black and white map suitable for newspaper publication depicting the site area | Appendix K |
| 2.m. | Discussion of present and future natural resource development in the area | 10.1 |
| 2.n. | Map and GIS requirements | 12, 12.1, 12.1, Appendix F, K |
| **69-06-08-01(1)** | **Exclusion areas** | -- |
| 1.a | Designated or registered national parks, memorial parks; historic sites and landmarks; natural landmarks; historic districts; monuments; wilderness areas; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; and grasslands | 7.1, Appendix F Figs. 1-3 |
| 1.b | Designated or registered state parks; forests, forest management lands; historic sites; grasslands; wild, scenic, or recreational rivers; game refuges; game management areas; management areas; and nature preserves | 7.1, Appendix F Figs. 1-3 |

| State Authority | Description | Relevant Section |
|---|---|---|
| 1.c | County parks and recreational areas; municipal parks, parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands | 7.1, Appendix F Figs. 1-3 |
| 1d. | Prime farmland and unique farmland, as defined by the land inventory and monitoring division of the soil conservation service, United States Department of Agriculture | 7.1, Appendix F Figs. 1-3 |
| 1.e | Irrigated land | 7.1, Appendix F Figs. 1-3 |
| 1.f | Areas critical to the life stages of threatened or endangered animal or plant species | 7.1, Appendix F Figs. 1-3 |
| 1.g | Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged | 7.1, Appendix F Figs. 1-3 |
| 1.h | Areas within 1200 feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility | 7.1, Appendix F Figs. 1-3 |
| **69-06-08-01(3)** | **Avoidance areas** | -- |
| 3.a. | Historic resources which are not designated as exclusion areas | 7.2, Appendix F Figs. 1-3 |
| 3.b. | Areas within city limits of a city or the boundaries of a military installation | 7.2, Appendix F Figs. 1-3 |
| 3.c. | Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood | 7.2, Appendix F Figs. 1-3 |
| 3.d. | Areas that are geologically unstable | 7.2, Appendix F Figs. 1-3 |
| 3.e. | Woodlands and wetlands | 7.2, Appendix F Figs. 1-3 |
| 3.f. | Areas of recreational significance which are not designated as exclusion areas | 7.2, Appendix F Figs. 1-3 |
| **69-06-08-01(5)** | **Selection Criteria:** | 7.3 |
| 5.a | Impact upon agriculture: | 7.3.1 |
| 5.a. (1) | Agricultural production | 7.3.1.1 |
| 5.a. (2) | Family farms and ranches | 7.3.1.2 |
| 5.a. (3) | Land economically suitable for irrigation | 7.3.1.3 |
| 5.a. (4) | Surface drainage patterns and groundwater flow patterns | 7.3.1.4, 7.3.1.5 |
| 5.a. (5) | The agricultural quality of the cropland | 7.3.1.6 |
| 5.b. | Impact upon the availability and adequacy of | 7.3.2 |
| 5.b. (1) | Law Enforcement | 7.3.2 |
| 5.b. (2) | School systems and education programs | 7.3.2 |
| 5.b. (3) | Governmental services and facilities | 7.3.2 |
| 5.b. (4) | General and mental health care facilities | 7.3.2 |
| 5.b. (5) | Recreational programs and facilities | 7.3.2 |
| 5.b. (6) | Transportation facilities and networks | 7.3.2 |
| 5.b. (7) | Retail services facilities | 7.3.2 |
| 5.b.(8) | Utility services | 7.3.2 |
| 5.c | Impact upon: | 7.3.3 |
| 5.c.(1) | Local institutions | 7.3.3.1 |
| 5.c.(2) | Noise-sensitive land uses | 7.3.3.2 |
| 5.c.(3) | Rural residences and businesses | 7.3.3.3 |

| State Authority | Description | Relevant Section |
|---|---|---|
| 5.c.(4) | Aquifers | 7.3.3.4 |
| 5.c.(5) | Human health and safety | 7.3.3.5 |
| 5.c.(6) | Animal health and safety | 7.3.3.6 |
| 5.c.(7) | Plant life | 7.3.3.7 |
| 5.c.(8) | Temporary and permanent housing | 7.3.3.9 |
| 5.c.(9) | Temporary and permanent skilled and unskilled labor | 7.3.3.8 |
| 5.d | The cumulative effects of the location of the facility in relation to existing and planned facilities and other industrial development | 11.8 |
| **69-06-08-01(6)** | **Policy criteria:** | 7.4 |
| 6.a. | Recycling of the conversion byproducts and effluents | 7.4.1 |
| 6.b. | Energy conversion through location, process, and design | 7.4.2 |
| 6.c. | Training and utilization of available labor in this state for the general and specialized skills required | 7.4.3 |
| 6.d. | Use of a primary energy source or raw materials located within the state | 7.4.4 |
| 6.e. | Not relocating residents | 7.4.5 |
| 6.f. | The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management | 7.4.6 |
| 6.g. | Economies of construction and operation | 7.4.7 |
| 6.h. | Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife | 7.4.13 |
| 6.i. | Use of citizen coordinating committees | 7.4.8 |
| 6.j. | A commitment of a portion of the energy produced for use in this state | 7.4.9 |
| 6.k. | Labor relations | 7.4.10 |
| 6.l. | Coordination of facilities | 7.4.11 |
| 6.m. | Monitoring of impacts | 7.4.12 |

# Contents

1.0 SIZE AND TYPE OF FACILITY ..... 1
2.0 DESCRIPTION OF THE FACILITY ..... 3
2.1 Design of the Proposed Facility ..... 3
2.2 Purpose of the Proposed Facility ..... 6
2.3 General Area to be Served ..... 6
2.4 Gross and Net Capacity ..... 7
2.5 Technology to be Deployed/Employed ..... 7
2.6 Type of Product to be Transmitted ..... 8
2.7 Source of Product to be Transmitted ..... 8
2.8 Final Destination of Product ..... 8
2.9 Estimated Thermal Efficiency of the Process ..... 8
2.10 Plans for Future Expansion ..... 9
2.11 Requirement for and General Location of any new Associated Facilities ..... 10
2.12 Estimated Total Cost of Construction ..... 10
2.13 Preferred Location of the Facility ..... 10
2.14 Merits and Detriments of the Preferred Location ..... 11
2.15 Description of Construction and Reclamation Procedures ..... 13
2.15.1 Best Management Practices ..... 13
2.15.2 Construction ..... 15
2.15.3 Reclamation ..... 16
2.16 Statements Describing How Targa Acquires Land ..... 17
2.16.1 Identification of Land to be Purchased ..... 17
2.16.2 Purchase of Land for Development ..... 17
3.0 NEED ..... 17
3.1 Need for the Facility ..... 18
3.2 Alternatives to the Proposed Facility ..... 18
3.3 Alternative Methods for Serving Need ..... 18
4.0 SCHEDULE ..... 19
4.1 Certificate of Compatibility ..... 19
4.2 Land acquisition ..... 19
4.3 Construction Start Date ..... 19
4.4 Construction Completion Date ..... 19

4.5 Test Operations ..... 19
4.6 Commencement of Commercial Production ..... 19
4.7 Any Expansions or Additions ..... 20
5.0 POLICIES ..... 20
5.1 Discussion of Utility's Policies and Commitments to Limit the Environmental Impact, Including Board Resolutions/Management Directives ..... 20
5.1.1 Health and Safety ..... 20
5.1.2 Environmental Management ..... 21
5.2 Justification for Any Deviations from the Applicant's Most Recent Ten Year Plan ..... 21
6.0 STUDIES ..... 21
6.1 Study Area ..... 21
6.2 Site ..... 23
6.3 Environmental Analysis ..... 23
6.3.1 Natural Resource Inventory ..... 23
6.3.2 U.S. Fish and Wildlife Service ..... 24
6.3.3 U.S. Fish and Wildlife Service Managed Lands ..... 28
6.3.4 North Dakota Game and Fish Department ..... 28
6.3.5 North Dakota Parks and Recreation Department ..... 29
6.3.6 North Dakota State Historic Preservation Office ..... 29
6.3.7 North Dakota Department of Health ..... 29
7.0 CRITERIA ..... 31
7.1 Exclusion Areas ..... 31
7.2 Avoidance Areas ..... 34
7.3 Discussion of Selection Criteria ..... 34
7.3.1 Agriculture ..... 34
7.3.2 Local Public Service Availability and Adequacy ..... 37
7.3.3 Impacts Overview (*impacts upon:*) ..... 37
7.4 Policy Criteria ..... 41
7.4.1 Recycling of the conversion byproducts and effluents ..... 41
7.4.2 Energy conservation through location, process and design ..... 41
7.4.3 Training and Utilization of North Dakota Labor for General and Specialized Skills Required ..... 41
7.4.4 Use of a primary energy source or raw material locatedwithin North Dakota ..... 41

7.4.5 Not relocating residents ..... 42
7.4.6 Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife ..... 42
7.4.7 Dedication of an area adjacent to the facility to land usew such as recreation, agriculture, or wildlife management ..... 42
7.4.8 Economics of Construction and Operation ..... 42
7.4.9 Use of Citizen Coordinating Committees ..... 42
7.4.10 Commitment of a Portion of the Transmitted Product for Use in North Dakota ..... 42
7.4.11 Labor Relations ..... 42
7.4.12 Coordination of Facilities ..... 43
7.4.13 Monitoring of Impacts ..... 43
8.0 MITIGATION ..... 44
8.1 Monitoring of Impacts ..... 44
8.1.1 Nesting Bird Surveys ..... 44
8.1.2 Vegetation Monitoring ..... 44
8.2 Best Management Practices ..... 44
8.3 Continuous Emission Monitoring Systems ..... 44
8.4 Stormwater Plan ..... 45
8.5 Spill Prevention, Containment, and Countermeasures Plan ..... 45
8.6 Risk Management Plan ..... 46
9.0 QUALIFICATIONS ..... 47
10.0 DEVELOPMENT ..... 48
10.1 Discussion of Present and Future Natural Resource Development in the Area ..... 48
10.2 Plans for Future Expansion ..... 48
11.0 SUMMARY OF EVALUATION FACTORS ..... 49
11.1 Location/Construction/Operation on Public Health and Welfare, Natural Resources, and the Environment ..... 49
11.2 Effects of New Energy Conversion and Transmission Technologies and Systems Designed to Minimize Adverse Environmental Effects ..... 49
11.3 Potential for Beneficial Uses of Waste Energy from a Proposed Conversion Facility ..... 49
11.4 Adverse Direct and Indirect Environmental Effects Which Cannot be Avoided Should the Proposed Site or Route be Designated ..... 49
11.5 Alternatives to the Proposed Site, Corridor, or Route Developed during the Hearing Process and Which Minimize Adverse Effects ..... 50

11.6 Irreversible and Irretrievable Commitments of Natural Resources Should the Proposed Site be Designated ..... 50
11.7 Direct and Indirect Economic Impact of the Proposed Facility ..... 50
11.8 Existing Plans of the State, Local Government, and Private Entities for Other Developments at or in the Vicinity of the Proposed Site ..... 50
11.9 Effect of the Proposed Site on Existing Scenic Areas, Historic Sites and Structures, and Paleontological or Archaeological Sites ..... 50
11.10 Biological Wealth or Habitats for Rare and Endangered Species ..... 51
11.11 Problems Raised by Federal Agencies, State Agencies, and Local Entities ..... 51
12.0 MAPS ..... 51
12.1 Maps of Criteria within Study Area ..... 51
12.2 Mylar Maps of the Study Area ..... 51
13.0 References ..... 51

# List of Tables

Table 1: Listing of Technologies and Power Ratings for the Gas Processing Units

Table 2: Total Product Volumes to be Produced

Table 3: Investment Costs for Little Missouri Gas Plant

Table 4: Surface Structure Locations

Table 5: Monthly Volumes of Gas Produced, Sold, and Flared in North Dakota

Table 6: Permitting Schedule for the Little Missouri Gas Facility

Table 7: Federally Endangered, Threatened, Proposed, and Candidate Species Known or Believed to Occur in McKenzie County, North Dakota

Table 8: Exclusion Areas within or near the Facility Area

Table 9: Avoidance Areas within the Study Corridor

Table 10: Listed Noxious Weeds – North Dakota

Table 11: Listed Noxious Weeds – McKenzie County, North Dakota

Table 12: Personnel Qualifications

# List of Figures

Figure 1. General Location of Facility

Figure 2. Block-Flow Diagrams of the Little Missouri Gas Plant

Figure 3. Gathering System Map

Figure 4. Area for Future Expansion

Figure 5. Site Location Map with Northern Border Pipeline Route

Figure 6. Study Area surrounding the Facility Area

# Acronyms and Abbreviations

| | |
|---|---|
| BGEPA | Bald and Golden Eagle Protection Act |
| BMPs | Best Management Practices |
| CFR | Code of Federal Regulation |
| Commission | North Dakota Public Service Commission |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |
| Facility | The Little Missouri Gas Plant, including all expansions |
| GCP | Gas Capture Plan |
| GIS | Geographic Information Systems |
| GSP | Gas Subcooled Process |
| LMGP I | Original Little Missouri Gas Plant |
| LMGP II | Second Expansion of the Little Missouri Gas Plant |
| LMGP III | Third Expansion of the Little Missouri Gas Plant |
| LMGP IV | Fourth Expansion of the Little Missouri Gas Plant |
| MBTA | Migratory Bird Treaty Act |
| MMSCFD | million standard cubic feet per day |
| N.D.C.C. | North Dakota Century Code |
| NDDH | North Dakota Department of Health |
| NDGF | North Dakota Game and Fish Department |
| NDPDES | North Dakota Pollutant Discharge Elimination System |
| NDPR | North Dakota Parks and Recreation Department |
| NGLs | natural gas liquids |
| NHD | National Hydrography Dataset |
| NLCD | National Land Cover Database |
| OHWM | Ordinary High Water Mark |
| OSHA | Occupational Safety and Health Administration |
| PTC | Permit to Construct |
| PLOTS | Private Lands Open to Sportsmen |
| Project | LMGP IV |
| RMP | Risk Management Plan |
| RVP | Reid Vapor Pressure |

| | |
|---|---|
| SASR | Sakakawea Area Spill Response, LLC |
| SBPD | Standard Barrels per Day |
| SHPO | State Historic Preservation Office |
| SPCC | Spill Prevention, Control, and Countermeasures |
| SWPPP | Storm Water Pollution Prevention Plan |
| Targa | Targa Badlands, LLC |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |

# List of Exhibits (Tab 2)

Appendix A: Corporate Documents

Appendix B: Class I & III Archaeology Reports

Appendix C: SHPO Concurrence Letter

Appendix D: Biological Field Report

Appendix E: Agency Communication

Appendix F: Maps of Exclusion and Avoidance Areas

Appendix G: Construction Drawings and Best Management Practices

Appendix H: Risk Management Plan

Appendix I: Spill Prevention, Control, and Countermeasures Plan and Stormwater Pollution Prevention, Erosion Control Plan

Appendix J: State and County Permits, and Deeds

Appendix K: Black & White Map

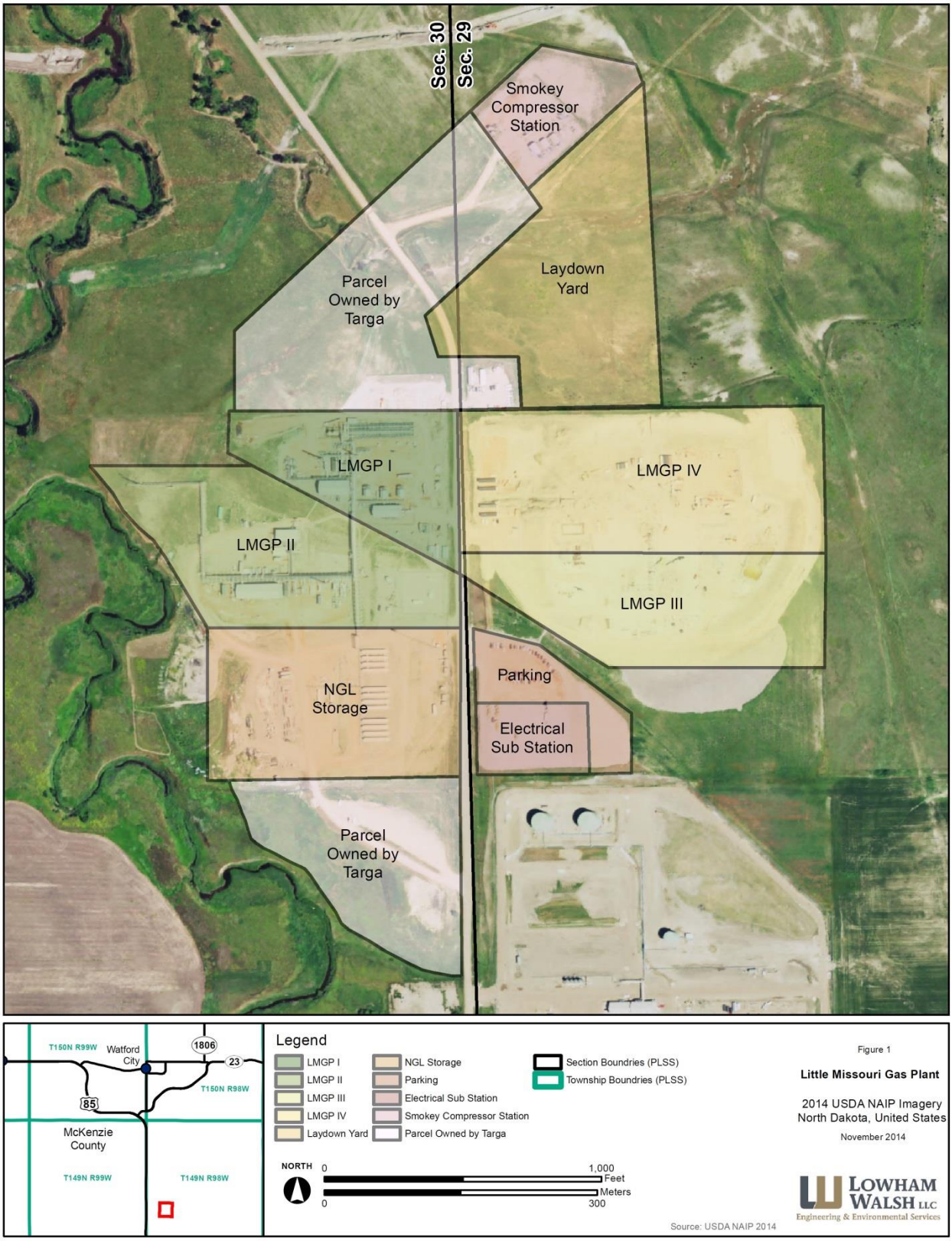
# 1.0 SIZE AND TYPE OF FACILITY

The Little Missouri Gas Plant (LMGP) is a gas processing facility originally built by Saddle Butte Pipeline, LLC (Saddle Butte). The original plant (LMGP I), constructed and operated by Saddle Butte, was designed to provide a gas processing capacity of 21 million standard cubic feet per day (MM SCFD), but was de-rated to 12MM SCFD. In December of 2012, Targa Badlands, LLC (Targa) acquired all Saddle Butte assets in North Dakota. Prior to the acquisition, Saddle Butte had initiated an expansion of the original plant to increase the total capacity to approximately 33MM SCFD through the addition of a 21MM SCFD processing plant (LMGP II). In 2013, Targa completed the construction of the 21MM SCFD LMGP II plant resulting in the combined plant capacity of 33MMSCFD. Targa initiated a second expansion (LMGP III) which is expected to be completed in January 2015. This expansion will add an additional plant capable of a processing capacity of 40MM SCFD, which will increase the combined total processing capacity to 73 MM SCFD. Finally, a third expansion (LMGP IV) with the capacity of processing 200MM SFCD is proposed which will increase net capacity of the facility to 273MM SCFD. This application for a site compatibility certificate includes the original plant purchased from Saddle Butte, as well as all expansions which will raise the net capacity of the plant to 273MM SCFD. A diagram depicting the layout of the plant with current and proposed expansions is shown in Figure 1.

The Facility includes LMGP I, II, III, IV, as well as a natural gas liquids (NGL) storage area, and a planned electric substation, hereinafter referred to as "Facility". The Project specifically refers to the LMGP IV expansion, which will include construction of the electrical substation (the "Project"). Figure 1 shows the locations of the existing components of the Facility as well as the Project. Properties owned by Targa adjacent to the existing Facility and the Project are also shown in Figure 1.

The "Smokey" compressor station is associated with the Facility. The station provides final compression to field gas prior to the gas entering the Facility. The parcel of land between Smokey and LMGP I is a short pipeline corridor for the inlets to the Facility. The parcel to the south of the NGL storage area is likewise owned by Targa, but no plans for this parcel have been developed at this time.

**Figure 1. General Location of the Facility**



# 2.0 DESCRIPTION OF THE FACILITY

The Facility will utilize two separate gas processing technologies based upon unit capacity. LMGP I and LMGP II utilize a mild refrigeration process to achieve dew point stability in the product. This will be followed by a stabilizer process and also a de-ethanizing process. This simple process provides both specification compliant gas and liquid products. Liquid products are currently stored in storage vessels and transported out of the facility by truck. Upon completion of a third-party pipeline connection, the liquid products will be transported from the facility by third-party pipeline.

LMGP III and LMGP IV will utilize a cryogenic process typically referred to as the Gas Subcooled Process (GSP). This process enables separation of the various components of the mixed gas entering the plant into products such as residue gas (natural gas sold as fuel to industrial and residential consumers) and Y-Grade natural gas liquids (NGLs, a mixture of ethane, propane, butanes, iso-butane mix, pentanes, and natural gasoline) which will be transported by a third-party pipeline to another facility for additional fractionation.

## 2.1 Design of the Proposed Facility

The Facility was originally planned to accommodate expansions as the gathering field production profile increased over time, and supply and commercial sale opportunities become available. At the present time, the facility is comprised of the original gas processing unit, LMGP I, and a first expansion, LMGP II, both of which are currently operating. A second expansion, LMGP III, is presently under construction, and is anticipated to be completed in January 2015. A third expansion, LMGP IV, is in planning stages. With the construction and operation of LMGP IV, the Facility will exceed the allowable "refinement of one hundred million cubic feet of gas per day," and a Certificate of Site Compatibility for an energy conversion facility must be sought. *See* N.D.C.C. § 49-22-03(5)(c).

The entire Facility will be comprised of four gas processing units. These will be LMGP I, LMGP II, LMGP III, and LMGP IV. The design of the Facility will accommodate the rich gas from the Bakken and Three Forks Formations. The Facility will utilize the varying technologies described above and in Section 2.5 based upon the size of the gas processing unit. Table 1 shows the various technologies utilized in each gas processing unit.

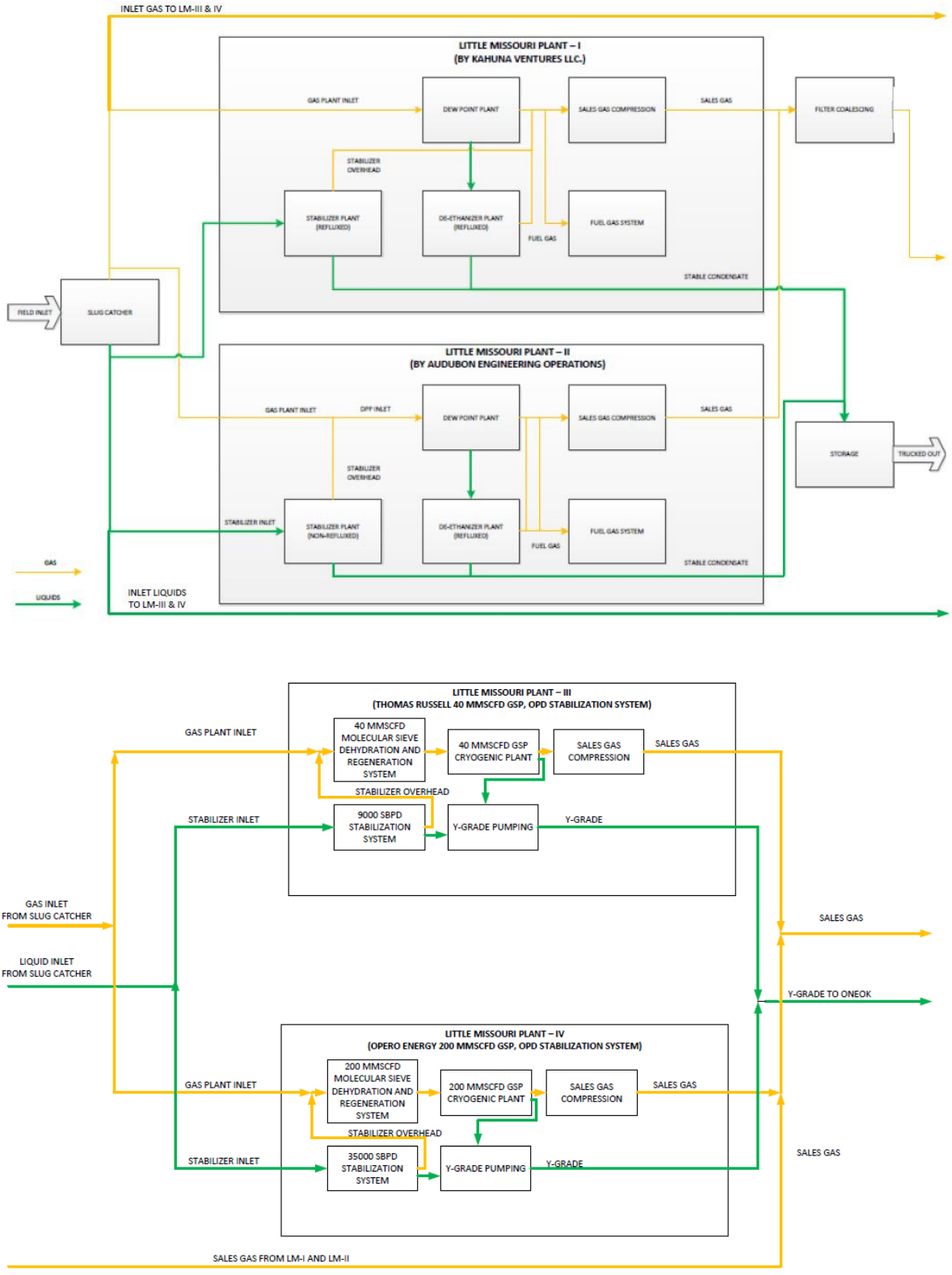
**Table 1. Listing of Technologies and Power Ratings for the Gas Processing Units**

| | LMGP I | LMGP II | LMGP III | LMGP IV |
|---|---|---|---|---|
| **Net Capacity** | 12MM SCFD | 21MM SCFD | 40MM SCFD | 200 MM SCFD |
| **Slug Catcher** | Shared | | Shared | |
| **Cryogenic GSP** | No | No | Yes | Yes |
| **Refrigeration (propane compression)** | Yes (1400 HP) | Yes (1500 HP) | Yes (800 HP) | Yes (6000 HP) |
| **Stabilizer** | 3000 SBPD (refluxed) | 8000 SBPD (non-refluxed) | 8000 SBPD (non-refluxed) | 35,000 SBPD (non-refluxed) |
| **Stabilizer overhead compression** | 557 HP (gas-fired) | 566 HP (gas-fired) | 700 HP (electric) | 2760 HP (gas fired) |
| **De-ethanizer Overhead Compression** | Included in Stabilizer | 292 HP (gas-fired) | None | None |
| **Residue Compression** | 840 HP (gas-fired) | 1680 HP (gas-fired) | 2760 HP (gas-fired) | 9248 HP (gas-fired) |
| **Hot Oil Heater** | 6.0MM BTU/hr | 2.47MM BTU/hr | 3.5MM BTU/hr | 16.7MM BTU/hr |
| **Regenerative Gas Heater** | None | None | 3.16MM BTU/hr | 6.39MM BTU/hr |
| **Waste Heat Recovery** | None | None | None | 2 x 17MM BTU/hr |
| **Flares** | 40MM SCFD (shared) | | 40MM SCFD | TBD |
| **Control Rooms** | Shared | | Shared | |

Key: MM BTU/hr = million British Thermal Units per hour
HP = Horsepower

A block flow-diagram for the facility, including all expansions is shown in Figure 2.

**Figure 2. Block-Flow Diagrams of the Little Missouri Gas Plant**



The Facility will have air emissions resulting from combustion of utility gas and operation of flares. The Facility will have no process water discharge.

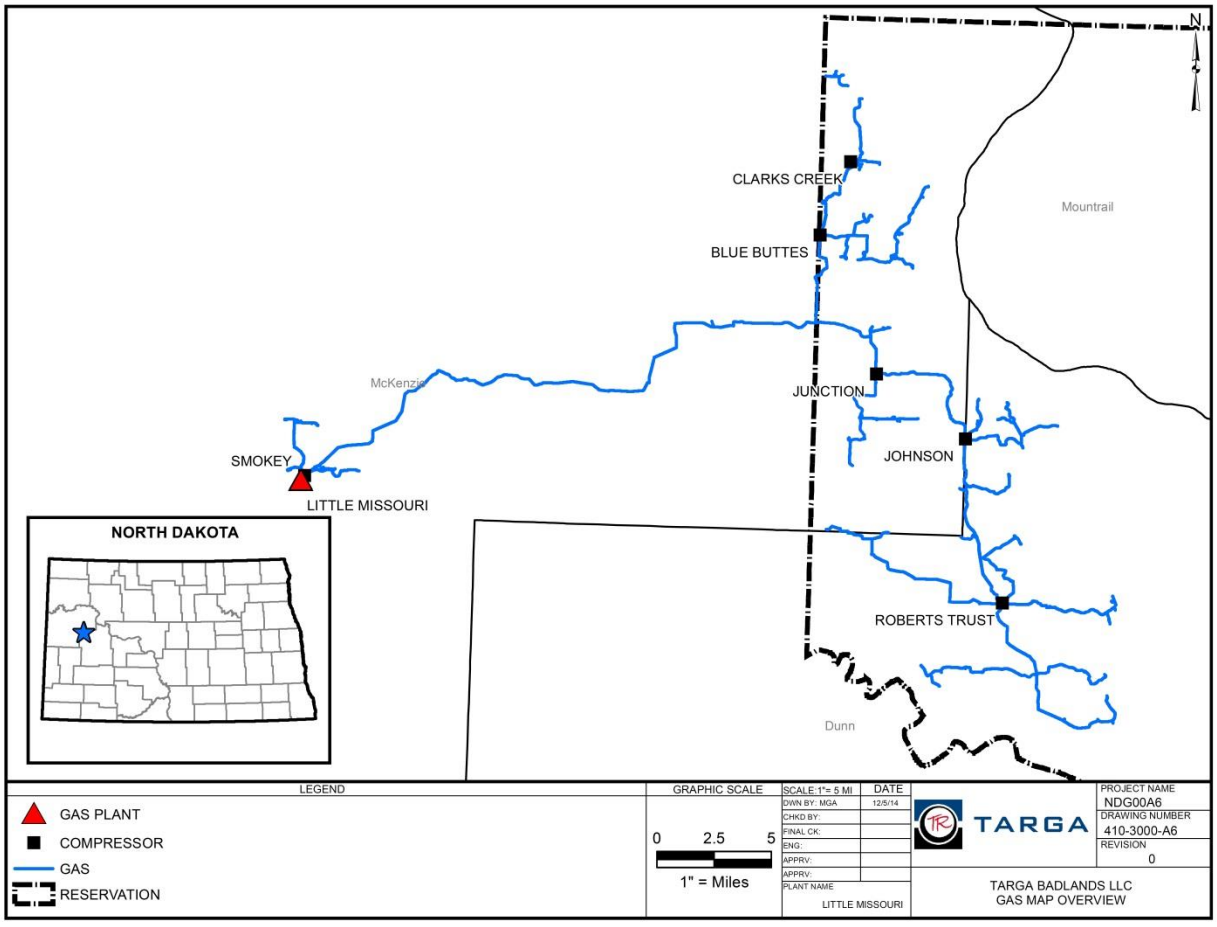
## 2.2 Purpose of the Proposed Facility

The purpose of the proposed Facility is to convert more than 303MM SCFD of wellhead gas to 273MM SCFD of saleable gas (residue gas) and NGLs. Residue gas will be transported to market via pipelines. NGLs will be transported to market via pipeline, truck, and rail.

## 2.3 General Area to be Served

Wellhead gas will be gathered from portions of McKenzie and Dunn Counties, including portions of the Fort Berthold Indian Reservation west of Lake Sakakawea. Wellhead gas will be transported via a gathering pipeline system to the Facility. A map of the gathering system is shown in Figure 3.

**Figure 3. Gathering System Map.**




Residue gas will be placed into the Northern Border Pipeline, which transects the Facility. Gas transported by the Northern Border Pipeline will serve industrial and residential consumers in the Midwestern United States.

NGLs from LMGP I and LMGP II are currently stored in storage vessels and transported from the Facility by truck. Beginning in 2015, NGLs will be placed into the Targa Lateral Pipeline, to be built, owned, and operated by ONEOK Rockies Midstream (hereinafter referred to as "Targa Lateral Pipeline"). The Targa Lateral Pipeline will transport the NGLs to facilities in the mid-continent and Gulf Coast regions for additional processing. Following processing, the resulting products will be distributed to various markets.

## 2.4 Gross and Net Capacity

After addition of LMGP IV, the gross capacity of the Facility will be more than 303MM SCFD. The net capacity of the plant will be 273MM SCFD of gas and 54,000 standard barrels per day of NGLs. Approximately 5.2MM SCFD of gas will be consumed on-site for utility purposes, including electrical power generation, powering gas compressors, and operation of the flares.

## 2.5 Technology to be Deployed/Employed

The gas processing technology currently utilized in LMGP I and LMGP II utilizes refrigeration methods. Gas to be processed in LMGP III and LMGP IV will utilize a cryogenic process referred to as the "Gas Subcooled Process". Both processes involve numerous steps.

The first process step involves of "slugs" of condensate that may arrive at the site with the field grade natural gas. The unit used to remove the slugs of condensate simply called the "slug catcher". Condensate captured in this unit will be moved to the stabilizer plant, the stabilized liquid then can be pumped the Targa Lateral Pipeline or moved to an onsite storage tank until it is transported off-site for sales.

The second process step involves compression of the gas. The increased pressure results in liquefaction of a portion of the NGLs. Separation of the gas and removal of the liquid phase occurs in the stabilizer towers.

The third process step involves the removal of moisture from the gas stream. This is achieved in a mole sieve unit, wherein two columns possessing mole sieve sorbent are utilized to scrub produced water from the gas stream. Only one column is in use at a time. While one column is removing produced water from the gas stream, the other column is undergoing "regeneration". After the second column is regenerated, and the first column is "saturated", the process stream is switched between the columns, and the saturated column begins the regeneration process.

The fourth process step involves separation of the remaining NGLs from the gas stream. This involves cooling the gas stream with cryogenic technology to a temperature whereby the NGLs fraction (beginning with ethane) is removed from the gas stream. Effective ethane removal is a key economic driver in the use of this technology.

Part of the cryogenic process involves effective heat transfer between outgoing and incoming gas streams. The outgoing residue gas is allowed to expand in volume, resulting in an isentropic expansion over a turboexpander. Simultaneously, incoming field gas is compressed, which increases the temperature of the gas stream. Exchange of heat between the two streams results in cooling of the incoming field gas and simultaneous warming of the outgoing residue gas. The heat exchange process provides thermal efficiency to the process. NGL product from the stabilizer tower and the cryogenic unit will be combined and ultimately placed into the Targa Lateral Pipeline which will then transport the NGLs product to the ONEOK Bakken NGL pipeline("ONEOK Pipeline"), which originates near Sidney, Montana. The

residue gas, gas which has been stripped of the vast majority of NGL components, will be placed into the Northern Border Pipeline.

A portion of the gas and NGL produced will fuel a flare. The flare is continuously available in event of a "plant upset", which is a sudden shutdown condition in the gas processing stream that requires diversion of the process gas away from a non-functioning unit. Rather than vent the heavier than air process gas to atmosphere, and risk a fire or explosion of the gas on plant site, the process gas will be safely combusted by the flare.

Various other plant features will support the gas processing units. These will include motor control center equipment and buildings, instrument air, drain systems, a control room, office and warehouse buildings, metering systems and buildings, truck loading systems, and site security systems.

## 2.6 Type of Product to be Transmitted

Primary products to be produced are residue gas and NGLs. Table 2 shows the projected volumes of products to be produced.

**Table 2: Total Product Volumes to be Produced**

| Product Name | Volume Produced |
|---|---|
| Residue Gas | 273MM SCFD |
| NGLs | 54,000 BPD |

## 2.7 Source of Product to be Transmitted

Wellhead gas will be gathered from portions of McKenzie and Dunn Counties, including portions of the Fort Berthold Indian Reservation west of Lake Sakakawea. Wellhead gas will be transported by gathering pipeline systems to the Facility.

## 2.8 Final Destination of Product

Residue gas will be placed into the Northern Border Pipeline, which transects the Facility. Gas transported by the Northern Border Pipeline will serve industrial and residential consumers in the Midwestern United States.

NGLs are currently stored in storage vessels and transported from the Facility by truck. Beginning in early 2015, NGLs will be placed into the Targa Lateral Pipeline. This pipeline will transport the NGL product to facilities in the mid-continent and Gulf Coast regions for additional processing. Following processing, the resulting products will be distributed to various markets.

## 2.9 Estimated Thermal Efficiency of the Process

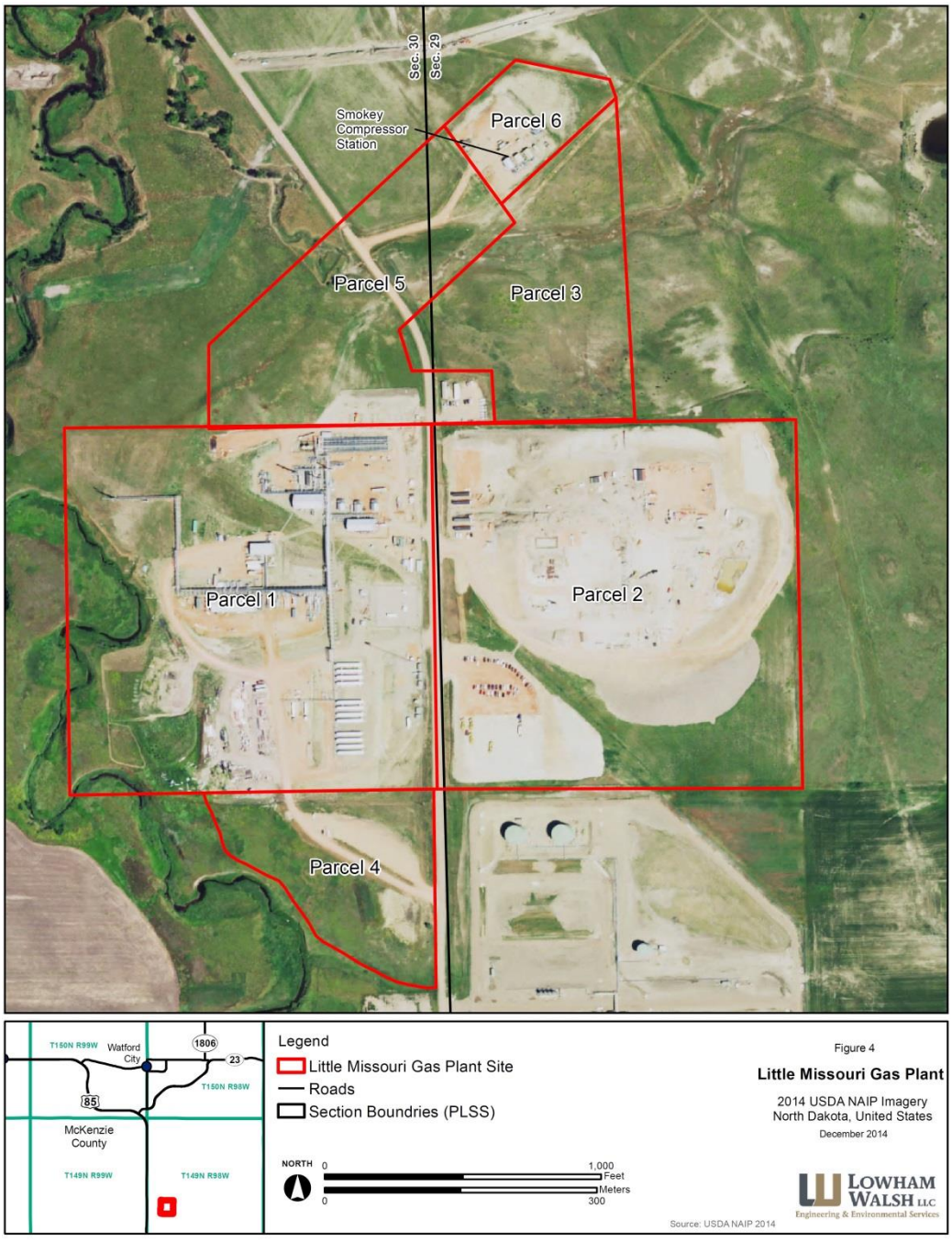
The estimated thermal efficiency of the process is 76%. This is calculated by dividing the total thermal value of products sold by the thermal value of the wellhead gas taken into the inlet of the plant. Since some fuel gas will be burned on site for utility purposes, the thermal value of the fuel gas is not included with the thermal value of the products.

## 2.10 Plans for Future Expansion

Future expansion may include addition of a Reid Vapor Pressure ("RVP") unit. This RVP unit may be positioned immediately to the south of LMGP III.

A laydown yard may be positioned immediately to the north of LMGP IV. The proposed location of the laydown yard is shown in Figure 4 as Parcel 3.

**Figure 4. Area for Future Expansion**



## 2.11 Requirement for and General Location of any new Associated Facilities

LMGP IV will be located on 40 acres within Section 29 of Township 149N, Range 98W. The facility is accessible via 125th Ave NW, east of Highway 85.

The proposed plant expansion site includes buildings and equipment for ongoing Targa operations. There is an existing pipeline easement and pipeline (Northern Border Pipeline) which transects the southern portion of the property (see Figure 5).

Potential future expansions of the Facility Area include a 13 acre tract of land to the north of the current Project area in Section 29 of Township 149N, Range 98W. It is unknown what types of expansion may be developed on this tract.

## 2.12 Estimated Total Cost of Construction

Targa acquired the LMGP I along with gas and crude petroleum gathering infrastructure and associated crude petroleum storage facilities from Saddle Butte for $950 million. It is difficult to place an exact value on only LMGP I due to the extensive nature of the asset acquisition.

The cost of the LMGP II expansion was $25 million. The estimated cost for LMGP III expansion is $72 million. The estimated cost for the LMGP IV expansion is $140 million.

**Table 3: Investment Costs for the Little Missouri Gas Plant Facility**

| Component Name | Investment Cost |
|---|---|
| LMGP I | Unknown |
| LMGP II | $25 million |
| LMGP III | $72 million |
| LMGP IV | $140 million |

## 2.13 Preferred Location of the Facility

The Facility is located at 1939 125th Avenue NW, Watford City, North Dakota. LMGP I was constructed by Saddle Butte on the southeast quarter of the southeast quarter of Section 30 of Township 149N - Range 98W. LMGP II was also constructed on the southeast quarter of the southeast quarter of Section 30 of Township 149N, Range 98W. LMGP III is being constructed on the southwest quarter of the southwest quarter of Section 29 of Township 149N, Range 98W.

The preferred location LMGP IV is the southwest quarter of the southwest quarter of Section 29 of Township 149N, Range 98W. This property is immediately across 125th Avenue NW from the original plant site and is the same property where LMGP III is located.

After construction is complete LMGP III and LMGP IV will occupy approximately forty acres of land in Section 29 of Township 149N, Range 98W.

**Table 4: Surface Structure Locations**

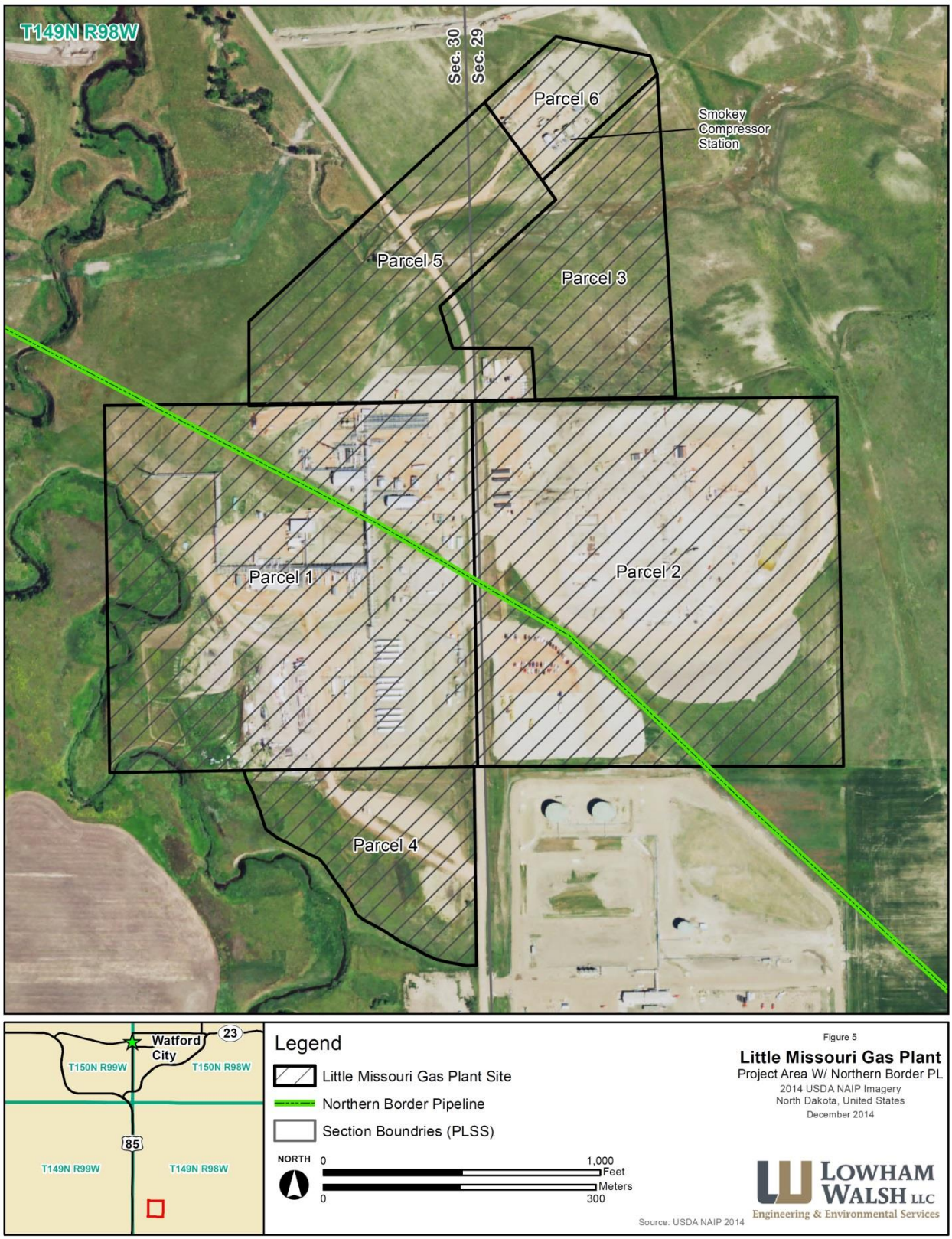
| Component Name | Location (Township-Range-Section) |
|---|---|
| LMGP I | T149N-R98W-S30-SE1/4-SE1/4 |
| LMGP II | T149N-R98W-S30-SE1/4-SE1/4 |
| LMGP III | T149N-R98W-S29-SW1/4-SW1/4 |
| LMGP IV | T149N-R98W-S29-SW1/4-SW1/4 |

A site location map is shown in Figure 4.

## 2.14 Merits and Detriments of the Preferred Location

The major merit of the Facility location is proximity and therefore access to the Northern Border Pipeline. Figure 5 shows the location of the pipeline in relation to the Facility. This co-siting of the Facility adjacent to the Northern Border Pipeline allows for direct supply of residue gas to the pipeline. Additionally, the location will soon have a connection to the Targa Lateral Pipeline for transportation of NGLs.

**Figure 5. Site Location Map with Northern Border Pipeline Route**



# 2.15 Description of Construction and Reclamation Procedures

## 2.15.1 Best Management Practices

Best Management Practices ("BMPs") are mitigation measures designed to provide for safe and efficient operations while minimizing undesirable impacts to the environment. Proper planning and consultation between the site owner and the construction contractors will typically result in a more efficient construction phase with reduced impacts to the environment.

### *2.15.1.1 General BMPs*

Targa will conduct environmental training for personnel on health, safety and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.

Emergency and spill response equipment will be kept available during construction. Targa has developed and implemented a Spill, Prevention, Control, and Countermeasure Plan ("SPCC") for the operating facility (Discussed further in Section 8.5).

Clearing of vegetation will be minimized to what is needed within the Project work area and in accordance with applicable federal, state, and local regulations. In addition, Targa will attempt to conduct initial vegetation clearing before the onset of the general bird breeding season for the region (April-July).

Vehicular travel will be restricted to areas within the Project boundary, including all areas within the construction, access, or maintenance easement(s).

Targa will prohibit or restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within 100 feet of wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.

Targa will identify, control, and minimize the spread of non-native invasive species and noxious weeds to the extent practicable.

Any herbicides used during construction, operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.

Waste generated during construction or maintenance, including solid waste, petroleum waste, and any potentially hazardous materials will be properly characterized and profiled for authorization to dispose at a permitted facility. Any potentially hazardous materials and chemicals will be transported, stored, and disposed of according to federal, state, or local regulations or permit requirements.

Targa will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies to the extent practicable. Targa will not place structures within the ordinary high water mark ("OHWM") of Waters of the United States. Targa will locate structures outside wetlands to the extent practicable.

Targa will establish streamside management zones within 10 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.

Targa will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, and large, contiguous tracts of native prairie). Impacts to these areas will be avoided and/or

minimized to the extent possible. Targa will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.

#### *2.15.1.2 Site Construction BMPs*

Construction procedures will conform to the approved permit to construct. In order to minimize surface disturbance, construction equipment appropriately sized to the scope and scale of the proposed operation will be used. All surface soil materials (topsoil) are to be removed from the entire cut and fill area and temporarily stockpiled for reuse during reclamation. The depth of topsoil to be removed and stockpiled should be determined during the onsite inspection.

Topsoil will be segregated and stored separately from subsurface materials to avoid mixing during construction, storage, and interim reclamation. Subsurface materials will not be placed on top of topsoil material at any point in the operation. Stockpiles will be located and protected so that wind and water erosion are minimized and reclamation potential is maximized.

Excavation of the cut and fill slopes is normally guided by information on the slope stakes. Fills will be compacted to minimize the chance of subsidence or slope failure. If excess cut material exists after fill areas have been brought to grade, the excess material will be stockpiled at approved locations. Snow and frozen soil material will not to be used in construction of fill areas, dikes, or berms.

Fill material placed below the high water mark will be free of any top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). All temporary fills will be removed upon completion of construction.

To reduce erosion and soil loss, it may be appropriate to divert storm water away from the Project location with ditches, berms, or waterbars above the cut construction site and to trap location runoff and sediments on or near the location through the use of sediment fences or berms, diversion dikes, erosion checks, riprap, mesh or burlap blankets or water retention ponds. Vegetation will be reestablished on disturbed areas upon construction completion. Targa Badlands will apply for a North Dakota Construction General Permit (NDR10-0000) which will cover storm water runoff during construction work on the site.

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. Contamination of surface waters will be prevented by following safe chemical handling and storage procedures. Stream bank and bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical or biological disruption. Herbicides or pesticides will not be used near these areas without consent of the North Dakota Department of Health ("NDDH").

Fragile or sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

Noise from construction activities will be minimized by ensuring that equipment used is equipped with the recommended muffler in good working order.

Since the proposed Facility may have the potential to be a source of emissions to the air capable of causing or contributing to air pollution, an Air Pollution Control Permit to Construct/Operate will be obtained from the NDDH Division of Air Quality.

#### *2.15.1.3 Access Construction BMPs*

Facility access excavation and fill construction will be performed to secure the greatest practicable degree of roadbed compaction and stability. Roadbed materials shall be placed parallel to the axis of the roadway in even, continuous, approximately horizontal layers. The full cross-section of the fill must be maintained as each successive layer is placed. The materials throughout the roadbed shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, gradation, or compaction from the surrounding material.

Stones larger than a 3-inch-square mesh opening will be buried at least 4 inches below the finished surface of the roadway. The operator will route construction equipment over the layers of roadbed material already in place and distribute the gravel evenly over the entire width of the embankment to obtain maximum compaction while placing the material and to avoid uneven compaction anywhere along the travel route. Excess excavation material will be used, where practical, to improve the road grade line or to flatten fill slopes. Other waste areas will be approved prior to placement of waste material.

Fill material placed below the high water mark will be free of any top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). All temporary fills will be removed upon completion of construction.

### 2.15.2 Construction

Targa will utilize a licensed North Dakota contractor for all construction work. Additionally, all structures and appurtenances will be constructed according to applicable Federal, State, and County codes.

#### *2.15.2.1 Site Access*

Access to the construction site will be achieved by utilizing the existing approaches and connecting to 125$^{th}$ Avenue NW.

#### *2.15.2.2 Surface Facilities*

The Project will include the construction of out buildings, gas processing units, and gas and water pipelines at the Facility location. All permanent structures, such as tanks, valves, valve cans, buildings, sheds, pipe racks, meters, etc., will be painted to match the surrounding landscape color, unless a different color is specified by the permitting authority. This will include all facilities except those required to comply with Occupational Safety and Health Act ("OSHA") regulations.

#### *2.15.2.3 Pipelines*

Prior to use, all newly constructed pipelines will be hydrostatically tested with water to locate any leaks occurring at 100 percent Maximum Allowable Work Pressure. Any leaks found during hydrotesting will be repaired. Discharge of water utilized for hydrostatic testing will be in accordance with the NDDH Water Discharge Permit (Permit ID: NDR103419).

#### *2.15.2.4 Water Supply*

Water will be provided only by approved and/or permitted sources. A non-potable water well will be drilled to supply the Facility with its water needs. The well will be permitted by McKenzie County and

will be classified as "domestic" by the State Water Commission. Project water requirements will not affect local availability. Annual water withdrawal from the proposed well will be less than 12.5 acre-feet per year. Additionally, water may be used for dust abatement. Water will be hauled by a licensed trucking company.

Potable water will be delivered to the site.

#### *2.15.2.5 Fugitive Dust*

All necessary measures will be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise regarding fugitive dust will be dealt with in a quick and efficient manner.

#### *2.15.2.6 Waste Disposal*

Any liquid or solid waste will be immediately removed and transported to an approved and permitted landfill disposal site. All spills will be reported to the appropriate North Dakota governmental authority.

Chemicals on the U.S. Environmental Protection Agency's ("EPA") Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986 may be used or stored in quantities over reportable quantities. Small quantities of retail products (paint, solvents, and lubrication oil) containing non-reportable volumes of hazardous substances may be stored and used on site. No extremely hazardous substances, as defined in Code of Federal Regulations ("CFR") Title 40 Part 355, will be used, produced, stored, transported, or disposed of under any of the alternatives.

Garbage, trash, and other waste materials will be collected in a portable, self-contained, fully-enclosed trash container during operations. Trash will not be burned on location. A portable toilet will be furnished and all human waste will be removed from the location and disposed of at an approved municipal sewage facility.

### 2.15.3 Reclamation

#### *2.15.3.1 Interim Reclamation*

Immediately upon completion of the Project, the location and surrounding areas will be cleared of all unused equipment, debris, materials, and trash. Any cut and fill slopes will be reseeded. A certified seed mixture will be applied by broadcasting over the topsoil and crimping the seed into the topsoil with a dozer or other tracked heavy equipment. Depending on the amount of slope on seeded areas, erosion blankets may be utilized. If initial seeding is unsuccessful, reseeding will take place during the next appropriate planting/growing season.

#### *2.15.3.2 Decommissioning of the Little Missouri Gas Plant and Final Reclamation*

At some time in the future, if decommissioning is required, NDDH guidelines and directives will be followed for final reclamation procedures. After facilities are removed and abandoned, the topsoil will be stripped and stockpiled off of the location, and the Facility site, pipelines, and access roads would be returned to their natural contours. The topsoil will be returned and properly graded, and the location seeded with appropriate perennial seed mix. Seed will be applied by broadcasting over the topsoil and crimping the seed into the topsoil with a dozer or other tracked heavy equipment. If initial seeding is not successful, reseeding would be required.

#### *2.15.3.3 Noxious and invasive Weeds*

Targa will control noxious and invasive weeds along all disturbed surface areas within the Project area by the use of mechanical and/or chemical treatments designed to best control weed species at a specific site. Disturbed surface areas may include: access roads, pipelines, or other applicable areas which are part of the plant site.

## 2.16 Statements Describing How Targa Acquires Land

### 2.16.1 Identification of Land to be Purchased

Targa acquired the North Dakota-based assets of Saddle Butte Pipeline, LLC in December 2012. The tract of land for LMGP I had previously been procured by Saddle Butte. Targa therefore did not have the opportunity to deal directly with the landowner during the land acquisition process. However, in subsequent land acquisitions, Targa followed the following procedure:

1. Identifies the proposed plant expansion size.
2. Determines from tax records the current owner of record for the property to be acquired.
3. After constructability is determined, makes contact with the landowner(s) to obtain their permission to survey.
4. Surveys the site and gathers data sufficient to prepare a legal description, prepare land plats, and develop layout sheets.
5. Selects environmental consultants and determines appropriate environmental surveys to be conducted.
6. Conducts needed environmental surveys (e.g., delineate wetlands, threatened and endangered species, cultural resources).
7. Performs title work to verify ownership and to identify any foreign lines.

### 2.16.2 Purchase of Land for Development

A land sale agreement form is prepared and the land plat with legal description is incorporated as part of the sale agreement, which is signed when all parties are in agreement. The Project moves to the construction phase only after the land has been procured. Targa considers the actual compensation provided to landowners as confidential information.

# 3.0 NEED

North Dakota gas production and flaring of unsold gas has attracted negative attention in past years. This negative attention has resulted in a number of actions. In late 2013, several groups of mineral owners filed numerous class action lawsuits seeking damages due to unpaid royalties resulting from flaring of unsold gas. In mid-2014, the North Dakota Industrial Commission approved policy aimed at reducing the amount of natural gas flaring from the Bakken and Three Forks Formations. The policy establishes oil production limits that will take effect if producers fail to meet requirements to capture natural gas at the well site. Previously, the Industrial Commission approved a six-step policy aimed at reducing flaring, which included the requirement of a Gas Capture Plan ("GCP"). Failure of the well operator to comply

with the GCP, as well as flaring reduction targets, could result in production restrictions recently implemented by the Industrial Commission. Additional gas processing capacity is needed in North Dakota in order for oil and gas producers to avoid flaring wellhead gas, or reducing production.

## 3.1 Need for the Facility

As part of the proposed and enacted regulation of gas flaring, North Dakota has established reduced flaring goals for the industry to meet. Key targets are linked to maximum allowed percent flaring by certain dates. Targets are no more than 26% of gas being flared by the end of the fourth quarter of 2014; no more than 23% of gas being flared by the end of the first quarter of 2015; and 10% with the potential for 5% of gas being flared by the fourth quarter of 2020.

Volumes of gas produced, sold, and flared in North Dakota for the third quarter months of 2014 are shown in Table 5 (NDIC, 2014). The calculated percentage of gas flared is provided for reference.

**Table 5: Monthly Volumes of Gas Produced, Sold, and Flared in North Dakota**

| Millions of Cubit Feet | July 2014 | August 2104 | September 2014 |
|---|---|---|---|
| Gas Produced | 40,119 | 41,703 | 42,103 |
| Gas Sold | 28,161 | 28,879 | 30,131 |
| Gas Flared | 10,822 | 11,482 | 10,420 |
| ***% Gas Flared*** | ***26.97%*** | ***27.53%*** | ***24.75%*** |

Further, flaring of gas on the Fort Berthold Indian Reservation is above the state average, with approximately 35% of wellhead gas being flared in August of 2014 (Scheid 2014). This is well above the State average, and indicates a need for gathering and processing of gas produced on the Fort Berthold Indian Reservation.

The proposed Project will ultimately process more than 303 MM SCFD, providing equivalent production of 273 MM SCFD plus 54,000 SBPD of NGLs to industrial and residential consumers.

## 3.2 Alternatives to the Proposed Facility

There are no reasonable alternatives to a full-scale gas processing plant facility. In certain instances, deployment of "LNG-in-a-box" skid systems may provide some relief from flaring of the full spectrum of wellhead gas components, but such systems require nearly continuous truck traffic to supply empty tube trailers and remove filled tube trailers.

Another alternative is the use of on-site power generation systems, which consume wellhead gas or separated components to provide power to remote pump jacks and supporting electric and electronic systems. However, these systems are not always applicable at every well pad. Further, only small amounts of gas are used in the utilization of these systems, making the only reasonable alternative a gas processing plant facility.

## 3.3 Alternative Methods for Serving Need

When viewed from a perspective for the need of additional gas processing capacity, at an estimated daily volume of 273 million standard cubic feet of gas, very few options are economically and technically viable in processing such large volumes. A full-scale gas plant is the only option which can readily

process a large volume of gas, remove valuable liquid components (NGLs), and provide a residue gas directly to a pipeline, all within economically viable boundaries.

# 4.0 SCHEDULE

## 4.1 Certificate of Site Compatibility

A Certificate of Site Compatibility is anticipated to be issued by the Commission on or before March 15, 2015.

## 4.2 Land acquisition

The expansion of LMGP III and LMGP IV will occur entirely within land owned by Targa and, as such, no additional land acquisition is required.

## 4.3 Construction Start Date

Targa will begin construction of LMGP IV upon receipt of necessary authorizations. Targa anticipates construction will commence on or before April 1, 2015.

## 4.4 Construction Completion Date

Targa anticipates construction to be completed by September 30, 2015.

## 4.5 Test Operations

Targa anticipates test operations will be completed by October 15, 2015.

## 4.6 Commencement of Commercial Production

Targa anticipates commencement of operations will begin by October 31, 2015.

## 4.7 Any Expansions or Additions

Targa is considering a possible addition of an RVP unit immediately to the south of LMGP III, as shown on Figure 4. Targa anticipates this addition could occur in 2016.

A schedule for the development of the Facility is presented in Table 6.

**Table 6: Permitting Schedule for The Little Missouri Gas Facility**

| Project | Start Construction | Complete Construction | Commissioning | Commencing Operations |
|---|---|---|---|---|
| LMGP I | | | | July 8, 2011 |
| LMGP II | | | | Sept. 10, 2013 |
| LMGP III | | | | Jan. 2015 |
| LMGP IV | April 1, 2015 | Sept. 30, 2015 | Oct. 15, 2015 | Oct. 31, 2015 |

# 5.0 POLICIES

## 5.1 Discussion of Utility's Policies and Commitments to Limit the Environmental Impact, Including Board Resolutions/Management Directives

### 5.1.1 Health and Safety

Targa's Environmental, Safety and Health Program focuses on protecting people, communities, and the environment. Targa is committed to protecting the health and safety of all employees, the people living in the communities in which Targa works, and everyone who uses Targa products. Wherever the company operates, Targa conducts business with respect and care for the environment and systematically manages risks to drive sustainable business growth. Targa's goal is to eliminate all injuries, occupational illnesses, unsafe practices, and incidents of environmental harm from all company activities.

At Targa, each employee is responsible for his or her own safety and as such, anyone may stop work at any time he or she believes a particular job or situation to be unsafe. As a result, employees are empowered to take the time to do a job right, so that everyone goes home safely each day to their families. Targa focuses on safety and health extends beyond company employees to all contract employees. To that point, Targa requires all contract employees to be ISN Networld-certified contractors and to comply with Targa's safety and health policies and procedures.

The OSHA Process Safety Management regulates Targa's gas plants and many of the company's storage terminals. Targa strives to design, operate, and audit its facilities according to industry standards and best management practices. Targa management is proud of the company's safety record, especially during these times when the industry segment is seeing rapid growth and expansion.

Targa employees live and work in the same community where the company's facilities are located. As such, it is the company's goal is to be a corporate neighbor of choice. This means being committed to the advancement of communities, encouraging environmental sustainability, and working hand-in-hand with Targa facilities' neighbors to address their concerns. Targa supports community initiatives and participates in, or provides support to, local fundraising events, festivals, charities, and school sports.

### 5.1.2 Environmental Management

Targa works to protect the environment—home to its employees and customers. Protection of the environment is an integral component of the way Targa conducts business. Environmental protection efforts span the life of each project, from planning through construction, restoration, and into full operation.

Environmental data collected to date include information on soils, land use, wetland and waterbody crossings, protected species, and cultural resources. Targa will continue to work with appropriate regulatory agencies and will continue to gather comprehensive information during the permitting process.

To support Targa's efforts in this area, the company has implemented a strong environmental management system that includes automated permit compliance tracking, systems development, compliance audits, and training. In addition, Targa actively works with federal and local agencies on new regulations, technology options, and benchmarking. For example, Targa is a member company of the EPA Natural Gas STAR Program, which is a voluntary partnership between the EPA and oil and natural gas companies to adopt cost effective technologies and practices to reduce emission of methane.

Because the Facility is a permanent, ongoing system, Targa has a continuing commitment to conduct its operations in an environmentally responsible manner. Substantial, continual effort is placed on mechanical integrity, operational safeguards, emergency response, and landowner relationships, all of which reduce the impact of the Facility on the environment. As needed, Targa supplements its internal environmental staff with engineering and environmental consultants to assure compliance with environmental regulations and applicable company policy.

## 5.2 Justification for Any Deviations from the Applicant's Most Recent Ten Year Plan

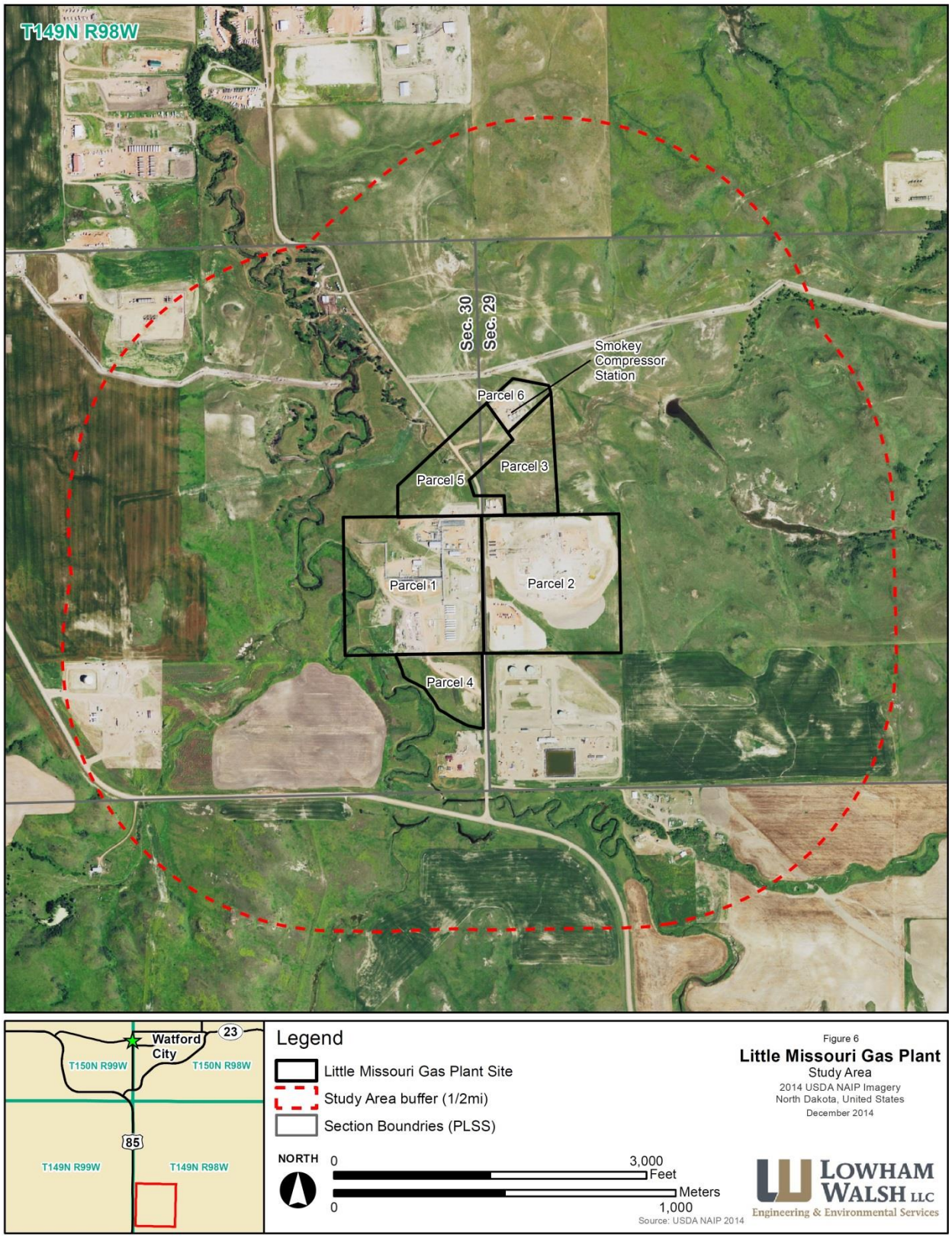
Targa submitted a Ten-Year Plan for 2014–2024 to the Commission in June 2014. The plan included the intent to construction an expansion of the Facility within the ensuing five years. Targa will submit a revised Ten-Year Plan in connection with this application reflecting current plans.

# 6.0 STUDIES

## 6.1 Study Area

The study area includes three parcels of land within the Facility Area (Figure 5) that have been or are being developed as a natural gas processing plant or where further expansion of the Facility is proposed. Parcels 1 and 2 are each 40 acres in size and are adjacent to one another, east to west. Parcel 3 is 13 acres in size, and is located immediately north of Parcel 2. In addition, the study area includes areas within ½ mile of these parcels for raptor nests only. Figure 6 depicts the study area and Facility features.

**Figure 6. Study Area surrounding the Facility Area.**



## 6.2 Site

The Site encompassing the three aforementioned land parcels, comprises a total of 93-acres (see Figure 4). A natural resource inventory was conducted on two separate days, October 23 and November 19, 2014. Resource inventories included a habitat analysis, wetland/waterbody delineations, and a wildlife inventory. Additionally, thorough desktop analyses were conducted for the study areas prior to conducting field surveys using available agency databases, including:

- National Wetlands Inventory Mapping;
- National Hydrography Dataset ("NHD") Mapping;
- U.S. Fish and Wildlife Service ("USFWS") Threatened and Endangered Species; and
- USFWS Critical Habitat analysis.

Field studies and agency consultations are summarized below

## 6.3 Environmental Analysis

### 6.3.1 Natural Resource Inventory

Targa retained Lowham Walsh to conduct a natural resource inventory of the Site. This inventory was conducted to study the presence of wetlands and waterbodies, in addition to threatened and endangered flora/fauna and to characterize the habitat(s) present within the Site. Field studies included a wetland and waterbody survey, a habitat assessment, and flora/fauna inventory. These surveys and inventories were conducted on two separate dates, October 23 and November 19, 2014. A copy of this report is provided in Appendix D.

The Site is classified as cultivated crops and herbaceous land cover according to the National Land Cover database (NLCD [U.S. Geological Survey ("USGS") 2014]).

#### *6.3.1.1 Botanical Inventory*

Based on NLCD, the sites are located within the cultivated crops and herbaceous land cover designations. The parcels of land have not been cultivated in past years. Spring Creek makes up the western boundary of Parcel 1, and pastureland occurs on the southeastern portion of Parcel 2, and all of Parcel 3. Parcel 1 is dominated by smooth brome (*Bromus inermis*), a non-native bunchgrass. Parcel 2 is dominated by several non-native species, including Russian thistle (*Salsola tragus*), sunflower (*Helianthus annuus*), and ragweed (*Ambrosia psilostachya*); although native species are also present, including blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), and needle-and-thread (*Hesperostipa comate*). Based on the Natural Resources Conservation Service all the plant species identified within parcel 1 and 2 are classified as facultative upland to obligate upland. Parcel 3 is dominated by non-native crested wheatgrass (*Agropyron cristatum*) in the upland areas of the site, while native alkali sacaton (*Sporobolus airoides*) and switchgrass (*Panicum virgatum*) are dominant species in the wet swale near the center of the site.

In addition to the aforementioned plant species identified within the Site, one state-designated noxious weed was observed in the Facility Area. Specifically, Canada thistle (*Cirsium arvense*), was identified in Parcel 1.

#### *6.3.1.2 Tree/Sapling/Shrub Inventory*

In general, the site lacks trees. However, shrubs were present within the riparian area along the eastern bank of Spring Creek in Parcel 1. Shrub species identified included snowberry (*Symphoricarpos* sp.) and Russian olive (*Elaeagnus angustifolia*). No trees or shrubs were identified within Parcels 2 and 3. The closest trees large enough to support nesting raptors are present 0.3 miles east of Parcel 2.

#### *6.3.1.3 Wetland and Waterbodies Inventory*

One wetland was recorded in the study area, of Parcel 3. Three waterbodies were recorded in the study area: one perennial stream and one ephemeral drainage within Parcel 1, and one intermittent stream within Parcel 3. These are mapped in Appendix D, "Targa Resources Little Missouri Gas Plant Expansion 2014 Field Report", in Appendix A of the report.

A single wetland was identified in the study area, within Parcel 3 (see Figure 4). The wetland covers approximately 1.83 acres, bisecting Parcel 3. The wetland is classified as a palustrine emergent wetland and is located within the USGS NHD-mapped tributary stream to Sand Creek. Dominant vegetation within the boundary of the wetland includes native sacaton and switchgrass. During the field investigation, standing water was noted in disconnected channel areas within the wetland, and the landform was a broad, bowl-shaped, gently sloping swale. This intermittent stream did not have a continuous bed and bank at this location.

A second waterbody, Spring Creek, was identified within the study area at the eastern edge of Parcel 1. The OHWM is approximately one foot deep and 10 feet wide, and the stream bed is comprised primarily of silts and clay. Spring Creek is mapped by the USGS NHD as a Level 5 stream. Water was observed in the streambed with flow to the northeast, indicating this stream is a perennial tributary of the Little Missouri River.

Finally, a single ephemeral drainage was identified flowing into Spring Creek. This drainage is located in the southwest corner of Parcel 1, flowing through pasture into Spring Creek. This ephemeral drainage lacked a defined OHWM and the channel was vegetated by dense pasture grasses.

#### *6.3.1.4 Wildlife Inventory*

Wildlife observed within the Site were sparse and few. Only two species of bird were identified within the site, grey partridge (*Perdix perdix*) and ring-neck pheasant (*Phasianus colchicus*). In general, the lack of wildlife species observed within the Site is indicative of the time of year at which the surveys were conducted. The survey was conducted during a period when birds are generally sparse and not singing; therefore, making them difficult to detect.

### 6.3.2 U.S. Fish and Wildlife Service

The USFWS administer a database of threatened and endangered species with potential presence by county throughout the United States. A review of threatened and endangered species for McKenzie County was conducted prior to the field visit (See Table 7). It is important to note that none of the species listed in Table 7 were identified by biologists during field visits to the Site.

#### *6.3.2.1 Federally Protected Species Review*

Under the authority of the Endangered Species Act ("ESA") of 1973, the USFWS assesses wildlife populations for viability throughout their current and historic ranges. Those species that have been characterized as threatened or endangered species as well as their critical habitats are managed by the USFWS under the authority of the ESA.

Lowham Walsh provided Targa with technical assistance regarding federally-protected species review. A review of USFWS published data identified the following listed species with the potential to occur within the Site.

**Table 7: Federally Endangered, Threatened, Proposed, and Candidate Species Known or Believed to Occur in McKenzie County, North Dakota**

| Common Name | Latin Name | Status |
|---|---|---|
| **Birds** | | |
| Whooping Crane | *Grus americana* | Endangered |
| Piping plover | *Charadrius melodus* | Threatened |
| Interior least tern | *Sterna antillarum* | Endangered |
| Red knot | *Calidris canutus rufa* | Threatened |
| Sprague's pipit | *Anthus spragueii* | Candidate |
| Bald and Golden Eagles | *Haliaeetus leucocephalus* and *Aquila chrysaetos* | None; protected under the BGEPA[1] |
| **Fish** | | |
| Pallid sturgeon | *Scaphirhynchus albus* | Endangered |
| **Invertebrates** | | |
| Dakota skipper | *Hesperia dacotae* | Threatened |
| **Mammals** | | |
| Black-footed ferret | *Mustela nigripes* | Endangered |
| Gray wolf | *Canis lupus* | Endangered |
| Northern Long-eared Bat | *Myotis septentrionalis* | Proposed Endangered |

Source: USFWS 2014

[1.] BGEPA: Bald and Golden Eagle Protection Act

The following subsections provide a brief description of each species, their habits, habitats, and their potential to occur within the Site, based on the habitats identified during the 2014 field surveys.

*Whooping Crane*

Whooping cranes are diurnal migrants that stop daily during spring and fall migration to forage and rest (Lewis 1995; Canadian Wildlife Service and USFWS 2007). They roost during the evenings in shallow water in wetlands, lakes, ponds, and riverine areas way from human activity (Lewis 1995). Whooping cranes leave their roost after daybreak to forage in a variety of croplands and emergent wetlands and generally wait until the air warms and provides thermal updrafts before continuing their migration (Lewis 1995). The October field survey may have overlapped with the tail end of the fall whooping crane migration to the south, and the November survey was not conducted after their migration would have moved through North Dakota (eBird 2014). However, there is limited suitable stopover habitat present at the Site. Additionally, the Site is in close proximity to anthropogenic influences (i.e., roads, agriculture,

and energy development). While the potential for whooping crane stopovers in the Site exists, it is doubtful that whooping cranes would directly utilize this habitat for even a short stopover due to the presence of human activity. This Facility is not likely to adversely affect Whooping cranes.

*Piping Plover*

The Northern Great Plains breeding population of piping plovers most commonly nests on alkali lakes, reservoirs, and rivers, and less commonly on freshwater lakes, dry alkali lakes, sandpits, industrial ponds, and gravel mines (Elliott-Smith and Haig 2004; Haig et al. 2005). Nesting habitats are typically more exposed and sparsely vegetated, as the species tends to prefer substrates with higher gravel content (Elliott-Smith and Haig 2004). The Site is not located in designated critical habitat (USFWS 2014c). Further, no suitable nesting habitat was observed during field surveys and it is highly unlikely that piping plovers would stopover or nest in the Site. This Facility is not likely to adversely affect the Piping plover.

*Interior Least Tern*

Interior least terns nest in colonies on bare or sparsely vegetated sand or dried mud along rivers, reservoirs, lakes, and salt flats (Thompson et al. 1997; Lott 2006; Tern & Plover Conservation Partnership 2014). They increasingly use human-modified nesting locations, such as sand/gravel pits, gravel rooftops, and industrial sites in proximity to water in areas where natural nesting habitat has been altered or removed (Sidle and Harrison 1990; Thompson et al. 1997). No suitable nesting and breeding habitat was observed within the Site. Although not observed during field surveys, least terns may use any aquatic habitat in the Site during post-breeding and fall migration, as the species has been observed in a variety of aquatic habitats throughout most of the United States during these periods (Thompson et al. 1997; Tern & Plover Conservation Partnership 2014). Given this information, the interior least tern is a possible, but unlikely, stopover migrant at wetlands and streams in or adjacent to the Site. This Facility is not likely to adversely affect the Interior least tern.

*Sprague's Pipit*

Sprague's pipits prefer well-drained areas of open, native grasslands (Robbins and Dale 1999). As such, the areas of native prairie documented in the Site may serve as potential nesting habitat for the species. No Sprague's pipits were observed; however, targeted surveys of the species during the breeding season were not conducted. Locally breeding individuals would have migrated out of the area by the time the surveys were conducted in late October and November. Sprague's pipit could potentially utilize the Site for foraging and/or nesting opportunities. This Facility is not likely to adversely affect the Sprague's pipit.

*Pallid Sturgeon*

Pallid sturgeon occur in the Missouri and Mississippi Rivers and some of their larger tributaries (USGS 2013). In North Dakota, their range is limited by damming, and the current range does not include McKenzie County. The Site is not likely to have any effect on pallid sturgeon as the Missouri River is not located within the Site nor is the species believed to be currently present in McKenzie County.

*Dakota Skipper*

Dakota skippers inhabit native prairie with high diversity of wildflowers and grasses (USFWS 2014d). No Dakota skippers were observed incidentally during October or November 2014 surveys, because adults emerge from pupae in June and July and generally live no longer than three weeks. Larvae build shelters underground and feed throughout the growing season, then become dormant in the fall. They overwinter in shelters at or just below ground level, usually in the base of native bunchgrasses. The pastureland habitat present in the Site most likely does not provide suitable habitat for the Dakota skipper as it is

dominated mostly by non-native, rhizomatous grasses and few flowering forbs. Designated critical habitat occurs in three locations in the vicinity of the Site, including two areas approximately 30 miles north of the Study Site near the Missouri River and one area approximately 25 miles east of the Study Area. Due to a lack of suitable habitat at the Site and the distance to the nearest designated critical habitat, the proposed Facility is not likely to have an impact on this species or the designated critical habitat.

*Black-footed Ferret*

While listed for the county by the USFWS, this particular black-footed ferret population is considered an experimental population, and therefore does not warrant any special protection under the ESA. Furthermore, the Site does not offer any habitat for this species. The Facility is likely to have no effect on the black-footed ferret.

*Gray Wolf*

The presence of gray wolves in North Dakota has been sporadic. Sightings of gray wolves have been documented, but biologists believe these animals are likely dispersing from packs located in Minnesota and Manitoba, Canada (USFWS 2013). The gray wolf's habitat is largely restricted to areas with low densities of human habitation and roads. In North Dakota, habitat most likely includes the forested areas in north-central and northeast North Dakota; however, they may appear anywhere in the state. Given the high density of roads and people near the Site, coupled with its distance from Manitoba and Minnesota, gray wolves are highly unlikely to occur in the Site. The Facility is likely to have no effect on the gray wolf.

*Northern Long-eared Bat*

Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances, constant temperatures, and high humidity with no air currents. During summer, they roost underneath bark, in cavities, or in crevices of both live and dead trees. They emerge at dusk to fly through the understory of forested hillsides and ridges and feed on insects, which they catch while in flight using echolocation. They breed in late summer or early fall when males begin swarming near hibernacula. After copulation, females store sperm during hibernation until spring, when they emerge and fertilize the egg. After fertilization, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup, which may occur from late-May to late-July (USFWS 2014e).

Northern long-eared bats are extremely susceptible to white-nose syndrome, which is named for the white fungus that appears on the muzzle and other parts of hibernating bats. This syndrome has a high mortality rate and has spread rapidly across the eastern and Midwestern United States since first being documented in New York in 2006-2007 (USFWS 2014f).

While the Northern Long-eared Bat is not presently listed under the Endangered Species Act, its status is currently under review by the USFWS for potential listing. The USFWS has recently proposed to list the Northern Long-eared Bat as endangered; however, the listing has not been finalized at this time. Due to a lack of suitable habitat at the Site, the proposed Facility is not likely to have an impact on this species.

*Rufa Red Knot*

Rufa red knots are shorebirds that make some of the longest distance migrations between wintering grounds in southern South America and breeding areas within the Canadian Arctic. Knots can fly thousands of miles without stopping and principally stopover in marine and estuarine habitats. They are

known to breed in the inland Arctic tundra where there is little vegetation and close access to the coast (USFWS 2011).

The rufa red knot was recently listed under the Endangered Species Act as threatened. No suitable habitat was observed and it is highly unlikely that knots would stopover or nest in the Site. The Facility is likely to have no effect on the northern Rufa red knot.

*Bald and Golden Eagles*

The Bald Eagle and Golden Eagle Protection Act provides for the protection of the Bald Eagle and the Golden Eagle. While the habitat in the area is not suitable for nesting, eagles are known to occur in the general area. The potential for Bald and Golden Eagle nesting in the Facility Area exists, but it is doubtful that eagles would utilize this habitat due to the presence of human activity. Therefore, the proposed Facility is likely to have no effect on these species.

#### *6.3.2.2 U.S. Fish and Wildlife Service Migratory Bird Treaty Consultation*

The Migratory Bird Treaty Act ("MBTA") (16 U.S.C. 760c-760g), as amended, implements protection of all native migratory game and non-game birds, with exceptions for the control of species that cause damage to agricultural or other interests. In total, 1,026 species are covered by the MBTA; however, non-native species (e.g., European starling [*Sturnus vulgaris*], house sparrow [*Passer domesticus*], and rock pigeon [*Columba livia*]) and most upland game birds (e.g., quail, grouse, and wild turkey) are not protected by the act. The MBTA prohibits the take of any migratory bird, part, nest, egg, or product. "Take," as defined in the MBTA, includes any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof by any means or in any manner. The MBTA does not explicitly include provisions for permits to authorize incidental take of migratory birds that result from an otherwise legal activity but is not the purpose of the activity.

The Site is comprised of relatively non-diverse habitat that undergoes regular anthropogenic impacts from nearby facilities. The Study Area is primarily comprised of pastureland and industrial lands; while industrial land is generally considered to not be suitable for nesting, pastureland is suitable for certain species of ground-nesting birds; therefore, suitable breeding habitat for certain migratory bird species is present. However, nesting would only be expected to occur within the Study Site during usual breeding season for North Dakota, and as such, impacts to breeding bird populations could be avoided via BMPs.

On November 19, 2014, Targa submitted a letter to the USFWS requesting assistance in identifying concerns or issues associated with Facility development. A representative sample of the letter sent to the USFWS is provided in Appendix E. At the time of this application, no response was received from the USFWS.

### 6.3.3 U.S. Fish and Wildlife Service Managed Lands

A review of public records was conducted to investigate the presence of USFWS-managed lands within the Site. Such sites include National Wildlife Refuges, Waterfowl Production Areas, and areas of unique habitats and/or features. No USFWS-managed lands were identified within the Site.

### 6.3.4 North Dakota Game and Fish Department

The North Dakota Game and Fish Department ("NDGF") is responsible for the protection, conservation, and enhancement of fish and wildlife and their associated habitats within North Dakota. As such, NDGF manages game species as well as specific lands, such as Private Land Open to Sportsmen (PLOTS).

Using publicly available records, no NDGF-managed lands (including PLOTS) were identified within the Study Area.

On November 19, 2014, Targa submitted a letter to NDGF requesting assistance in identifying concerns or issues associated with Facility development. A representative sample of the letter sent to the NDGF is provided in Appendix E. A response provided by NDGF is provided in Appendix E.

### 6.3.5 North Dakota Parks and Recreation Department

The North Dakota Parks and Recreation Department ("NDPR") is responsible for administering state parks and recreation areas deemed to have state-wide or regional significance (NDPR 2014). The Natural Resource Division of the NDPR is responsible for biological resources, such as rare species and communities. Additionally, the Natural Resource Division maintains a database of North Dakota's natural features and establishes priorities for their protection; the database is known as the Natural Heritage Inventory.

On November 19, 2014, Targa submitted a letter to NDPR requesting assistance in identifying concerns or issues associated with Facility development. A representative sample of the letter sent to NDPR is provided in Appendix E. A response provided by NDPR is provided in Appendix E.

### 6.3.6 North Dakota State Historic Preservation Office

The North Dakota State Historic Preservation Office (SHPO) is the office responsible for management of state historic and archaeological resources. A letter to the SHPO was sent on November 19, 2014, identifying the Site and requesting recommendations to satisfy applicable rules and regulations.

On November 24, 2014, the SHPO responded to Targa recommending that Targa conduct a Class III archaeological survey for all areas directly impacted by construction of the Project, including any access roads and staging areas.

Targa contracted Metcalf Archaeological Consultants to perform a Class III archaeological survey for the Site; however, weather conditions prevented archaeologists from performing surveys, as snow cover was present throughout much of the site, limiting visibility of the surface of the site. Until surveys are completed, the best available archaeological data comes from a study conducted in the Study Area between 1980 and 1982. During this study, flaking debris and tools were identified, including side-notched bifaces, which were hypothesized to be from the Early Plains Archaic period (Gregg and Root 1983). In total, 8 tool specimens were identified throughout the 1.75 hectare site. Additionally, seven shovel tests were conducted, all of which yielded negative results (Gregg and Root 1983). At the time of the study, the site was comprised of plowed fields and it was theorized that the surface artifacts discovered were likely a result of farming practices (e.g. tilling). Supporting information is provided in Appendix B. A letter of concurrence for the development of LMGP I is provided in Appendix B.

### 6.3.7 North Dakota Department of Health

The North Dakota Department of Health administers regulatory programs that monitor and enforce compliance with state and federal laws related to potential adverse impacts to air and water quality resulting from Project construction and operation. Presently, Targa is corresponding with NDDH during the permitting process with respect to potential construction impacts related to air emissions and water discharge.

On November 19, 2014, Targa submitted a letter to NDDH requesting assistance in identifying concerns or issues associated with the LMGP IV expansion, in addition to advisement on permits or conditions required for project compliance. A response was received by e-mail on November 21, 2014 stating that an Air Pollution Control Permit to Construct ("PTC") will be required prior to construction of the new gas processing plant. Copies of the NDDH correspondence are provided in Appendix E.

#### *6.3.7.1 NDDH Air Quality*

The NDDH, Division of Air Quality has issued the following North Dakota Air Pollution Control PTC authorizing construction of equipment at the Facility: PTC 10041 (September 28, 2010) (LMGP I); PTC 11032 (April 12, 2011) (LMGP I revisions); PTC 12013 (May 1, 2012; revised November 13, 2013) (LMGP II); PTC 14059 (October 23, 2014) (LMGP III). These permits establish emission limits and stack height requirements, and other conditions for existing emission units to ensure compliance with ambient air quality standards. Targa will soon apply to NDDH for a PTC to authorize construction of the LMGP IV expansion. Construction of the LMGP IV will comply with all permit requirements.

On September 10, 2014, Targa applied to NDDH for a Title V Permit to Operate for the Little Missouri Gas Plant. Targa will submit a permit revision to reflect the addition of LMGP IV in accordance with applicable NDDH and federal rules. NDDH has not yet issued the Permit to Operate. Targa is authorized to continue to operate under its PTCs until the NDDH issues a Permit to Operate.

#### *6.3.7.2 NDDH Pollutant Discharge Elimination System*

The North Dakota Pollutant Discharge Elimination System ("NDPDES") is the state regulatory program charged with regulation of water discharge. The following permit will be obtained from the NDDH for water discharge associated with construction and operation of the Facility.

*Construction Stormwater:*

As construction of the Project would require disturbance of greater than five acres, coverage under a general permit for construction will be required, specifically under NDR10-0000, *Authorization to Discharge Under the North Dakota Pollutant Discharge Elimination System*. A Master Stormwater Pollution Prevention Plan (SWPPP) has been prepared and will be adhered to for the duration of the Project. The purpose of the Master SWPPP is to identify potential sources of sediment or other pollution from construction activity and to ensure practices are implemented to control pollutants in stormwater from construction site runoff during construction and after completion.

# 7.0 CRITERIA

The following criteria, which include but are not limited to the criteria required by Section 69-06-08-01 of the North Dakota Administrative Code, were considered in evaluating the location of the Facility Site:

- Exclusion Areas
- Avoidance Areas
- Selection Criteria
- Policy Criteria
- Design and Construction Limitations
- Economic Considerations

Each criterion is discussed in detail, including descriptions, potential impacts, and mitigation measures where appropriate.

The Project area was selected after consideration of its impact on humans and the environment. Alternative options (see Sections 3.2 and 3.3) are not preferable and would typically result in more significant impacts. Development of the industrial site will result in permanent loss of slightly less than 100 acres of land providing habitat of one type or another. Operation of the plant is expected to result in minimal impacts to the local environment with respect to air and water quality.

The following is a general analysis of the existing human and natural environment near the Site and the impacts or potential impacts of right-of-way preparation, construction practices, and operation and maintenance procedures.

## 7.1 Exclusion Areas

As set forth in Section 69-06-08-01 (1) of the North Dakota Administrative Code, Exclusion Areas are geographical areas that must be excluded in the consideration of a site for an energy conversion facility. These areas are listed in Table 8.

Exclusion and Avoidance Areas located within McKenzie, Dunn, and Williams Counties are depicted on maps located in Appendix F. No Exclusion Areas are located within the Project area, or within 5 miles of the Facility Area. Areas such as the Theodore Roosevelt National Park and the Maah Daah Hey Trail are expansive in nature, so the distance from the Facility Area was determined utilizing the shortest distance from the exclusion area to the boundary of the Facility Area. For example, the distance from the Maah Daah Hey Trail to the site is the length measured from the northern trailhead.

Mapped locations may be found in Appendix F.

**Table 8: Exclusion Areas within or near the Facility Area**

| Feature | Location | Map ID | Closest Distance to Facility | Anticipated Effects |
|---|---|---|---|---|
| **Designated or Registered National: Parks, Memorial Parks, Historic Sites and Landmarks, Natural Landmarks, Historic Districts, Monuments, Wilderness Areas, Wildlife Areas, Wild, Scenic, or Recreational Rivers, Wildlife Refuges, and Grasslands** | | | | |
| **National Parks** | | | | |
| Theodore Roosevelt National Park – North Unit | T147N-R99W, T147N-R100W, T148N-R99W, T148N-R100W | 4 | 5.2 miles | None |
| **No National Memorials within 30 miles** | | | | |
| **National Historic Sites and Landmarks** | | | | |
| Fort Union National Historic Site | T152N-R104W-S07 | 3 | 41.6 miles | None |
| Old Sod Post Office (N.H.R. #80002919) | Grassy Butte | 5 | 20.6 miles | None |
| Fairview Lift Bridge (N.H.R. #97000239) | Cartwright | 6 | 34.4 miles | None |
| Sandstone School (N.H.R. #08000278) | Keene | 7 | 20.1 miles | None |
| **No National Natural Landmarks within 30 miles** | | | | |
| **No National Historic Districts within 30 miles** | | | | |
| **No National Monuments with 30 miles** | | | | |
| **No National Wilderness Areas within 30 miles** | | | | |
| **No National Wildlife Areas within 30 miles** | | | | |
| **No National Wild, Scenic, or Recreational Rivers** | | | | |
| **No National Wildlife Refuges within 30 miles** | | | | |
| **National Grasslands** | | | | |
| Little Missouri National Grasslands | T152N-R99W-S04 | 27 | 2.0 miles | |
| **Designated or Registered State: Parks, Forests, Forest Management Lands, Historic Sites, Monuments, Historical Markers, Archaeological Sites, Grasslands, Wild Scenic, or Recreational Rivers, Game Refuges, Game Management Areas, Management Areas, and Nature Preserves** | | | | |
| **State Parks** | | | | |
| Lewis & Clark | T154N-R98W-S25 | 11 | 29.7 miles | None |
| Tobacco Gardens | T153N-R97W-S01 | 12 | 28.2 miles | None |
| **No State Forests within 30 miles** | | | | |
| **No State Forest Management Lands within 30 miles** | | | | |
| **State Historic Sites** | | | | |
| Fort Bufford State Historic Site | T152N-R104W-S16 | 9 | 39.6 miles | None |
| Missouri-Yellowstone Confluence Interpretative Center | T152N-R104W-S15 | 10 | 39.1 miles | None |
| **No State Monuments within 30 miles** | | | | |
| **No State Monuments within 30 miles** | | | | |
| **No Historical Markers in McKenzie County** | | | | |
| **No Eligible Archaeological Sites within Area of Potential Effects** | | | | |
| **No State Grasslands within 30 miles** | | | | |
| **Wild, Scenic or Recreational Rivers** | | | | |
| Little Missouri River | T148N-R99W-S32 | 25 | 7 miles | None |
| **No State Game Refuges within 30 miles** | | | | |
| **State Game Management Areas within 30 miles** | | | | |
| Antelope Creek WMA | T153N-R94W-S14 | 29 | 35.5 miles | None |
| Big Oxbow WMA | T152N-R104W-S27 | 32 | 37.4 miles | None |
| Lewis & Clark WMA | T153N-R100W-S06 | 30 | 31.8 miles | None |
| Neus Point WMA | T152N-R104W-S23 | 34 | 36.9 miles | None |
| Ochs Point WMA | T152N-R104W-S35 | 35 | 36.8 miles | None |
| Overlook WMA | T152N-R103W-S30 | 33 | 34.8 miles | None |
| Sullivan WMA | T152N-R104W-S35 | 36 | 36.6 miles | None |
| Tobacco Gardens WMA | T153N-R97W-S11 | 31 | 27.4 miles | None |
| Killdeer Mountains WMA | T148N-R95W-S16 | 39 | 21.5 miles | None |
| Killdeer Mountains WMA | T146N-R97W-S06 | 38 | 15.5 miles | None |

**Table 8: Exclusion Areas within or near the Facility Area**

| Feature | Location | Map ID | Closest Distance to Facility | Anticipated Effects |
|---|---|---|---|---|
| State PLOTS Lands | T149N-R99W-S10 | 43 | 4.2 miles | None |
| | T149N-R99W-S11 | 44 | 3.4 miles | None |
| | T149N-R99W-S14 | 46 | 2.7 miles | None |
| | T149N-R99W-S15 | 45 | 3.1 miles | None |
| | T149N-R99W-S23 | 47 | 2.2 miles | None |
| **No State Management Areas within 30 miles** | | | | |
| **No State Nature Preserves within 30 miles** | | | | |
| **No State Recreation Areas within 30 miles** | | | | |
| **County Parks and Recreational Areas, Municipal Parks or Parks Owned Or Administered By Other Government Subdivisions, Hardwood Draws, and Enrolled Woodlands** | | | | |
| **Parks and Museums** | | | | |
| Lewis & Clark Trail Museum | Alexander | 22 | 20.3 miles | None |
| Long-X Trading Post Visitor Center | Watford City | 20 | 7.2 miles | None |
| McKenzie County Heritage Park | Watford City | 19 | 7.3 miles | None |
| Nature Park | Watford City | 17 | 6.8 miles | None |
| Pioneer Museum of McKenzie County | Watford City | 21 | 7.2 miles | None |
| Three Affiliated Tribes Museum | Four Bears Village | 23 | 37.3 miles | None |
| Tourist Park Campground | Watford City | 16 | 7.3 miles | None |
| Veteran's Memorial Park | Watford City | 15 | 7.3 miles | None |
| Wild West Water Park | Watford City | 13 | 7.0 miles | None |
| **Recreation Areas** | | | | |
| Children's Playground | Watford City | 18 | 7.2 miles | None |
| Crow Flies High | T152N-R93W-S14 | 37 | 38.5 miles | None |
| Maah Daah Hey Trail (U.S.F.S.) | T147N-R99W-S03 | 1 & 2 | 7.3 miles | None |
| **Memorial Parks** | | | | |
| Four Bears Memorial Park | Four Bears Village | 8 | 37 miles | None |
| **Memorials** | | | | |
| Veteran's Memorial Building | Watford City | 14 | 7.4 miles | None |
| Walter Chaloner Memorial | Near Entrance to Theodore Roosevelt National Park – North Unit | 24 | 6.5 miles | None |
| **No Administered Hardwood Draws within 30 miles** | | | | |
| **No Enrolled Woodlands within 30 miles** | | | | |
| **No Prime Farmland and Unique Farmland in the Facility Area** | | | | |
| **No Irrigated Land in the Facility Area** | | | | |
| **Areas Critical to the Life Stages of Threatened or Endangered Animal or Plant Species** | | | | |
| Dakota Skipper Critical Habitat Units | | | | |
| Unit 10 | T149N-R94W-S28 | 40 | 24.6 miles | None |
| Unit 11 | T153N-R95W-S13 | 41 | 32.2 miles | None |
| Unit 12 | T153N-R96W-S12 | 42 | 29.5 miles | None |
| | | | | |
| **Areas Where Animal or Plant Species that are Unique or Rare to this State Would be Irreversibly Damaged** | | | | |
| None | | | | |
| **Areas within 1,200 Feet of the Geographic Center of an ICBM Launch or Launch Control Center** | | | | |
| None | | | | |

Key: N.H.R. = National Historic Registry
WMA = Wildlife Management Area
PLOTS = Private Land Open to Sportsmen
U.S.F.S. = U.S. Forest Service
ICBM = Intercontinental ballistic missile

## 7.2 Avoidance Areas

Avoidance Areas, as set forth in Section 69-06-08-01(3) of the North Dakota Administrative Code, are areas that may not be approved as a site for an energy conversion facility unless it is shown by the applicant that under the circumstances there is no reasonable alternative. Avoidance Areas were identified within the study area (see Table 9).

Two cultural resources were found to be in the Facility Area. The first is classified as a material scatter (32MZ474, Root & Gregg, 1983). Previously, the Northern Border Pipeline traversed a portion of this cultural resource site. The second is an artifact scatter (MZ32x959, Bielakowski, 2010). Both sites have been recommended as *not eligible* for the National Register of Historic Places, and no avoidance was recommended. Further discussion of these sites is provided in Appendix B.

The next closest avoidance area is the Little Missouri National Grasslands, the closest parcel of which is 2.2 miles from the Facility Area.

**Table 9: Avoidance Areas within the Study Corridor**

| Feature | Location | Map ID | Closest Distance to Facility | Anticipated Effects |
|---|---|---|---|---|
| **Historical resources which are not designated as exclusion areas** | | | | |
| 32MZ474 | T149N-R98W-S29 | | Facility Area | Significant |
| 32MZx959 | T149N-R98W-S30 | | Facility Area | Significant |
| **No Areas within the city limits of a city or the boundaries of a military installation** | | | | |
| **Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood** | | | | |
| Floodplain of Spring Creek is not mapped | | | | |
| **No Areas which are geologically unstable** | | | | |
| **Woodlands and Wetlands** | | | | |
| Wetlands | Portions of Parcel 3 | | 0 miles | None |
| **Areas of recreational significance which are not designated as exclusion areas** | | | | |
| Lake Sakakawea | T153N-R94W-S08 | 28 | 22 miles | None |
| Little Missouri National Grasslands | T148N-R99W-S04 | 26 | 2.2 miles | None |
| Tobacco Gardens | T153N-R97W-S11 | 12 | 27.4 miles | None |

The wetland area listed in Table 9 is mapped in the Field Report provided in Appendix D. The map is available in Appendix A of the Field Report.

## 7.3 Discussion of Selection Criteria

### 7.3.1 Agriculture

#### *7.3.1.1 Agricultural Production*

Within the Facility Area are approximately 61 acres of tillable agriculture land that will be removed from agricultural production (USGS NLCD 2014). This area represents the minimum amount of surface area necessary to develop the gas processing capacity with current design specifications while maintaining minimum spacing requirements for the equipment, and installation of necessary peripheral equipment such as a flare, power substation, roads, and continually occupied office building.

While the Facility is sited in large part on agricultural lands, it will be in an area that does not contain high-value farmland and is located adjacent to existing facilities. None of the Facility Area is considered

Prime Farmland or Irrigated Land. However, approximately 10 acres are considered Farmland of Statewide Importance (Natural Resources Conservation Service 2014).

Construction and reclamation activities have the potential to introduce noxious weeds and invasive species in agricultural areas. Targa will implement mitigation measures (Section 2.15) to avoid the infestation of noxious weeds on reclaimed farmland.

Noxious weeds can be a threat to agricultural productivity. Established populations of noxious weeds will out-compete desirable forbs and grasses in pastures, fields, and native grasslands, potentially impacting agricultural production and livestock forage. Species considered noxious weeds under North Dakota state law for the State and for McKenzie County are provided in Tables 9 and 10. For more information on noxious weeds in the Facility Area, refer to the November 2014 field report (Section 3.1.2, "Noxious Weeds") in Appendix D.

**Table 10: Listed Noxious Weeds – North Dakota**

| Common Name | *Scientific Name* |
|---|---|
| Absinth wormwood | *Artemisia absinthium* |
| Canada thistle | *Cirsium arvense* |
| Diffuse knapweed | *Centaurea diffusa* |
| Leafy spurge | *Euphorbia esula* |
| Musk thistle | *Carduus nutans* |
| Purple loosestrife | *Lythrum salicaria* |
| Russian knapweed | *Acroptilon repens* |
| Spotted knapweed | *Centaurea maculosa* |
| Yellow toadflax | *Linaria vulgaris* |
| Dalmatian toadflax | *Linaria genistifolia* |
| Saltcedar | *Tamarix chinensis, T. parviflora, T. ramosissima* |

**Table 11: Listed Noxious Weeds – McKenzie County, North Dakota**

| Common Name | Scientific Name |
|---|---|
| Black henbane | *Hyoscyamus niger* |
| Houndstongue | *Cynoglossum officinale* |
| Common burdock | *Arctium minus* |
| Halogeton | *Halogeton glomeratus* |
| Baby's breath | *Gypsophila paniculata* |

#### *7.3.1.2 Family Farms and Ranches*

Approximately 61 acres of agricultural land are within the Facility Area (Natural Resources Conservation Service 2014). This property has been or is being acquired through sale agreements negotiated by Targa and the landowners. This land will be converted from agricultural to industrial use.

The impact to family farms and ranches outside of the study area will be minimal. However, construction activities can cause short-term disruption of livestock operations and can inconvenience farm activities. Targa will work with local landowners to minimize construction interference. Temporary fences and gates will be constructed if necessary to prevent livestock from entering into the construction zone.

#### *7.3.1.3 Land Economically Suitable for Irrigation as Demonstrated by Landowner (Soil, Topography, Drainage, and Available Water Supply)*

Construction of the LMGP IV will not impact irrigated lands. There are no Irrigated Lands within the study area (Natural Resources Conservation Service 2014). Above-ground irrigation systems have not been identified in the study area. In addition, the rolling topography of the study area is not well suited for irrigation.

#### *7.3.1.4 Surface Drainage Patterns (Impact on Agriculture)*

Surface water drainage in the study area is well developed with one perennial stream, one intermittent stream, and one drainage ditch flowing towards the northwest. Spring Creek borders the western boundary of the Facility Area. Spring Creek is a level 5 perennial tributary to the Missouri River and is mapped as a perennial stream on the USGS NHD map (USGS 2014), on aerial imagery from Google Earth (2014), and on the Tepee Butte 7.5 minute quadrangle (1997). A tributary of Spring Creek, mapped as a level 6 intermittent tributary to the Missouri River passes through the northern portion of the study area.

Construction of the Project will not permanently alter surface drainage patterns. However, surface drainage patterns may be temporarily impacted during construction. Mitigation measures will be followed to minimize these temporary impacts. These mitigation measures are discussed in Section 8. Targa will also work with local landowners to minimize construction interference.

#### *7.3.1.5 Groundwater Flow Patterns (Impact on Agriculture)*

Groundwater within the Facility Area is available in the Tongue River aquifer system (USGS 1985). The aquifer system ranges in depth from 140 to 500 feet below ground surface and consists of Lower Tertiary age, inter-bedded, sands, silts, mudstones, carbonaceous shales, and lignites of the Fort Union Formation (Carlson 1985). Recharge to the Tongue River aquifer system is from precipitation and seepage from lakes and streams. Discharge occurs to the north outside of McKenzie County. The groundwater typically has a yellowish brown color. Well yields are typically around 25 gallons per minute. The Tongue River aquifer system is suitable for domestic and livestock uses, but not for irrigation or municipal uses.

The local groundwater use is utilized for domestic and livestock use. Groundwater is virtually the sole source of water for domestic use by rural residents and residents of small communities with no public distribution system.

Due to the shallow depth of construction activities (average depth of 5 feet, maximum depth of 8 feet) and the relatively deep location of the area's aquifers, installation of the Project will not have a significant effect on regional groundwater flow patterns or agriculture.

#### *7.3.1.6 Agricultural Quality of Cropland*

Land acquired for the Facility will be permanently removed from agricultural production. No other impact to agricultural land is anticipated.

### 7.3.2 Local Public Service Availability and Adequacy

Due to the nature of the Project as an expansion of the existing facility, no overall effect to the availability and adequacy of the local public services including law enforcement, fire department and health care services is anticipated as a result of the expansion. Public services are currently provided by the nearby town of Watford City, North Dakota.

Temporary impacts to transportation facilities and networks and retail services may be anticipated during the construction period. The construction period is anticipated to occur over 4 – 6 months with an influx of approximately 160 individual laborers, skilled trades, technicians, engineers and environmental professionals to support construction. These resource areas may experience a short-term increased demand on services during the construction period.

Targa will continue to coordinate with local health care providers and emergency responders providing services to the existing facility in advance of construction to ensure awareness and training for emergency response coordination.

### 7.3.3 Impacts Overview (*impacts upon:*)

#### *7.3.3.1 Local Institutions*

Due to its proximity to the Facility, Watford City, North Dakota may see the greatest impact from the Facility. These impacts from Project construction will be temporary, as the majority of the construction will be completed by October 2015. Construction of LMGP IV will require approximately 160 full time employees. After LMGP IV is operational, Targa anticipates that it will need to employ approximately 3 additional full time employees to operate the Facility. Plant operations will engage local businesses and contractors to support the Facility. Generally, the impacts will be beneficial to the local economy due to the addition of revenues from outside of the community being spent on goods and services locally.

The beneficial impacts of the additional permanent workforce required to operate the Facility will have long term benefits on the economy that are anticipated to be greater than the demands placed upon the institutions.

#### *7.3.3.2 Noise-Sensitive Land Uses*

There are no noise-sensitive resources located within 500 feet of the Site. The Facility has been sited approximately 7 miles south of Watford City in a rural setting, effectively isolating the Facility from the majority of sensitive receptors. Local residents may experience additional motor vehicle volumes on area roadways, but the noise associated with vehicles will be similar to existing background levels and occur largely during normal business hours.

#### *7.3.3.3 Rural residences and Businesses*

The Facility is located approximately 7 miles from Watford City. Residents may experience additional traffic congestion and an increase in commerce in response to the influx of temporary workers purchasing goods and services. The Plant will likely benefit the local economy for the near future and long term.

#### *7.3.3.4 Aquifers*

Groundwater within the study area is available in the Tongue River aquifer system (USGS 1985). The aquifer system ranges in depth from 140 to 500 feet below ground surface and consists of Lower Tertiary age, inter-bedded, sands, silts, mudstones, carbonaceous shales, and lignites of the Fort Union Formation (Carlson 1985). Recharge to the Tongue River aquifer system is from precipitation and seepage from lakes and streams. Discharge occurs to the north outside of McKenzie County. The groundwater typically has a yellowish brown color. Well yields are typically around 25 gallons per minute. The Tongue River aquifer system is suitable for domestic and livestock uses, but not for irrigation or municipal uses.

The local groundwater is utilized for domestic and livestock use. Groundwater is virtually the sole source of water for domestic use by rural residents and residents of small communities with no public distribution system.

Water demands during and after construction are anticipated to be minimal and will not affect local availability. Water will be provided by approved and/or permitted existing sources. In addition, one county permitted domestic groundwater well will be installed as part of the Project. Targa expects the permitting process associated with siting the well will ensure that the resource will be sufficient to support the anticipated demand without impacting other current or anticipated beneficial use of the resource.

#### *7.3.3.5 Human Health and Safety*

Targa is committed to providing a safe and healthy workplace during construction and operations of all its facilities. Targa enforces a corporate health and safety policy that meets or exceeds federal and state laws, rules and regulations that is adhered to by all employees and contractors. Targa oversees all construction, operations, and activities, and implements safe work procedures and best management practices designed to protect personnel and property and maintain regulatory compliance.

#### *7.3.3.6 Animal Health and Safety*

Construction and operation of LMGP IV will have only a small potential to result in direct and indirect impacts on wildlife. Desktop analysis and field studies, indicated that no federally listed endangered, threatened, or candidate species are likely to occur on or near the Facility Area (see Section 6). There is a small potential for Sprague's pipit to be present in nearby areas outside of the Facility Area, but even these habitats are considered low quality for this species. However, a portion of the LMGP IV site and undeveloped areas adjacent to all portions of the Facility may provide habitat for other more common wildlife, including mammals, amphibians, migratory birds, and fish in Spring Creek.

The Facility Area is characterized primarily by previously active agricultural lands. An existing paved road bisects the Facility Area (north-south). Based on a review of historical aerial imagery, LMGP I and LMGP II sites and the Tank Storage site (see Figure 1) were all actively farmed prior to 2011. The LMGP III site was mostly actively farmed until 2013 (northeast corner was previous a pasture with a mix of native and non-native grasses), and the entire LMGP IV site was farmed until 2013. Approximately one-third of the LMGP IV site has already been cleared and graded (as part of the LMGP III construction), and it is bound by an un-related industrial facility to the south, a parking lot to the west, the LMGP III site to the north, and conservation reserve program type grassland to the east. Although the Facility parcels extend west of the perennial Spring Creek on the western portion of the Facility, all Facility-related ground disturbance or placement of facilities was halted 40 feet east of this water feature. Little natural habitat for wildlife was present in the Facility Area prior to construction of the various Project components, although agricultural fields likely provided foraging habitat for some species. In the

Facility Areas that are proposed for further development, the remaining fallow agricultural field in the LMGP IV site may at best provide grazing habitat for large mammals, or marginal, low-quality nesting habitat for some ground-nesting bird species. However, the areas immediately to the east, north, west, and southwest of the Facility Area all contain grassland prairie and wetland/stream habitats that can support native wildlife (see Figure 1).

Potential Direct Impacts

There is a low probability that collisions with construction equipment or vehicles could occur during construction, resulting in direct mortality of or injury to wildlife within the Facility boundary or on Facility access roads. If construction occurs during the general migratory bird breeding season for the region (March-July), active nests could be disturbed or abandoned, resulting in the loss of eggs or chicks. Spills of hazardous materials (diesel, hydraulic fluid, oil) or incorrect use of herbicides during noxious weed control could result in mortality of or injury to less mobile species, especially any fish or amphibians that may be present in nearby wetlands or streams. Noise, ground vibrations, or human presence during construction could result in sensory impacts on animals that are foraging, breeding, or nesting/rearing young in the vicinity of the Facility. For some raptor species, such as Bald and Golden eagles, these sensory impacts could potentially occur relatively far (e.g. one-quarter mile or one-half mile) beyond the Facility boundary, especially if nests are in the line-of-site of Project construction.

Targa will implement a number of mitigation measures designed to avoid or minimize these direct impacts, including environmental training for all Project personnel, prohibiting ground disturbance or vehicle travel beyond the approved Project work areas or access roads, and clear demarcation of any sensitive wildlife habitats. Targa will attempt to construct after the general bird breeding season, or if this is not possible, to clear any trees or shrubs before the onset of the bird breeding season. If construction is scheduled to occur during the nesting season, Project biologists would conduct pre-construction surveys for the nests of migratory birds in the Project boundary and within one-half mile for raptor species. Appropriate disturbance buffers will be established around active nests, and maintained until eggs have hatched and chicks have fledged and left the nest (see Section 6 for potential buffer sizes). Targa will notify the USFWS if any endangered or threatened species are observed during pre-construction surveys (in a report after surveys are completed) or within 48 hours if observed during construction. To avoid impacts on wildlife from hazardous materials contamination, Targa will enforce refueling buffers around wetlands, streams, and other sensitive areas, and appropriate personnel will be trained in proper methods of spill prevention, containment, and clean-up. In addition, Project construction areas will be fenced to avoid impacts on cattle or big game. Targa does not anticipate direct impacts on migratory birds or other wildlife after implementation of all mitigation measures, and any impacts that do occur are likely to be small and temporary.

Potential Indirect Impacts

Vegetation clearing, grading, and other ground-disturbing activities in Project work areas may indirectly impact wildlife by removing and modifying suitable habitat. The risk of accidental fires will increase during construction activities, especially in the dry season. Fires could accidentally start as a result of sparks from equipment or vehicle exhaust systems (catalytic converters). The spread of some invasive species, such as cheatgrass (*Bromus tectorum*) and tumble mustard (*Sisymbrium sp*.), can increase the frequency, intensity, and extent of fires. Traffic into the Project site could introduce or spread designated noxious weeds or other invasive species to areas within or adjacent to the Project area, degrading native habitat by outcompeting native species. Spills of hazardous materials could contaminate habitats (especially wetlands and streams), making them unsuitable for wildlife.

To minimize loss and modification of wildlife habitat, Targa has sited over 90 percent of the Project in active agricultural lands. As soon as possible after completion of construction, Targa will restore all temporary work areas that are located outside of the Project fence line. These areas will be returned to original grade and allowed to re-vegetate to natural conditions. If needed, Targa may apply a seed mix of native and desirable species to help ensure quicker restoration, after coordinating with the landowner. Areas to be restored mostly consist of grassland species and are expected to become reestablished within 1-3 growing seasons after construction. Areas with permanent aboveground features will not be restored to natural conditions after construction and will be considered a permanent habitat impact. Ground disturbances in wetlands will be minimized and removal of low-lying vegetation within ten feet of stream banks will be avoided, as feasible. Targa will develop a noxious weed control plan and a fire prevention plan that will be implemented throughout construction and operations of the Facility. Given that most Project disturbance areas were actively cultivated lands prior to construction, Targa does not anticipate substantial impacts on wildlife habitat. Any impacts that remain are likely to be small and temporary after implementation of all mitigation measures.

#### *7.3.3.7 Plant Life*

No special status plants or habitat were observed within the Facility Area or in its immediate vicinity. Over 90 percent of the Facility Area was actively cultivated land prior to development between 2010 and 2014. The only sensitive area identified in the Facility Area is perennial Spring Creek and potential associated wetlands at the western extent of the Facility; however, all Project-related ground disturbance or placement of facilities was halted 40 feet east of this water feature. Ground disturbances in wetlands will be minimized and removal of low-lying vegetation within ten feet of stream banks will be avoided, as feasible. Targa will develop a noxious weed control plan and a fire prevention plan that will be implemented throughout construction and operations of the Facility. Targa does not anticipate impacts on special status plants, and any impacts on common vegetation should be insubstantial.

#### *7.3.3.8 Temporary and Permanent Housing*

McKenzie County has experienced an increased demand for housing resultant of the continued expansion of resource production in North Dakota. The area has witnessed increased resource production since the early 2000's and has gradually increased housing resources. The temporary work force is expected to be willing to accept non-traditional housing opportunities such as work or man camps if necessary.

#### *7.3.3.9 Temporary and Permanent Skilled and Unskilled Labor*

Temporary skilled and unskilled labor is required for the construction of the Project. LMGP IV expansion is anticipated to utilize approximately 160 temporary employees. The construction employees will consists of skilled labor such as carpenters, operating engineers, iron workers, welders, electricians, boilermakers. The general assistance of skilled labor will be supported by the use of unskilled employees who work closely with skilled trades.

Additional permanent operations staff is required after completion of LMGP IV. Targa currently anticipates that it will add 3 new full time positions to the existing Facility staff. The Facility staff is responsible for the operation and maintenance of the Facility.

## 7.4 Policy Criteria

The Commission may give preference to an applicant that will maximize benefits resulting from the adoption of policies and practices identified in Section 69-06-08-02(4) of the North Dakota Administrative Code. These policies, and the extent to which the Facility aligns with or reinforces these policies, are discussed below.

### 7.4.1 Recycling of the conversion byproducts and effluents

The recycling of conversion byproducts and effluents is not applicable to the processes at the Facility.

### 7.4.2 Energy conservation through location, process and design

The location of the Facility was previously determined by Saddle Butte on the southeast quarter of Section 30 of Township 149N, Range 98W. The Facility is strategically located in close proximity to gas production areas and natural gas transmission pipelines. Wellhead production gas will be gathered from portions of McKenzie and Dunn Counties that included portions of the Fort Berthold Indian Reservation. LMGP III and LMGP IV are located on the southwest quarter of Section 29 of Township 149N – Range 98W, immediately adjacent to the original plant site, across 125$^{th}$ Avenue NW. Utilization of existing gathering pipeline systems will continue to supply gas to the Facility for processing.

Northern Border Pipeline transects the Site and will continue to serve as the primary transportation method for the product gas produced. The production of NGLs will be placed into the Targa Lateral Pipeline for transportation to the Mid-West and Gulf Coast regions for additional processing. ONEOK Rockies Midstream is to build, own and operate the lateral pipeline.

The original design of the Facility incorporates the ability to increase capacity to accommodate the needs of the changing gathering field profile. As such, some of the technologies and equipment utilized for each gas processing units are shared between expansions. This reduces the overall footprint of the Facility and increase efficiencies within each expansion. Gas processing technologies such as the slug catchers, flares and control rooms are shared between expansions. General facility buildings and parking areas are common to the entire Facility, further reducing impact of the overall site.

### 7.4.3 Training and Utilization of North Dakota Labor for General and Specialized Skills Required

Targa employs 23 full-time hourly employees at the average rate of $23.95 per hour. Targa presently anticipates that it will add three additional full-time salaried employees to the staff after construction of LMGP IV. All new employment positions will be located in North Dakota and support the operation of the Facility.

### 7.4.4 Use of a primary energy source or raw material located within North Dakota

To the extent practicable, the primary energy source for the Facility is generated for product gas and utilizes North Dakota electric utilities for portions of the processing system and electric service to onsite structures. Production gas will be distributed both in State and out of state via the Northern Border Pipeline system.

### 7.4.5 Not relocating residents

The Facility is located in a rural and agricultural area surrounded by a mix of cultivated fields, scrub shrub, herbaceous and deciduous forest areas. There are no residents within a quarter-mile of the Facility. The relocation of residents was not required for the construction of LMGP III and will not be required for the construction of LMGP IV. Additionally, any future expansions will likely not require any relocating of residents.

### 7.4.6 Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife

The areas utilized for the expansion of the Facility will result in the creation of an industrial processing facility that is not conducive for recreation activities or the enhancement of wildlife.

### 7.4.7 Dedication of an area adjacent to the facility to land use such as recreation, agriculture, or wildlife management

Targa does not own nor control the lands adjacent to the Facility that may be suitable for recreation, agricultural, or wildlife management.

### 7.4.8 Economics of Construction and Operation

Materials used to construct LMGP IV, will be obtained from suppliers in the United States whenever possible. If items of United States manufacture are not available, materials of foreign manufacture will be used in order to meet construction schedules. The cost for the LMGP II expansion was $25 million. The estimated cost of construction for the LMGP III and LMGP IV are $72 million and $140 million, respectively.

Annual wages and salaries for North Dakota employees to support operation and maintenance of the Facility will be approximately $1.2 million.

### 7.4.9 Use of Citizen Coordinating Committees

A dialog was conducted with city officials about the expansion of the existing gas facility. Ultimately, the city approved the Facility at its current location and granted a building permit for the construction of the Facility.

### 7.4.10 Commitment of a Portion of the Transmitted Product for Use in North Dakota

It is unknown what portion of the products produced by the proposed Project will be committed to use within North Dakota. Product is sold according to contractual arrangements. Future contractual arrangements may direct a portion of the transmitted product for use in North Dakota.

### 7.4.11 Labor Relations

Targa is an Equal Opportunity Employer and works hard to foster excellent employee relations. As a growth-oriented provider of midstream natural gas and natural gas liquids services and as one of the largest independent midstream energy companies in the country, Targa offers a dynamic work

environment where employees can learn, develop, and grow. Targa encourages employee input and active involvement towards the company's continuous performance improvement in all areas of their business. With people as the priority, Targa is committed to safety and to providing the support required to help employees achieve their goals.

Targa offers a competitive benefits program for full-time employees, which includes: 1) medical plan and prescription drug coverage, 2) vision coverage, 3) dental coverage, 4) flexible spending accounts, 5) life insurance coverage, 6) disability coverage, 7) 401(k) Profit Sharing Plan wherein Targa contributes 3 percent of employees' pay into the plan, regardless of employee participation, and Targa matches employee contributions up to 5 percent. Plus, Targa may make an additional contribution based on company profits. Eligibility for healthcare benefits and 401(k) enrollment begins on the first day of employment.

### 7.4.12 Coordination of Facilities

Targa supports the mission of and participates in the Sakakawea Area Spill Response ("SASR") network, in order to coordinate better with other companies in the industry. This network is an industry-led coalition of companies operating in the area surrounding Lake Sakakawea. The focus of the coalition is to respond in a prepared manner to any spill of crude petroleum or other oilfield-associated material that could threaten to impact the waters of Lake Sakakawea. The coalition pre-positions supplies and equipment in strategic locations in the area and maintains the inventories and capabilities in a "constant ready" state. In the event of a spill, the resources are available to both SASR members and non-members in order to mount a response. SASR non-members pay a rate for supplies and services greater than those paid by members.

SASR also performs both tabletop and field exercises to acquaint members in one company with their counterparts in other companies and to familiarize individuals with the standard practices that will be employed.

### 7.4.13 Monitoring of Impacts

Facilities are maintained according to industry standards. Tank inspections are performed on a regular basis, which covers inspection, repair, alteration, and reconstruction of aboveground storage tanks. Daily visual inspections of the tanks are conducted. The tanks also are subject to monthly inspections and gauge verification tests, including high-level shutdown verification.

The system incorporates a Supervisory Control and Data Acquisition system at the Facility.

Targa maintains a facility Risk Management Plan ("RMP") (see Appendix H) per the Clean Air Act amendments of 1990. Targa also maintains a SWPPP and Erosion Control Plans (see Appendix I).

# 8.0 MITIGATION

Targa is committed to minimizing impacts to the environment through effect mitigation techniques. The two primary mitigation measures utilized for construction, are avoidance and minimization of disturbance to sensitive resources. As described in previous sections, Targa's siting and design takes into consideration various elements including the use of shared technologies between expansions that maximize efficiencies while minimizing impacts to the environment by reduced impact area. Coupled with other mitigation measures, including temporal construction constraints, construction activities are timed to avoid potential impacts for specific species and habitat. The following sections present the mitigation measures that the applicant will enact to conform to the approved permits and minimize adverse impacts that could result from construction and operation of the Facility in the proposed area.

## 8.1 Monitoring of Impacts

### 8.1.1 Nesting Bird Surveys

If construction is scheduled to occur during the general bird breeding season for this region (April-July), Targa will conduct pre-construction surveys for nesting migratory birds within Project disturbance areas. In addition, Targa will conduct surveys for active raptor nests within one-half mile of the Project disturbance area. If active nests are observed, Targa will consult with the USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

### 8.1.2 Vegetation Monitoring

Since the site is going to be fully developed as an industrial site, vegetation monitoring will not be required during construction phases. If needed, revegetation of the perimeter, outside the fence, will be conducted according to best management practices, including monitoring of revegetation success.

## 8.2 Best Management Practices

Best Management Practices are mitigation measures designed to provide for safe and efficient operations while minimizing undesirable impacts to the environment. Proper planning and consultation between the site owner and the construction contractors will typically result in a more efficient construction phase with reduced impacts to the environment. Targa's BMPs are discussed in detail in Section 2.15.

## 8.3 Continuous Emission Monitoring Systems

The NDDH, Division of Air Quality has issued the following North Dakota Air Pollution Control PTC authorizing construction of equipment at the Facility: PTC 10041 (September 28, 2010) (LMGP I); PTC 11032 (April 12, 2011) (LMGP I revisions); PTC 12013 (May 1, 2012; revised November 13, 2013) (LMGP II); PTC 14059 (October 23, 2014) (LMGP III). Copies of these permits are provided in Appendix J. These permits establish emission limits, stack height requirements, monitoring requirements, and other conditions for existing emission units to ensure compliance with ambient air quality standards. Targa will soon apply to NDDH for a PTC to authorize construction of the LMGP IV expansion. Construction of LMGP IV will comply with all permit requirements.

On September 10, 2014, Targa applied to NDDH for a Title V Permit to Operate for the Little Missouri Gas Plant. Targa will submit a permit revision to reflect the addition of LMGP IV in accordance with

applicable NDDH and federal rules. NDDH has not yet issued the Permit to Operate. Targa is authorized to continue to operate under its PTCs until the NDDH issues a Permit to Operate.

In addition, Targa must comply with applicable provisions of 40 CFR 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines; 40 CFR 60, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines; 40 CFR 60, Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution; and 40 CFR 60, Subpart HH, National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Facilities.

## 8.4 Stormwater Plan

Targa has prepared a Master SSWPPP in compliance with 40 CFR 122 and is within the jurisdiction of the EPA implementing the NDPDES and Clean Water Act. The SWPPP is provided in Appendix I.

The objectives of the SWPPP are to identify sources of sediment or other pollution from construction activities to ensure measures are implemented to control pollutants in storm water from construction site runoff both during construction and after completion.

The SWPPP includes:

- Guidelines for compliance
- Site Description
- Standard Construction Practices
- Best Management Practices
- Final Stabilizations

## 8.5 Spill Prevention, Control, and Countermeasure Plan

The SPCC Plan has been developed by Targa for the Facility in accordance with the regulatory requirements found in the EPA 40 CFR 112, Oil Pollution Prevention; specifically sections §112.1-7 of Subpart A and §112.9 of Subpart B where applicable. The SPCC Plan is provided in Appendix I.

The Facility discharge prevention measures, including procedures for routine handling of products (loading, unloading, facility transfers, etc.) include, but are not limited to, containment, employee training, spill response equipment, security measures, and periodic inspections.

The Facility discharge discovery, response, and cleanup capabilities include trained oil-handling employees, on-site spill control equipment, and contract environmental response companies. The resources available to the Facility for discharge cleanup and response are provided in the Contact List in the SPCC Plan. In addition to available resources in the contact list, spill response equipment is staged at each facility regulated by 40 CFR 112. If a spill occurs, personnel (or contractors hired to clean up material) will promptly clean up spilled material and collect it properly. The contract resources available to the Facility for discharge cleanup are provided in the Emergency Response Notification List in the SPCC Plan.

The Facility will dispose of all recovered materials in accordance with all applicable local, state and federal guidelines.

## 8.6 Risk Management Plan

The RMP has been developed by Targa for the Facility in accordance with the regulatory requirements found in the EPA Clean Air Act section 112(r), General Duty Clause and Risk Management Plans. This regulation requires facilities holding more than a threshold quantity of a regulated substance in a process to comply with EPA's Risk Management Program regulations. The regulations require owners or operators of covered facilities to implement a risk management program and to submit an RMP to EPA. The RMP for the Facility is provided in Appendix H.

The RMP for the Facility presents; a hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; a prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and an emergency response program that spells out emergency health care, employee training measures, and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

# 9.0 QUALIFICATIONS

The qualifications of the personnel who contributed to this application are provided in Table 12.

**Table 12: Personnel Qualifications**

| Name | Degree(s) | Qualifications and Experience |
|---|---|---|
| Jessica Keiser | B.S., Environmental Engineering | Currently serves as Vice President of Environmental, Safety, and Health for Targa Resources Corporation and manages Targa's compliance, due diligence, and advocacy efforts. She previously worked as an environmental engineer at Milliken Chemical in Spartanburg, South Carolina and focused on air and wastewater related projects, safety, and Total Quality Management (TQM) efforts. In 2000, she worked for Trinity Consultants where she conducted air permitting and federal Clean Air Act work for refineries, petrochemical, and batch chemical manufacturing as well as the midstream natural gas industry. |
| David McQuade, P.E., P.G. | B.S., Petroleum Engineering | Currently serves as the Environmental Director at Targa Resources Corp. Before joining Targa David worked has an environmental consultant for 13 years for clients located in the southeastern, Midwestern, western, and southwestern United States as well as in Mexico and the United Kingdom. David's work primarily focused on CERCLA site assessment and remediation, environmental due diligence, and Clean Water Act compliance. In the past 12 years he has worked in the upstream, midstream, and downstream oil and gas pipeline industry. He is currently leading Targa's water, waste, and remediation programs as well as participating in acquisition due diligence. Mr. McQuade is a professional engineer and professional geoscientist (geology focus) in the State of Texas. |
| Paul Pansegrau, Ph.D. | Ph.D., Chemistry<br>B.S., Chemistry | 20 years of experience in the North Dakota energy and fuels industries. Experienced in production, operations, and environmental areas. Specific areas include lignite utilization and conversion to fuels and chemicals, and renewable fuels and chemical production. Dr. Pansegrau also possesses expertise in environmental sampling, analyses, and reporting. |
| Jim Thornton | B.A., Psychology | 39 years of experience in environmental planning, permitting, and management of large power infrastructure projects, including pipelines, transmission lines, thermo generation plants, and renewable energy projects. Experience includes being a consultant to energy facility siting boards and state and federal agencies for the preparation of environmental impact statements. |
| Casey Talento | B.S., Environmental Engineering | 10 years of experience as an environmental project coordinator. MS. Talento has prepared and coordinated environmental permit applications and Federal Energy Regulatory Commission (FERC) filings for energy construction projects to ensure compliance with NEPA, the Clean Water Act, National Pollutant Discharge Elimination System, Endangered Species Act, Migratory Bird Treaty Act, National Historic Preservation Act, and Resource Conservation and Recovery Act. |

**Table 12: Personnel Qualifications**

| Name | Degree(s) | Qualifications and Experience |
|---|---|---|
| Marit Sawyer | B.S. Range Science | 17 years of experience in resource management, including regulatory oversight of existing projects at Wyoming Department of Environmental Quality and the preparation of new state and federal permits for mining, pipeline, and power line projects. Ms. Sawyer's work focuses on evaluating rangeland resources (vegetation, soils, threatened and endangered species, wildlife) and preparing reclamation plans and costing for projects. |

# 10.0 DEVELOPMENT

## 10.1 Discussion of Present and Future Natural Resource Development in the Area

The Facility is surrounded by agricultural lands and private industrial developments including oil wells and gathering systems, and crude oil terminals. Directly adjacent to the south of Parcel 2 is a crude oil terminal. A private industrial development has recently been developed to the north of the Plant. The surrounding area is largely agricultural in nature with a mixture of production fields and open grazing fields, although the number of oil wells and other pipeline systems are increasing in the area.

The area surrounding the Plant is undergoing rapid change. In the area north of the Plant, between Watford City and the Plant, development associated with exploration, production, and transport of petroleum continues to grow rapidly. The area to the west and east is also experiencing conversion of agricultural lands to industrial purposes, although the rate of change is significantly relaxed compared to the areas to the north. Lands to the south of the tank facility are still dedicated to agricultural production.

## 10.2 Plans for Future Expansion

A future expansion may include the addition of a Reid Vapor Pressure (RVP) unit. Current plans call for installation of the RVP unit in the southeast corner of Parcel 2.

Targa is considering other possible additions immediately adjacent to LMGP III and LMGP IV to the north, shown as Parcel 3 on Figure 4. The exact nature of the possible expansions is not known at the present time.

Environmental evaluation and study of Parcel 3 has been completed and the results are included in this application. A Class III archaeological survey of Parcel 3 is pending the absence of snow on this parcel.

# 11.0 SUMMARY OF EVALUATION FACTORS

## 11.1 Location/Construction/Operation on Public Health and Welfare, Natural Resources, and the Environment

Public health and welfare will benefit from the Project. The creation of long-term, well-compensated jobs will provide economic stability to employees and their families. Due to Targa's employment policies of providing benefited positions to employees, those employees and their families will have access to medical and dental care (Section 5). Additionally, employees will be provided a safe work environment.

Natural resources developed and refined by the Facility will provide energy and feedstocks for production of modern materials. Both the energy and the modern materials will support a variety of lifestyles across the United States.

Impacts to the environment will be minimal. The plant will operate within the limits imposed in the construction and subsequent operations permits. This will primarily involve air emission. There will be no process water discharge from the plant.

## 11.2 Effects of New Energy Conversion and Transmission Technologies and Systems Designed to Minimize Adverse Environmental Effects

New technology to be implemented at the Facility is most evident in anticipated the thermal efficiency of the plant. With an anticipated thermal efficiency of 76%, there will be very little (by modern standards) feedstock that is not placed into a pipeline for sale. This results in minimized impacts to the environment. This is largely achieved by the use of the GSP process for LMGP III and LMGP IV.

## 11.3 Potential for Beneficial Uses of Waste Energy from a Proposed Conversion Facility

Since the proposed facility will be operating at a thermal efficiency of 76%, there will be very little opportunity to capture and utilize the 24% waste energy. Current engineering technology that would be capable of capturing and utilizing this waste heat would not be cost effective; the investment would not be repaid during operation.

## 11.4 Adverse Direct and Indirect Environmental Effects Which Cannot be Avoided Should the Proposed Site or Route be Designated

Adverse environmental effects which cannot be avoided will include loss of farmland, minimal impacts during construction, and long-term air emission. Loss of farmland will be minimal as the Facility is anticipated to occupy less than 100 acres. Construction impacts will be managed through the use of appropriate BMPs. Air emission will be within limits set by the NDDH in the PTC, and the subsequent permit to operate.

## 11.5 Alternatives to the Proposed Site, Corridor, or Route Developed during the Hearing Process and Which Minimize Adverse Effects

Alternatives to the proposed Site would have impacts similar to those resulting from the construction of the Facility at the proposed Site. Providing product gas to the Northern Border Pipeline at the proposed Site minimizes impacts that would be associated with installation of a lateral pipeline of greater length were the gas plant to be built in a different location.

## 11.6 Irreversible and Irretrievable Commitments of Natural Resources Should the Proposed Site be Designated

Irreversible and irretrievable commitments of Natural Resources to the proposed facility include natural gas supplied to the plant. However, since the Williston Basin is primarily a "liquids play," a significant volume of the associated gas is being flared, rather than sold for beneficial use. The construction and operation of the Facility will result in the sale and beneficial use of gas that is presently being flared for no specific purpose.

## 11.7 Direct and Indirect Economic Impact of the Proposed Facility

The Facility will provide long-term employment opportunities in McKenzie County for gas plant operators, instrumentation technicians, and maintenance technicians. A limited number of professional positions will also be required to support plant operations. It is anticipated that the operation lifetime of the plant will be 40 years.

Economic impact to Watford City, McKenzie County, and North Dakota will be positive. Long-term direct and indirect economic impacts will provide for sustainable communities in western North Dakota. This will include growth of small communities, expansion of school districts, expansion of existing recreational facilities and creation of new ones. Existing retail business will grow, and new businesses will be added to the region.

## 11.8 Existing Plans of the State, Local Government, and Private Entities for Other Developments at or in the Vicinity of the Proposed Site

The immediate vicinity of the proposed Project location is being developed as an industrial park supporting the oil and gas industry. Other projects in the area include a crude oil storage facility, and an oil field service business.

## 11.9 Effect of the Proposed Site on Existing Scenic Areas, Historic Sites and Structures, and Paleontological or Archaeological Sites

The effect of the proposed site on existing scenic areas (i.e. the Little Missouri River Valley) will be minimal. The proposed site is shielded from the Little Missouri Valley view-shed by an array of hills and ridgelines. There are no historic sites or structures in the immediate vicinity of the proposed Project site. Additionally, there are no significant paleontological or archaeological sites in the immediate vicinity of the proposed Project.

## 11.10 Biological Wealth or Habitats for Rare and Endangered Species

The proposed site is comprised of less than 100 acres of land, none of which constitutes habitat for rare or endangered species found in North Dakota. Additionally, the proposed site does not possess rare or unique habitat, nor does it possess a significant degree of biological wealth.

## 11.11 Problems Raised by Federal Agencies, State Agencies, and Local Entities

Concerns and issues raised in a timely manner by Federal, State, and Local agencies and entities will be addressed prior to the Public Service Commission Public Hearing date. Targa intends to apply for and obtain all applicable permits and certificates prior to the Public Hearing date.

# 12.0 MAPS

## 12.1 Maps of Criteria within Study Area

Maps showing the proposed site location and Exclusion and Avoidance locations as defined in North Dakota Administrative Code 69-06-08-01 are included in Appendix F.

## 12.2 Mylar Maps of the Study Area

Use of Mylar Maps for recording and transmitting survey information has been replaced by geographic information system (GIS) data management technology. The GIS software in current use by the Commission is ESRI's ArcGIS and companion software packages. A DVD containing copies of the ArcGIS shapefiles has been included with this application.

# 13.0 References

Bielakowski, A. 2010. Class I Literature Search and Class III Intensive Archaeological Investigation for Hiland and Saddle Butte Interconnect and Meter Station Projects, McKenzie County, North Dakota. North Dakota SHPO Manuscript Number 11755.

Canadian Wildlife Service and United States Fish and Wildlife Service (Canadian Wildlife Service and USFWS). 2007. International Recovery Plan for the Whooping Crane. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 162 pp.

Carlson, Clarence G. 1985. Geology of McKenzie County, North Dakota. For the North Dakota Geological Survey.

eBird. 2014. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. Accessed December 3, 2014.

Elliott-Smith, Elise and Susan M. Haig. 2004. Piping Plover (*Charadrius melodus*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/002. Accessed May 30, 2014.

Google Earth. 2014. Accessed on line October to November 2014 at earth.google.com/earth

Haig, Susan M., Cheron L. Ferland, Francesca J. Cuthbert, Jack Dingledine, J. Paul Goossen, Anne Hecht, and Nell McPhillips. 2005. A Complete Species Census and Evidence for Regional Declines in Piping Plovers. *Journal of Wildlife Management* 69(1):160–173.

Lewis, James C. 1995. Whooping Crane (*Grus americana*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/153. Accessed May 29, 2014.

Lott, C.A. 2006. Distribution and Abundance of the Interior Population of the Least Tern (*Sternula antillarum*), 2005. A Review of the First Complete Range-Wide Survey in the Context of Historic and Ongoing Monitoring Efforts. U.S. Army Corps of Engineers, Engineer Research and Development Center, Dredging Operations and Environmental Research Program.

Natural Resources Conservation Service. 2014. The PLANTS Database National Plant Data Team, U.S. Department of Agriculture, Greensboro, North Carolina. http://plants.usda.gov. Accessed May 28, 2014.

North Dakota Department of Agriculture. 2014. Noxious Weeds. http://www.nd.gov/ndda/program/noxious-weeds. Accessed May 27, 2014.

North Dakota Industrial Commission (NDIC), Department of Mineral Resources (DMR). 2014, "Gas 1990 to Present" spreadsheet. Available at: https://www.dmr.nd.gov/oilgas/stats/statisticsvw.asp. Accessed Nov. 26, 2014.

North Dakota State Parks. n.d. Lewis and Clark State Park Preliminary Plant Checklist. Epping, North Dakota.

Robbins, Mark B. and Brenda C. Dale. 1999. Sprague's Pipit (*Anthus spragueii*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/439. Accessed May 30, 2014.

Root, M.L. and Gregg, M.L. 1983. Archeology of the Northern Border Pipeline, North Dakota: Survey and Background Information, Department of Anthropology and Archaeology, University of North Dakota, Grand Forks, ND.

Scheid, B. 2014. "The Barrel, The Essential Perspective on Global Energy", New Frontiers: Cutting Back on Natural Gas Flaring in North Dakota Hits a Bump. October 20, 2014.

Sidle, John G. and William F. Harrison. 1990. Recovery Plan for the Interior Population of the Least Tern (*Sterna antillarum*). United States Fish and Wildlife Service, Twin Cities, Minnesota.

Tern & Plover Conservation Partnership. 2014. Interior Least Tern (*Sternula antillarum athalassos*). University of Nebraska – Lincoln. http://ternandplover.unl.edu/tern/index-tern.asp. Accessed May 30, 2014.

Thompson, B.C., J.A. Jackson, J. Burger, L.A. Hill, E.M. Kirsch, and J.L. Atwood. 1997. Least tern. The Birds of North America.

United States Fish and Wildlife Service (USFWS). 2013. Gray Wolf (Canis lupus). North Dakota Field Office. http://www.fws.gov/northdakotafieldoffice/endspecies/species/gray_wolf.htm. Accessed May 30, 2014.

———. 2014a. Critical Habitat Portal. http://ecos.fws.gov/crithab/. Accessed May 5, 2014.

———. 2014b. Dakota Skipper (*Hesperia dacotae*). North Dakota Field Office. http://www.fws.gov/northdakotafieldoffice/endspecies/species/dakota_skipper.htm. Accessed May 30, 2014.

_____. 2014c. Northern long-eared bat (*Myotis septentrionalis*) Fact Sheet. Midwest Region. http://www.fws.gov/Midwest/endangered/mammals/nlba/nlbaFactSheet.html. Accessed December 5, 2014.

2014d. White-Nose Syndrome Fact Sheet. Midwest Region. https://www.whitenosesyndrome.org/sites/default/files/resource/white-nose_fact_sheet_6-2014_1.pdf. Accessed December 5, 2014.

2011. U.S Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form. Rufa Red Knot (*Calidris canutus ssp. rufa*). Northeast Region. May 16, 2011. http://ecos.fws.gov/docs/candidate/assessments/2011/r5/B0DM_V01.pdf.

United States Geological Survey. 1985. Groundwater Resources of McKenzie County, North Dakota. By M.G. Croft

United States Geological Survey (USGS). 2013. North Dakota's Federally Listed Endangered, Threatened, and Candidate Species: Pallid Sturgeon (*Scaphirhynchus albus*). Northern Prairie Wildlife Research Center. http://www.npwrc.usgs.gov/resource/wildlife/nddanger/species/scapalbu.htm. Accessed May 30, 2014.

_____. National Land Cover Database in the Multi-Resolution Land Characteristics Consortium website. Available online: http://www.mrlc.gov/. Accessed: November, 2014.

_____. 2014. Hydrography: National Hydrography Dataset and Watershed Boundary Dataset. Available online: http://nhd.usgs.gov/. Accessed: August 19, 2014.

# Tab 2

# Appendix A:
# Corporate Documents

# State of North Dakota

## SECRETARY OF STATE

**CERTIFICATE OF GOOD STANDING**
**OF**

TARGA BADLANDS LLC

The undersigned, as Secretary of State of the State of North Dakota, hereby certifies that TARGA BADLANDS LLC, a FOREIGN LIMITED LIABILITY COMPANY, authorized to transact business in the State of North Dakota on January 11, 2013, and according to the records of this office as of this date, has paid all fees due this office as required by North Dakota statutes governing a FOREIGN LIMITED LIABILITY COMPANY.

ACCORDINGLY the undersigned, as such Secretary of State, and by virtue of the authority vested in him by law, hereby issues this Certificate of Good Standing to

TARGA BADLANDS LLC

Issued: April 14, 2014

Alvin A. Jaeger
Secretary of State

# Delaware



## The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "TARGA BADLANDS LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE FOURTEENTH DAY OF APRIL, A.D. 2014.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE BEEN PAID TO DATE.

Jeffrey W. Bullock, Secretary of State

5260122 8300

AUTHENTICATION: 1289847

140466190

DATE: 04-14-14

You may verify this certificate online at corp.delaware.gov/authver.shtml

# Delaware



## The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF FORMATION OF "TARGA BADLANDS LLC", FILED IN THIS OFFICE ON THE SEVENTEENTH DAY OF DECEMBER, A.D. 2012, AT 12:21 O'CLOCK P.M.

Jeffrey W. Bullock, Secretary of State

5260122 8100

AUTHENTICATION: 0074950

121348824

DATE: 12-17-12

You may verify this certificate online at corp.delaware.gov/authver.shtml

State of Delaware
Secretary of State
Division of Corporations
Delivered 12:48 PM 12/17/2012
FILED 12:21 PM 12/17/2012
SRV 121348824 - 5260122 FILE

# CERTIFICATE OF FORMATION

## OF

## TARGA BADLANDS LLC

This Certificate of Formation (this "***Certificate***"), dated December 17, 2012, has been duly executed and is filed pursuant to the Delaware Limited Liability Company Act (the "***LLC Act***") to form a limited liability company (the "***Company***") under the LLC Act.

1. *Name.* The name of the Company is "Targa Badlands LLC".

2. ***Registered Office; Registered Agent.*** The address of the registered office of the Company in the State of Delaware is 1209 Orange Street, Wilmington, Delaware, 19801. The name and address of the registered agent for service of process is The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware, 19801.

3. ***Limitation of Member Liability.*** To the fullest extent the LLC Act, as it exists on the date hereof or may hereafter be amended, permits the limitation or elimination of liability of members, a member shall not be liable to the Company or the other members for monetary damages for conduct as a member. Any amendment to or repeal of this Section 3 shall not adversely affect any right or protection of a member for or with respect to any acts or omissions of such member occurring prior to such amendment or repeal.

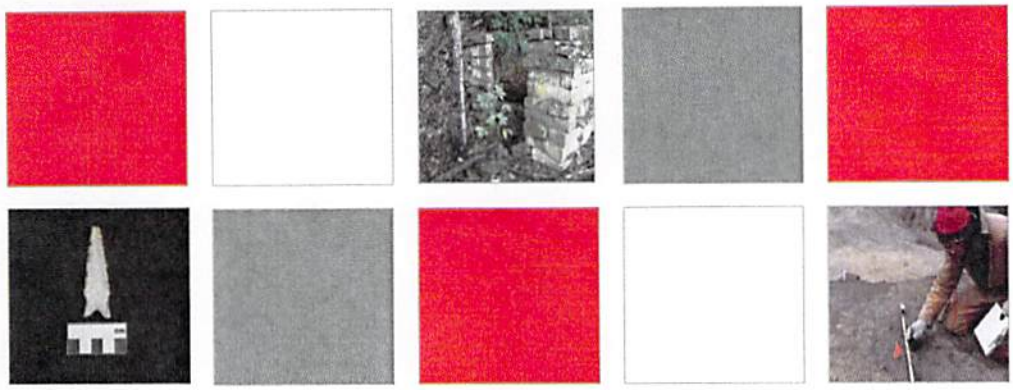
IN WITNESS WHEREOF, the undersigned has executed this Certificate as of the date written first above.

**Targa Resources Operating LLC,**
**Member of Targa Badlands LLC**

By: _____
Jeffrey J. McParland
Authorized Person

# Appendix B:
# Class I & III Archaeology Reports

11755



# CLASS I LITERATURE SEARCH AND CLASS III INTENSIVE ARCHAEOLOGICAL INVESTIGATION FOR THE HILAND AND SADDLE BUTTE INTERCONNECT AND METER STATION PROJECTS, MCKENZIE COUNTY, NORTH DAKOTA

**Submitted to:**
**Northern Border Pipeline Company**

Northern Border Partners, L.P.

**Submitted by:**
**Merjent, Inc.**

merjent

**September 2010**

## MANUSCRIPT DATA RECORD FORM

1. Manuscript Number: **[SHPO assigns]**
2. SHPO Reference #: **[SHPO assigns]** 10-2290
3. Author(s): **Andrew Bielakowski, M.A.**
4. Title: **Class I Literature Search and Class III Intensive Archaeological Investigation for the Hiland and Saddle Butte Interconnect and Meter Station Projects, McKenzie County, North Dakota**
5. Report Date: **September 2010**
6. Number of Pages: **32**
7. Type – I, T, E, O: **I**
8. Acres: **5.1**
9. Legal Location(s) (no quarter sections) with Historic Context Study Unit(s):
   Consult the township tables in *The North Dakota Comprehensive Plan for Historic Preservation: Archeological Component*, (SHSND 2008; available online at http://history.nd.gov/hp/hpforms.html) for Study Unit assignments.
   Study Units: LM, CB, KN, HE, SM, GA, JA, GR, NR, SR, SO, SH, YE

| COUNTY | TWP | RNG | SEC | SU |
|---|---|---|---|---|
| **McKenzie** | **151N** | **103W** | **4** | ~~GA~~ YE |
| **McKenzie** | **149N** | **98W** | **30** | **LM** |

# CLASS I LITERATURE SEARCH AND CLASS III INTENSIVE ARCHAEOLOGICAL INVESTIGATION FOR THE HILAND AND SADDLE BUTTE INTERCONNECT AND METER STATION PROJECTS, MCKENZIE COUNTY, NORTH DAKOTA

**SHPO File No. Pending**
**ND Archaeological License: 2010 Annual License**

**Submitted to:**
**Northern Border Pipeline Company**
**717 Texas Ave, 24th Floor**
**Houston, Texas 77002-2761**

**Submitted by:**
**Merjent, Inc.**
**615 First Avenue NE, Suite 425**
**Minneapolis, Minnesota 55413**

**Report Author:**
**Andrew Bielakowski, M.A.**

**September 2010**

**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**

## MANAGEMENT SUMMARY

During August 2010, Merjent, Inc. (Merjent) conducted a Class I Literature Search and Class III Intensive Archaeological Investigation for the Hiland Interconnect and Meter Station Project (Hiland Project) and the Saddle Butte Interconnect and Meter Station Project (Saddle Butte Project). The Projects were conducted under contract with Northern Border Pipeline Company (Northern Border). Each project is being permitted and constructed separately. However, for ease of review, both projects are being included together in this correspondence since both are located within the same county and have similar project schedules. The projects will be regulated by the Federal Energy Regulatory Commission (FERC) under the Blanket Certificate for Northern Border's system. The overall projects will be regulated by FERC's integrity management program of the Natural Gas Act subpart F of Part 157 under Section 157.211 (Delivery Points). Therefore, the projects will receive automatic authorization from FERC. Northern Border, however, must comply with Section 106 of the National Historic Preservation Act (16 USC 470) and implementing regulations (36 CFR 800), and consult with the North Dakota State Historic Preservation Office (SHPO), Assiniboine and Sioux Tribes of Fort Peck Indian Reservation, Montana, Fort Belknap Indian Community of the Fort Belknap Reservation of Montana, and three Affiliated Tribes of the Fort Berthold Reservation, North Dakota, who have been identified as having aboriginal interests in McKenzie County, North Dakota.

The purpose of the Class I Literature Search was to provide a preliminary understanding of what archaeological and architectural resources may be within the Project areas and was a tool with which to inform further archaeological and architectural history investigations. Any known archaeological sites or historic properties within the Project areas were identified. In addition, the study determined if any portions of the project area had been previously surveyed or were obviously disturbed, and, therefore, had no potential to contain significant archaeological resources. Based on the information gathered during the Class I Literature Search, the purpose of the Class III Intensive Archaeological Investigation was to determine whether the Project areas contained any previously unrecorded archaeological resources and determine their potential eligibility for listing on the National Regis ter of Historic Places (NRHP).

The Hiland Project is located in the northwest quarter of the northwest quarter of Section 4, Township 151 North, Range 103 West. The Saddle Butte Project is located in the northeast quarter of the southeast quarter of Section 30, Township 149 North, Range 98 West. The Class I Literature Search consisted of a review of documentation of previously recorded archaeological sites and architectural history properties within one mile (1.6 kilometers) of the project area and of surveys previously conducted within the project area. A Class III Intensive Archaeological Investigation was performed within the Project areas to identify any intact archaeological sites within the construction limits of the Project areas. The archaeological survey area/area of potential effects (APE) includes approximately 5.1 acres (2.1 hectares) within the Garrison and Little Missouri archaeological study units. Andrew Bielakowski, M.A., served as principal investigator for the Projects.

**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**

The APE for architectural history accounts for any physical, auditory, or visual impacts to historic properties of the Projects. The APE for architectural history consisted of an area in which the proposed project would be within viewshed of any structures or architectural history properties. The Class I Literature Search consisted of a review of documents of previously inventoried architectural history properties and of surveys previously conducted within the project area, as well as a field survey to identify, document, and evaluate properties that are 50 years of age or older within the APE. The architectural history APE includes approximately 251.8 acres (101.9 hectares).

During the Class I Literature Search, no archaeological sites or architectural history properties were identified within the Project areas or APEs. Since no architectural history properties of 50 years of age or older were located within the proposed APE for the Project, Merjent determined that the Project would have no impact on architectural history properties and further architectural history investigation was not warranted. During the Class III Intensive Archaeological Investigation, no archaeological artifacts or aboveground features were identified during the survey within the Project areas. As a result, no further archaeological work is recommended prior to construction-related use of the Hiland and Saddle Butte Project areas.

**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**

# MAC
# Metcalf Archaeological Consultants, Inc.

December 19, 2014

Paul Pansegrau
Loham Walsh
ppansegrau@lowhamwalsh.com

RE: Class III Cultural Resource Inventory for the Proposed Little Missouri Gas Plant Expansion Located in McKenzie County, North Dakota

Mr. Pansegrau,

On December 11, 2014 Ed Stine, serving as Principal Investigator, along with archaeological technicians Bill Christensen and Lynsee Langsdon attempted to conduct a Class III Cultural Resource Inventory of the proposed Little Missouri Gas Plant expansion in McKenzie County, North Dakota. Reduced ground surface visibility due to snow cover over most of the project area precluded systematic coverage of the project area. The one area where snow had melted was the location of site 32MZ474, a lithic scatter recorded in 1980 by UNDAR as part of the Northern Border Pipeline inventory. The site was described as a small dispersed lithic scatter situated on the top and upper slopes of a small knoll above Spring Creek with artifacts scattered over a 150 x 150 meter area in a plowed field. UNDAR collected 19 pieces of flaking debris and eight tools, including a side notched projectile point, and excavated seven shovel probes. None of the probes yielded cultural remains. UNDAR recommended the site as not eligible for inclusion on the National Register of Historic Places and that construction of the pipeline proceed. When Metcalf archaeologists visited the site, they found the area devoid of vegetation and covered with backdirt. It was unclear if the backdirt was hauled in or the result of local landscaping. They did not observe any artifacts or features. The site has lost all integrity as a result of cultivations, pipeline construction, and recent landscaping. Pipeline construction has destroyed the southern portion of the site and landscaping the northern area; only a small finger of the site between the two areas may remain. Metcalf concurs with UNDAR's recommendation: the site is not eligible for the NRHP. The site condition is documented on the attached photographs.

Sincerely,

Ed Stine
Principal Investigator
Metcalf Archaeological Consultants, Inc.

**Metcalf Archaeological Consultants, Inc., P.O. Box 2154 Bismarck, ND 58502**
**Office 701-258-1215 | Fax 701-258-7156 | Email: macnodak@metcalfarchaeology.com**

# MAC
# Metcalf Archaeological Consultants, Inc.

December 23, 2014

Paul Pansegrau
Lowham Walsh, LLC
107 West Main Avenue, Suite 325
Bismarck, ND 58501
ppansegrau@lowhamwalsh.com

RE: Targa Badlands Little Missouri Gas Plant Expansion Parcels 1, 2, and 3 Class I Files Search in McKenzie County, North Dakota

Dear Mr. Pansegrau,

Lowham Walsh, LLC (Lowham Walsh) contacted Metcalf Archaeological Consultants (Metcalf) to conduct a Class I search of the site and manuscript files at the State Historic Society of North Dakota for the Targa Badlands Little Missouri Gas Plant Expansion in three parcels. The search encompassed 12 sections in McKenzie County, North Dakota, and included the undertaking area of potential effects (APE) and the surrounding one mile. The results of this files search are documented in the enclosed Tables 1 and 2 and on the enclosed USGS 1:24,000 topographic maps. The maps also depict the APE.

The Targa Badlands Little Missouri Gas Plant files search was undertaken in conjunction with the proposed expansion of the Little Missouri Gas Plant in McKenzie County with oversight from the Public Service Commission (PSC). As the lead federal agency, PSC is responsible for compliance with the National Historic Preservation Act (NHPA). The object of the files search was to assist Lowham Walsh with planning for this proposed project. A total of 17 cultural resources have been recorded within the search area. The resources consist of:

- Two architectural sites with postcontact (historic) components
- Four postcontact sites
- Two precontact (prehistoric/archaeological) sites
- Nine precontact isolated finds

One precontact isolated find, 32MZx959, is located in the southeast quadrant of Parcel 1. Isolated finds are *not eligible* for the National Register of Historic Places and do not need to be avoided. One precontact site 32MZ474, a precontact cultural material scatter, is located in the southeastern corner of Parcel 2. The site has been recommended as *not eligible* for the National Register of Historic Places and no avoidance is recommended.

The search also revealed that 23 cultural resource inventories have been conducted in the search area. These projects include 16 associated with oil and gas development, three for telephone lines, two for transmission lines, one for a road project, and one for a waterline.

Thank you for considering Metcalf for this project. Should you have any questions or require further information please contact the Metcalf Bismarck Office at the address below.

Sincerely,

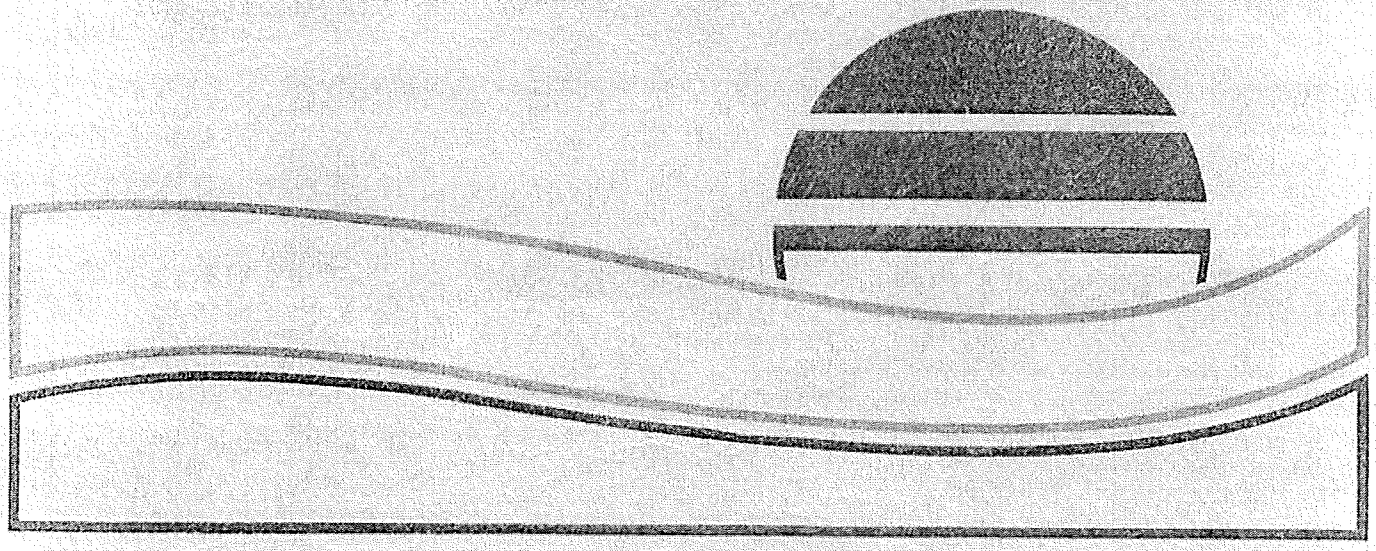
Damita Engel
Regional Manager

Enclosures

3455
Vol 1

# Archeology of the Northern Border Pipeline

# NORTH DAKOTA



## Volume 2

Part 1

3455
vol 1

# ARCHEOLOGY OF THE NORTHERN BORDER PIPELINE, NORTH DAKOTA: SURVEY AND BACKGROUND INFORMATION

edited by

Matthew J. Root and Michael L. Gregg

Department of Anthropology and Archaeology
University of North Dakota
Grand Forks, North Dakota

Principal Investigators

Michael L. Gregg and Matthew J. Root

report prepared for

Northern Border Pipeline Company
Omaha, Nebraska

June 1983

Volume 2 (2 parts) in the Archeology of the Northern Border Pipeline, North Dakota (5 Volumes). University of North Dakota, Department of Anthropology and Archaeology, Contribution 194.

## ABSTRACT

From 1980 to 1982, the Department of Anthropology, University of North Dakota, conducted an archeological survey of a 449 km transect across western and south-central North Dakota. The transect crosses the Missouri; Little Missouri; Knife, and Heart rivers and runs just south and east of a major group of KRF quarries in Dunn County. The purpose of the survey was to locate and evaluate the significance of sites potentially impacted by construction of the North Dakota segment of the Northern Border natural gas pipeline. The first 11 chapters of this volume present background information relevant to the understanding and interpretation of survey results. The pipeline route, its construction schedule and its impact on archeological sites are summarized. A research design, posing general research topics that guided the analysis of North Dakota Northern Border project sites, is presented. Regionally specific information relevant to these research topics is summarized in chapters dealing with the physical environment, archeology, ethnography and Euro-American history of western North Dakota and the Northern Plains. Finally, procedures followed by the project in conducting archeological survey and laboratory analyses are outlined. The last nine chapters of the volume present the results of the archeological survey. The survey recorded 204 prehistoric Native American sites, 22 historic Euro-American sites, and 203 archeological find spots. The locations and physiographic contexts of each site are discussed. Artifact analyses are presented for 151 sites which were not subjects of further controlled excavations. A management summary discusses the cultural resource significance of the unexcavated sites.

Large streams such as the Missouri River, the Little Missouri River Badlands, and the Killdeer Mountains are areas of concentrated resources and all contain high site densities. The grasslands between these features generally contain relatively few sites. The entire area surrounding the Dunn County KRF quarries is one of high site density. The styles of recovered projectile points suggest that at least most of the surveyed regions have been inhabited since the Early Plains Archaic period. Most sites contain shallow, low artifact density deposits. These sites represent palimpsest accumulations of artifacts that have

built up over long periods of time. Thus, classification of individual sites into narrow settlement types is difficult. However, large stream valleys and other areas of relatively abundant resources may have been places where field camps or base camps were established. The entire surveyed area probably contains the remains of numerous extractive locations and stations.

# PREFACE

This report is Volume 2 in the report series detailing archeological work conducted in North Dakota by the University of North Dakota as part of the Northern Border project. In May of 1980, archeological survey began along the route of the Northern Border pipeline. This work continued until July of 1982. These surface survey investigations are the focus of this report. A research design which guided project studies and background information on the natural and cultural environments of western and south-central North Dakota are also presented in this volume.

## ACKNOWLEDGEMENTS

Northern Border Pipeline Company of Omaha, Nebraska is gratefully acknowledged for providing generous financial support for these studies. I wish to thank the Department of Anthropology and Archaeology, University of North Dakota for providing laboratory facilities.

There are numerous individuals who served on the project throughout its history and we acknowledge the input of all those people. Cynthia Kordecki deserves special mention here for her dedicated effort over the long project history. She served as my right-hand person during both field and lab work, skillfully supervised the survey during 1981 and 1982 when project demands dictated that I focus my attention elsewhere, and served as my perennial co-author during the months of report writing. She also provided valuable editorial advice and assistance during the grueling months of report editing.

Cathy Volmuth and Kim Breakey served as editorial assistants and are thanked for their superlative job. Sarah Moore drafted all line drawings, took artifact photographs, and printed the photographic material. R. A. Ketcherside also took artifact photographs. Sarah Moore also pasted up the final copy of the report. Ruth Eider served as the project secretary and helped keep the whole thing organized. The editors wish to thank the individual authors for their contributions.

Table 13.8. Raw material distribution in stone tools and flaking debris from site 32MZ480.

| Raw Material Class | Stone Tools n | Stone Tools % | Flaking Debris G1-3 n | Flaking Debris G1-3 % | Flaking Debris ∠G3 n | Flaking Debris ∠G3 % | Cortex n | Total |
|---|---|---|---|---|---|---|---|---|
| 08. Clear, Gray, Red Chalcedony | 0 | 0 | 1 | 6.7 | 0 | 0 | 0 | 1 |
| 28. KRF | 3 | 60.0 | 0 | 0 | 0 | 0 | 3 | 3 |
| 29. Waxy Brown Chert | 2 | 40.0 | 14 | 93.3 | 0 | 0 | 9 | 16 |
| Site Total | 5 | 100.0 | 15 | 100.0 | 0 | 0 | 12 | 19 |

## 32MZ474

### General Description

This lithic scatter is situated on the top and upper slopes of a small knoll above Spring Creek (Figure 13.11). Nineteen pieces of flaking debris and eight tools are widely scattered over a 150 x 150 m area, covering 1.75 ha (Table 13.10). Included among the tools are two proximal fragments of side notched bifaces which may have an Early Plains Archaic period affiliation. The site is in a plowed field which had no plant cover when the site was investigated. Seven shovel tests all had negative results. No intact cultural deposit was documented nor can any be inferred based on current data.

Spring Creek courses around the site to the south and west, about 300 m away. The creek is intermittent, however at the time of investi-

Table 13.9. Stone tools by functional class and use-phase, 32MZ480.

| Functional Class | Use-Phase Class 1 | 2 | 3 | 4 | Total n | % |
|---|---|---|---|---|---|---|
| Bifacial cutting tools | 0 | 1 | 0 | 1 | 2 | 40.0 |
| All possible core tools | 0 | 0 | 0 | 1 | 1 | 20.0 |
| Cores | 0 | 0 | 1 | 1 | 2 | 40.0 |
| Total (n) | 0 | 1 | 1 | 3 | 5 | 100.0 |
| (%) | 0 | 20.0 | 20.0 | 60.0 | | |

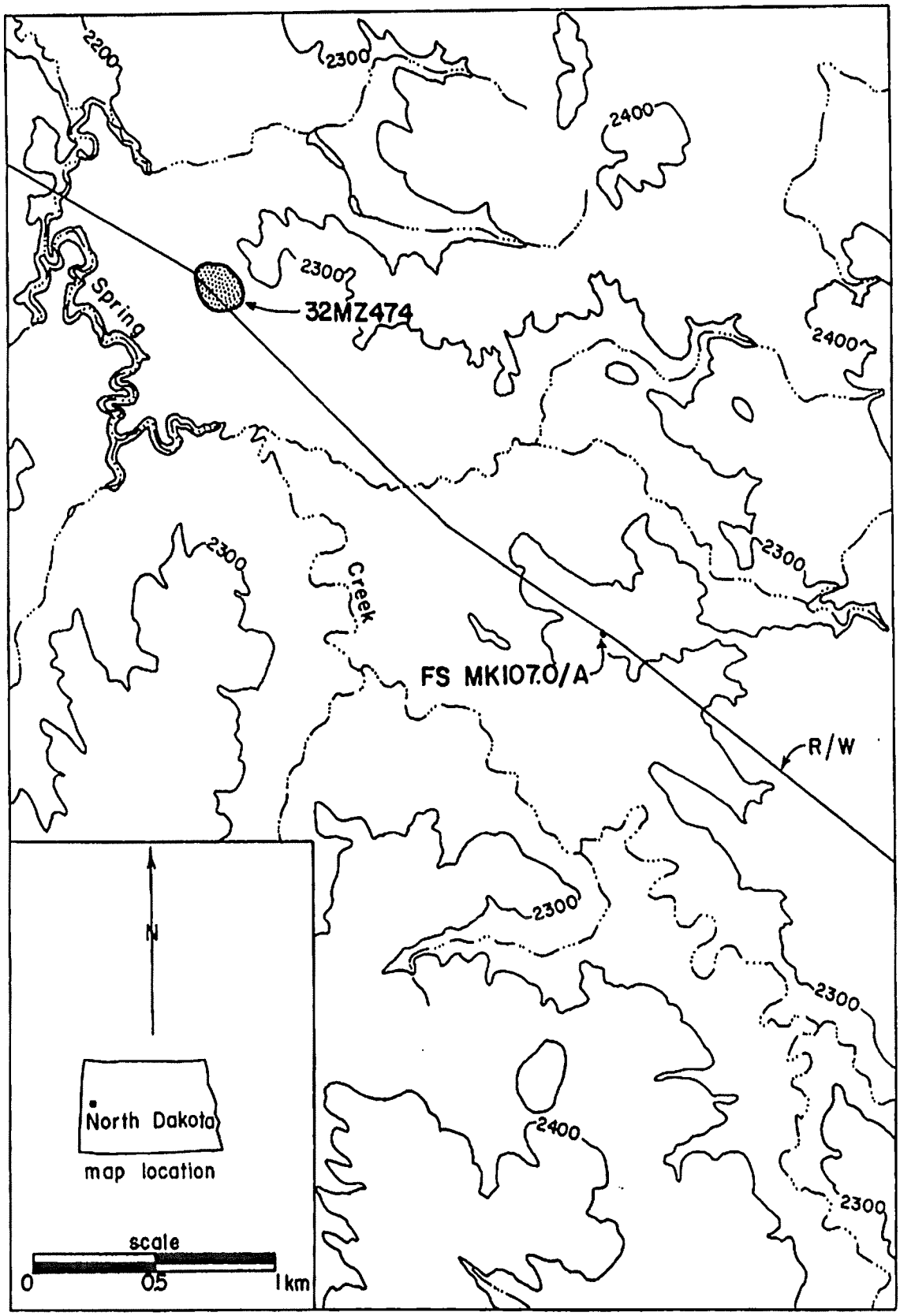



Figure 13.11. The locations of site 32MZ474 and find spots MK107.0/A (elevations are ft msl).

Table 13.10. Inventory of surface collected material from site 32MZ474.

| Provenience | Flaking Debris G1-3 (n) | ∠G3 (n) | C.S. Tools (n) |
|---|---|---|---|
| Grab Surface | 19 | 0 | 8 |

gations water was flowing. The site is near the southern limits of glaciation (Moran 1973) and erratics on and around the site provide a potential raw material source. The Little Missouri River Badlands are several kilometers south and southwest.

Artifact Analyses

The stone tool aggregate consists of eight specimens which represent nine functional tools. The multifunctional tool is a side notched point; a second fragmentary side notched point was also found. These specimens are morphologically similar to those recovered from the Hawken and Hawken III sites which date to the Early Plains Archaic period (Figure 13.4b, g) (Frison 1978:193-201; Frison et al. 1976).

The nine functional tools fall into four of the generalized functional classes (Table 13.11). Knife River flint is the predominant raw material and small amounts of chert and chalcedony are also present (Table 13.12). The two side notched tool fragments both probably served as projectiles. One has a distally directed flake with pronounced ripples which apparently originated from the base; the other has a burin like fracture on the blade (Figure 13.4b,g). Burin like fractures, such

Table 13.11. Stone tools by functional class and use-phase, 32MZ474.

| Functional Class | Use-Phase Class 1 | 2 | 3 | 4 | Total n | % |
|---|---|---|---|---|---|---|
| All possible projectile points | 0 | 0 | 0 | 2 | 2 | 22.2 |
| Bifacial cutting tools | 0 | 0 | 0 | 3 | 3 | 33.3 |
| Jagged or irregular cutting tools | 0 | 0 | 3 | 0 | 3 | 33.3 |
| Other flake tools | 0 | 0 | 0 | 1 | 1 | 11.1 |
| Total (n) | 0 | 0 | 3 | 6 | 9 | 99.9 |
| (%) | 0 | 0 | 33.3 | 66.7 | | |

Table 13.12. Raw material distribution in stone tools and flaking debris from site 32MZ474.

| Raw Material Class | Stone Tools n | Stone Tools % | Flaking Debris G1-3 n | Flaking Debris G1-3 % | Flaking Debris ∠G3 n | Flaking Debris ∠G3 % | Cortex n | Total |
|---|---|---|---|---|---|---|---|---|
| 06. Jasper/Chert | 1 | 12.5 | 0 | 0 | 0 | 0 | 1 | 1 |
| 08. Clear, Gray, Red Chalcedony | 0 | 0 | 4 | 21.0 | 0 | 0 | 0 | 4 |
| 28. KRF | 7 | 87.5 | 15 | 79.0 | 0 | 0 | 7 | 22 |
| Site Total | 8 | 100.0 | 19 | 100.0 | 0 | 0 | 8 | 27 |

as this one, have been shown experimentally to be caused by impact (Ahler 1971:85) and the distally directed fracture may result from heavy impact of the point against the shaft. Blade margins of the more complete tool have moderate blunting, indicative of cutting use. Notch and basal margins are moderately ground. The presence of three complete, expedient cutting tools (e.g., Figure 13.5a) and the broken, discarded tools (use-phase 4) suggests that a variety of cutting tasks took place on the site.

The two side notched tools were probably discarded during an Early Plains Archaic occupation, but the association of the remaining artifacts with them is uncertain. The knoll above Spring Creek may have drawn repeated occupation. The site is relatively large and artifacts are extremely dispersed; density averages only 15.4 artifacts/ha. No internal clustering of artifacts was observed. Several, small, short-term occupations may be represented.

## 32MZ479

### General Description

This small, extremely low density scatter of unknown affiliation is situated on a knoll summit not far from the Little Missouri Badlands. The site is 1 km west of a side canyon of the Badlands which was carved by Rough Creek and its tributaries. Five pieces of flaking debris and one undiagnostic chipped stone tool were dispersed over an area 60 m N-S

# Appendix C:
# SHPO Concurrence Letter

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

John Hoeven
*Governor of North Dakota*

**North Dakota State Historical Board**

Chester E. Nelson, Jr.
*Bismarck - President*

Gereld Gerntholz
*Valley City - Vice President*

Richard Kloubec
*Fargo - Secretary*

Albert I. Berger
*Grand Forks*

Calvin Grinnell
*New Town*

Diane K. Larson
*Bismarck*

A. Ruric Todd III
*Jamestown*

Sara Otte Coleman
*Director*
*Tourism Division*

Kelly Schmidt
*State Treasurer*

Alvin A. Jaeger
*Secretary of State*

Mark A. Zimmerman
*Director*
*Parks and Recreation Department*

Francis Ziegler
*Director*
*Department of Transportation*

Merlan E. Paaverud, Jr.
*Director*

*Accredited by the American Association of Museums since 1986*

August 26, 2010

Mr. David C. Peters
Project Manager
Saddle Butte Pipeline LLC
1970 East 3rd Avenue
Durango CO 81301

**ND SHPO REF: 10-2089 Natural Gas Processing Plant in portions of [T149N R98W Section 30 NE ¼ of the SE 1/4] McKenzie County, North Dakota**

Dear Mr. Peters,

We reviewed ND SHPO REF: 10-2089 Natural Gas Processing Plant in portions of [T149N R98W Section 30 NE ¼ of the SE 1/4] McKenzie County, North Dakota. We would concur with a "No Historic Properties Affected" (federal) and "No Significant Sites Affected" (state of North Dakota) determinations, provided the ground disturbance is in the **E ½** of the NE ¼ of the SE ¼, which appears to be the case form the map provided. If ground disturbance extends into the W 1/2 of the NE ¼ of the SE ¼, then we would recommend a cultural resources survey by a permitted archaeologist.
Thank you for the opportunity to review this project. If you have any questions please contact Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota)
and
Director
State Historical Society of North Dakota

**STATE HISTORICAL SOCIETY OF NORTH DAKOTA**

Jack Dalrymple
*Governor of North Dakota*

**North Dakota State Historical Board**

Calvin Grinnell
*New Town - President*

A. Ruric Todd III
*Jamestown - Vice President*

Margaret Puetz
*Bismarck- Secretary*

Albert I. Berger
*Grand Forks*

Gereld Gerntholz
*Valley City*

Diane K. Larson
*Bismarck*

Chester E Nelson, Jr.
*Bismarck*

Sara Otte Coleman
*Director*
*Tourism Division*

Kelly Schmidt
*State Treasurer*

Alvin A. Jaeger
*Secretary of State*

Mark Zimmerman
*Director*
*Parks and Recreation Department*

Grant Levi
*Director*
*Department of Transportation*

Merlan E. Paaverud, Jr.
*Director*

*Accredited by the American Alliance of Museums since 1986*

November 24, 2014

Mr. Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

**ND SHPO REF: 15-0177 ND PSC Targa Badlands Application to ND PSC for Expansion of the Little Missouri Gas Plant in portions of [T149N R98W Sections 29 & 30] McKenzie County, North Dakota**

Dear Mr. Salazar,

We reviewed your information on ND SHPO REF: 15-0177 ND PSC Targa Badlands Application to ND PSC for Expansion of the Little Missouri Gas Plant in portions of [T149N R98W Sections 29 & 30] McKenzie County, North Dakota. As a project with potential to become a federal undertaking, we encourage early agency consultation as part of the review process.

We recommend a Class III archeological (pedestrian) survey for all areas directly impacted by the project including access roads and staging areas. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed, particularly archaeological site 32MZ474. If the project APE changes, we will request additional inventories, surveys and consultation.

Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms. If you have any questions please contact Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota) and
Director, State Historical Society of North Dakota

# Appendix D:
# Biological Field Report

120099.0004.01

# Targa Resources
# Little Missouri Gas Plant Expansion
# 2014 Field Report

**November 2014**

**Prepared for:**
**Targa Resources**

**Prepared by:**

**Lowham Walsh LLC**
**107 West Main Avenue, Suite 325**
**Bismarck, ND 58501**

# Table of Contents

**Section** **Page**

List of Tables ..... iv
List of Figures ..... v
List of Appendices ..... v
Acronyms and Abbreviations ..... vi

**1 Introduction ..... 1-1**
1.1 Project Background ..... 1-1
1.2 Project Description ..... 1-1
1.2.1 Little Missouri Gas Plant Expansion ..... 1-1
1.2.2 Climatic Features ..... 1-1
1.2.3 Topography ..... 1-2
1.2.4 Hydrology ..... 1-2
1.2.5 Vegetation ..... 1-2

**2 Methods ..... 1-1**
2.1 Desktop Analysis ..... 1-1
2.1.1 NWI Mapping ..... 1-1
2.1.2 USGS NHD Mapping ..... 1-1
2.1.3 Federal Regulations ..... 1-1
2.2 Field Methodology ..... 1-2
2.2.1 Upland Vegetation ..... 1-2
2.2.2 Wetland Delineation Methodology ..... 1-3
2.2.3 Waterbody Identification Methodology ..... 1-3
2.2.4 Wildlife ..... 1-3

**3 Results ..... 1-1**
3.1 Vegetation ..... 1-1
3.1.1 Cover Types ..... 1-1
3.1.2 Noxious Weeds ..... 1-2
3.2 Wetlands & Waterbodies ..... 1-2
3.3 Wildlife ..... 1-3
3.3.1 Whooping Crane ..... 1-4
3.3.2 Piping Plover ..... 1-4
3.3.3 Interior Least Tern ..... 1-4
3.3.4 Sprague's Pipit ..... 1-5
3.3.5 Pallid Sturgeon ..... 1-5
3.3.6 Dakota Skipper ..... 1-5
3.3.7 Gray Wolf ..... 1-5
3.3.8 Northern Long-Eared Bat ..... 1-6
3.3.9 Rufa Red Knot ..... 1-6

3.3.10 Bald & Golden Eagles ..... 1-6
3.4 Summary ..... 1-7
4 References ..... 7

# List of Tables

**Page**

Table 3-1: Listed Noxious Weeds – North Dakota ..... 1-2

Table 3-2: Listed Noxious Weeds – McKenzie County, North Dakota ..... 1-2

Table 3-3: Federally Endangered, Threatened, Proposed, and Candidate Species Known or Believed to Occur in McKenzie County, North Dakota ..... 1-3

# List of Figures

Figure 1: Field Report Map

Figure 2: NWI and NHD Waterbodies

Figure 3: Wetlands

# List of Appendices

Appendix A: Maps of the Project Area

Appendix B: Photographs of the Project Area

Appendix C: Plants Observed in the Project Area

Appendix D: Wetland Delineation Form

# Acronyms and Abbreviations

| | |
|---|---|
| ag | agriculture |
| BGEPA | Bald and Golden Eagle Protection Act |
| Commission | North Dakota Public Service Commission |
| CFR | Code of Federal Regulations |
| CWA | Clean Water Act of 1977 |
| EC | erosion control |
| EPA | Environmental Protection Agency |
| GPS | Global Positioning System |
| HDD | horizontal directional drilling |
| LRR | Land Resource Region |
| MBTA | Migratory Bird Treaty Act |
| MLRA | Major Land Resource Area |
| NDDA | North Dakota Department of Agriculture |
| NHD | National Hydrographic Dataset |
| NRCS | Natural Resources Conservation Service |
| NWI | National Wetlands Inventory |
| OHWM | Ordinary High Water Mark |
| Project | Little Missouri Gas Plant Expansion |
| U.S. | United States of America |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USFWS | United States Fish and Wildlife Service |
| WoUS | waters of the United States |

This page intentionally left blank.

# 1 Introduction

## 1.1 Project Background

The proposed Little Missouri Gas Plan Expansion (Project Area) is located in central McKenzie County, North Dakota.

Lowham Walsh LLC conducted field surveys of the Project Area on October 23, and November 19, 2014. A team of two biologists delineated wetlands and streams and collected biological resource data inside of the proposed Project footprint, and within ½ mile of the Project boundary for raptor nests only.

## 1.2 Project Description

### 1.2.1 Little Missouri Gas Plant Expansion

The Project Area includes two land parcels that Targa is developing to be used for a gas processing plant. A third tract of land is being considered for an associated capability expansion (**Figure 1**). Parcels 1 and 2 are each 40 acres in size and are adjacent to each other, east to west. Parcel 3 is 13 acres in size and lies to the north of Parcel 2. The Project Area is located within the Tepee Buttes USGS Quadrangle and is approximately 7.5 miles south of Watford City, ND. It is approximately 0.8 miles east of U.S. Highway 85, 0.25 miles north of McKenzie County Road CR-34, and it is bisected by 125$^{th}$ Ave NW, in McKenzie County, ND. The Project Area lies within Sections 29 and 30, Township 149N, Range 98W. **Figure 1** shows roads, buildings, waterbodies, general habitat types, and data collection points located within and adjacent to the Northern Border pipeline ROW as of imagery copyrighted in 2014. Due to active oil development, additional facilities and roads may have been constructed since the background imagery was prepared.

### 1.2.2 Climatic Features

The Project Area is located within Natural Resources Conservation Service (NRCS) Major Land Resource Area (MLRA) 54. This area is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers to movement of air masses on the northern Great Plains, which travel unobstructed across the plains and account for rapid changes in temperature. Annual precipitation ranges from 14 to 18 inches per year with the majority falling as rain in the spring and early summer. The normal average annual temperature is about 42° F. January is the coldest month with average temperatures ranging from about 13° F to about 16° F. July is the warmest month with temperatures averaging from about 69° F to about 72° F. The range of normal average monthly temperatures between the coldest and warmest months is about 57° F. This large annual range attests to the continental nature of this MLRA's climate. Winds are generally stronger during the day than at night, and occasional strong storms

may bring brief periods of high winds with gusts that may exceed 50 miles per hour. The growing season in this MLRA is typically around 127 days with a freeze-free period of 148 days (NRCS 2014).

### 1.2.3 Topography

The landscape in the Project Area is generally flat to rolling, with elevation increasing from west to east. Elevation ranges from approximately 2,205 feet above sea level at the western extent of the project area, to 2,310 (Teepee Buttes USGS Quadrangle) feet above sea level in the eastern part of the Project Area.

### 1.2.4 Hydrology

Spring Creek borders the western boundary of the Project Area. Spring Creek is a level 5 perennial tributary to the Missouri River and is mapped as a perennial stream on the U.S. Geological Survey (USGS) National Hydrologic Dataset (NHD) map (USGS 2014), on aerial imagery from Google Earth (2014), and on the Tepee Butte 7.5 minute quadrangle (1997). An intermittent tributary of Spring Creek, mapped as a level 6 perennial tributary r passes through the northern portion of Parcel 3 in the Project Area. The NHD and NWI information for the area is overlaid on aerial imagery as **Figure 2** in Appendix A.

### 1.2.5 Vegetation

The majority of the Project Area is classified as Cultivated Crops and Herbaceous Land Cover according to the National Land Cover Database (NLCD) (USGS 2014). The primary land cover types through which the Project passes are shown on **Figure 1** in Appendix A. Western wheatgrass (*Pascopyrum smithii*) and green needlegrass (*Nasella viridula*) were the historically dominant vegetation in this area, which has since been developed into wheat cropland and cattle grazing. Growth of native cool-season plants begins in late March and continues to early to mid-July. Native warm-season plants begin growth in mid-May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present (NRCS 2014).

# 2 Methods

## 2.1 Desktop Analysis

Aerial photographs, topographic maps, Google Earth imagery, and other data sources were the subject of a desktop analysis prior to going to the field to characterize the landscape within the proposed Project Area. This included roads, waterways, wetlands, pasturelands, and croplands within the Project Area. Plant and wildlife species listed under the Endangered Species Act that could potentially occur in McKenzie County were identified using the United States Fish and Wildlife Service (USFWS) Environmental Conservation Online System (2014b). North Dakota does not have state-designated threatened or endangered species (North Dakota Game and Fish Department 2013). Plant books and web resources, including the North Dakota Department of Agriculture's (NDDA) noxious weed webpage (NDDA 2014), were reviewed. **Section 2.2.1** "Vegetation" lists the resources used.

### 2.1.1 NWI Mapping

United States Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps were consulted prior to beginning field work to determine the locations of potential wetlands crossings to be developed by the Project. NWI data use the federal standard for wetland classification (Cowardin et al. 1979) to catalog and map wetlands nationwide. NWI maps were used as a resource during field surveys to provide support for wetland determinations within the Project Area. NWI wetland mapping provided an approximation of the number and extent of wetlands within the Project Area. These maps were not used for the formal delineation of wetland boundaries. NWI data are shown in **Figure 2**.

### 2.1.2 USGS NHD Mapping

The United States Geological Survey (USGS) National Hydrographic Dataset (NHD) was consulted prior to field work to determine the locations of waterbodies crossed by the Project ROW. NHD is used to portray surface water on the National Map and represents the drainage network with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gauges (USGS 2014). NHD maps were used in support of waterbody determinations by providing an approximation of the number and extent of waterbodies within the Project Area. These maps were not used for the formal delineation of waterbody boundaries. NHD data are also shown in **Figure 2**.

### 2.1.3 Federal Regulations

The Clean Water Act (CWA) is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which regulates discharges into waters of the United States. Section 404 of the CWA regulates activities, including fill material placed in wetlands that are adjacent to navigable waters of the United States. In 1976, the United States Army Corp of Engineers (USACE) and the Environmental Protection Agency (EPA) adopted a regulatory definition of wetlands:

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3).

The onsite determination methods outlined in the USACE 1987 Wetland Delineation Manual (Environmental Laboratory 1987) and the Great Plains Regional Supplement (USACE 2010) were used to delineate wetlands and other waters of the United States.

According to these manuals, the identification of wetlands is based on three factors: (1) the presence of hydrophytic vegetation; (2) hydric soil; and (3) wetland hydrology indicators. Under normal circumstances, all three of these factors must be present for an area to be considered a wetland under Section 404 of the CWA. McKenzie County, North Dakota is covered by the Great Plains Regional Supplement and includes Land Resource Region F (LRR F) – Northern Great Plains Spring Wheat Region.

The USACE regulates the discharge of dredged and/or fill materials into Waters of the U.S. (WoUS) pursuant to Section 404 of the CWA. Under the same section, the USACE also has authority to permit discharge of dredged or fill material in WoUS. Identifying potential WoUS in the field is based on the presence of a defined bed and bank, or ordinary high water mark (OHWM). Corps regulations for the CWA define OWHM as "the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (33 CFR 328.3[e]).

## 2.2 Field Methodology

The field surveys took place October 22 and November 19, 2014. During the field surveys, data points were collected at notable observation locations along the Project ROW. Data points were recorded for the following and designated as indicated: active and inactive raptor nests; cover types such as agricultural and native prairie lands; streams; wetlands; photo points; or other areas where other noteworthy observations were recorded. Noxious weed locations were documented by species and an approximate number of individuals and area was recorded. Further details of each point including plant and animal species observed, soil conditions, and general habitat observations were recorded in a logbook and iPad using the GPS Kit mobile Geographic Information Systems application. Photographs were taken at one side of each stream or wetland and associated soil pit locations, at photo location points (shown in **Figure 1**), noxious weed locations, and at cover type locations.

### 2.2.1 Upland Vegetation

A non-exhaustive list of species observed during surveys was recorded in the logbook and digital data. . Deciduous trees and shrubs were identified by bark, stem shape, dead leaves, and surrounding habitat, as they were largely leafless due to the mid- to late fall survey times. Grasses and most forbs were identified by the current year's flowers and vegetative characteristics since most were in a senescent state in October and all were senescent in

November. The species list may not be complete, due to the time of year surveys took place. Resources used to identify plants included the U.S. Department of Agriculture's PLANTS database (Natural Resources Conservation Service 2014), "Lewis and Clark State Park Preliminary Plant Checklist" pamphlet (North Dakota State Parks n.d.), the *North Dakota Tree Handbook* (North Dakota State University n.d.), *North American Range Plants* (Stubbendieck, Hatch, and Kjar 1982), and the NDDA noxious weed webpage.

### 2.2.2 Wetland Delineation Methodology

On November 19, 2014, an abbreviated wetland survey was completed due to frozen soils and snow cover. This survey focused on vegetation, landform, and hydrology to determine the presence of a wetland. Wetland boundaries were determined using a combination of field observations and aerial imagery. Paired sampling was not employed due to frozen ground conditions.

### 2.2.3 Waterbody Identification Methodology

Non-wetland waters include perennial and intermittent waterways, ephemeral washes, and ditches. USGS topographic maps, aerial photography, and other available mapping were used to identify potential waterbodies. During field surveys, these areas were identified based on the presence of flow and/or indicators of an ordinary high water mark (OHWM), such as changes in the character of the soil, shelving, sediment deposition, scour, and destruction of terrestrial vegetation.

Waterway locations were mapped and the characteristics were recorded using a GPS receiver. Field biologists documented regime (i.e., ephemeral, intermittent, perennial), and OHWM width and depths when field conditions permitted. The OHWM on both banks was located and mapped within the Project Area. The field team photographed each waterway identified and recorded the direction and location of the photograph.

### 2.2.4 Wildlife

Surveyors recorded wildlife species and their sign that were incidentally observed on or adjacent to the Project Area while conducting other surveys. Surveys searched all trees, large shrubs, and manmade structures within 0.25 miles of the Project Area for raptor nests, where land access did not restrict viewing opportunities.

# 3 Results

**Figure 1** in Appendix A shows the Project Area and each photo location recorded along it. Photographs associated with these observations points are provided in **Appendix B**.

## 3.1 Vegetation

The Project Area is located within the Cultivated Crops and Herbaceous Land Cover designations, as identified by the National Land Cover Database. During field surveys, plants identified within and adjacent to the ROW were recorded as being in one of two main "cover type" lists. These are: 1) Agricultural land, which is subdivided into (a) cropland (wheat) or (b) pastureland, and 2) Industrial land. Field teams also documented noxious weeds within the Project Area. A list of species observed by cover type is in **Appendix C**.

### 3.1.1 Cover Types

#### *Industrial Land*

This cover type consisted of areas that have been developed as part of the Little Missouri Gas plant, parking areas, and associated infrastructure in Parcels 1 and 2. **Photos 1 and 3** in Appendix B show the newly constructed facilities of the Little Missouri Gas Plant in Parcel 2 and the background of **Photo 4** shows the main facility in Parcel 1.

#### *Pastureland*

Pastureland areas, located near the west boundary of the Project Area in Parcel 1, the southeast portion of Parcel 2, and encompassing all of Parcel 3, consisted of pasture grasses primarily used for cattle grazing, and is shown in **Photos 2, 4, 6, 8, 9, and 10** in **Appendix B**. Smooth brome (*Bromus inermis*) was the dominant species in the Parcel 1 pastureland and much of the area had been previously mowed, most likely as part of the gas plant's maintenance. Shrubs were present in the riparian area along the east bank of Spring Creek adjacent to Parcel 1. Shrubs observed growing along the banks of Spring Creek included snowberry (*Symphoricarpos* sp.) and Russian olive (*Elaeagnus angustifolia*).

In Parcel 2, non-native species such as Russian thistle (*Salsola tragus*), sunflower (*Helianthus annuus*), and ragweed (*Ambrosia psilostachya*) dominated as the land was recently used for agricultural production. However, some native pasture grasses such as blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), and needle-and-thread grass (*Hesperostipa comata*) were observed. No shrubs were observed in Parcel 2.

In Parcel 3, crested wheatgrass (*Agropyron spicatum*) was the dominant plant species in the upland areas while alkali sacaton (*Sporobolus airoides*) and switchgrass (*Panicum virgatum*) were dominant in the swale near the center of Parcel 3. No shrubs were observed in Parcel 3.

### 3.1.2 Noxious Weeds

**Table 3-1** lists those plants that are considered noxious weeds by the state of North Dakota. **Table 3-2** lists those plants that are considered noxious weeds by McKenzie County, North Dakota. One infestation of Canada thistle (*Cirsium arvense*) was documented in the Project Area in Parcel 1 on the border of pastureland and industrial land areas to the east of Spring Creek, and is shown in **Photo 7** in **Appendix B,** and shown near the bottom-left corner of **Figure 1**. The infestation was approximately 10 x 10 feet in area with approximately 50 individual plants. No other noxious weeds were noted within the Project Area.

**Table 3-1: Listed Noxious Weeds – North Dakota**

| Common Name | *Scientific Name* |
|---|---|
| Absinth wormwood | *Artemisia absinthium* |
| Canada thistle | *Cirsium arvense* |
| Diffuse knapweed | *Centaurea diffusa* |
| Leafy spurge | *Euphorbia esula* |
| Musk thistle | *Carduus nutans* |
| Purple loosestrife | *Lythrum salicaria* |
| Russian knapweed | *Acroptilon repens* |
| Spotted knapweed | *Centaurea maculosa* |
| Yellow toadflax | *Linaria vulgaris* |
| Dalmatian toadflax | *Linaria genistifolia* |
| Saltcedar | *Tamarix chinensis, T. parviflora, T. ramosissima* |

**Table 3-2: Listed Noxious Weeds – McKenzie County, North Dakota**

| Common Name | Scientific Name |
|---|---|
| Black henbane | *Hyoscyamus niger* |
| Houndstongue | *Cynoglossum officinale* |
| Common burdock | *Arctium minus* |
| Halogeton | *Halogeton glomeratus* |
| Baby's breath | *Gypsophila paniculata* |

## 3.2 Wetlands & Waterbodies

Field biologists identified two (2) waterbodies, one (1) drainage, and one (1) wetland. The first waterbody is located in Parcel 1 and shown in **Photo 5** in **Appendix B**, within the Project Area. This waterbody, named Spring Creek, is mapped by USGS NHD as a perennial tributary. The OWHM width is approximately 10 feet with bed comprised mostly of silts and clay. Water was observed in the streambed flowing northeast at a normal depth of approximately one foot. ..

The second waterbody identified by field biologists is located in Parcel 3 and mapped by USGS NHD as an intermittent tributary to Spring Creek. This waterbody is contained within a

wetland shown in **Photo 9 of Appendix B**. No bed and bank were observed in the field due to snow cover and the OWHM was observed as discontinuous where standing water had frozen in place. Because the waterbody is contained within the wetland and the ground conditions were frozen and snow covered, no OWHM was mapped.

Field biologists identified one ephemeral drainage flowing into Spring Creek. This drainage, shown in **Photo 6** in **Appendix B**, is located in the southwest corner of Parcel 1 and flows through native pasture into Spring Creek. The drainage lacked a defined OWHM and the channel was vegetated by dense pasture grasses, such as smooth brome.

Field biologists identified one wetland in Parcel 3. This wetland, shown in **Photo 9** of **Appendix B**, covers 1.83 acres and bisects Parcel 3. The wetland is classified as a PEM wetland and is located within a USGS NHD mapped tributary stream to Spring Creek. Dominant vegetation includes alkali sacaton and switchgrass. Standing water was noted in disconnected channel areas within the wetland, and the landform was a broad, bowl-shaped, gently sloping swale. The wetland is shown as a polygon in Parcel 3 of **Figure 1,** and is shown in closer view in **Figure 3**. A Wetland Delineation Form is included in **Appendix E**.

## 3.3 Wildlife

Two (2) wildlife species, grey partridge (Perdix perdix) and ring-neck pheasants (*Phasianus colchicus*), were recorded incidentally during Project field surveys. These species are non-native, upland game birds and are not protected by the Migratory Bird Treaty Act (MBTA). No raptor nests were observed within 0.25 miles of the Project.

**Table 3-3** details the species that are listed, or are candidates for listing, under the Endangered Species Act that are known or believed to occur in McKenzie County (USFWS 2014b). None of the species in **Table 3-3** were observed during the field surveys; however, surveys targeting these species were not conducted and most of these species do not occur in the area at the times the surveys were conducted (i.e., late October and November).

**Table 3-3: Federally Endangered, Threatened, Proposed, and Candidate Species Known or Believed to Occur in McKenzie County, North Dakota**

| Common Name | Latin Name | Status |
|---|---|---|
| Whooping Crane | *Grus americana* | Endangered |
| Piping Plover | *Charadrius melodus* | Threatened |
| Interior Least Tern | *Sterna antillarum* | Endangered |
| Sprague's Pipit | *Anthus spragueii* | Candidate |
| Pallid Sturgeon | *Scaphirhynchus albus* | Endangered |
| Dakota Skipper | *Hesperia dacotae* | Threatened |
| Gray Wolf | *Canis lupus* | Endangered |
| Northern Long-Eared Bat | *Myotis septentrionalis* | Proposed |
| Rufa Red Knot | *Calidris canutus rufa* | Proposed |

**Table 3-3: Federally Endangered, Threatened, Proposed, and Candidate Species Known or Believed to Occur in McKenzie County, North Dakota**

| Common Name | Latin Name | Status |
|---|---|---|
| Bald and Golden Eagles | *Haliaeetus leucocephalus & Aquila chrysaetos* | Bald and Golden Eagle Protection Act (BGEPA) |

The following subsections provide a brief description of each species, their habits and habitat, and their potential to occur in the Project Area based on the habitat observed during the October 2014 field surveys:

### 3.3.1 Whooping Crane

Whooping cranes are diurnal migrants that stop daily during spring and fall migration to forage and rest (Lewis 1995; Canadian Wildlife Service and USFWS 2007). They roost during the evenings in shallow water in wetlands, lakes, ponds, and riverine areas away from human activity (Lewis 1995). Whooping cranes leave their roost after daybreak to forage in a variety of croplands and emergent wetlands and generally wait until the air warms and provides thermal updrafts before continuing their migration (Lewis 1995). The October field survey may have overlapped with the tail end of the fall whooping crane migration to the south, and the November survey was not conducted after their migration would have moved through North Dakota (eBird 2014). However, there is limited suitable stopover habitat present in the Project Area and it is in close proximity to human activity (i.e., roads, agriculture, and energy development). While the potential for whooping crane stopovers in the Project Area exists, it is doubtful that Whooping cranes would utilize this habitat for even a short stopover due to the presence of human activity.

### 3.3.2 Piping Plover

The Northern Great Plains breeding population of piping plovers most commonly nests on alkali lakes, reservoirs, and rivers, and less commonly on freshwater lakes, dry alkali lakes, sandpits, industrial ponds, and gravel mines (Elliott-Smith and Haig 2004; Haig et al. 2005). Nesting habitats are typically more exposed and sparsely vegetated, as the species tends to prefer substrates with higher gravel content (Elliott-Smith and Haig 2004). The Project Area is not located in designated critical habitat (2014c). Further, no suitable nesting habitat was observed and it is highly unlikely that piping plovers would stopover or nest in the Project Area.

### 3.3.3 Interior Least Tern

Interior least terns nest in colonies on bare or sparsely vegetated sand or dried mud along rivers, reservoirs, lakes, and salt flats (Thompson et al. 1997; Lott 2006; Tern & Plover Conservation Partnership 2014). They increasingly use human-modified nesting locations, such as sand/gravel pits, gravel rooftops, and industrial sites in proximity to water in areas where natural nesting habitat has been altered or removed (Sidle and Harrison 1990; Thompson et al. 1997). No suitable nesting and breeding habitat was observed within the Project Area. Although not observed during field surveys, least terns may use any aquatic habitat in the Project Area during post-breeding and fall migration, as the species has been observed in a variety of aquatic

habitats throughout most of the United States during these periods (Thompson et al. 1997; Tern & Plover Conservation Partnership 2014). Given this information, the interior least tern is a possible, but unlikely, stopover migrant at wetlands and streams in or adjacent to the Project Area.

### 3.3.4 Sprague's Pipit

Sprague's pipits prefer well-drained areas of open, native grasslands (Robbins and Dale 1999). As such, the areas of native prairie documented in the Project Area may serve as potential nesting habitat for the species. No Sprague's pipits were observed; however, targeted surveys of the species during the breeding season were not conducted. Locally breeding individuals would have migrated out of the area by the time the surveys were conducted in late October and November.

### 3.3.5 Pallid Sturgeon

Pallid sturgeon do occur in the Missouri and Mississippi Rivers and some of their larger tributaries (USGS 2013). In North Dakota, their range is limited by damming, and the current range does not include McKenzie County. The Project is not likely to have any effect on pallid sturgeon as the Missouri River is not located within the Project Area nor is the species believed to be currently present in McKenzie County.

### 3.3.6 Dakota Skipper

Dakota skippers inhabit native prairie with high diversity of wildflowers and grasses (USFWS 2014d). No Dakota skippers were observed incidentally during October or November 2014 surveys, because adults emerge from pupae in June and July and generally live no longer than three weeks. Larvae build shelters underground and feed throughout the growing season, then become dormant in the fall. They overwinter in shelters at or just below ground level, usually in the base of native bunchgrasses. The pastureland habitat present in the Project Area most likely does not provide suitable habitat for the Dakota skipper as it is dominated mostly by non-native, rhizomatous grasses and few flowering forbs. Designated critical habitat occurs in three locations in the vicinity of the Project, including two areas approximately 30 miles north of the Project near the Missouri River and one area approximately 25 miles east of the Project. Due to a lack of suitable habitat at the Project Area and the distance to the nearest designated critical habitat, the proposed project is not likely to have an impact on this species or the designated critical habitat. The proposed project is not likely to have an impact on the designated critical habitat.

### 3.3.7 Gray Wolf

The presence of gray wolves in North Dakota has been sporadic. Sightings of gray wolves have been documented, but biologists believe these animals are likely dispersing from packs located in Minnesota and Manitoba, Canada (USFWS 2013). The gray wolf's habitat is largely restricted to areas with low densities of human habitation and roads. In North Dakota, habitat most likely includes the forested areas in north-central and northeast North Dakota;

however, they may appear anywhere in the state. Given the high density of roads and people in the Project Area, coupled with its distance from Manitoba and Minnesota, gray wolves are highly unlikely to occur in the Project Area.

### 3.3.8 Northern Long-Eared Bat

Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. During summer, they roost underneath bark, in cavities, or in crevices of both live and dead trees. They emerge at dusk to fly through the understory of forested hillsides and ridges and feed on insects, which they catch while in flight using echolocation. They breed in late summer or early fall when males begin swarming near hibernacula. After copulation, females store sperm during hibernation until spring, when they emerge and fertilize the egg. After fertilization, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup, which may occur from late-May to late-July (USFWS 2014e).

Northern long-eared bats are extremely susceptible to white-nose syndrome, which is named for the white fungus that appears on the muzzle and other parts of hibernating bats. This syndrome has a high mortality rate and has spread rapidly across the eastern and Midwestern United States since first being document in New York in 2006-2007 (USFWS 2014f).

While the Northern Long-eared Bat is not presently listed under the Endangered Species Act, its status is currently under review by the USFWS for potential listing. The USFWS has recently proposed to list the Northern Long-eared Bat as endangered; however, the listing has not been finalized at this time. Due to a lack of suitable habitat at the Project Area the proposed project is not likely to have an impact on this species.

### 3.3.9 Rufa Red Knot

Rufa red knots are shorebirds that make of the longest distance migrations between wintering grounds in southern South America and breeding areas within the Canadian Arctic. Knots can fly thousands of miles without stopping and principally stopover in marine and estuarine habitats. They are known to breed in the inland Arctic tundra where there is little vegetation and close access to the coast (USFWS 2011).

The rufa red knot is not presently listed under the Endangered Species Act, its status is currently under review by the USFWS for potential listing. The USFWS has recently proposed to list the rufa red knot as threatened; however, the listing has not been finalized at this time. No suitable habitat was observed and it is highly unlikely that knots would stopover or nest in the Project Area.

### 3.3.10 Bald & Golden Eagles

The BGEPA provides for the protection of the Bald Eagle and the Golden Eagle. While the habitat in the area is not suitable for nesting, eagles are known to occur in the general area. While the potential for Bald and Golden Eagle nesting in the Project Area exists, it is doubtful

that eagles would utilize this habitat due to the presence of human activity. Therefore, the proposed project is not likely to have an impact on these species.

## 3.4 Summary

Surveyors identified one perennial waterbody, one intermittent waterbody, one ephemeral drainage, and one wetland. No wildlife species of concern were observed during the surveys. The survey was completed after most breeding and migrating birds had left the area for points further south, and when butterfly larvae such as the Dakota skipper had gone into dormancy. It is possible that protected animal species may use lands in or adjacent to the Project Area, although the available habitats suggest that these species would use these lands as a stop-over area rather than for nesting or rearing of young, with the exception of the Sprague's pipit. In addition, vegetation was in a dormant phase during the survey period. It is possible that additional noxious weeds that bloom earlier in the year may be present within the Project Area but were not observed because their above-ground parts had already died back.

# 4 References

Canadian Wildlife Service and United States Fish and Wildlife Service (Canadian Wildlife Service and USFWS). 2007. International Recovery Plan for the Whooping Crane. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 162 pp.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. United States Fish and Wildlife Service Biological Report 79/31, Washington D.C.

eBird. 2014. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. Accessed December 3, 2014.

Elliott-Smith, Elise and Susan M. Haig. 2004. Piping Plover (*Charadrius melodus*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/002. Accessed May 30, 2014.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Gretag/Macbeth. 2000. Munsell® color. New Windsor, NY.

Google Earth. 2014. Accessed on line October to November 2014 at earth.google.com/earth

Haig, Susan M., Cheron L. Ferland, Francesca J. Cuthbert, Jack Dingledine, J. Paul Goossen, Anne Hecht, and Nell McPhillips. 2005. A Complete Species Census and Evidence for Regional Declines in Piping Plovers. *Journal of Wildlife Management* 69(1):160–173.

Lewis, James C. 1995. Whooping Crane (*Grus americana*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/153. Accessed May 29, 2014.

Lott, C.A. 2006. Distribution and Abundance of the Interior Population of the Least Tern (*Sternula antillarum*), 2005. A Review of the First Complete Range-Wide Survey in the Context of Historic and Ongoing Monitoring Efforts. U.S. Army Corps of Engineers, Engineer Research and Development Center, Dredging Operations and Environmental Research Program.

Natural Resources Conservation Service. 2014. The PLANTS Database National Plant Data Team, U.S. Department of Agriculture, Greensboro, North Carolina. http://plants.usda.gov. Accessed May 28, 2014.

North Dakota Department of Agriculture. 2014. Noxious Weeds. http://www.nd.gov/ndda/program/noxious-weeds. Accessed May 27, 2014.

North Dakota Game and Fish Department. 2013. Threatened and Endangered Species. http://gf.nd.gov/wildlife/fish-wildlife/threatened-and-endangered-species. Accessed May 5, 2014.

North Dakota State Parks. n.d. Lewis and Clark State Park Preliminary Plant Checklist. Epping, North Dakota.

Preston, C. R. and R. D. Beane. 2009. Red-tailed Hawk (*Buteo jamaicensis*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/052. Accessed May 29, 2014.

Robbins, Mark B. and Brenda C. Dale. 1999. Sprague's Pipit (*Anthus spragueii*). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. http://bna.birds.cornell.edu/bna/species/439. Accessed May 30, 2014.

Sidle, John G. and William F. Harrison. 1990. Recovery Plan for the Interior Population of the Least Tern (*Sterna antillarum*). United States Fish and Wildlife Service, Twin Cities, Minnesota.

Stubbendieck, J., Stephan L. Hatch, and Kathie J. Kjar. 1982. *North American Range Plants*, Second Edition. University of Nebraska Press, Lincoln, Nebraska.

Tern & Plover Conservation Partnership. 2014. Interior Least Tern (*Sternula antillarum athalassos*). University of Nebraska – Lincoln. http://ternandplover.unl.edu/tern/index-tern.asp. Accessed May 30, 2014.

U.S. Department of Agriculture (USDA) Soil Conservation Service. 1994. Changes in Hydric Soils of the United States. Federal Register 59(133): 35680-35681, July 13, 1994.

United States Fish and Wildlife Service (USFWS). 2013. Gray Wolf (Canis lupus). North Dakota Field Office. http://www.fws.gov/northdakotafieldoffice/endspecies/species/gray_wolf.htm. Accessed May 30, 2014.

_____. 2014a. National Wetlands Inventory. Available at http://www.fws.gov/Wetlands/data/index.html Accessed October 2014.

———. 2014b. Environmental Conservation Online System. Species by County Report: Mountrail County, North Dakota. http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=38061 Accessed May 5, 2014.

———. 2014c. Critical Habitat Portal. http://ecos.fws.gov/crithab/. Accessed May 5, 2014.

———. 2014d. Dakota Skipper (*Hesperia dacotae*). North Dakota Field Office. http://www.fws.gov/northdakotafieldoffice/endspecies/species/dakota_skipper.htm. Accessed May 30, 2014.

_____. 2014e. Northern long-eared bat (*Myotis septentrionalis*) Fact Sheet. Midwest Region. http://www.fws.gov/Midwest/endangered/mammals/nlba/nlbaFactSheet.html. Accessed December 5, 2014.

2014f. White-Nose Syndrome Fact Sheet. Midwest Region. https://www.whitenosesyndrome.org/sites/default/files/resource/white-nose_fact_sheet_6-2014_1.pdf. Accessed December 5, 2014.

2011. U.S Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form. Rufa Red Knot (*Calidris canutus ssp. rufa*). Northeast Region. May 16, 2011. http://ecos.fws.gov/docs/candidate/assessments/2011/r5/B0DM_V01.pdf.

United States Geological Survey (USGS). 2013. North Dakota's Federally Listed Endangered, Threatened, and Candidate Species: Pallid Sturgeon (*Scaphirhynchus albus*). Northern Prairie Wildlife Research Center. http://www.npwrc.usgs.gov/resource/wildlife/nddanger/species/scapalbu.htm. Accessed May 30, 2014.

_____. National Land Cover Database in the Multi-Resolution Land Characteristics Consortium website. Available online: http://www.mrlc.gov/. Accessed: November, 2014.

_____. 2014. Hydrography: National Hydrography Dataset and Watershed Boundary Dataset. Available online: http://nhd.usgs.gov/. Accessed: August 19, 2014.

U.S. Army Corps of Engineers (USACE). 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

# Appendix A: Maps of Project Area

This page intentionally left blank.

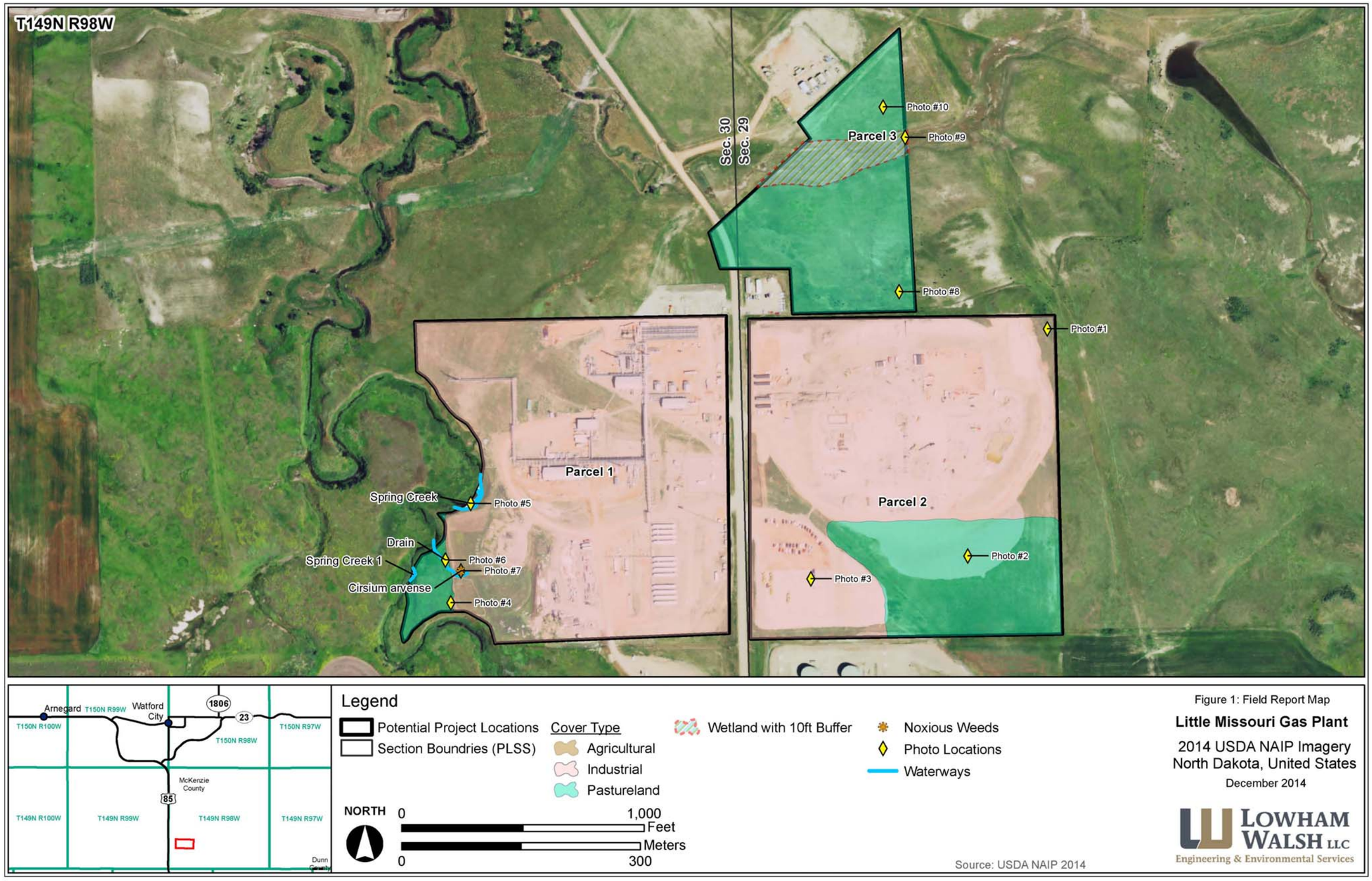



Figure 1: Field Report Map

**Little Missouri Gas Plant**

2014 USDA NAIP Imagery
North Dakota, United States
December 2014

LOWHAM WALSH LLC
Engineering & Environmental Services


T149N R98W
Spring Creek
Spring Creek
Spring Creek
Sec. 30
Sec. 29
Parcel 3
Parcel 1
Parcel 2
Arnegard
T150N R99W
Watford City
1806
23
T150N R100W
T150N R98W
T150N R97W
McKenzie County
85
T149N R100W
T149N R99W
T149N R98W
T149N R97W
Dunn
Legend
Potential Project Locations
Section Boundries (PLSS)
NWI Wetlands
NHD Drainages
NORTH
0
1,000
Feet
Meters
0
300
Source: USDA NAIP 2014
Figure 2: NWI and NHD Waterbodies
Little Missouri Gas Plant
2014 USDA NAIP Imagery
North Dakota, United States
December 2014
LOWHAM WALSH LLC
Engineering & Environmental Services

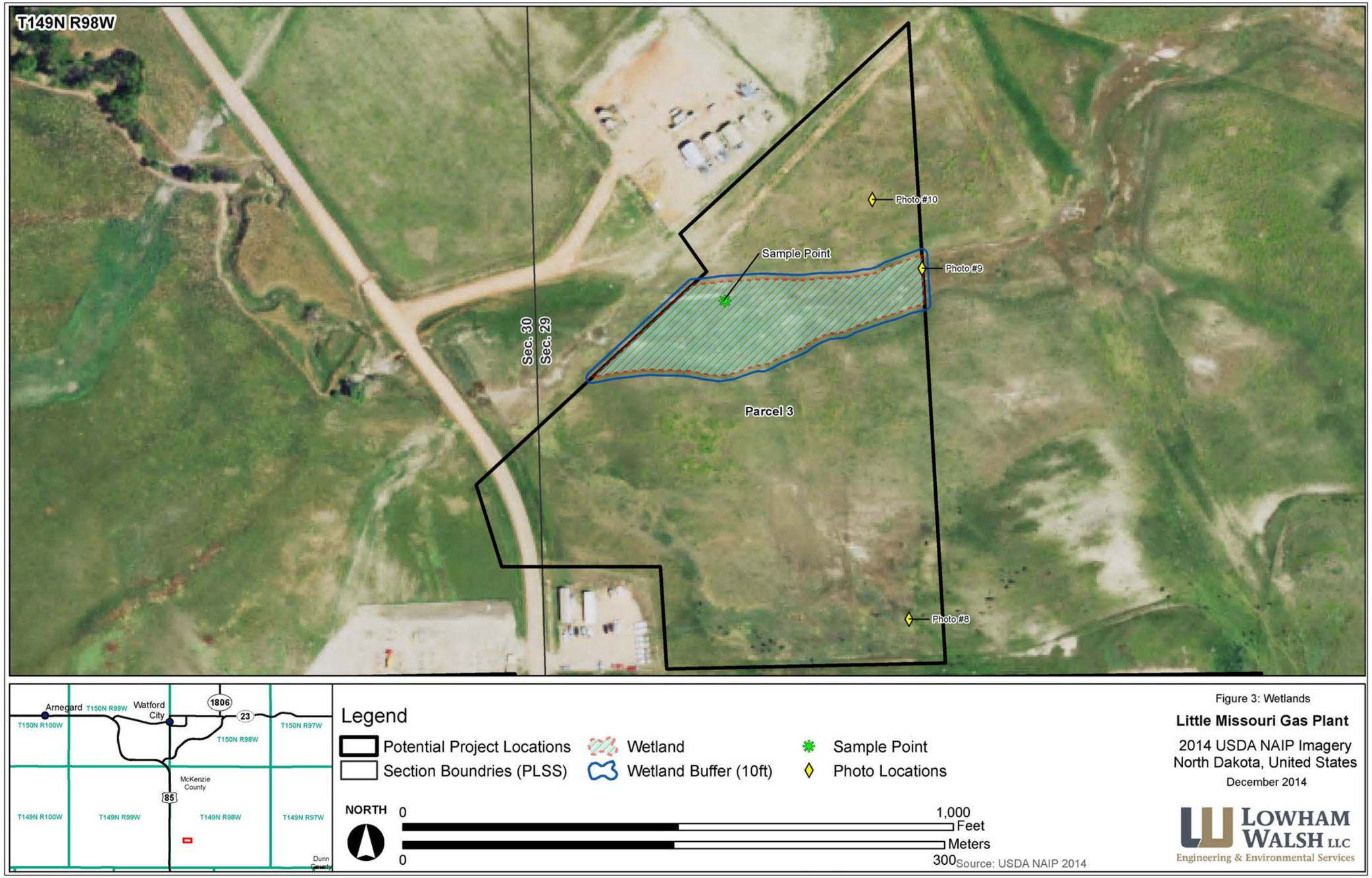



Figure 3: Wetlands

**Little Missouri Gas Plant**

2014 USDA NAIP Imagery
North Dakota, United States
December 2014

LOWHAM WALSH LLC
Engineering & Environmental Services

# Appendix B: Photographs of Project Area

This page intentionally left blank.



Photo 1: Industrial (looking west). View from the northeastern boundary of Parcel 2 of the facilities under construction at the Little Missouri Gas Plant.



Photo 2: Old agricultural field (looking southwest). View of an old agricultural field that has reverted back to pastureland in the southeastern portion of Parcel 2. Although the area was mostly dominated by non-native annuals such as Russian thistle, native plants such as sunflower, and ragweed, some native pasture grasses such as blue grama, little bluestem, and needle-and-thread grass were also observed.



Photo 3: Industrial (looking northwest). View of the parking facility in Parcel 2 at the Little Missouri Gas Plant.



Photo 4: Pastureland (looking northeast). Overview photo the pastureland area in the southwest corner of Parcel 1. In the background is the Little Missouri Gas Plant's main facility.



Photo 5: Spring Creek (looking northeast). View of the perennial stream Spring Creek as it flows into and out of the boundary of the Little Missouri Gas Plant in Parcel 1.



Photo 6: Drain (looking northwest and down-gradient). View of ephemeral draw that drains northwest into Spring Creek.



Photo 7: Cirsium arvense (looking east). View of Canada thistle (*Cirsium arvense*) - noxious weed infestation. This patch is located to the east of Photo 6. Plants are small and hard to discern in this photo, although biologists estimated there were approximately 50 thistle plants in a 10 x 10 foot square area.



Photo 8: Pastureland (looking northwest). View of pastureland taken from the southeast boundary of Parcel 3.



Photo 9: Wetland (looking west). Wetland area that contains an NHD mapped stream located in the north portion of Parcel 3. The wetland contained rush, broadleaf cattails, foxtail barley, alkali sacaton and switchgrass. Hydric soil indicators were unable to be collected due to frozen ground but an approximate wetland boundary was mapped using hydrology and vegetation indicators and then given a 10-foot buffer zone around the entire wetland polygon.



Photo 10: Pastureland (looking south). View of the pastureland near the north boundary of Parcel 3.

# Appendix C: Plants Observed in the Project Area

| **Pastureland** | |
|---|---|
| Blue grama | *Bouteloua gracilis* |
| Little bluestem | *Schizachyrium scoparium* |
| Needle-and-thread | *Hesperostipa comata* |
| Crested wheatgrass | *Agropyron cristatum* |
| Smooth brome | *Bromus inermis* |
| Western wheatgrass | *Pascopyrum smithii* |
| Canada thistle | *Cirsium arvense* |
| Curlycup gumweed | *Grindelia squarrosa* |
| Fringed sage | *Artemisia frigida* |
| Yellow sweet-clover | *Melilotus officinalis* |
| Prickly Russian-thistle | *Salsola tragus* |
| Ragweed | *Ambrosia psilostachya* |
| Annual sunflower | *Helianthus annuus* |
| Snowberry | *Symphoricarpos sp.* |
| Russian olive | *Elaeagnus angustifolia* |
| **Wetlands and Streams** | |
| Switchgrass | *Panicum virgatum* |
| Alkali sacaton | *Sporobolus airoides* |
| Rush sp. | *Juncus sp. and/or Schoenoplectus sp* |
| Broadleaf cattail | *Typha latifolia* |
| Prairie cordgrass | *Spartina pectinata* |
| Foxtail barley | *Hordeum jubatum* |

# Appendix D: Wetland Delineation Form

# WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Little Missouri Gas Plan Expansion - Parcel 3 City/County: McKenzie Sampling Date: Nov 19, 2014

Applicant/Owner: Targa Resources State: ND Sampling Point: 1

Investigator(s): Marit Sawyer, Kaitlin Oress Section, Township, Range: S29, T49N, R98W

Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): concave Slope (%): 1%

Subregion (LRR): LRR F Lat: 47 deg. 41.43 min. Long: 103 deg. 15.42 min. Datum: WGS 1984

Soil Map Unit Name: E0835A Savage-Grail NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No _____ | **Is the Sampled Area within a Wetland?** Yes X No _____ |
| Hydric Soil Present? | Yes X No _____ | |
| Wetland Hydrology Present? | Yes X No _____ | |

Remarks:Wetland evaluation limited because ground was snow covered and frozen.
The area appears to have been worked by machinery (plowed?) in the past. There are apparent drill row lines and wheel depressions. Some of these, however, are frost-heave hummocks.

## VEGETATION – Use scientific names of plants.

| | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| Tree Stratum (Plot size: _____) | | | |
| 1. No trees present | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 0 = Total Cover | | |
| Sapling/Shrub Stratum (Plot size: _____) | | | |
| 1. No shrubs present | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 0 = Total Cover | | |
| Herb Stratum (Plot size: 40' x 40') | | | |
| 1. Sporobolus airoides | 60 | Y | FAC |
| 2. Panicum virgatum | 30 | Y | FAC |
| 3. Hordeum jubatum | 2 | N | FACW |
| 4. Agropyron cristatum | 2 | N | UPL |
| 5. Typha sp. | 2 | N | OBL |
| 6. Schoenoplectus sp. | 1 | N | OBL |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| | 97 = Total Cover | | |
| Woody Vine Stratum (Plot size: _____) | | | |
| 1. No woody vines present | | | |
| 2. | | | |
| | 0 = Total Cover | | |

% Bare Ground in Herb Stratum 3

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes X No _____

Remarks:Area has been previously worked by machinery. Small areas of standing water (ice) noted (< 0.1 ac) which contained Typha and Schoenoplectus. Landform is concave to flat. A stock pond is located upgradient of the area, which provides a connection to Spring Creek. The area clearly carries water either via surface or sub-surface flow intermittently through the year. If disturbed, this water would need to be conveyed through the disturbed area as part of a storm water control program, and to manage muddy conditions in the work area.

## SOIL

Sampling Point: 1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Redox Features Type[1] | Redox Features Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | dark brown | | iron-manganese concentrations in matrix | | | | silty clay | reddish features appear to indicate hydric conditions - soils deformed due to frozen conditions and unable to be accurately colored |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** X **No** _____

Remarks: One soil sample to 6 inches was dug with a spud bar due to frozen ground conditions. The sample was deformed due to this collection technique and ground conditions; therefore, an accurate soil color was unable to be recorded. Soil was dark brown, moist, silty-clay. Prominent redox concentrations were observed in the matrix as iron-manganese masses. Area most likely meets F6 indicator, but soils were too frozen to fully detail.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- X Frost-Heave Hummocks (D7) (**LRR F**)

**Field Observations:**

Surface Water Present? Yes X No _____ Depth (inches): 0 - Ice

Water Table Present? Yes X No _____ Depth (inches): likely 3 to 6" below surface

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

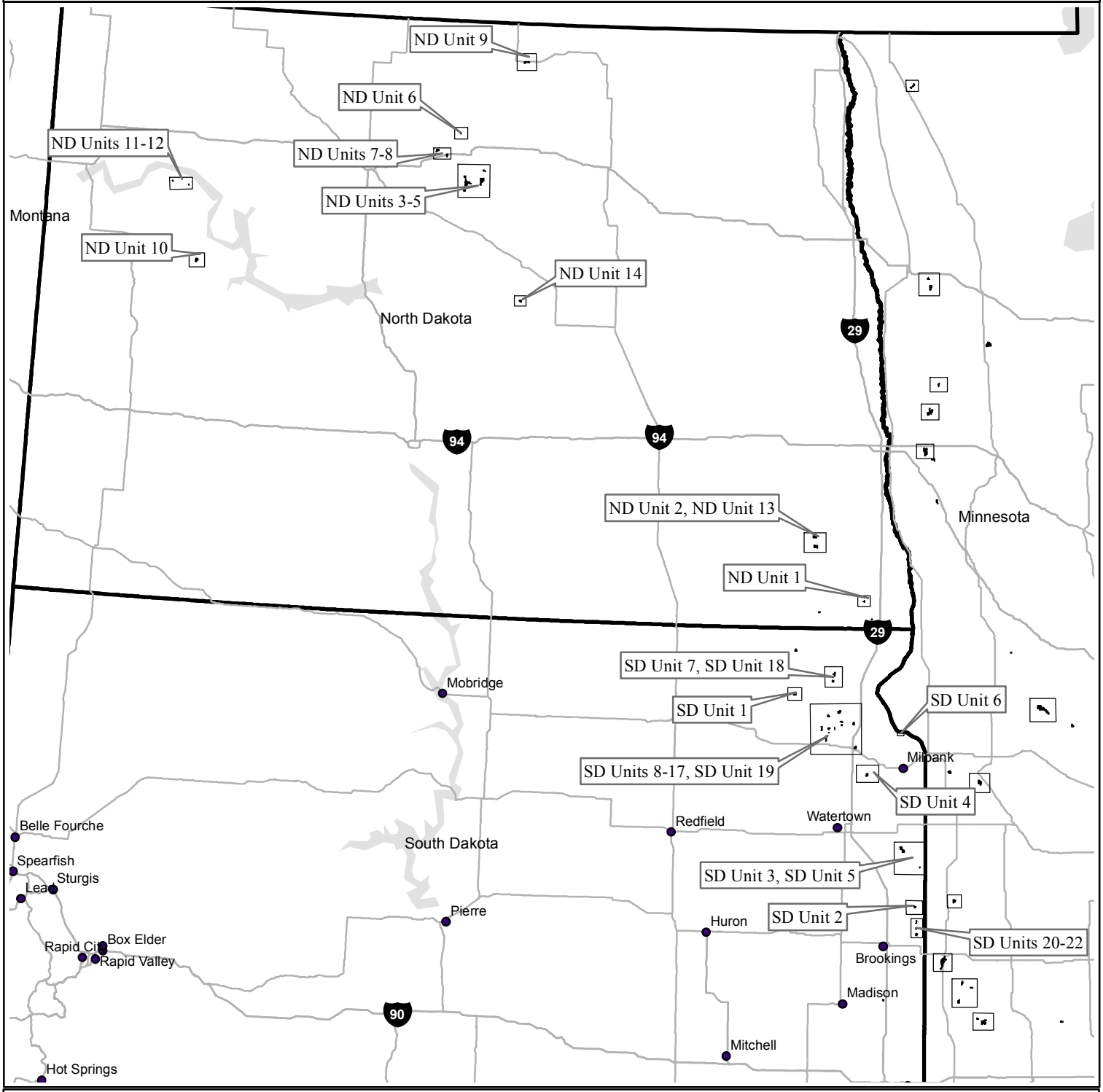
**Wetland Hydrology Present?** **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available: NWI map lists stock pond above project area as PAB-FH (Palustrine, Aquatic bed, semi-permanent to permanently inundated). USGS (1997) map shows drainage as being perennial.

Remarks:

Aerial photo taken in fall shows apparent wet areas (dark brown in color) in recently installed pipeline corridor, and spring photo shows distinct vegetation change between the swale and nearby uplands, with the swale supporting greener vegetation. Photo taken early in spring before uplands greened up. Imagery sources: Google Earth, NAIP. Standing water was frozen at time of sampling.

# Dakota Skipper Critical Habitat
## North and South Dakota Index Map



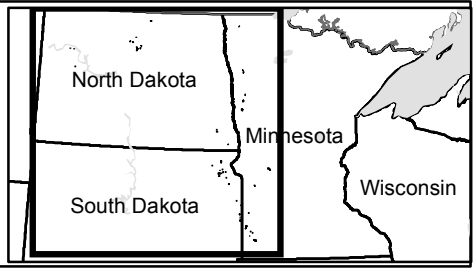

**Legend**

- Dakota Skipper Critical Habitat
- map_extent
- City or Town
- Major Roads

N

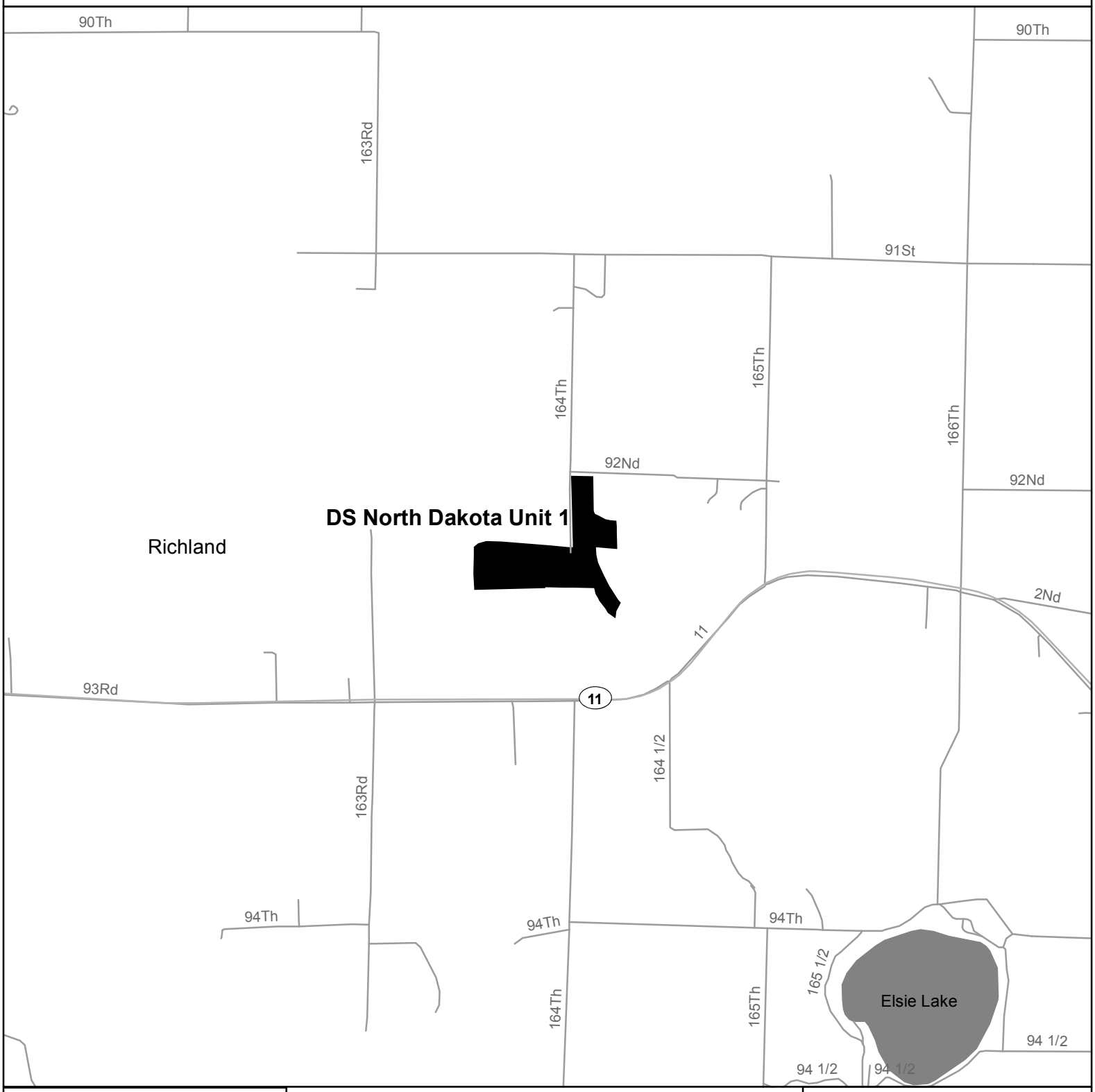
0 10 20 40 60 80 Miles

0 1020 40 60 80 Kilometers



# Dakota Skipper Critical Habitat

## North Dakota Unit 1, Richland County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

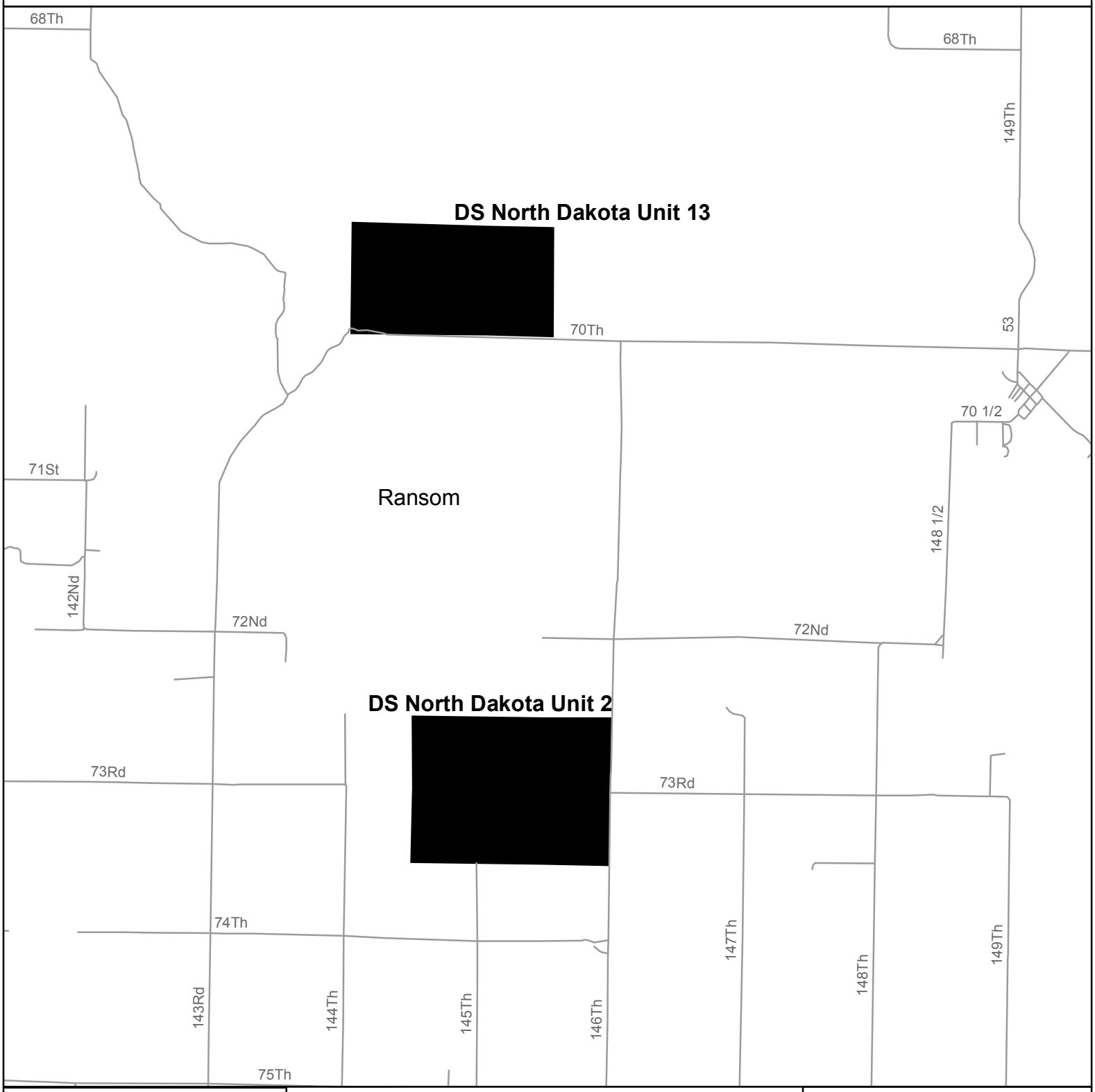
0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Units 2 and 13, Ransom County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.375 0.75 1.5 2.25 Miles

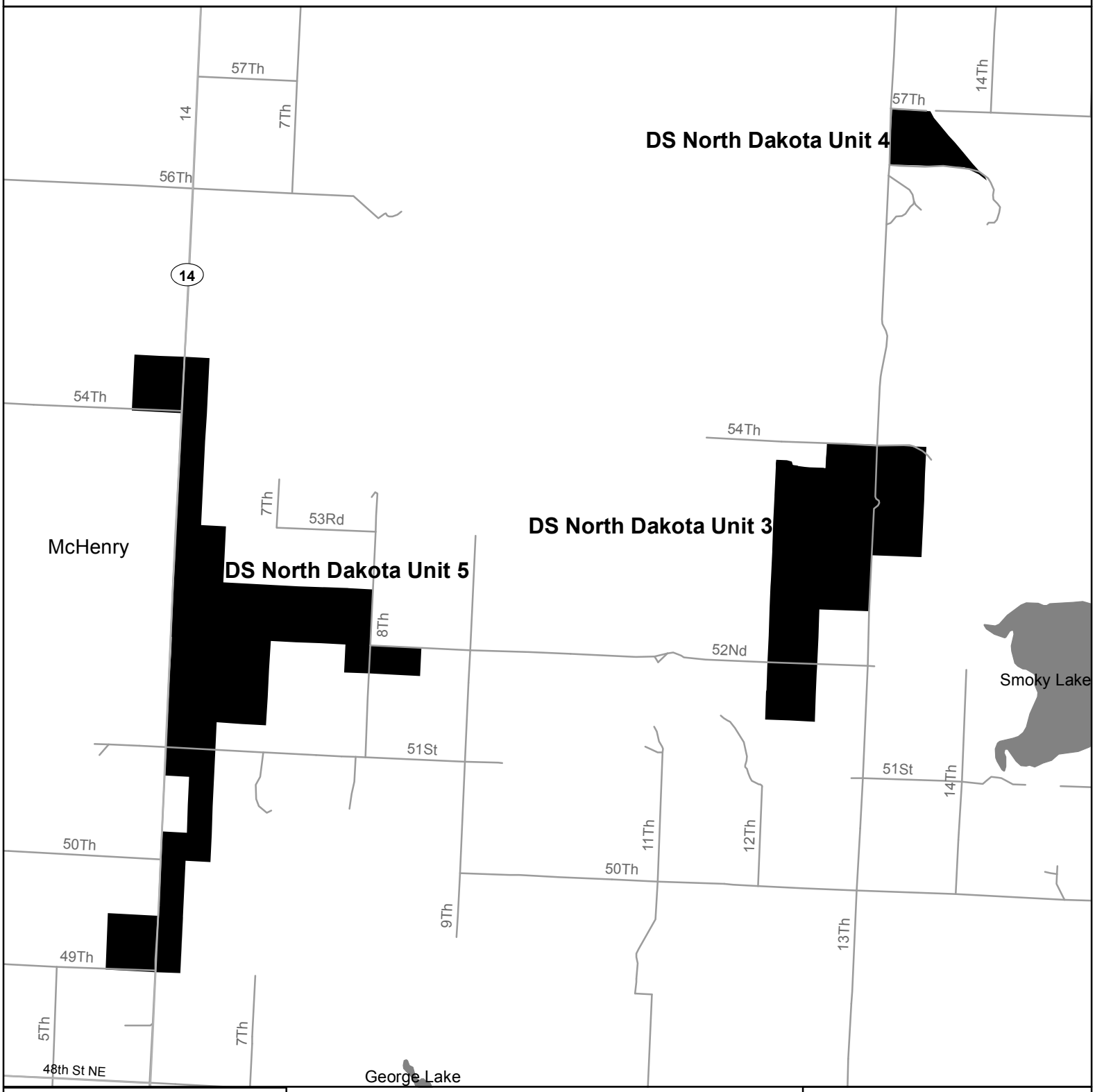
0 0.75 1.5 3 Kilometers

1:60,000



# Dakota Skipper Critical Habitat

## North Dakota Units 3, 4 and 5, McHenry County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.5 1 2 3 Miles

0 1 2 4 Kilometers

1:80,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 6, McHenry County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

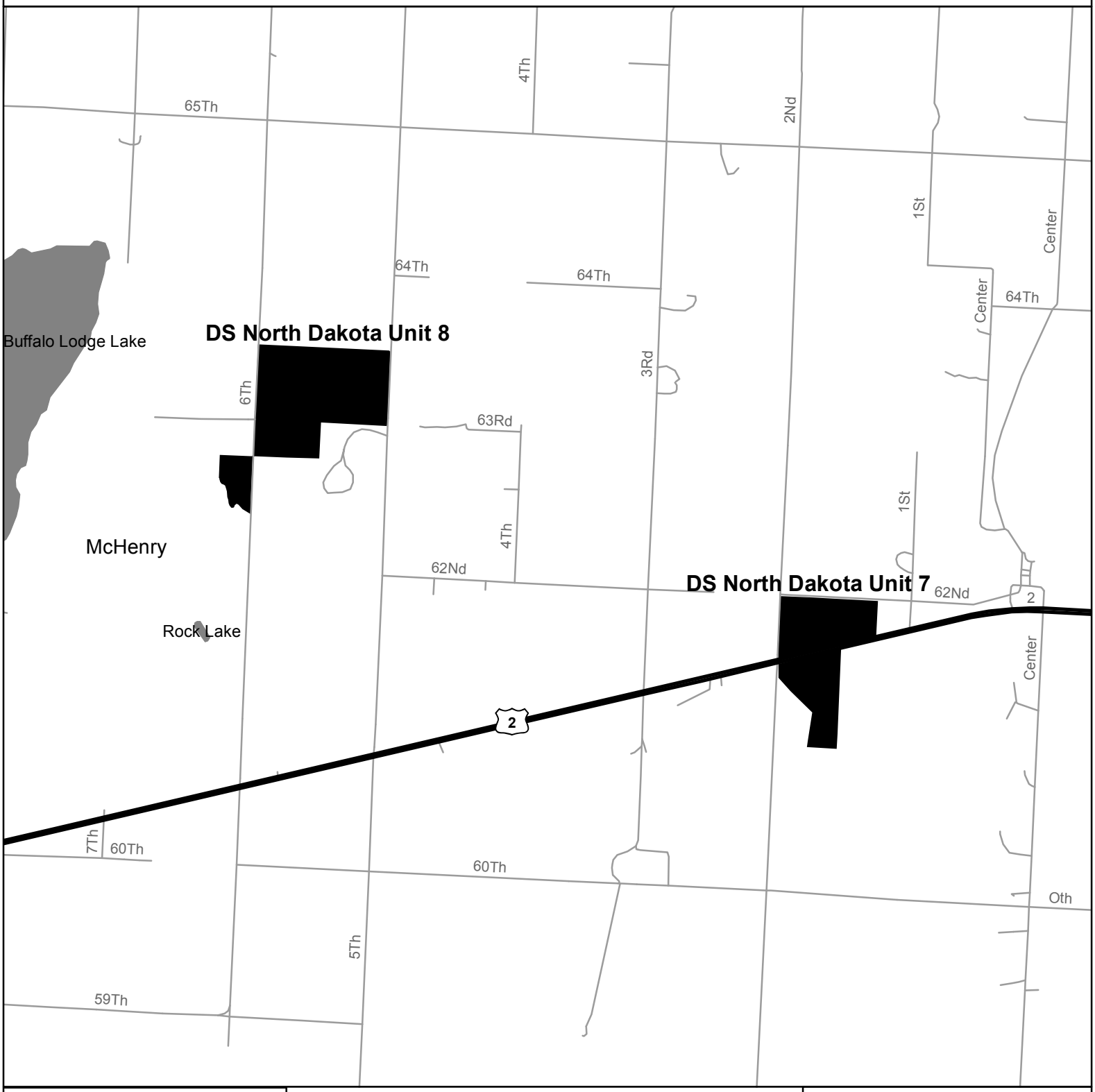
0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Units 7 and 8, McHenry County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.375 0.75 1.5 2.25 Miles

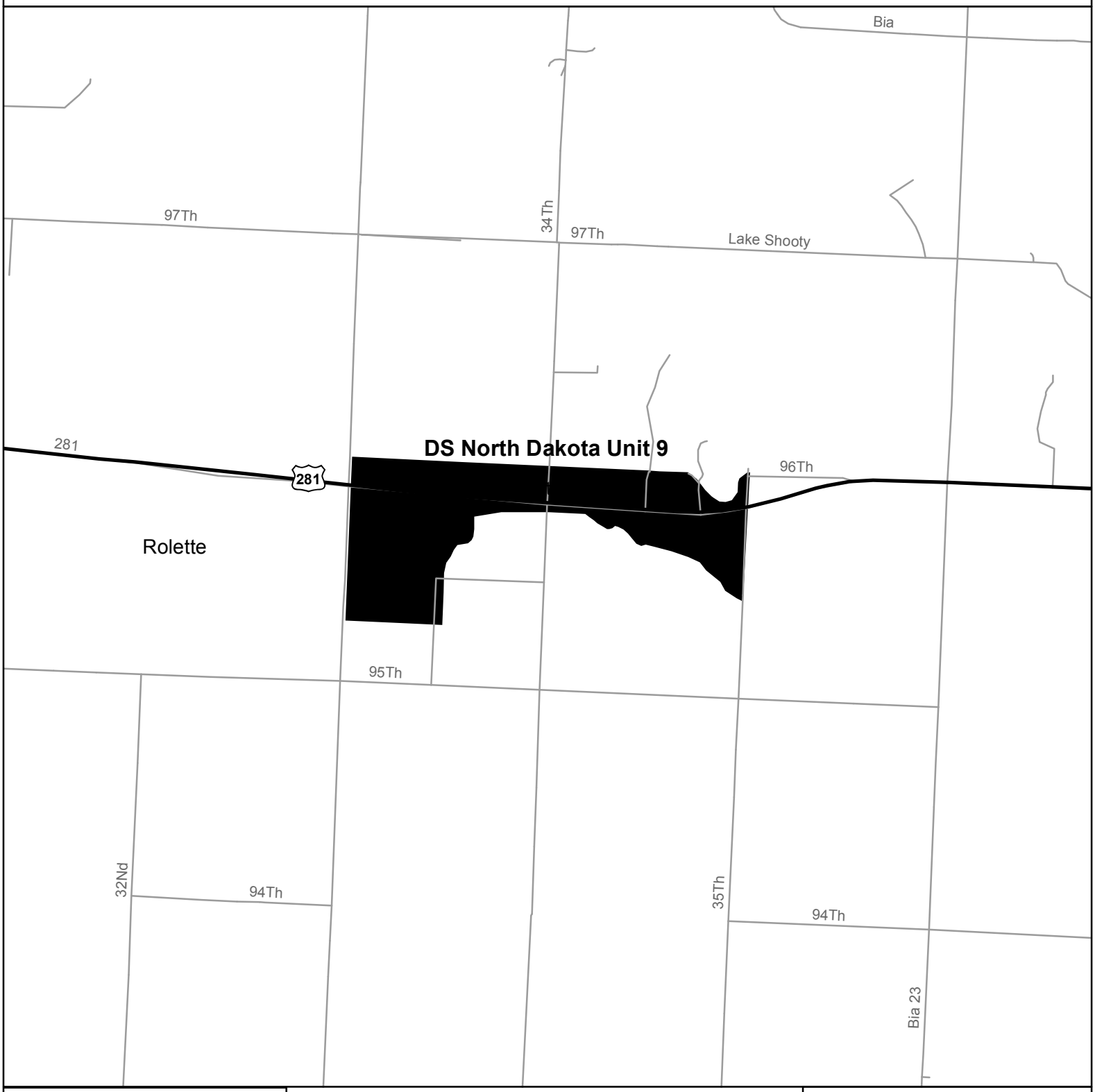
0 0.75 1.5 3 Kilometers

1:60,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 9, Rolette County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

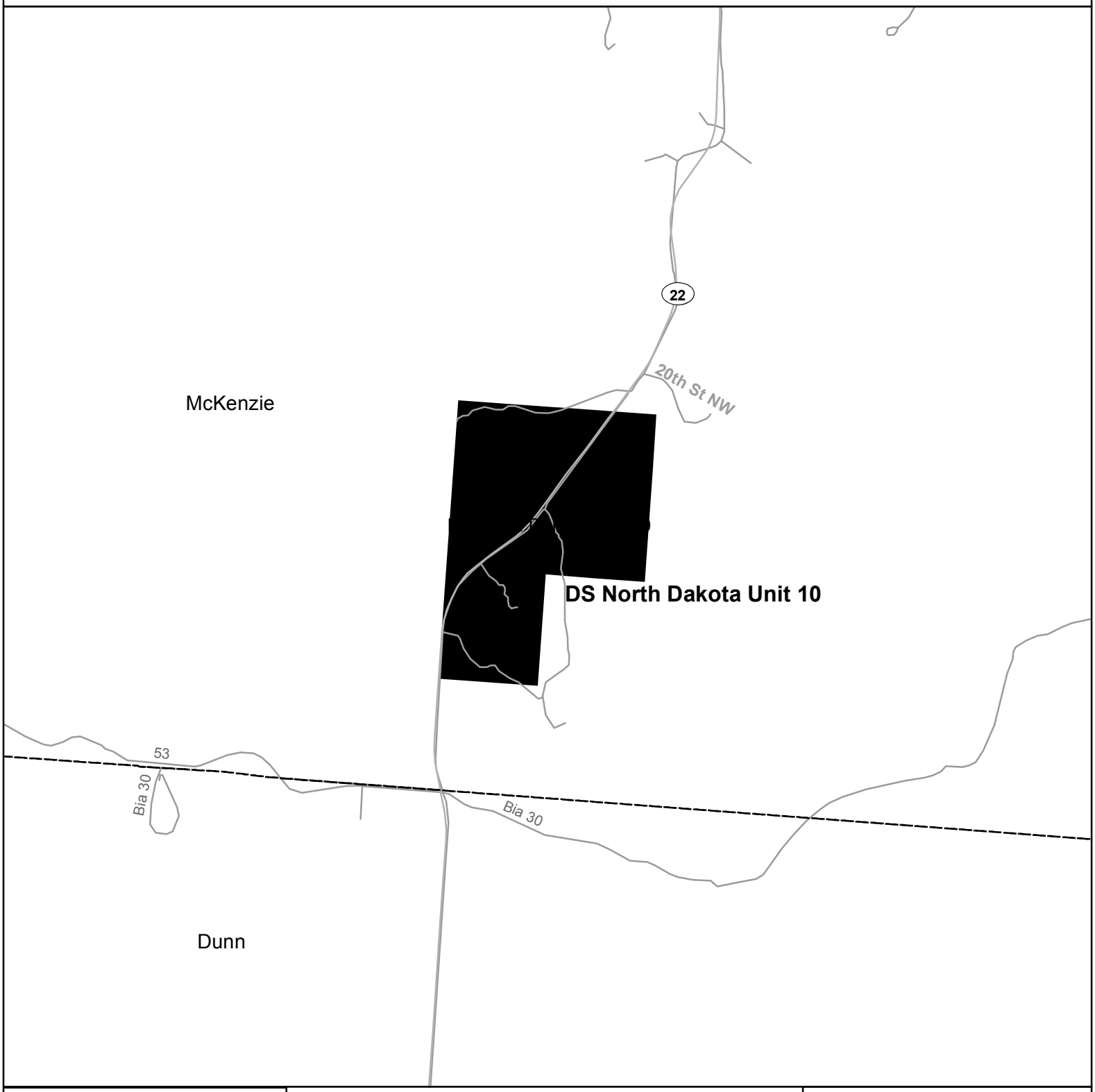
0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 10, McKenzie County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 11, McKenzie County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 12, McKenzie County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

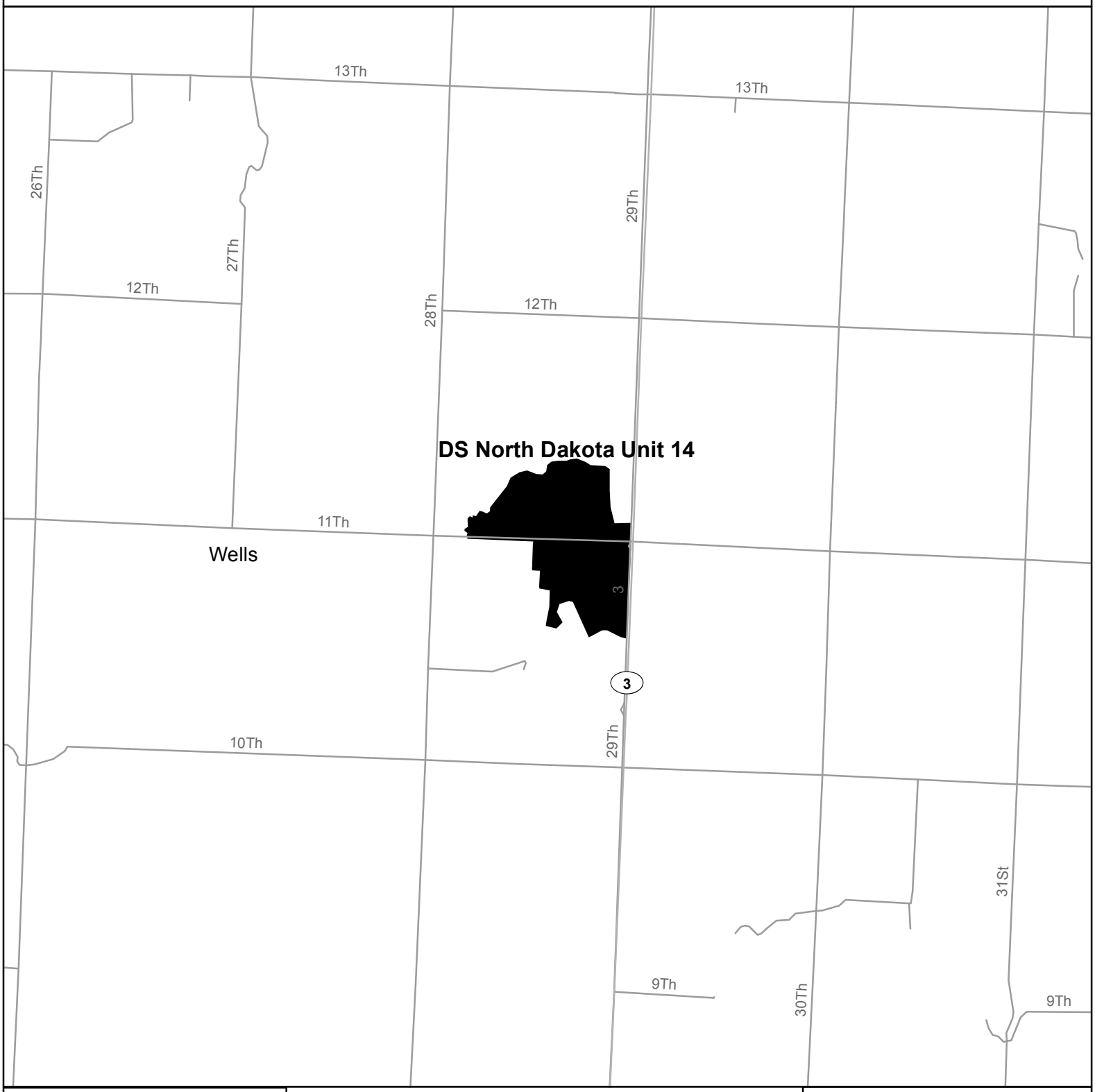
0 0.5 1 2 Kilometers

1:40,000



# Dakota Skipper Critical Habitat

## North Dakota Unit 14, Wells County




**Legend**

- Dakota Skipper Critical Habitat
- City or Town
- Highways
- Local Roads
- County
- Major Water

N

0 0.25 0.5 1 1.5 Miles

0 0.5 1 2 Kilometers

1:40,000



# Appendix E:
# Agency Communication

1. Aeronautics commission

Kyle C. Wanner
Interim Director and Aviation Planner
ND Aeronautics Commission
PO Box 5020
Bismarck, ND 58502

2. Attorney general

Wayne Stenehjem
Attorney General's Office
State Capitol
600 E. Boulevard Avenue
Dept. 125
Bismarck, ND 58505

3. Department of agriculture

Doug Goehring
Agriculture Commissioner
ND Department of Agriculture
600 E Boulevard Ave Dept. 602
Bismarck, ND 58505-0020

4. State department of health

Dr. Terry Dwelle
State Health Officer
North Dakota Department of Health
600 East Boulevard Avenue
Bismarck, N.D. 58505-0200

5. Department of human services

Maggie Anderson
Executive Director
North Dakota Department of Human Services
600 East Boulevard Avenue,
Dept. 325
Bismarck N.D. 58505-0250

6. Labor department

Troy T. Seibel
Commissioner of Labor
North Dakota Department of Labor and Human Rights
600 East Boulevard Avenue
Dept. 406
Bismarck ND 58505-0340

7. Department of career and technical education

Wayne Kutzer
Director and Executive Officer
North Dakota Department of Career and Technical Education
State Capitol 15th Floor
600 East Boulevard Avenue, Dept. 270
Bismarck, ND 58505-0610

8. Department of commerce

Al Anderson
Commissioner
North Dakota Department of Commerce
1600 E. Century Avenue,
Suite 2
Bismarck, ND 58503

9. Energy development impact of office

Lance Gaebe
Director
Energy Infrastructure and Impact Office
1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523

10. Game and Fish department

Terry Steinwand
Director
North Dakota Game and Fish Department
100 N. Bismarck Expressway,
Bismarck, ND 58501-5095

11. Industrial commission

Karlene Fine
Executive Director & Secretary
North Dakota Industrial Commission
State Capitol, 14th Floor, 600 E Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

12. Governor

Jack Dalrymple
Governor
Office of Governor
State of North Dakota
600 East Boulevard Avenue
Bismarck, ND 58505-0100

13. Department of transportation

Grant Levi, P.E.
Director
North Dakota Department of Transportation
608 East Boulevard Avenue
Bismarck, ND 58505-0700

14. State historical society of North Dakota

Merlan E. Paaverud, Jr.
Director
North Dakota State Historical Society
612 East Boulevard Avenue
Bismarck, North Dakota 58505

15. Indian affairs commission

Scott J. Davis
Executive Director
Indian Affairs Commission
State Capitol Building
600 East Boulevard Avenue
1st Floor, Judicial Wing - Room #117
Bismarck, ND 58505

16. Job service North Dakota

Cheri Giesen
Executive Director
Job Service North Dakota
PO Box 5507
Bismarck, ND 58506-5507

17. Department of trust lands

Mike Brand, Director
Surface Management Division
North Dakota Department of Trust Lands
1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523

18. Parks and Recreation Department

Mark Zimmerman
Director
North Dakota Parks and Recreation Department
1600 E. Century Avenue
Suite 3
Bismarck, ND 58503-0649

19. Soil Conservation Committee

Tom Burau
Vice Chair
North Dakota Soil Conservation Committee
9941 County Road 6
Columbus, ND 58727

20. State Water Commission

Todd Sando
State Engineer
North Dakota State Water Commission
900 East Boulevard Avenue, Dept. 770
Bismarck, ND 58505-0850

21. U.S. Department of Defense

Joey Specht
445 Peacekeeper Place
Minot AFB, ND 58705

22. U.S. Fish and Wildlife Service

Scott Larson
Field Supervisor
North Dakota Field Office
U.S. Fish and Wildlife Service
3425 MIRIAM AVENUE
BISMARCK, NORTH DAKOTA 58501-7926

23. U.S. Army Corps of Engineers

Daniel Cimarosti
Regulatory Program Manager
U.S. Army Corps of Engineers
North Dakota Regulatory Office
1513 South 12th Street
Bismarck, North Dakota 58504

24. Federal Aviation Administration

Laurie Suttmeier
Airports District Office Manager
Federal Aviation Administration
Bismarck Airports District Office, BIS-ADO-600
2301 University Drive, Building 23B
Bismarck, North Dakota 58504

25. The County Commission of the county or counties where the project is located

McKenzie County Commission
201 5th Street NW
Suite 543
Watford City, ND

Commission

Ronald A Anderson, Chairman
10891 33rd ST NW
Keene, ND 58847-9443
701-675-2267
ronmyra@restel.net

Richard Cayko, Vice Chairman
3691 158th Ave NW
Fairview, MT 59221-9340
701-7 4 4-5139
rcayko@midrivers.com

Roger Chinn
581 Highway 85 S
Grassy Butte, ND 58634-9376
701-863-6604
xrranch@ndsupernet.com

Rick Lawlar
3102 127th Ave NW
Watford City ND 58854-9697
701-842-3719
**rickylawlar@yahoo.com**

Douglas Nordby
PO Box 1287
Watford City, ND 58854-1287
701-444-3850-H
701-444-3221-W
drd@ruggedwest.com

26. North Dakota Transmission Authority

Karlene Fine
Executive Director & Secretary
North Dakota Transmission Authority
State Capitol, 14th Floor, 600 E Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

27. North Dakota Pipeline Authority

Justin Kringstad
Director
North Dakota Pipeline Authority
State Capitol, 14th Floor
600 E. Boulevard Avenue
Department 405
Bismarck, ND 58505-840

28. Lostwood WMD Complex

David Gillund
Project Leader
Lostwood WMD Complex
10100 Highway 42
Crosby, ND 58730

Nov. 19, 2014

Kyle C. Wanner
Director and Aviation Planner
ND Aeronautics Commission
P.O. Box 5020
Bismarck, ND 58502-5020

**RE: Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility for Expansion of the Little Missouri Gas Plant.**

Dear Mr. Wanner:

Targa Badlands LLC (Targa) is preparing an application for a North Dakota Public Service Commission (PSC) Certificate of Site Compatibility in accordance with North Dakota Century Code § 49-22-08. The proposed project will expand an existing gas processing plant to a processing capacity requiring a Public Service Commission certification.

The project is located in McKenzie County, south of Watford City, on sections 29 and 30 of Township 149N, Range 98W. Targa plans to construct a new gas processing plant with a processing capacity of approximately 200 million standard cubic feet per day. The new gas processing plant will be in addition to Targa's existing gas processing facilities currently in operation or under construction at the site, which have a total processing capacity of close to 100 million standard cubic feet per day. Product gas will be transported from the facility via the Northern Border Pipeline, and NGL product will be transported from the facility via the ONEOK Bakken NGL Pipeline.

Per North Dakota Administrative Code 69-06-01-05 (PSC administrative rules) we are consulting with the Aeronautics Commission for assistance in identifying concerns or issues associated with this project. A map showing the location of the proposed project is provided at the end of this letter.

Information, comments, and guidance provided by your office will be utilized to help guide further developments and improvements to this project. Please advise on permits or conditions your office will require for project compliance.

We have sent similar letters to other federal and state agencies and offices regarding this project. We would appreciate a response by December 17, 2014. Please contact either Rudy Salazar at either 1-713-584-1264 or rsalazar@targaresources.com or Paul Pansegrau at either 1-701-258-5166 or ppansegrau@lowhamwalsh.com if you have any questions.

SAMPLE

Respectfully,

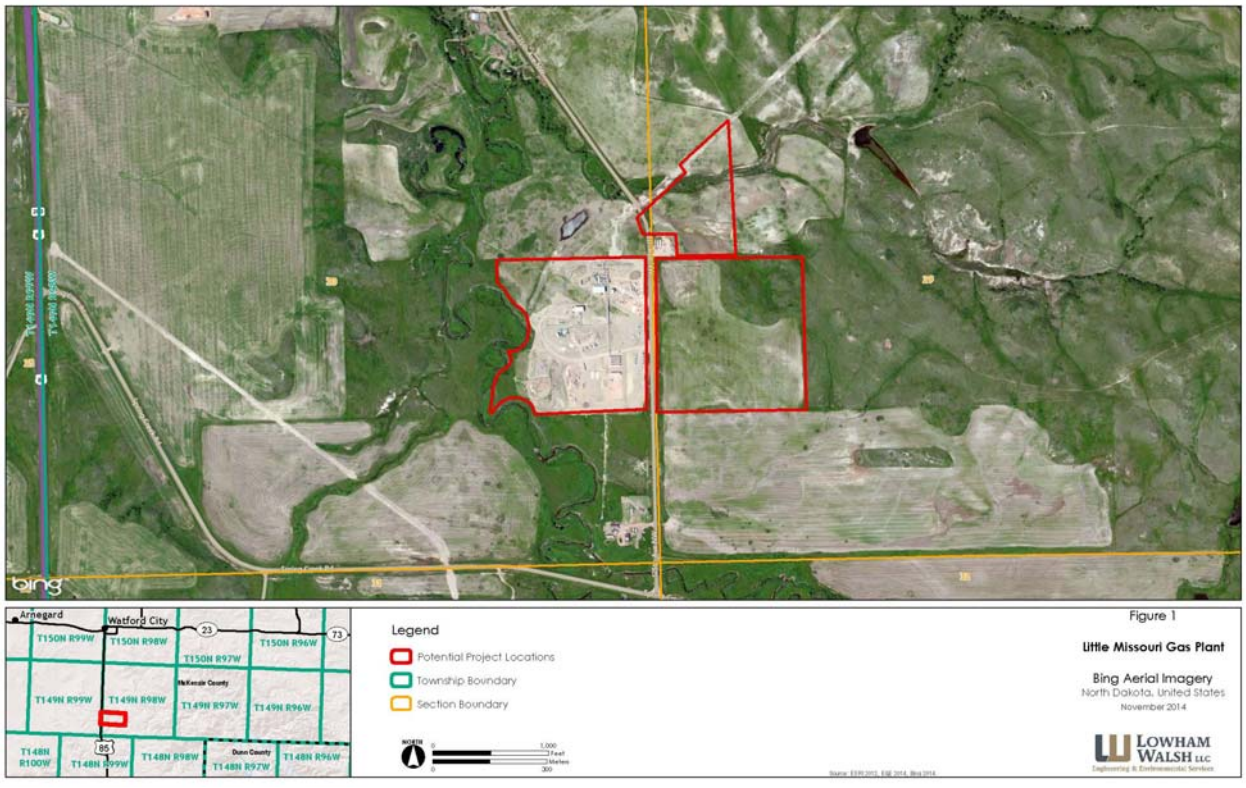
Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

Enclosures: Project Map

cc: Paul Pansegrau, Lowham Walsh

| Table 1. Key Component Locations | | | |
|---|---|---|---|
| Component Name | Township | Range | Sections |
| Little Missouri Gas Plant Complex | 149N | 98W | 29 & 30 |

Map: Proposed Project Location



# North Dakota Department of Transportation

Grant Levi, P.E.
*Director*

Jack Dalrymple
*Governor*


December 10, 2014

Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

APPLICATION FOR EXPANSION OF THE LITTLE MISSOURI GAS PLANT, MCKENZIE COUNTY, SOUTH OF WATFORD CITY, NORTH DAKOTA

We have reviewed your November 19, 2014, letter.

This project should have no adverse effect on the North Dakota Department of Transportation (NDDOT) highways; however, consideration during construction should be given to the movement of heavy loads to the site. Loads in excess of 300,000 should be moved during the winter months when the ground is frozen.

Additionally, if because of this project any work needs to be done on highway right of way, appropriate permits and risk management documents will need to be obtained from the Department of Transportation District Engineer, Joel Wilt at 701-774-2700.

Robert Fode

ROBERT A. FODE, P.E., DIRECTOR - OFFICE OF PROJECT DEVELOPMENT

57\raf\js
c: Joel Wilt, Williston District

# North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
701-328-2750 • TDD 701-328-2750 • FAX 701-328-3696 • INTERNET: http://swc.nd.gov


December 10, 2014

Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

Dear Mr. Salazar:

This is in response to your request for review of environmental impacts associated with the application to the North Dakota Public Service Commission for a Certificate of Site Compatibility for Expansion of the Little Missouri Gas Plant. The project is located in McKenzie County, south of Watford City, on Sections 29 and 30 of Township 149N, Range 98W.

The proposed project has been reviewed by State Water Commission staff and the following comments are provided:

- There are no floodplains identified and/or mapped where this proposed project is to take place. The project is located in Zone X. It is also believed that the project will not affect an identified floodplain as identified by the National Flood Insurance Program (NFIP).

- It is the responsibility of the project sponsor to ensure that local, state and federal agencies are contacted for any required approvals, permits, and easements.

- All waste material associated with the project must be disposed of properly and not placed in identified floodway areas.

- No sole-source aquifers have been designated in ND.

Thank you for the opportunity to provide review comments. If you have any questions, please call me at 701-328-4967.

Sincerely,

Linda Weispfenning
Water Resource Planner

LW:dm/1570


JACK DALRYMPLE, GOVERNOR
CHAIRMAN

TODD SANDO, P.E.
SECRETARY AND STATE ENGINEER

## Eric Lenderman

**From:** Thorstenson, Craig D. <cthorstenson@nd.gov>
**Sent:** Friday, November 21, 2014 9:03 AM
**To:** rsalazar@targaresources.com
**Cc:** Roberts, Melanie; Keiser, Jessica; Paul Pansegrau; Kautzman, Rheanna M.; Rookey, Adam S.
**Subject:** Little Missouri Gas Plant
**Attachments:** 3841_001.pdf

Mr. Salazar:

Our Department received the attached letter regarding expansion of the Little Missouri Gas Plant. The letter requests that we advise you as to permits or conditions required by our Department.

An Air Pollution Control Permit to Construct will be required prior to construction of the new gas processing plant. Our Permit to Construct process is described at: http://ndhealth.gov/AQ/AirPermitting.htm.

If you should have any questions regarding air quality, feel free to contact me.

Craig Thorstenson
Environmental Engineer
North Dakota Dept. of Health
Division of Air Quality
918 E. Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947

Phone: 701-328-5188
Fax: 701-328-5185
E-mail: cthorstenson@nd.gov
Website: http://www.ndhealth.gov/AQ/

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

## Eric Lenderman

**From:** FONTE, BENJAMIN R 2d Lt USAF AFGSC 5 CES/CEN <benjamin.fonte.1@us.af.mil>
**Sent:** Thursday, November 20, 2014 3:19 PM
**To:** rsalazar@targaresources.com; Paul Pansegrau
**Cc:** SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CENP
**Subject:** Expansion of the Little Missouri Gas Plant

Mr. Salazar/Mr. Pansaegrau,

Minot Air Force Base does not have any foreseeable concerns with the expansion project located south of Watford City. There will be no need for any special permits or items of that nature on our behalf with this project. We appreciate your time in consulting with us. If you have any further questions, contact either myself or Mr. Specht.

Very Respectfully,

Ben Fonte, 2d Lt, USAF
Community Planner
5 CES, Minot AFB ND
Comm: 701-723-7051
DSN: 453-7051

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

## Eric Lenderman

**From:** Salazar, Rudy <rudysalazar@targaresources.com>
**Sent:** Tuesday, December 23, 2014 10:14 AM
**To:** McQuade, David; Paul Pansegrau
**Subject:** Fwd: Targa Badlands LLC - Little Missouri Gas Plant Expansion

Fyi...

Rudy Salazar
Sr. Environmental Specialist
Targa Resources
1000 Louisiana St.
Houston, TX 77002
713-584-1264 - Office
713-419-1002 - Cell
RudySalazar@targaresources.com

----- Forwarded message -----
From: "Salazar, Lee" <RSalazar@targaresources.com>
To: "Salazar, Rudy" <rudysalazar@targaresources.com>
Subject: Targa Badlands LLC - Little Missouri Gas Plant Expansion
Date: Tue, Dec 23, 2014 11:12 AM

---

**From:** Schumacher, John D. [mailto:jdschumacher@nd.gov]
**Sent:** Wednesday, December 17, 2014 6:21 PM
**To:** Salazar, Lee
**Subject:** Targa Badlands LLC - Little Missouri Gas Plant Expansion

Mr. Salazar,

The North Dakota Game and Fish Department has reviewed these projects for wildlife concerns. We do not believe they will have significant adverse effects on wildlife or wildlife habitat based on the information provided.

**JOHN SCHUMACHER**
**RESOURCE BIOLOGIST**
**ND GAME AND FISH DEPT**
**701.328.6321**

This email (including any attachments and accompanying emails) may contain proprietary and confidential information. If you are not the intended recipient, please telephone the sender and immediately delete this e-mail (including any attachments and accompanying emails). Please do not replicate, disclose, distribute, forward, or retain this e-mail or any part of this email. Thank you.

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

---

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

John Hoeven
*Governor of North Dakota*

**North Dakota State Historical Board**

Chester E. Nelson, Jr.
*Bismarck - President*

Gereld Gerntholz
*Valley City - Vice President*

Richard Kloubec
*Fargo - Secretary*

Albert I. Berger
*Grand Forks*

Calvin Grinnell
*New Town*

Diane K. Larson
*Bismarck*

A. Ruric Todd III
*Jamestown*

Sara Otte Coleman
*Director*
*Tourism Division*

Kelly Schmidt
*State Treasurer*

Alvin A. Jaeger
*Secretary of State*

Mark A. Zimmerman
*Director*
*Parks and Recreation Department*

Francis Ziegler
*Director*
*Department of Transportation*

Merlan E. Paaverud, Jr.
*Director*

*Accredited by the American Association of Museums since 1986*

August 26, 2010

Mr. David C. Peters
Project Manager
Saddle Butte Pipeline LLC
1970 East 3rd Avenue
Durango CO 81301

**ND SHPO REF: 10-2089 Natural Gas Processing Plant in portions of [T149N R98W Section 30 NE ¼ of the SE 1/4] McKenzie County, North Dakota**

Dear Mr. Peters,

We reviewed ND SHPO REF: 10-2089 Natural Gas Processing Plant in portions of [T149N R98W Section 30 NE ¼ of the SE 1/4] McKenzie County, North Dakota. We would concur with a "No Historic Properties Affected" (federal) and "No Significant Sites Affected" (state of North Dakota) determinations, provided the ground disturbance is in the **E ½** of the NE ¼ of the SE ¼, which appears to be the case form the map provided. If ground disturbance extends into the W 1/2 of the NE ¼ of the SE ¼, then we would recommend a cultural resources survey by a permitted archaeologist.
Thank you for the opportunity to review this project. If you have any questions please contact Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota)
and
Director
State Historical Society of North Dakota

TARGA

Nov. 19, 2014

Dr. Terry Dwelle
State Health Officer
North Dakota Department of Health
600 East Boulevard Avenue
Bismarck, N.D. 58505-0200

RECEIVED
NOV [illegible] 2014
EHS Chief's Office

**RE: Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility for Expansion of the Little Missouri Gas Plant.**

Dear Dr. Dwelle:

Targa Badlands LLC (Targa) is preparing an application for a North Dakota Public Service Commission (PSC) Certificate of Site Compatibility in accordance with North Dakota Century Code § 49-22-08. The proposed project will expand an existing gas processing plant to a processing capacity requiring a Public Service Commission certification.

The project is located in McKenzie County, south of Watford City, on sections 29 and 30 of Township 149N, Range 98W. Targa plans to construct a new gas processing plant with a processing capacity of approximately 200 million standard cubic feet per day. The new gas processing plant will be in addition to Targa's existing gas processing facilities currently in operation or under construction at the site, which have a total processing capacity of close to 100 million standard cubic feet per day. Product gas will be transported from the facility via the Northern Border Pipeline, and NGL product will be transported from the facility via the ONEOK Bakken NGL Pipeline.

Per North Dakota Administrative Code 69-06-01-05 (PSC administrative rules) we are consulting with the Department of Health for assistance in identifying concerns or issues associated with this project. A map showing the location of the proposed project is provided at the end of this letter.

Information, comments, and guidance provided by your office will be utilized to help guide further developments and improvements to this project. Please advise on permits or conditions your office will require for project compliance.

We have sent similar letters to other federal and state agencies and offices regarding this project. We would appreciate a response by December 17, 2014. Please contact either Rudy Salazar at either 1-713-584-1264 or rsalazar@targaresources.com or Paul Pansegrau at either 1-701-258-5166 or ppansegrau@lowhamwalsh.com if you have any questions.

Respectfully,

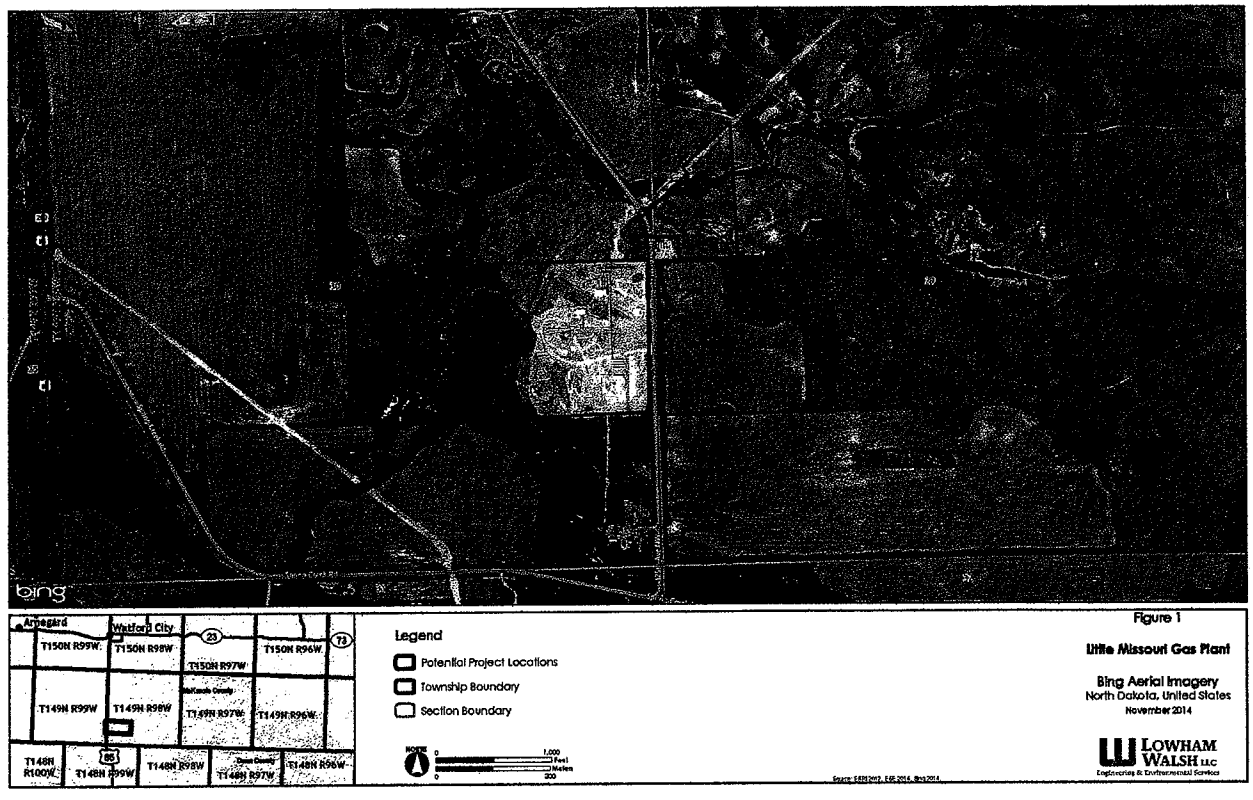
Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

Enclosures: Project Map

cc: Paul Pansegrau, Lowham Walsh

| Table 1. Key Component Locations | | | |
|---|---|---|---|
| Component Name | Township | Range | Sections |
| Little Missouri Gas Plant Complex | 149N | 98W | 29 & 30 |

Map: Proposed Project Location



NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

December 1, 2014

Mr. Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana Street
Houston, TX 77007

Re: Expansion of the Little Missouri Gas Plant
McKenzie County, North Dakota

Dear Mr. Salazar:

This department has reviewed the information concerning the above-referenced project submitted to Dr. Terry Dwelle under date of November 19, 2014, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. An industrial storm water discharge permit also may be required based on the type of industrial activity at the facility. A waste water discharge permit is required if the facility will discharge process waste water to waters of the state. Further information on the discharge permits may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210).

   Cities or counties may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system, and may require provisions to address the quality

of post-construction storm water runoff from new development and redevelopment projects. Check with the local officials to be sure any local storm water management considerations are addressed.

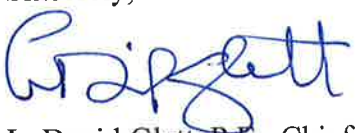
4. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

5. The proposed project appears to have the potential to be a source of emissions to the air capable of causing or contributing to air pollution and may be required to have an Air Pollution Control Permit to Construct/Operate as required by Chapter 33-15-14 of the North Dakota Air Pollution Control Rules. The applicant should contact the Department's Air Pollution Control Program at 701-328-5188 prior to commencing construction.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,



L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# Construction and Environmental Disturbance Requirements

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

## Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

## Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

## Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

**STATE HISTORICAL SOCIETY OF NORTH DAKOTA**

Jack Dalrymple
*Governor of North Dakota*

**North Dakota State Historical Board**

Calvin Grinnell
*New Town - President*

A. Ruric Todd III
*Jamestown - Vice President*

Margaret Puetz
*Bismarck- Secretary*

Albert I. Berger
*Grand Forks*

Gereld Gerntholz
*Valley City*

Diane K. Larson
*Bismarck*

Chester E Nelson, Jr.
*Bismarck*

Sara Otte Coleman
*Director*
*Tourism Division*

Kelly Schmidt
*State Treasurer*

Alvin A. Jaeger
*Secretary of State*

Mark Zimmerman
*Director*
*Parks and Recreation Department*

Grant Levi
*Director*
*Department of Transportation*

Merlan E. Paaverud, Jr.
*Director*

*Accredited by the American Alliance of Museums since 1986*

November 24, 2014

Mr. Rudy Salazar
Senior Environmental Specialist
Targa Resources, LLC
1000 Louisiana St.
Houston, TX 77007

**ND SHPO REF: 15-0177 ND PSC Targa Badlands Application to ND PSC for Expansion of the Little Missouri Gas Plant in portions of [T149N R98W Sections 29 & 30] McKenzie County, North Dakota**

Dear Mr. Salazar,

We reviewed your information on ND SHPO REF: 15-0177 ND PSC Targa Badlands Application to ND PSC for Expansion of the Little Missouri Gas Plant in portions of [T149N R98W Sections 29 & 30] McKenzie County, North Dakota. As a project with potential to become a federal undertaking, we encourage early agency consultation as part of the review process.

We recommend a Class III archeological (pedestrian) survey for all areas directly impacted by the project including access roads and staging areas. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed, particularly archaeological site 32MZ474. If the project APE changes, we will request additional inventories, surveys and consultation.

Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms. If you have any questions please contact Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota) and
Director, State Historical Society of North Dakota

*Jack Dalrymple, Governor*
*Mark A. Zimmerman, Director*

*1600 East Century Avenue, Suite 3*
*Bismarck, ND 58503-0649*
*Phone 701-328-5357*
*Fax 701-328-5363*
*E-mail parkrec@nd.gov*
*www.parkrec.nd.gov*

December 10, 2014

Rudy Salazar
Targa Resources, LLC
1000 Louisiana Street
Houston, TX 77007

Re: Expansion of the Little Missouri Gas Plant

Dear Mr. Salazar:

The North Dakota Parks and Recreation Department (the Department) has reviewed the above referenced project in Williams County.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage or Land and Water Conservation Fund recreation projects that we coordinate.

The North Dakota Natural Heritage biological conservation database has been reviewed to determine if any plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, there are no documented occurrences in our database within project area. Because this information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

The Department recommends that the project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the project area to help secure rare species conservation in North Dakota. Regarding any reclamation efforts, we recommend that any impacted areas be revegetated with species native to the project area.

We appreciate your commitment to rare plant, animal and ecological community conservation, management and inter-agency cooperation to date. For additional information please contact me at (701-328-5370 or kgduttenhefner@nd.gov). Thank you for the opportunity to comment on this proposed project.

Sincerely,

*Kathy Duttenhefner*

Kathy Duttenhefner, Coordinator
Natural Resources Division

R.USNDNHI*2014-205KD12/10/2014KD12/10/2014

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
1513 SOUTH 12TH STREET
BISMARCK ND 58504-6640

REPLY TO
ATTENTION OF

November 26, 2014

North Dakota Regulatory Office

Mr. Rudy Salazar
Targa Resources, LLC
1000 Louisiana Street
Houston, Texas 77007

Dear Mr. Salazar:

This is in response to your letter dated November 19, 2014, requesting US Army Corps of Engineers (Corps) comments regarding your application to the North Dakota Public Service Commission for a Certificate of Site Compatibility for expansion of the Little Missouri Gas Plant located in Sections 29 and 30, Township 149 North, Range 98 West, McKenzie County, North Dakota.

Please be advised, Corps regulatory offices administer Section 10 of the Rivers and Harbors Act (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 regulates work impacting navigable waters. Section 10 waters in North Dakota are the Missouri River (including Lake Sakakawea and Lake Oahe), Yellowstone River, James River south of the railroad track in Jamestown, North Dakota, Bois de Sioux River, Red River of the North, and the Upper Des Lacs Lake. Work over, in, or under navigable waters is considered to have an impact. Section 404 of the Clean Water Act regulates the discharge of dredged or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States.

Based upon information within your November 19, 2014 letter, there appears to be waters of the United States on the project site. I suggest Targa complete a field wetland delineation to identify the extent of wetland resources, and, identify other waters located on site, i.e., streams, creeks, etc.

Printed on Recycled Paper

Do not hesitate to contact this office by letter or telephone, (701) 255-0015, if we can be of further assistance.

Sincerely,

Daniel E. Cimarosti
Regulatory Program Manager
North Dakota

# Appendix F:
# Maps of Exclusion and Avoidance Areas

# Avoidance and Exclusion Area Map Index

| Name | Map ID/Label Number |
|---|---|
| Maah Daah Hey Trail - North Trailhead | 1 |
| Maah Daah Hey Trail - South Trailhead | 2 |
| Fort Union National Historic Site | 3 |
| North Unit Theodore Roosevelt National Park | 4 |
| Old Sod Post Office - Grassy Butte, ND | 5 |
| Fairview Lift Bridge - Cartwright, ND | 6 |
| Sandstone School | 7 |
| Four Bears Memorial Park | 8 |
| Fort Buford State Historical Site | 9 |
| Missouri-Yellowstone Confluence Interpretative Center | 10 |
| Lewis & Clark State Park | 11 |
| Tobacco Gardens Area | 12 |
| Wild West Water Park | 13 |
| Vererans Memorial Building | 14 |
| Veteran's Memorial Park | 15 |
| Tourist Park Campground | 16 |
| Nature Park | 17 |
| Children's Playground | 18 |
| McKenzie County Heritage Park | 19 |
| Long X Trading Post Visitor Center | 20 |
| Pioneer Museum of McKenzie County | 21 |
| Lewis & Clark Trail Museum | 22 |
| Three Affiliated Tribes Museum | 23 |
| Walter Chaloner Memorial | 24 |
| Little Missouri River (Scenic River) | 25 |
| Little Missouri National Grasslands | 26 |
| Little Missouri National Grasslands | 27 |
| Lake Sakakawea | 28 |
| Antelope Creek WMA | 29 |
| Lewis & Clark WMA | 30 |

| | |
|---|---|
| Tobacco Gardens WMA | 31 |
| Big Oxbow WMA | 32 |
| Overlook WMA | 33 |
| Neus Point WMA | 34 |
| Ochs Point WMA | 35 |
| Sullivan WMA | 36 |
| Crow Flies High SRA | 37 |
| Killdeer Mountians WMA 1 | 38 |
| Killdeer Mountains WMA 2 | 39 |
| Dakota Skipper Habitat Unit #10 | 40 |
| Dakota Skipper Habitat Unit #11 | 41 |
| Dakota Skipper Habitat Unit #12 | 42 |
| State PLOTS Land | 43 |
| State PLOTS Land | 44 |
| State PLOTS Land | 45 |
| State PLOTS Land | 46 |
| State PLOTS Land | 47 |
| State School #1 | 49 |
| State School #2 | |
| State School #4 | |
| State School #3 | |

Appendix G - Figure 1

# Little Missouri Gas Plant

## Avoidance and Exclusion Areas

North Dakota, United States

December 2014

### Legend

- Little Missouri Gas Plant Site
- City Boundries
- Roads
- Rivers and Streams
- Avoidance and Exclusion Points

Avoidance & Exclusion Areas

- Antelope Creek
- Fort Union Trading Post National Historic Site
- Killdeer Mountains
- Lewis and Clark
- Lewis and Clark State Park
- Little Missouri Bay State Park
- Little Missouri National Grasslands
- Little Missouri State Park
- Lost Bridge
- Sod House Historic Site
- State Trust Lands - Eastern
- State Trust Lands - Northeast
- Theodore Roosevelt National Park
- Theodore Roosevelt Wilderness
- Tobacco Garden
- Lake Sakakawea
- Fort Berthold Reservation
- Dakota Skipper Critical Habitat
- State PLOTS Land
- State School Land

NORTH

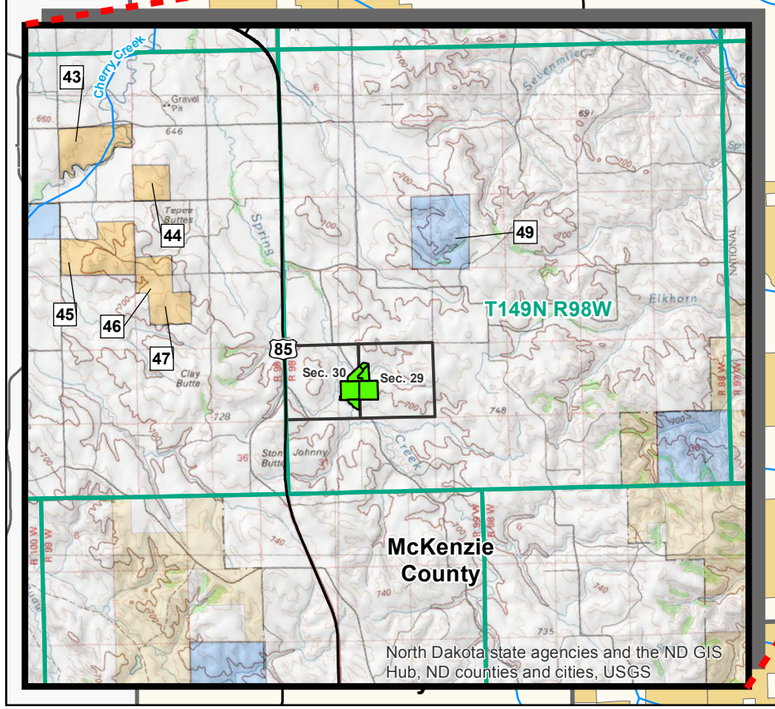
0 10 Miles

0 16 Kilometers

Source: USDA NRCS 2014; ND GIS HUB 2014

LOWHAM WALSH LLC

Engineering & Environmental Services






Appendix G - Figure 2

# Little Missouri Gas Plant

Avoidance and Exclusion Areas

North Dakota, United States

December 2014

## Legend

- Little Missouri Gas Plant Site
- City Boundries
- Section Boundries (PLSS)
- Township Boundries (PLSS)
- ND Counties
- Roads
- Rivers and Streams

### Avoidance and Exclusion Areas

- Little Missouri National Grasslands
- State PLOTS Land
- State School Land
- Avoidance and Exclusion Points

NORTH

0 2 Miles

0 3 Kilometers

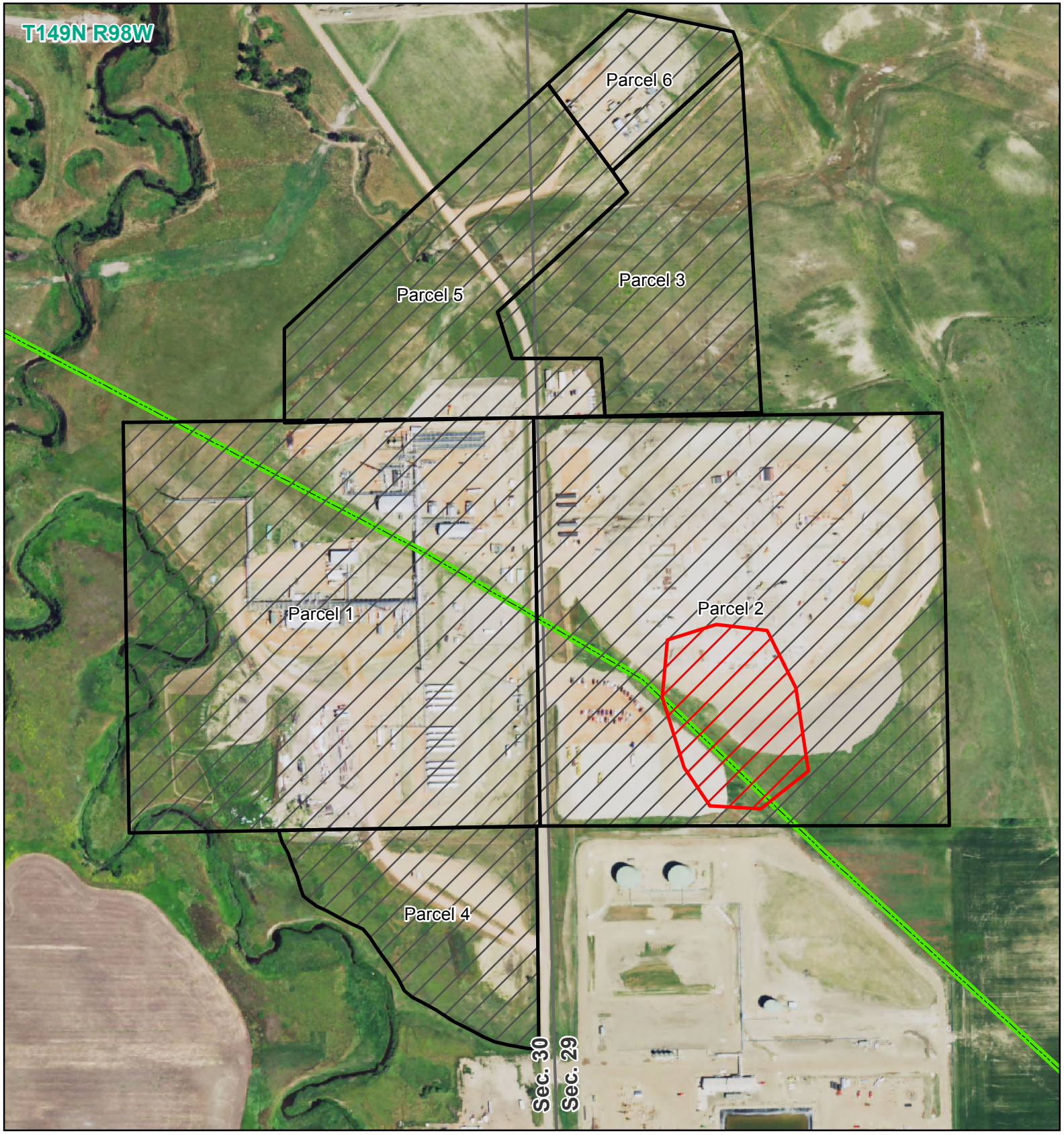
Source: USDA NRCS 2014; ND GIS HUB 2014

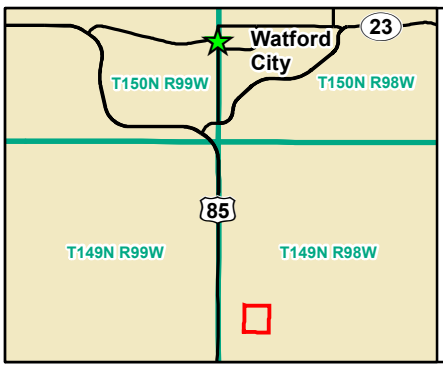
LOWHAM WALSH LLC

Engineering & Environmental Services




North Dakota state agencies and the ND GIS Hub, ND counties and cities, USGS




## Legend

- Little Missouri Gas Plant Site
- Archaeological Site
- Northern Border Pipeline
- Section Boundries (PLSS)

NORTH

0 — 1,000 Feet

0 — 300 Meters

Source: USDA NAIP 2014

Appendix G - Figure 3

**Little Missouri Gas Plant**

Avoidance and Exclusion Areas

2012 USDA NAIP Imagery

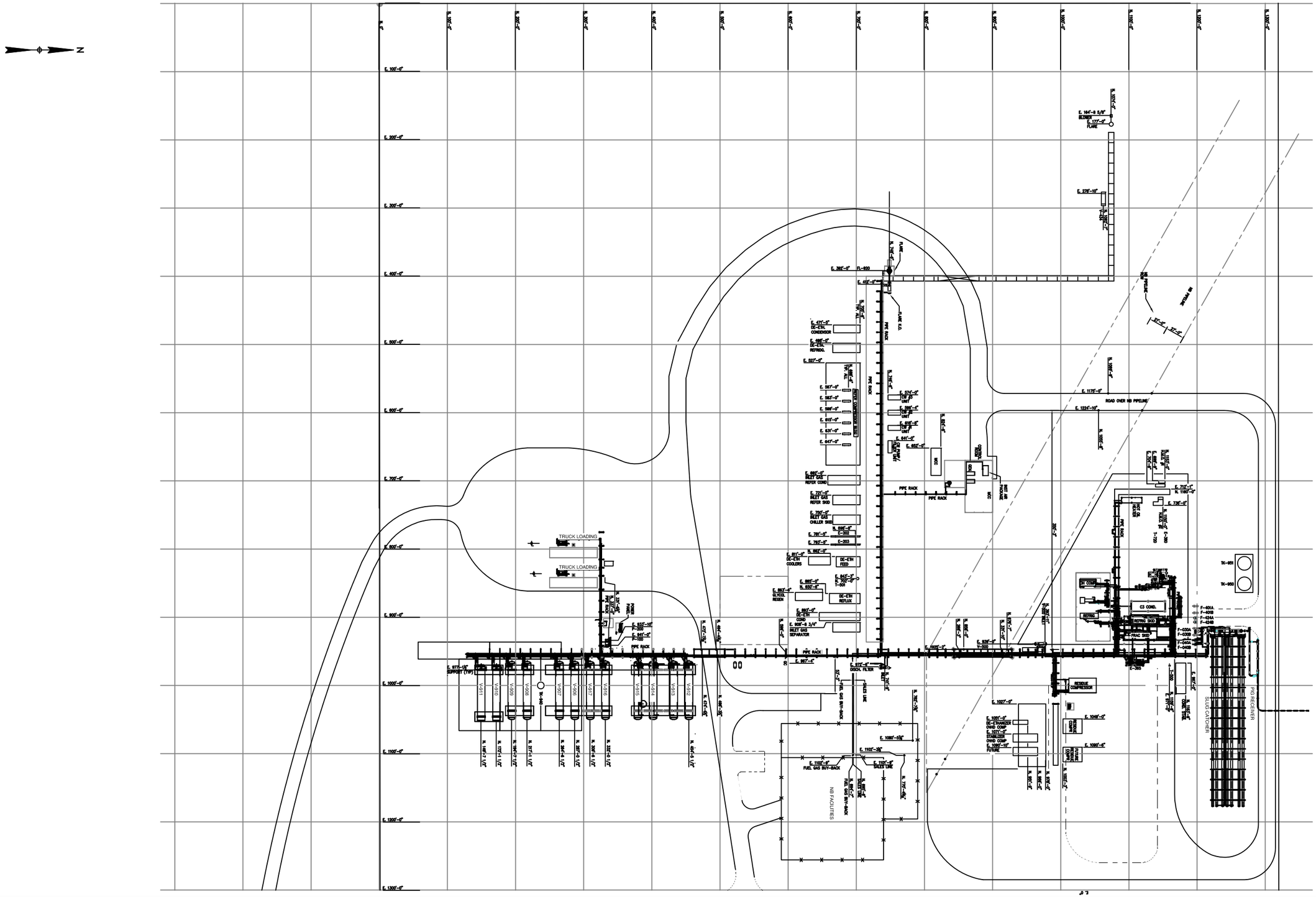
North Dakota, United States

December 2014

LOWHAM WALSH LLC

Engineering & Environmental Services

# Appendix G:
# Construction Drawings
# and Best Management Practices



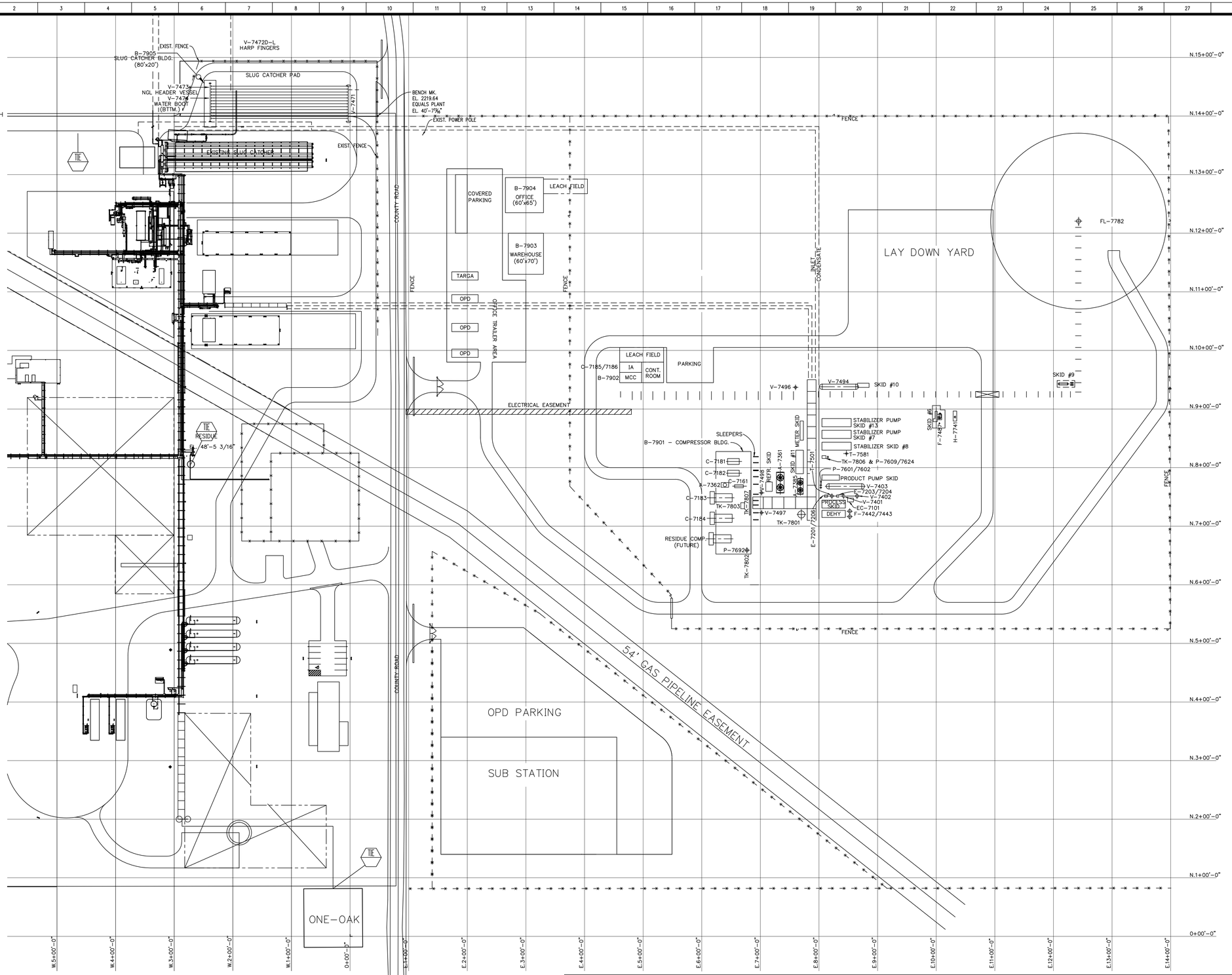

audubon

| REFERENCE DRAWINGS | No | REVISIONS | BY | CHKD | PM | DATE |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | 0 | ISSUED FOR CONSTRUCTION | KED | | | 3/14/12 |

SADDLE BUTTE PIPELINE, LLC

NORTH DAKOTA
LITTLE MISSOURI PLANT
OVERALL LAYOUT
PLOT PLAN

| FILE NUMBER | DRAWING NUMBER | SCALE | REVISION |
|---|---|---|---|
| LM-PP-3000 | LM-PP-3003 | NONE | 0 |




## EQUIPMENT LIST

### DEHYDRATION SKID #1

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7446 | REGENERATION GAS SCRUBBER |
| P-7141 | REGEN. GAS COMPRESSOR LUBE OIL PUMP |

### PROCESS SKID #2

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TRIM REBOILER |
| V-7499 | CHILLER DEOILER (NEW) |

### PRODUCT PUMP SKID #3

| | |
|---|---|
| P-7603/7604/7605 | PRODUCT PIPELINE PUMPS |

### EXPANDER/COMPRESSOR SKID #4

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |
| A-7101 | EXPANDER LUBE OIL COOLER |

### REFRIGERATION SKID #5

| | |
|---|---|
| V-7461 | REFRIGERANT SUCTION SCRUBBER |
| V-7462 | REFRIGERANT ECONOMIZER |
| V-7463 | REFRIGERANT ACCUMULATOR |

### HEAT MEDIUM SKID #6

| | |
|---|---|
| F-7487 | HEAT MEDIUM FILTER |
| P-7686/7687 | HEAT MEDIUM PUMPS |
| V-7492 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

### STABILIZER PUMP SKID #7

| | |
|---|---|
| P-7683 | CONDENSATE PIPELINE PUMPS |
| F-7485 | INLET FILTER SEPERATOR |

### STABILIZER SKID #8

| | |
|---|---|
| E-7281 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| F-7481/7482 | STABILIZER FEED FILTERS |
| F-7483/7484 | STABILIZER FEED COALESCERS |
| V-7475 | CONDENSATE SURGE TANK |
| E-7282/7283 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7284 | STABILIZER REBOILER |

### FLARE KNOCK OUT SKID #9

| | |
|---|---|
| V-7493 | FLARE KNOCK OUT DRUM |
| P-7688/7689 | FLARE KNOCK OUT PUMPS |

### CLOSED DRAIN SKID #10

| | |
|---|---|
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |
| P-7693/7694 | CLOSED DRAIN TANK HIGH PRESSURE PUMPS |

### FUEL GAS SKID #11

| | |
|---|---|
| F-7486 | RESIDUE GAS FILTER COALESCER |
| V-7495 | FUEL GAS SCRUBBER |
| E-7285 | FUEL GAS HEATER |

### STABILIZER PUMP SKID #13

| | |
|---|---|
| P-7684/7685 | CONDENSATE PIPELINE PUMPS |
| F-7490 | CONDENSATE FILTER |

### BUILDINGS

| | |
|---|---|
| B-7901 | COMPRESSOR BUILDING |
| B-7902 | CONTROL ROOM/MCC/I.A. BUILDING |
| B-7903 | WAREHOUSE BUILDING |
| B-7904 | OFFICE BUILDING |
| B-7905 | SLUG CATCHER BUILDING |

### OFF SKID

| | |
|---|---|
| A-7361 | REFRIGERANT CONDENSER |
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| A-7383/7384 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7385 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7161 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| F-7442/7443 | MOL SIEVE DEHYDRATORS |
| F-7464 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7609/7624 | METHANOL INJECTION PUMP |
| P-7625 | JACKET WATER PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7581 | STABILIZER |
| TK-7801 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | JACKET WATER TANK |
| TK-7806 | METHANOL TANK |
| TK-7807 | COMPRESSOR CYLINDER LUBE OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7471 | HEADER VESSEL |
| V-7472D-L | HARP FINGERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7494 | CLOSED DRAIN TANK |
| V-7496 | INSTRUMENT AIR RECIEVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7498 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|
| | | | | |
| 1 | REVISED AS NOTED - OPD JOB #14025 | JH | JC | 7/18/14 |
| 0 | ISSUED FOR CONSTRUCTION | RBJ | JL | 6/27/14 |
| B | ISSUED FOR APPROVAL | RBJ | | |
| A | ISSUED FOR BID - OPD JOB #14025 | RBJ | · | · |

| | DATE |
|---|---|
| SCALE: 1" = 80' | |
| DWN BY: RBJ | 3/7/14 |
| CHKD BY: | |
| FINAL CK: | |
| ENGR.: MP | |
| APPRV: | |
| APPRV: | |

PLANT NAME
LITTLE MISSOURI #3

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

TARGA

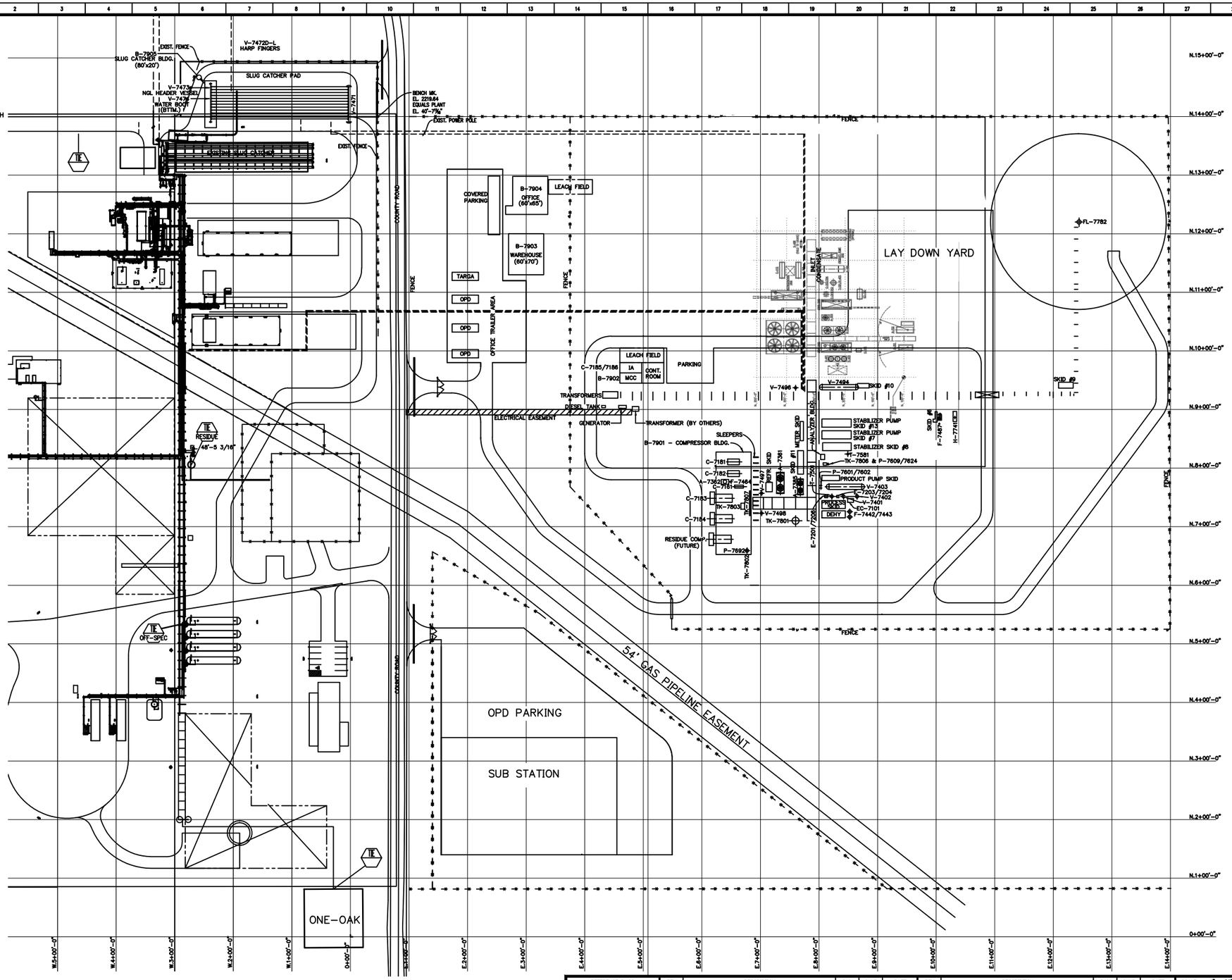
DRAWING NUMBER
LM-3000

CAD FILE NAME
LM-3000

REVISION
1

# PLOT PLAN
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: -




## EQUIPMENT LIST

### DEHYDRATION SKID #1

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7448 | REGENERATION GAS SCRUBBER |
| P-7141 | REGEN. GAS COMPRESSOR LUBE OIL PUMP |

### PROCESS SKID #2

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TRIM REBOILER |
| H-7499 | CHILLER DEOILER HEATER (NEW) |
| P-7695 | REFRIGERANT OIL PUMP (EXISTING THR METHANOL PUMP) |
| V-7499 | CHILLER DEOILER (NEW) |

### PRODUCT PUMP SKID #3

| | |
|---|---|
| P-7603/7604/7605 | PRODUCT PIPELINE PUMPS |

### EXPANDER/COMPRESSOR SKID #4

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |
| A-7101 | EXPANDER LUBE OIL COOLER |

### REFRIGERATION SKID #5

| | |
|---|---|
| V-7461 | REFRIGERANT SUCTION SCRUBBER |
| V-7462 | REFRIGERANT ECONOMIZER |
| V-7463 | REFRIGERANT ACCUMULATOR |

### HEAT MEDIUM SKID #6

| | |
|---|---|
| F-7487 | HEAT MEDIUM FILTER |
| P-7686/7687 | HEAT MEDIUM PUMPS |
| V-7492 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

### STABILIZER PUMP SKID #7

| | |
|---|---|
| P-7683 | CONDENSATE PIPELINE PUMPS |
| F-7485 | INLET FILTER SEPERATOR |

### STABILIZER SKID #8

| | |
|---|---|
| E-7281 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| F-7481/7482 | STABILIZER FEED FILTERS |
| F-7483/7484 | STABILIZER FEED COALESCERS |
| V-7475 | CONDENSATE SURGE TANK |
| E-7282/7283 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7284 | STABILIZER REBOILER |

### FLARE KNOCK OUT SKID #9

| | |
|---|---|
| V-7493 | FLARE KNOCK OUT DRUM |
| P-7688/7689 | FLARE KNOCK OUT PUMPS |

### CLOSED DRAIN SKID #10

| | |
|---|---|
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |
| P-7693/7694 | CLOSED DRAIN TANK HIGH PRESSURE PUMPS |

### FUEL GAS SKID #11

| | |
|---|---|
| F-7486 | RESIDUE GAS FILTER COALESCER |
| V-7495 | FUEL GAS SCRUBBER |
| E-7285 | FUEL GAS HEATER |

### STABILIZER PUMP SKID #13

| | |
|---|---|
| P-7684/7685 | CONDENSATE PIPELINE PUMPS |
| F-7490 | CONDENSATE FILTER |

### BUILDINGS

| | |
|---|---|
| B-7901 | COMPRESSOR BUILDING |
| B-7902 | CONTROL ROOM/MCC/I.A. BUILDING |
| B-7903 | WAREHOUSE BUILDING |
| B-7904 | OFFICE BUILDING |
| B-7905 | SLUG CATCHER BUILDING |

### OFF SKID

| | |
|---|---|
| A-7361 | REFRIGERANT CONDENSER |
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| A-7363/7384 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7385 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7161 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| F-7464 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7801/7602 | PRODUCT BOOSTER PUMPS |
| P-7609/7624 | METHANOL INJECTION PUMP |
| P-7625 | JACKET WATER PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7581 | STABILIZER |
| TK-7801 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | JACKET WATER TANK |
| TK-7806 | METHANOL TANK |
| TK-7807 | COMPRESSOR CYLINDER LUBE OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7442/7443 | MOL SIEVE DEHYDRATORS |
| V-7471 | HEADER VESSEL |
| V-7472D-L | HARP FINGERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7494 | CLOSED DRAIN TANK |
| V-7496 | INSTRUMENT AIR RECEIVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7498 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | 2 | GENERAL REVISIONS - OPD JOB #14025 | JC | RBJ | 09/16/14 |
| | 1 | REVISED AS NOTED - OPD JOB #14025 | JH | JC | 7/18/14 |
| | 0 | ISSUED FOR CONSTRUCTION | RBJ | JL | 6/27/14 |
| | B | ISSUED FOR APPROVAL | RBJ | | |
| | A | ISSUED FOR BID - OPD JOB #14025 | RBJ | · | · |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

SCALE: 1" = 80'

DWN BY: RBJ — DATE: 3/7/14

CHKD BY:

FINAL CK:

ENGR.: MP

APPRV:

APPRV:

PLANT NAME: LITTLE MISSOURI #3

TARGA

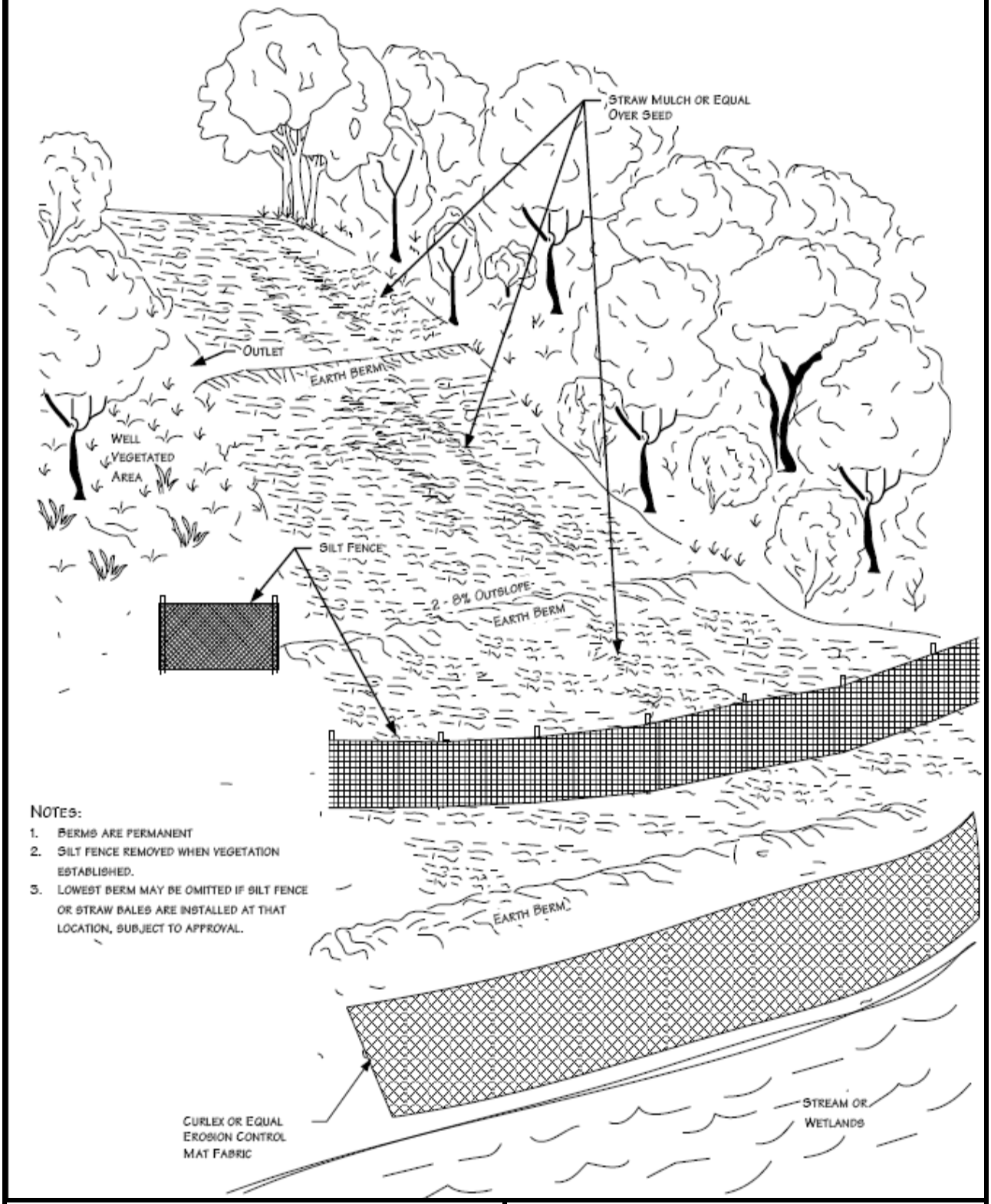
DRAWING NUMBER: LM-PP-3001

CAD FILE NAME: LM-PP-3001

REVISION: 2

# PLOT PLAN
# LITTLE MISSOURI #3 GAS PLANT

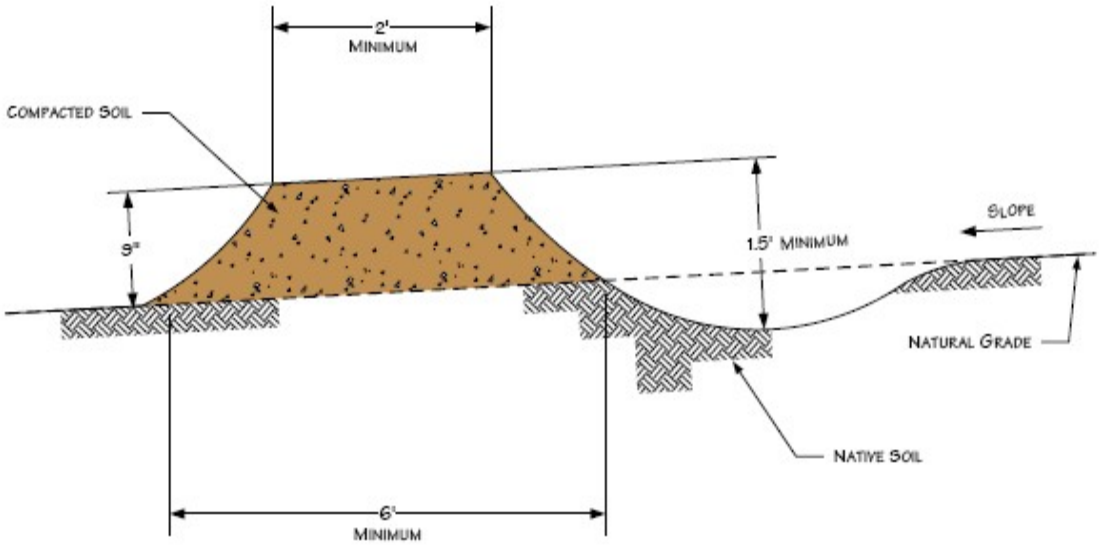
PLOT DATE: -




TARGA

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

**Figure 6.1.1 – Typical Temporary or Permanent Berms-Perspective View**
Little Missouri Gas Plant
August 2013

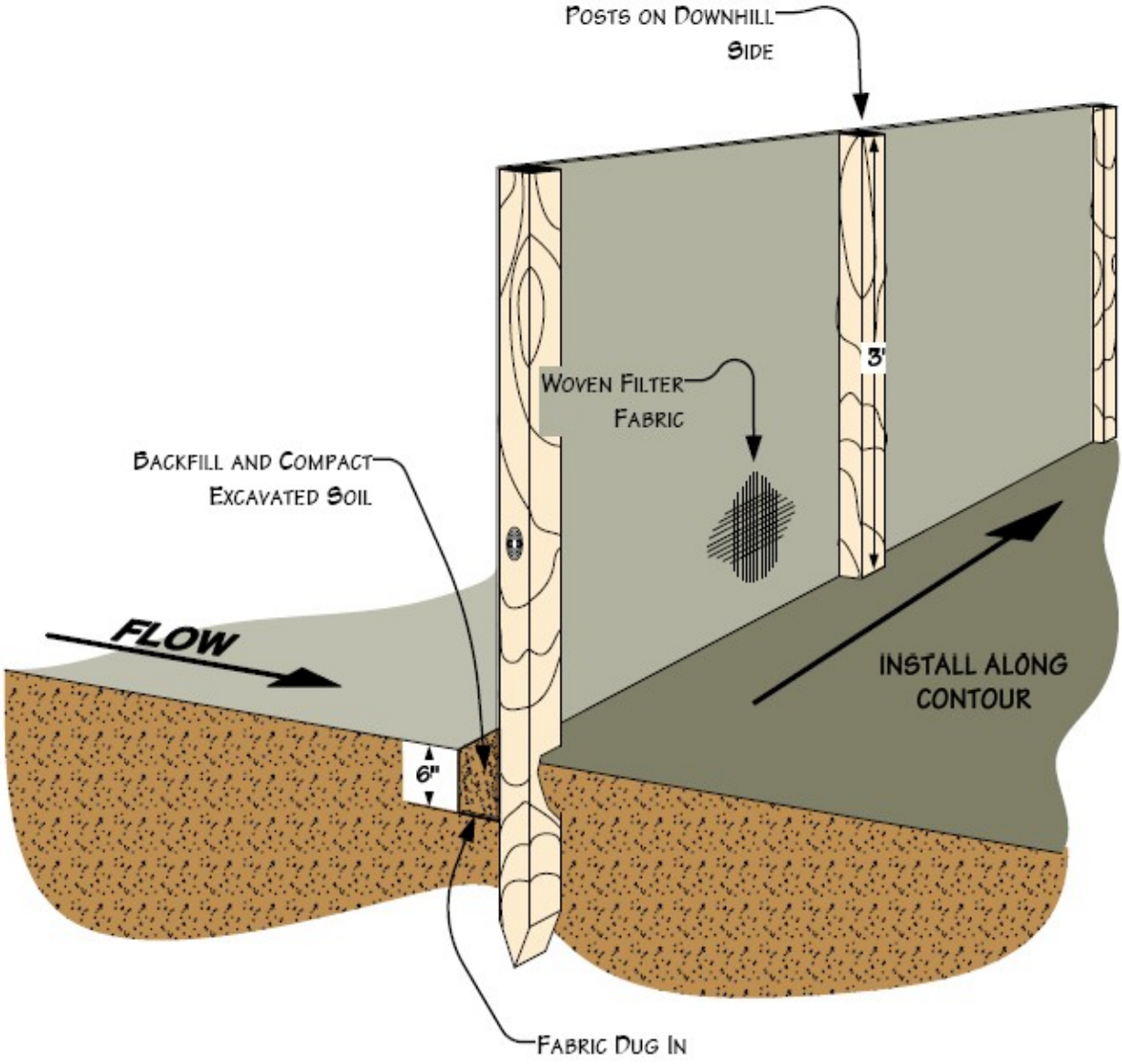



NOTES

1. BERMS SHALL BE CONSTRUCTED WITH 2 TO 8 PERCENT OUTSLOPE.
2. BERMS SHALL BE OUTLETED TO WELL VEGETATED STABLE AREAS, SILT FENCES, STRAW/HAY BALES OR ROCK APRONS.
3. BERMS SHALL BE SPACED AS DESCRIBED IN CONSTRUCTION SPECIFICATIONS.
4. ADDITIONAL INFORMATION INCLUDED ON OTHER DRAWINGS.

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

**Figure 6.1.2 – Typical Temporary or Permanent Berm-Elevation View**
Little Missouri Gas Plant
August 2013

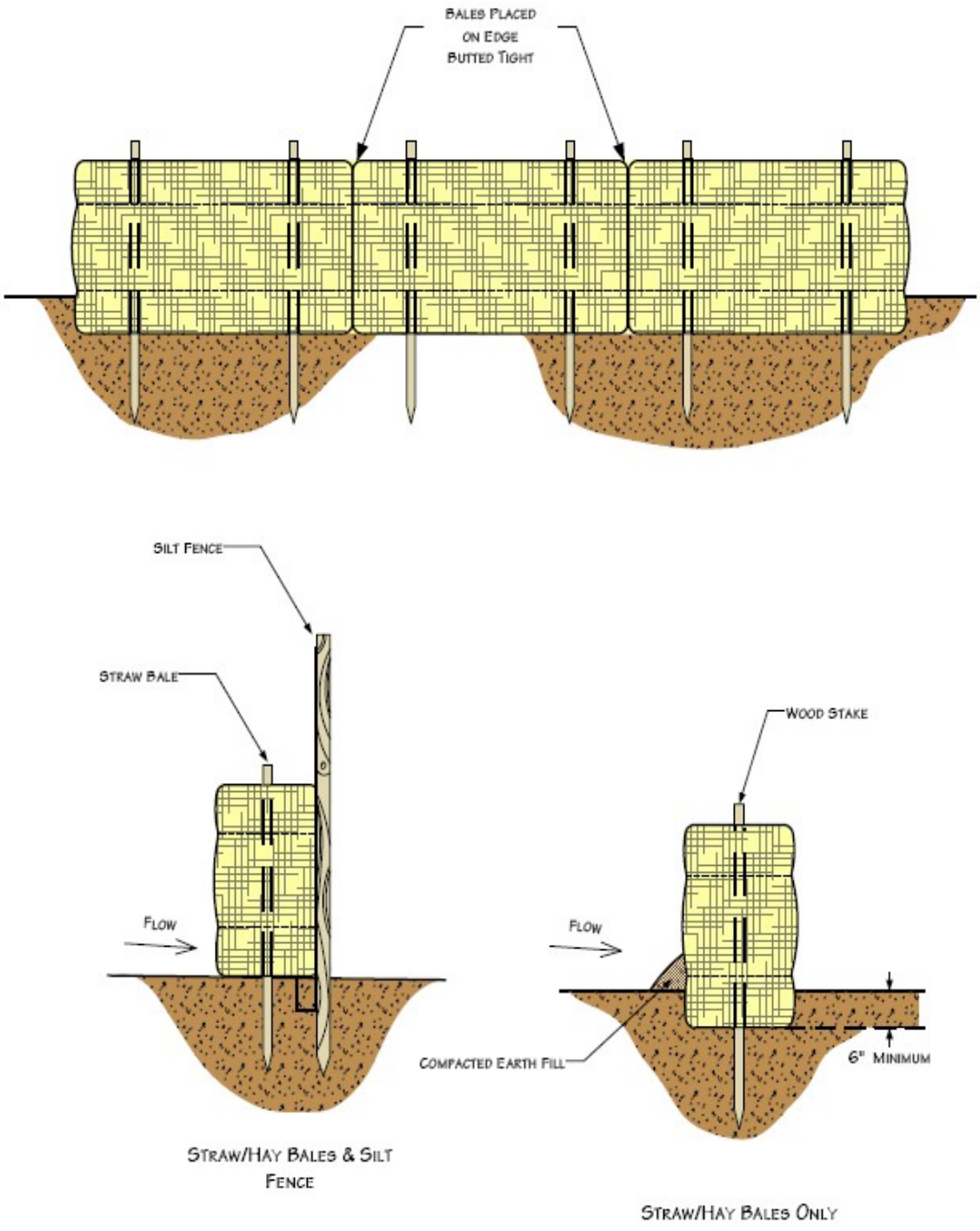



TARGA

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

**Figure 6.1.3 –Typical Silt Fence Installation**

Little Missouri Gas Plant
August 2013



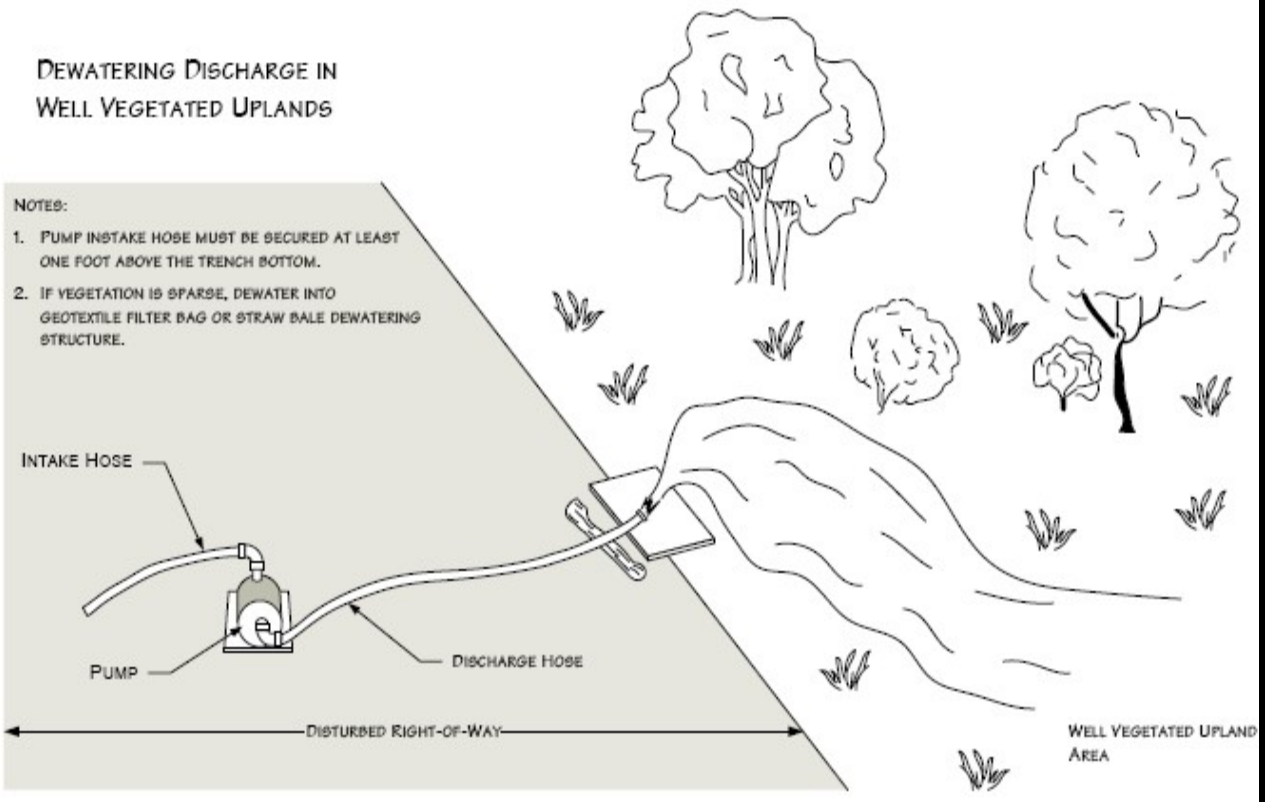

TARGA

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

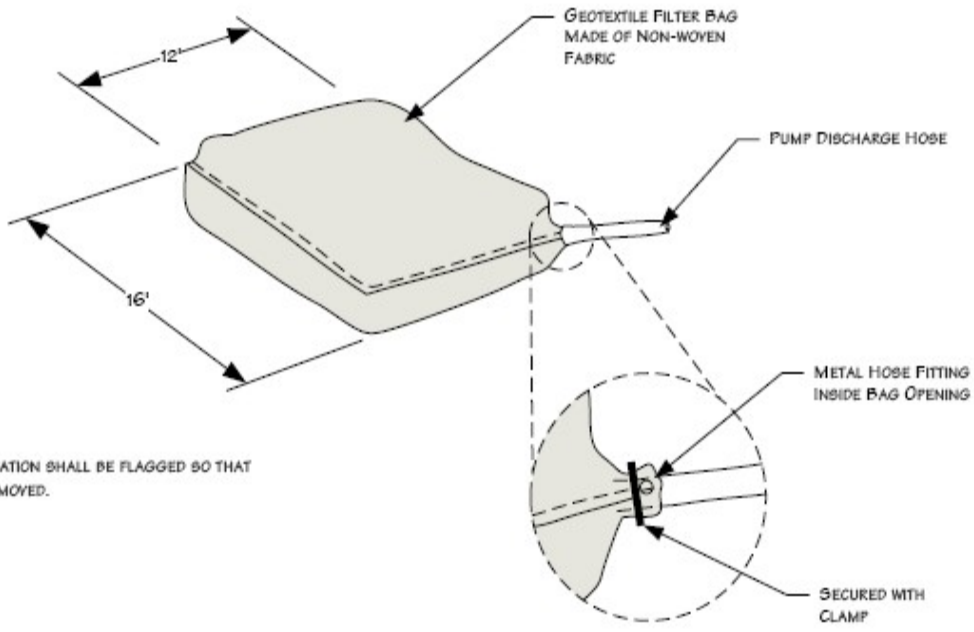
**Figure 6.1.4 –Straw Bale Installation**

Little Missouri Gas Plant
August 2013

## Dewatering Discharge in Well Vegetated Uplands




## Geotextile Filter Bag



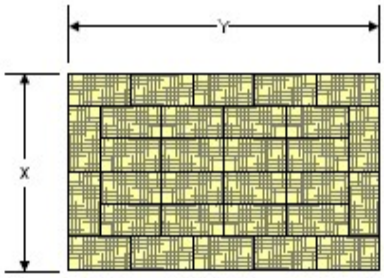

NOTE:

1. FILTER BAG LOCATION SHALL BE FLAGGED SO THAT BAG CAN BE REMOVED.

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

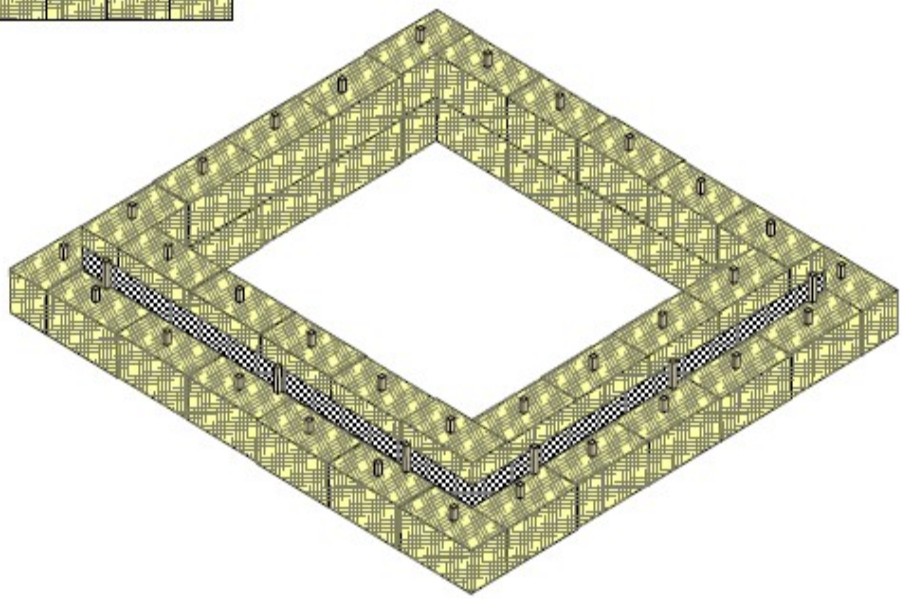
**Figure 6.1.5– Typical Dewatering Measures**

Little Missouri Gas Plant
August 2013

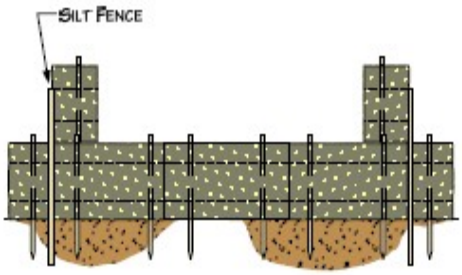



NOTES

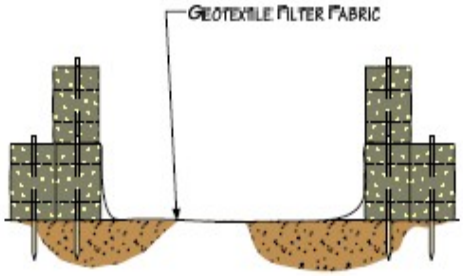
1. ARRANGE THE STRAW BALES TO THE X AND Y DIMENSIONS AS SPECIFICIED BELOW.
2. IF BOTTOM OF STRUCTURE IS NOT LINED WITH STRAW BALES (OPTION 1), LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC.



PERSPECTIVE VIEW




OPTION 1



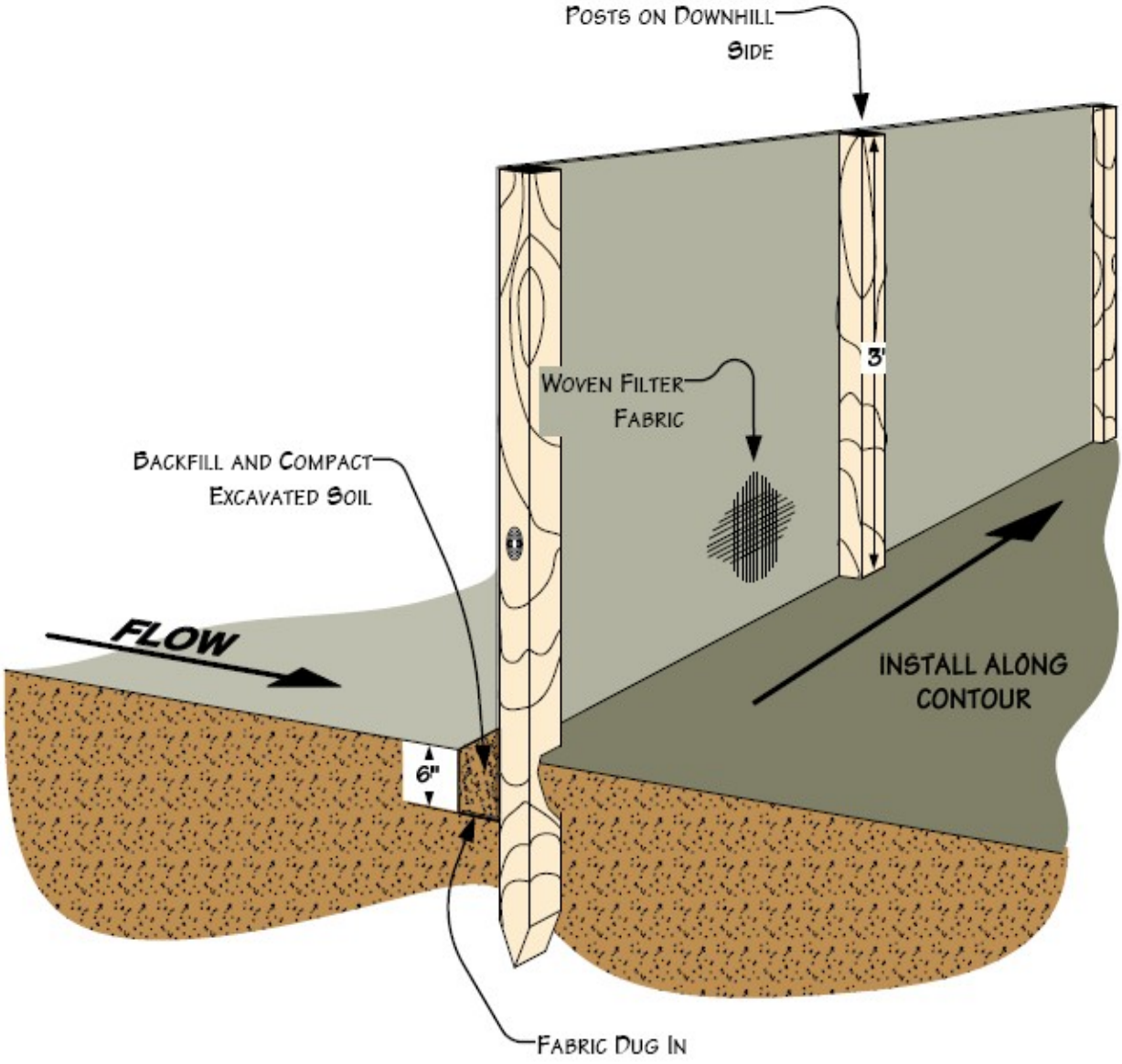

OPTION 2

| MINIMUM SUMP DIMENSIONS (FEET) | | MAXIMUM PUMPING RATE |
|---|---|---|
| X | Y | GALLONS PER MINUTE |
| 10 | 20 | 300 |
| 15 | 20 | 350 |
| 20 | 20 | 400 |
| 20 | 25 | 450 |
| 25 | 25 | 500 |
| 25 | 30 | 550 |
| 30 | 30 | 660 |

TARGA

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

**Figure 6.1.6 –Typical Straw-Bale Dewatering Structure**
Little Missouri Gas Plant
August 2013




TARGA

Targa Badlands, LLC
1000 Louisiana,
Suite 4300
Houston, TX 77002

**Figure 6.1.3 –Typical Silt Fence Installation**

Little Missouri Gas Plant
August 2013

# Appendix H:
# Risk Management Plan

# Section 1. Registration Information

| | |
|---|---|
| 1.1 Source Identification | |
| 1.1.a. Facility Name | Little Missouri Gas Plant |
| 1.1.b. Parent Company #1 Name | Targa Resources Inc. |
| 1.1.c. Parent Company #2 Name | |
| 1.2 EPA Facility Identifier | 100000214911 |
| 1.3 Other EPA Systems Facility Identifier | |
| 1.4 Dun and Bradstreet Numbers (DUNS) | |
| 1.4.a. Facility DUNS | |
| 1.4.b. Parent Company #1 DUNS | 138735688 |
| 1.4.c. Parent Company #2 DUNS | |
| 1.5 Facility Location | |
| 1.5.a. Street - Line 1 | 1939 125th Ave NW |
| 1.5.b. Street - Line 2 | |
| 1.5.c. City | Watford City |
| 1.5.d. State | ND |
| 1.5.e. Zip Code - Zip +4 Code | 58854 |
| 1.5.f. County | MCKENZIE |
| 1.5.g. Facility Latitude (in decimal degrees) | 47.693405 |
| 1.5.h. Facility Longitude (in decimal degrees) | -103.263073 |
| 1.5.i. Method for determining Lat/Long | Interpolation - Satellite |
| 1.5.j. Description of location identified by Lat/Long | Facility Centroid |
| 1.5.k. Horizontal Accuracy Measure (meters) | 1 |
| 1.5.l. Horizontal Reference Datum Code | North American Datum of 1983 |
| 1.5.m. Source Map Scale Number | |
| 1.6 Owner or Operator | |
| 1.6.a. Name | Targa Badlands LLC |
| 1.6.b. Phone | (713) 584-1000 |
| 1.6.c. Street - Line 1 | 1000 Louisiana Street |
| 1.6.d. Street - Line 2 | Suite 4300 |
| 1.6.e. City | Houston |
| 1.6.f. State | TX |
| 1.6.g. Zip Code - Zip +4 Code | 77002 |
| Foreign Country | |
| Foreign State/Province | |
| Foreign Zip/Postal Code | |
| 1.7 Name, title and email address of person or position responsible for RMP (part 68) implementation | |
| 1.7.a. Name of person | David Low |
| 1.7.b. Title of person or position | Area Manager |
| 1.7.c. Email address of person or position | DavidLow@targaresources.com |

# Section 1. Registration Information

| | |
|---|---|
| 1.8 Emergency Contact | |
| 1.8.a. Name | David Low |
| 1.8.b. Title of person or position | Area Manager |
| 1.8.c. Phone | (701) 842-3315 |
| 1.8.d. 24-Hour Phone | (701) 300-1206 |
| 1.8.e. 24-Hour Phone Extension/PIN # | |
| 1.8.f. Email address for emergency contact | DavidLow@targaresources.com |
| 1.9 Other Points of Contact | |
| 1.9.a. Facility or Parent Company E-mail Address | SFeucht@targaresources.com |
| 1.9.b. Facility Public Contact Phone Number | (713) 584-1419 |
| 1.9.c. Facility or Parent Company WWW Homepage Address | www.targaresources.com |
| 1.10 Local Emergency Planning Committee (LEPC) | Mckenzie County LEPC |
| 1.11 Number of fulltime equivalent (FTEs) employees on site | 10 |
| 1.12 Covered by | |
| 1.12.a. OSHA PSM | Y |
| 1.12.b. EPCRA section 302 | |
| 1.12.c. CAA Title V Air Operating Permit Program | |
| 1.12.d. Air Operating Permit ID # | |
| 1.13 OSHA Star or Merit Ranking | |
| 1.14 Last Safety Inspection (by an External Agency) Date | 12/05/2011 |
| 1.15 Last Safety Inspection Performed by an External Agency | Sterr Technical Risk Agency, Inc. |
| 1.16 Will this RMP involve Predictive Filing? | |
| 1.18 RMP Preparer Information | |
| 1.18.a. Name | |
| 1.18.b. Phone | |
| 1.18.c. Street - Line 1 | |
| 1.18.d. Street - Line 2 | |
| 1.18.e. City | |
| 1.18.f. State | |
| 1.18.g. Zip | |
| Foreign Country | |
| Foreign State/Province | |
| Foreign Zip Code | |

# Section 1. Registration Information

## Section 1.17 Process Specific Information

### Process 1

| | | | |
|---|---|---|---|
| Process ID # | 1000059602 | | |
| Process Description | NGL Storage | | |
| 1.17.a. Program Level | 3 | | |
| 1.17.b. NAICS Code(s) | | | |
| 211112 (Natural Gas Liquid Extraction) | | | |
| 1.17.c. Chemical(s) | | | |
| | Chemical Name | CAS Number | Quantity |
| | Flammable Mixture | 00-11-11 | 3204000 |
| | Chemicals in Flammable Mixture | | CAS Number of Chemical in Mixture |
| | Methane | | 74-82-8 |
| | Ethane | | 74-84-0 |
| | Propane | | 74-98-6 |
| | Butane | | 106-97-8 |
| | Pentane | | 109-66-0 |
| | Propane | 74-98-6 | 14580 |

# Section 4. Flammables: Worst Case

## Scenario 1

| Process Name | NGL Storage |
|---|---|
| Chemical | Flammable Mixture |
| 4.1.a. Chemical Name | Flammable Mixture |
| 4.2 Model Used | EPA's RMP*Comp(TM) |
| 4.3 Scenario | Vapor Cloud Explosion |
| 4.4 Quantity Released (lbs) | 267000 |
| 4.5 Endpoint Used | 1 PSI |
| 4.6 Distance to endpoint (miles) | 0.6 |
| 4.7 Estimated residential population within distance to endpoint (numbers) | 0 |
| 4.8 Public receptors within distance to endpoint | |
| 4.8.a. Schools | |
| 4.8.b. Residences | |
| 4.8.c. Hospitals | |
| 4.8.d. Prison/Correctional Facilities | |
| 4.8.e. Recreational Areas | |
| 4.8.f. Major commercial, office or industrial areas | Y |
| 4.8.g. Other | |
| 4.9 Environmental receptors within distance to endpoint | |
| 4.9.a. National or State Parks, Forests or Monuments | |
| 4.9.b. Officially Designated Wildlife Sanctuaries, Preserves or Refuges | |
| 4.9.c. Federal Wilderness Area | |
| 4.9.d. Other | |
| 4.10 Passive mitigation considered | |
| 4.10.a. Blast Walls | |
| 4.10.b. Other | |
| 4.11 Graphic file | |

# Section 5. Flammables: Alternative Release

## Scenario 1

| Process Name | NGL Storage |
|---|---|
| Chemical | Flammable Mixture |
| 5.1.a. Chemical Name | Flammable Mixture |
| 5.2 Model Used | EPA's RMP*Comp(TM) |
| 5.3 Scenario | Vapor Cloud Explosion |
| 5.4 Quantity Released (lbs) | 25617 |
| 5.5 Endpoint Used | 1 PSI |
| 5.6 Distance to endpoint (miles) | 0.1 |
| 5.7 Estimated residential population within distance to endpoint (numbers) | 0 |
| 5.8 Public receptors within distance to endpoint | |
| 5.8.a. Schools | |
| 5.8.b. Residences | |
| 5.8.c. Hospitals | |
| 5.8.d. Prison/Correctional Facilities | |
| 5.8.e. Recreational Areas | |
| 5.8.f. Major commercial, office or industrial areas | Y |
| 5.8.g. Other | |
| 5.9 Environmental receptors within distance to endpoint | |
| 5.9.a. National or State Parks, Forests or Monuments | |
| 5.9.b. Officially Designated Wildlife Sanctuaries, Preserves or Refuges | |
| 5.9.c. Federal Wilderness Area | |
| 5.9.d. Other | |
| 5.10 Passive mitigation considered | |
| 5.10.a. Dikes | |
| 5.10.b. Fire walls | |
| 5.10.c. Blast walls | |
| 5.10.d. Enclosures | |
| 5.10.e. Other | |
| 5.11 Active mitigation considered | |
| 5.11.a. Sprinkler systems | |
| 5.11.b. Deluge systems | |
| 5.11.c. Water curtain | |
| 5.11.d. Excess flow valve | |
| 5.11.e. Other | |
| 5.12 Graphic file | |

# Section 7. Prevention Program: Program Level 3

## Program 1

| Prevention Program Description: | |
|---|---|
| 7.1 NAICS Code for process | |
| 7.1.a. Process Name | 1000059602 (NGL Storage) |
| 7.1.b. NAICS | 211112 (Natural Gas Liquid Extraction) |
| 7.2 Chemicals | |
| Flammable Mixture | |
| 7.3 Date on which the safety information was last reviewed or revised | 08/30/2012 |
| 7.4 Process Hazard Analysis (PHA) | |
| 7.4.a. Date of last PHA or PHA update | 08/30/2012 |
| 7.4.b. Technique used | |
| 7.4.b.1. What if | |
| 7.4.b.2. Checklist | |
| 7.4.b.3. What if/Checklist Combined | |
| 7.4.b.4. HAZOP | Y |
| 7.4.b.5. Failure mode & effects analysis | |
| 7.4.b.6. Fault tree analysis | |
| 7.4.b.7. Other | |
| 7.4.c. Expected or actual date of completion of all changes resulting from last PHA or PHA update | 11/01/2012 |
| 7.4.d. Major hazards identified | |
| 7.4.d.1. Toxic release | |
| 7.4.d.2. Fire | Y |
| 7.4.d.3. Explosion | Y |
| 7.4.d.4. Runaway reaction | |
| 7.4.d.5. Polymerization | |
| 7.4.d.6. Overpressurization | Y |
| 7.4.d.7. Corrosion | Y |
| 7.4.d.8. Overfilling | Y |
| 7.4.d.9. Contamination | Y |
| 7.4.d.10. Equipment failure | Y |
| 7.4.d.11. Loss of cooling, heating, electricity, instrument air | Y |
| 7.4.d.12. Earthquake | |
| 7.4.d.13. Floods | |
| 7.4.d.14. Tornado | |
| 7.4.d.15. Hurricanes | |
| 7.4.d.16. Other | |
| 7.4.e. Process controls in use | |
| 7.4.e.1. Vents | Y |
| 7.4.e.2. Relief valves | Y |
| 7.4.e.3. Check valves | Y |
| 7.4.e.4. Scrubbers | Y |
| 7.4.e.5. Flares | Y |
| 7.4.e.6. Manual shutoffs | Y |

## Section 7. Prevention Program: Program Level 3

| | |
|---|---|
| 7.4.e.7. Automatic shutoffs | Y |
| 7.4.e.8. Interlocks | Y |
| 7.4.e.9. Alarms and procedures | Y |
| 7.4.e.10. Keyed bypass | |
| 7.4.e.11. Emergency air supply | |
| 7.4.e.12. Emergency power | Y |
| 7.4.e.13. Backup pump | |
| 7.4.e.14. Grounding equipment | |
| 7.4.e.15. Inhibitor additions | |
| 7.4.e.16. Rupture disks | Y |
| 7.4.e.17. Excess flow device | |
| 7.4.e.18. Quench system | |
| 7.4.e.19. Purge system | |
| 7.4.e.20. None | |
| 7.4.e.21. Other | |
| 7.4.f. Mitigation systems in use | |
| 7.4.f.1. Sprinkler system | |
| 7.4.f.2. Dikes | Y |
| 7.4.f.3. Fire walls | |
| 7.4.f.4. Blast walls | |
| 7.4.f.5. Deluge system | |
| 7.4.f.6. Water curtain | |
| 7.4.f.7. Enclosure | |
| 7.4.f.8. Neutralization | |
| 7.4.f.9. None | |
| 7.4.f.10. Other | |
| 7.4.g. Monitoring/detection systems in use | |
| 7.4.g.1. Process area detectors | Y |
| 7.4.g.2. Perimeter monitors | |
| 7.4.g.3. None | |
| 7.4.g.4. Other | |
| 7.4.h. Changes since last PHA update | |
| 7.4.h.1. Reduction in chemical inventory | |
| 7.4.h.2. Increase in chemical inventory | Y |
| 7.4.h.3. Change in process parameters | Y |
| 7.4.h.4. Installation of process controls | Y |
| 7.4.h.5. Installation of process detection systems | |
| 7.4.h.6. Installation of perimeter monitoring systems | |
| 7.4.h.7. Installation of mitigation systems | |
| 7.4.h.8. None recommended | |
| 7.4.h.9. None | |
| 7.4.h.10. Other | |
| 7.5 Date of most recent review or revision of operating procedures | 06/01/2012 |
| 7.6 Training | |

## Section 7. Prevention Program: Program Level 3

| | |
|---|---|
| 7.6.a. Date of most recent review or revision of training programs | 05/02/2011 |
| 7.6.b. Type of training provided | |
| 7.6.b.1. Classroom | |
| 7.6.b.2. On the job | Y |
| 7.6.b.3. Other | |
| 7.6.c. Type of competency testing used | |
| 7.6.c.1. Written test | |
| 7.6.c.2. Oral test | |
| 7.6.c.3. Demonstration | Y |
| 7.6.c.4. Observation | |
| 7.6.c.5. Other | |
| 7.7 Maintenance | |
| 7.7.a. Date of most recent review or revision of maintenance procedures | 05/02/2011 |
| 7.7.b. Date of most recent equipment inspection or test | 09/24/2012 |
| 7.7.c. Equipment most recently inspected or tested (equipment list) | PSVs |
| 7.8 Management of change | |
| 7.8.a. Date of most recent changes that triggered management of change procedures | 10/09/2012 |
| 7.8.b. Date of most recent review or revision of management of change procedures | 10/23/2012 |
| 7.9 Date of most recent pre-startup review | 06/01/2011 |
| 7.10 Compliance audits | |
| 7.10.a. Date of most recent compliance audits | |
| 7.10.b. Expected or actual date of completion of all changes resulting from the most recent compliance audits | |
| 7.11 Incident investigation | |
| 7.11.a. Date of most recent incident investigation | 09/07/2012 |
| 7.11.b. Expected or actual date of completion of all changes resulting from the incident investigation | 12/31/2012 |
| 7.12 Date of most recent review or revision of employee participation plans | 07/27/2012 |
| 7.13 Date of most recent review or revision of hot work permit procedures | 03/01/2011 |
| 7.14 Date of most recent review or revision of contractor safety procedures | 06/11/2012 |
| 7.15 Date of most recent evaluation of contractor safety performance | 12/06/2012 |

# Section 9. Emergency Response

| | |
|---|---|
| 9.1 Written emergency response (ER) plan | |
| 9.1.a. Is your facility included in the written community emergency response plan? | |
| 9.1.b. Does your facility have its own written emergency response plan? | Y |
| 9.2 Does your facility's ER plan include specific actions to be taken in response to accidental releases of regulated substances? | Y |
| 9.3 Does your facility's ER plan include procedures for informing the public and local agencies responding to accidental releases? | Y |
| 9.4 Does your facility's ER plan include information on emergency health care? | Y |
| 9.5 Date of most recent review or update of your facility's ER plan | 02/29/2012 |
| 9.6 Date of most recent ER training for your facility's employees | 02/29/2012 |
| 9.7 Local agency with which your facility's ER plan or response activities are coordinated | |
| 9.7.a. Name of agency | Watford City Fire Department |
| 9.7.b. Phone number | (701) 444-3516 |
| 9.8 Subject to | |
| 9.8.a. OSHA Regulations at 29 CFR 1910.38 | Y |
| 9.8.b. OSHA Regulations at 29 CFR 1910.120 | |
| 9.8.c. Clean Water Act Regulations at 40 CFR 112 | |
| 9.8.d. RCRA Regulations at 40 CFR 264, 265, 279.52 | |
| 9.8.e. OPA-90 Regulations at 40 CFR 112, 33 CFR 154, 49 CFR 194, 30 CFR 254 | Y |
| 9.8.f. State EPCRA Rules of Laws | |
| 9.8.g. Other | |

# Executive Summary

Targa Badlands LLC - Little Missouri Gas Plant
Risk Management Plan Executive Summary

Accidental Release Prevention and Emergency Response Policies
Targa Resources is committed to protecting the health and safety of company personnel, contract workers, our neighbors, the surrounding community and the environment. This commitment is strongly supported by senior management and is demonstrated by the resources invested in accident prevention, such as employee training and in considering safety in the design, installation, operation and maintenance of the facility. Targa Resources implements both administrative and engineering controls to reasonably minimize the risk of an uncontrolled release of a hazardous substance. The Little Missouri Gas Plant does not anticipate having any type of uncontrolled release. However, if an uncontrolled release does occur, the personnel supporting the site in cooperation with local agencies are trained to respond, minimize and eliminate any exposure that would occur to protect employees and the surrounding area.

Description of Stationary Source and Regulated Substances
The Little Missouri Gas Plant is located near Watford City, North Dakota and is a natural gas processing plant which receives raw natural casing gas from oil well production. Natural gas liquids (NGLs) are extracted from the raw gas and stored on site. The extracted NGLs include methane, ethane, propane, butane and a pentane natural gasoline mixture that is delivered to market via transportation vehicles. The gas remaining after the liquids extraction it routed to a natural gas pipeline for commercial sale. There is also refrigerant propane at the site. There are no listed toxic substances which exceed their respective threshold quantities stored at this facility.

Facility Location and Driving Directions
The Little Missouri Gas Plant's location address is 1939 125th Ave NW, Watford City, ND 58854. Driving directions have been included for clarification of facility location. The facility can be found by traveling State Highway 85 south for 5.6 miles from Watford City, North Dakota until it intersects with County Road 37. Travel 0.5 miles east on County Road 37 to the intersection with 125th Avenue NW. From intersection of County Road 37 and 125th Avenue NW, travel south on 125th Avenue NW for 1.8 miles to the Little Missouri facility.

Hazard Assessment - Worst Case Scenario
The Worst Case Scenario for this facility is a release of a flammable mixture that would result as a failure of a natural gas liquids storage tank releasing the entire contents instantaneously to the atmosphere having an offsite impact. EPA's RMP*Comp was used to calculate a scenario where the entire contents of the largest facility bullet storage tank were considered for a vapor cloud explosion release. This type of scenario is unlikely to occur. In addition, qualified individuals operate the subject processes. The equipment is inspected and maintained according to a preventative maintenance schedule further reducing the likelihood of this release occurring.

General Accident Release Prevention Program
The following is a summary of the accidental release prevention program in place at the Little Missouri Gas Plant. The Little Missouri Gas Plant has been classified as a Program 3 facility because of the close proximity to a nearby commercial facility. The facility is not only regulated by the EPA's Risk Management Program but also the OSHA's Process Safety Management (PSM) standard. This summary addresses many of the OSHA PSM elements.

Employee Participation
Targa Resources encourages employees to participate in all facets of process safety management and accident prevention. Examples of employee participation range from updating and compiling process safety information to participation as a member of a process hazard analysis (PHA) team. Employees have access to all information created as part of the facility's PSM and accidental release prevention programs. In addition, facility has a number of initiatives that address process safety and employee safety issues including plant safety meetings and safety training to promote both process and personal safety.

Process Safety Information
Targa Resources keeps a variety of technical documents that are used to help maintain safe operation of the process. These documents address chemical properties and associated hazards, limits for key process parameters and specific chemical inventories, and equipment design basis/configuration information. Up-to-date process safety information is maintained on a going basis. The reference documents are readily available at the plant location.

Chemical-specific information, including exposure hazards and emergency response/exposure treatment considerations, is provided in material safety data sheets (MSDS). The facility ensures that the process is maintained within safe operating limits using process controls and monitoring instruments, highly trained

# Executive Summary

personnel, and protective instrument systems (e.g., automated shutdown systems).

The gas plant also maintains numerous technical documents that provide information about the design and construction of process equipment. This information includes material of construction, design pressure and temperature ratings, and electrical rating of equipment. This information, in combination with trained personnel, provides a basis for establishing inspection and maintenance activities, as well as for evaluating proposed process and facility changes to ensure that safety features integral to the process are not compromised.

Process Hazard Analysis (PHA)
Targa Resources systematically examines the Little Missouri Gas Plant facility processes to identify any potential hazards and ensures that adequate controls are in place to manage these hazards.

The Little Missouri Gas Plant primarily uses the hazard and operability (HAZOP) analysis technique to perform these evaluations. HAZOP analysis is recognized as one of the most systematic and thorough hazard evaluation techniques. OSHA and the EPA recognize the analysis as an approved method for conducting PHAs. Plant PHAs are conducted using a team of people who have operating and maintenance experience as well as engineering and safety expertise. The team identifies and evaluates hazards of the process as well as accident prevention and mitigation measures, and the team makes suggestions for additional prevention and/or mitigation measures when the team believes such measures are necessary.

The PHA team findings are forwarded to company's local and corporate management for resolution. Implementation of mitigation options in response to PHA findings is based on a relative risk ranking assigned by the PHA team. This ranking helps ensure that potential accident scenarios assigned the highest risk receive immediate attention. All approved mitigation options in responses to PHA team findings are tracked until they are completed. The final resolution of each finding is documented and retained.

Targa Resources periodically updates and revalidates the PHA results to ensure that the process controls and/or process hazards do not deviate significantly over time from the original design and safety features. These periodic reviews are conducted at least every 5 years and will be conducted at this frequency until the process is no longer operating. The results and findings from these updates are documented and retained. Any team findings are forwarded to management for consideration, and the final resolution of the findings are documented and retained.

Operating Procedures
The Little Missouri Gas Plant maintains written procedures that address various modes of process operations, such as:

1. Unit startup
2. Normal operations
3. Temporary operations
4. Emergency shutdown
5. Normal shutdown
6. Initial startup of a new process

These procedures can be used as a reference by experienced operators and provide a basis for consistent training of new operators. These procedures are periodically reviewed and annually certified as current and accurate. The procedures are kept current and accurate by revising them as necessary to reflect changes made through the management of change process.

Training
An established comprehensive training program has been developed and implemented by Targa Resources. All employees are trained in an overview of the process as well as in appropriate safe work practices. In addition to training required of all employees, personnel having specific responsibilities under the operating and maintenance procedures are aptly trained in those procedures.

Contractors
Targa Resources uses contractors to supplement its workforce during periods of increased maintenance or construction activities. Because some contractors work on or near process equipment, the gas plant has procedures in place to ensure that contractors:

1. Perform their work in a safe manner
2. Have the appropriate knowledge and skills
3. Are aware of the hazards in their workplace
4. Understand what they should do in the event of an emergency
5. Understand and follow site safety rules

# Executive Summary

6. Inform gas plant personnel of any hazards that they find during their work

This is accomplished by providing contractors with:
1. Process Overview
2. Information about safety and health hazards
3. Emergency response plan requirements
4. Safe work practices prior to their beginning work
5. Site safety comprehension test

Targa Resources evaluates contractor safety programs and performance during the selection of a contractor. Plant personnel periodically monitor contractor performance to ensure that contractors are fulfilling their safety obligations.

Pre-startup Safety Reviews (PSSRs)
Targa Resources conducts a PSSR for any new facility or facility modification that requires a change in the process safety information. The purpose of the PSSR is to ensure that safety features, procedures, personnel, and equipment are appropriately prepared for startup prior to placing the equipment into service. This review provides one additional check to make sure construction is in accordance with the design specifications and that all supporting systems are operationally ready. The PSSR team uses checklists to verify all aspects of readiness. A PSSR involves field verification of the construction and serves a quality assurance function by requiring verification that accident prevention program requirements are properly implemented.

Mechanical Integrity
Targa Resources has established practices and procedures to maintain pressure vessels, piping systems, relief and vent systems, controls, pump and compressors, and emergency shutdown systems in a safe operating condition. The basic aspects of this program include:

1. Maintenance and operational personnel training
2. Developing written procedures
3. Performing inspections and tests
4. Correcting identified deficiencies
5. Applying quality assurance measures

The combination of these activities forms a system that maintains the mechanical integrity of the process.

Safe Work Practices
Safe work practices have been developed to ensure safe operations that are consistent with industry practice and meet regulatory requirements. Safe work practices include site control, lockout/tagout, line breaking, confined space entry and hot work to ensure the safety and well being of employees and the surrounding area.

Management of Change (MOC)
Targa Resources has developed a MOC program to ensure that all permanent and temporary changes to flammable or hazardous processes maintain or enhance the safety, environmental, mechanical and technical integrity of the intended design. The primary intent of the MOC program is to preclude the occurrence of catastrophic releases that could occur through the improper control of changes.

The MOC program applies to all permanent and temporary changes involving any chemicals, procedures, process equipment, processing rates, technology, control systems, monitoring systems and safety systems associated with flammable or hazardous processes. The MOC program requires that changes be documented, authorized by appropriate facility personnel, and that the changes are adequately conducted to prevent any type of release. The MOC program also ensures that changes are communicated to affected personnel and that training has been conducted as necessary.

Incident Investigation
Targa Resources promptly investigates all incidents that resulted in, or reasonably could have resulted in, a fire/explosion, toxic gas release, major property damage, environmental loss, or personal injury. The goal of each investigation is to determine the facts and develop corrective actions to prevent a recurrence of the incident or a similar incident. The investigation team documents its findings, develops recommendations to prevent a recurrence, and forwards these results to management for resolution. Corrective actions taken in response to the investigation team's findings and recommendations are tracked until they are complete. The final resolution of each finding or recommendation is documented, and the investigation results are reviewed with all employees (including contractors) who could be affected by the findings. Incident investigation reports are retained for at least 5 years so that the reports can be reviewed during future PHAs and PHA revalidations.

# Executive Summary

Compliance Audits
Targa Resources periodically conducts an audit of the Little Missouri Gas Plant to determine whether the procedures and practices required by the accident prevention program are being implemented and functioning properly. Compliance audits are scheduled at least every 3 years. Audit findings are forwarded to the plant management team for resolution. The management team initiates any corrective actions taken in response to the audit and tracks them until they are complete. The final resolution of each finding is documented and the two most recent audit reports are retained.

5 Year Accident History
The Little Missouri Gas Plant is a newly constructed facility. As such, there have been no releases of listed Hazardous Substances which have resulted in offsite effects.

Emergency Response Program
Targa Resources has written emergency response procedures to protect workers, ensure public safety and to protect the environment. These procedures address all aspects of emergency response including response to a regulated substance release including the possibility of a fire or explosion in the event that a flammable substance is accidently released. Procedures also address evacuation, accounting for personnel and company and agency notification. The emergency response plan is updated when necessary based on modifications made to the process or facility. The overall emergency response plan is coordinated with the local emergency responders including local law enforcement and the McKenzie County Local Emergency Planning Committee (LEPC).

Planned Changes to Improve Safety
Targa Resources personnel are continually developing new ways to improve the safety of it's equipment and operations. This is done through training which is considered a vital part of any safety program. Training is conducted according to a schedule so employees and contractors are given the most up to date information available. All new and modified equipment is designed with appropriate safety controls and devices.

# Appendix I:
# Spill Prevention, Control, and Countermeasures Plan and Stormwater Pollution Prevention, Erosion Control Plan

# SPILL PREVENTION, CONTROL, AND COUNTERMEASURES PLAN

**For**

**40 CFR PART 112 Regulated Facility**
**Located At:**

**Latitude: 47.6951° / Longitude: -103.2619°**

**LITTLE MISSOURI GAS PLANT**
**Township 149N, Range 98W, Section 30, SE/4**
**McKenzie County, ND**

**Owner/Operator:**
**Targa Resources Partners, LP**
**1000 Louisiana**
**Houston, TX 77002**

**REVISION NO. - 0**
**AUGUST 2013**

## TABLE OF CONTENTS

Page

LIST OF FIGURES ..... iii
LIST OF APPENDICES ..... iii
CODE OF FEDERAL REGULATIONS CROSS-REFERENCE TABLE ..... iv
MANAGEMENT APPROVAL AND PROFESSIONAL ENGINEER CERTIFICATION ..... vi
PLAN IMPLEMENTATION MEASURES NOT FULLY OPERATIONAL ..... vii
SPCC PLAN REVIEW ..... viii
SPILL RESPONSE COORDINATORS ..... viii
SPCC INSPECTION AND DOCUMENTATION ..... viii
CERTIFICATION OF SUBSTANTIAL HARM DETERMINATION ..... ix

1.0 GENERAL INFORMATION ..... 1
1.1 Plan Availability ..... 1
1.1.1 Plan Distribution List ..... 1
1.2 Deviations to the SPCC Rule ..... 1
1.3 Plan Review and Update Process ..... 2
1.4 Spill Reporting to Regional Administrator ..... 3
1.5 Contact List and Phone Numbers ..... 3
1.6 Notification Data Sheet ..... 3
1.7 Personnel, Training and Discharge Prevention ..... 3
1.8 Prevention, Response and Cleanup ..... 4
1.9 Impracticability ..... 4
1.10 Conformance with Other Requirements ..... 4

2.0 FACILITY INFORMATION ..... 5
2.1 Facility and Owner/Operator Information ..... 5
2.2 Facility Description ..... 5
2.3 Facility Layout and Diagram ..... 5
2.4 Storage Containers and Potential Spills ..... 6
2.5 Bulk Storage Containers ..... 8
2.5.1 Mobile or Portable Storage Containers ..... 8
2.5.2 Buried or Bunkered Storage Tanks ..... 9
2.5.3 Bulk Storage Containers with Internal Heating Coils ..... 9
2.5.4 Bulk Container Inventory Control ..... 9
2.6 Inspections, Tests and Records ..... 9
2.6.1 Bulk Storage Container Inspection ..... 9
2.6.2 Bulk Storage Container Integrity Testing ..... 10
2.6.3 In-Service Piping and Transfer Equipment ..... 10
2.7 Facility Drainage ..... 10
2.7.1 Facility Diked Drainage ..... 10
2.7.2 Facility Undiked Area Drainage ..... 11
2.7.3 Effluent Treatment Facilities ..... 11
2.8 Transfer Operations, Pumping and In-Plant Processes ..... 11
2.8.1 Buried Piping ..... 11
2.8.2 Out-of-Service Piping ..... 11
2.8.3 Aboveground Valves and Piping ..... 11
2.9 Tank Truck and Tank Car Loading Racks ..... 12
2.10 Vehicle Warnings ..... 12
2.11 Facility Security ..... 13

## LIST OF FIGURES


| Figure | Title | Page |
|---|---|---|
| 1 | Site Location Map | 14 |
| 2 | Simplified Site Plan | 15 |
| 3 | Containment Calculations | 16 |


## LIST OF APPENDICES


| Appendix | Title |
|---|---|
| A | SPCC Personnel Training Program and Documentation |
| B | Inspections, Testing and Records |
| C | Targa Emergency Response Notification List |
| D | Spill Reporting Form and Submittal of Information to Regional Administrator for Qualified Discharge(s) |
| E | Containment Drainage Records |

| CODE OF FEDERAL REGULATIONS CROSS-REFERENCE TABLE | | |
|---|---|---|
| **Citation** | **Description** | **Section/Page** |
| **§112.3** | **Requirement to Prepare and Implement a SPCC Plan** | **See below** |
| §112.3 | Owner/operator must prepare SPCC plan | All |
| §112.3(d)(1) | Professional Engineer Certification | vi |
| §112.3(e) | Maintain complete copy of plan | 1.1, 1.2 |
| §112.3(g) | Qualified facilities/self-certification | 1.2 |
| **§112.4** | **Amendment of SPCC Plan by Regional Administrator** | **See below** |
| §112.4(a) | Report to EPA after specific discharges | 1.4, App D |
| §112.4(c) | Send above report to appropriate state agencies | 1.4, App D |
| **§112.5** | **Amendment of SPCC by Owners / Operators** | **See below** |
| §112.5(a) | Amendment of SPCC plan by owner or operator | viii, 1.3 |
| §112.5(b) | Management of Five Year Review | viii, 1.3 |
| §112.5(c) | PE certification of amendments | viii, 1.3 |
| **§112.6** | **Qualified Facility Plan Requirements** | **See below** |
| §112.6(a) | Preparation and Self-Certification of Plan | 1.3 |
| §112.6(b) | Self-Certification of Technical Amendments | 1.3 |
| §112.6(c) | Applicable requirements | 1.3 |
| §112.6(d) | Professional Engineer Certifications of Portions of a Qualified Facility's Self-Certified Plan | 1.3 |
| **§112.7** | **General Requirements for SPCC Plans** | **See below** |
| §112.7 | Management approval of plan | vi |
| §112.7 | Cross reference table if plan does not follow sequence of regulations | iv |
| §112.7 | Facilities not yet fully operational | vii |
| §112.7(a)(1) | Discussion of conformance with the requirements of SPCC | All |
| §112.7(a)(2) | Explanation of any deviations-equivalent environmental protection, alternative measures | 1.2, throughout |
| §112.7(a)(3) | Physical layout of the facility including facility diagram | 2.2, 2.3, Figs. |
| §112.7(a)(3)(i) | Type of oil in each container and its storage capacity | 2.4 |
| §112.7(a)(3)(ii) | Discharge prevention measures including procedures for routine handling of products | 1.7, 1.8 |
| §112.7(a)(3)(iii) | Discharge or drainage controls such as secondary containment around containers and other structures, equipment and procedures for control of a discharge | 2.4 |
| §112.7(a)(3)(iv) | Countermeasures for discharge discovery, response and cleanup | 1.8 |
| §112.7(a)(3)(v) | Methods of disposal of recovered materials | 1.8 |
| §112.7(a)(3)(vi) | Contact list and phone numbers | App C |
| §112.7(a)(4) | Procedures for reporting a discharge, unless FRP has been submitted | 1.6, App D |
| §112.7(b) | Discharge predication / Fault analysis | 2.4 |
| §112.7(c) | Appropriate containment or diversion: | 2.4 |
| §112.7(d) | Deviations due to impracticability | 1.9 |
| §112.7(e) | Inspections, tests, and records | 2.6 |
| §112.7(f) | Employee training and discharge prevention procedures | 1.7, App B |
| §112.7(f)(1) | Oil-handling and inspection personnel training | 1.7, App B |
| §112.7(f)(2) | Accountable person for discharge prevention | viii |
| §112.7(f)(3) | Discharge prevention briefings | 1.7 |
| §112.7(g) | Security (excluding oil production facilities) | 2.11 |
| §112.7(g)(1) | Fencing and lock/guard gates | 2.11 |
| §112.7(g)(2) | Fail-safe valves for containers | 2.11 |

| REGULATORY CROSS-REFERENCE (Cont'd.) | | |
|---|---|---|
| §112.7(g)(3) | Starter control on each pump | 2.11 |
| §112.7(g)(4) | Loading/unloading connections of oil pipelines or facility piping when not in service | 2.11 |
| §112.7(g)(5) | Lighting | 2.11 |
| §112.7(h) | Tank Car and Tank Truck Loading / Unloading Rack | 2.9 |
| §112.7(h)(1) | Handling discharges | 1.8, App D |
| §112.7(h)(2) | Preventing early vehicle departure | 2.9 |
| §112.7(h)(3) | Inspection for discharges prior to filling and departure | 2.9 |
| §112.7(i) | Evaluate field-construct above ground tanks upon repair, etc. | 2.6.1 |
| §112.7(j) | Conformance with other requirements | 1.10 |
| §112.7(k) | Qualified Oil-Filled Operational Equipment | 2.4 |
| §112.7(k)(1) | Qualification Criteria-Reportable Discharge History | 1.4, 1.6 |
| §112.7(k)(2) | Alternative Requirements to General Secondary Containment | N/A |
| §112.7(k)(2)(i) | Establishment of Inspection & Monitoring Plan | 2.6 |
| §112.7(k)(2)(ii)(A) | Provide oil spill contingency plan | N/A |
| §112.7(k)(2)(ii)(B) | Written commitment of manpower, equipment, and materials to control and remove spill | vi, App C |
| **§112.8** | **Requirements for onshore facilities (excluding production facilities)** | **See below** |
| §112.8(a) | General and specific requirements | All |
| §112.8(b) | Facility drainage | 2.7 |
| §112.8(b)(1) | Restrain drainage from diked storage areas | 2.7 |
| §112.8(b)(2) | Manual valves in diked areas | 2.7.1 |
| §112.8(b)(3) | Facility drainage systems from undiked areas with a potential for a discharge | 2.7.2 |
| §112.8(b)(4) | If not 8(b)(3), diversion system for ditches | N/A |
| §112.8(b)(5) | If pump transfer required for drainage water treatment, provide fail-safe pumps and at least two pumps | N/A |
| §112.8(c) | Bulk storage containers | 2.4, 2.5 |
| §112.8(c)(1) | Material and construction | 2.4 |
| §112.8(c)(2) | Secondary means of containment | 2.4 |
| §112.8(c)(3) | Drainage controls to storm drain or open water bodies | 2.7 |
| §112.8(c)(4) | Protection of completely buried metallic tanks from corrosion | 2.5.2 |
| §112.8(c)(5) | Partially buried or bunkered metallic tanks protection from corrosion | 2.5.2 |
| §112.8(c)(6) | Aboveground container testing for integrity | 2.6, App B |
| §112.8(c)(7) | Monitor possible leakage from defective internal heating coils | 2.5.3 |
| §112.8(c)(8) | Container installation updates per good engineering practice (fail-safe precautions) | 2.6.2 |
| §112.8(c)(9) | Observation of effluent treatment facilities | 2.7.3 |
| §112.8(c)(10) | Correction of visible discharges | 2.4 |
| §112.8(c)(11) | For mobile or portable containers provide secondary containment | 2.4, 2.5.1 |
| §112.8(d) | Facility transfer operations, pumping, and facility process | 2.8 |
| §112.8(d)(1) | Buried pipe corrosion protection | 2.8.1 |
| §112.8(d)(2) | Capping and marking pipe out of service | 2.8.1 |
| §112.8(d)(3) | Pipe supports | 2.8.3 |
| §112.8(d)(4) | Inspect aboveground valves, pipelines, appurtenances and buried piping | 2.8 |
| §112.8(d)(5) | Vehicle warnings | 2.10 |

TARGA RESOURCES PARTNERS, LP

LITTLE MISSOURI GAS PLANT
Township 149N, Range 98W, Section 30, SE/4
McKenzie County, ND

## MANAGEMENT APPROVAL

Targa is committed to preventing discharges of oil to navigable waters of the United States or adjoining shorelines. By signature below, I approve this Plan and acknowledge that the elements identified in the Plan have been implemented. The Spill Response Coordinator at the Facility has been giving the authority to commit the necessary resources to implement this Plan. This SPCC Plan will be implemented as herein described. Details to any impracticability are discussed in Section 1.9 of this SPCC Plan.

Signature: David Low

I certify that the above information is true and accurate to the best of my knowledge.

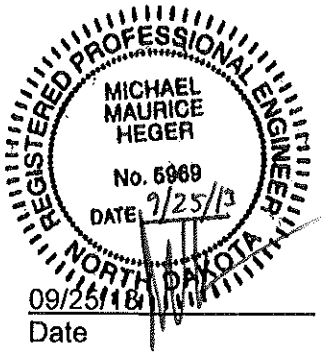
Name: David Low

Title: Area Manager

## PROFESSIONAL ENGINEER CERTIFICATION

I hereby attest: (1) that I am familiar with the requirements of 40 CFR 112; (2) that I or my agent has visited and examined the facility; (3) that this Spill Prevention Control and Countermeasures Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of 40 CFR 112; (4) that procedures for required inspections and testing have been established; and (5) the plan is adequate for the facility.

Michael Maurice Heger
Printed Name of Registered Professional Engineer




Signature of Registered Professional Engineer

| PE-5969 | North Dakota | 09/25/13 |
|---|---|---|
| Registration Number | State | Date |

## PLAN IMPLEMENTATION MEASURES NOT YET FULLY OPERATIONAL

- Any implementation measures that are required by this Plan or recommended by the Professional Engineer to bring the Facility into compliance with the SPCC requirements shall be identified on the following table.
- The Plan is conditionally approved and certified by the Professional Engineer based upon satisfactory completion and documentation of the Implementation Measures identified below.
- These measures must be satisfied by the scheduled completion date by the Responsible Party.
- Upon completion, a date and signature shall be provided and the actions items that were taken to address the implementation measures must be noted.
- Example implementation measures that may not be fully operational at the time of Plan development include but are not limited to:
  - Secondary containment structures
  - Diversionary structures
  - Security measures
  - Integrity testing program

| Implementation Measure | Responsible Party | Scheduled Due Date | Actions Taken | Completed | |
|---|---|---|---|---|---|
| | | | | Date | Signature |
| Replace current outdoor portable drum containment areas with an area adequate to contain loss of a single drum or tote plus freeboard | David Low | 30 Nov | | | |
| Provide an adequate passive secondary containment system for hot oil overflow tank T5. Total capacity ~1500 gallons | David Low | 3 months from date of plan certification | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## PLAN REVIEW AND AMENDMENTS

The Spill Response Coordinator (SRC) will review the SPCC plan at least once every five years and any amendments, if required, will be made within six months of the review. This SPCC plan will be amended within six months whenever there is a change in facility design, construction, operation, or maintenance procedure that materially affects the facility's potential for an oil spill.

**NON-TECHNICAL AMENDMENTS**

- Non-technical amendments are not certified by a Professional Engineer (PE)
- Examples include name changes, phone number changes, or similar non-technical text changes

**TECHNICAL AMENDMENTS**

- All technical amendments are certified by a PE
- Examples of technical changes include
  - Replacement, reconstruction or movement of tanks, vessels or piping systems
  - Any alteration of secondary containment
  - Changes to standard operating procedures related to discharge prevention measures
- A technical amendment is required "when there is a change that materially affects the facility's potential to discharge oil"
- Any amendment made under this section will be prepared within 6 months of the change and implemented as soon as possible but always within 6 months of the preparation of the amendment
- If a technical amendment only affects certain pages, the PE can certify those pages. These changes will be documented on the log form below

**MANAGEMENT REVIEW**

- Management will review this SPCC Plan at least each five (5) years and document the review on the form below

| Review / Amend Date | Signature (Specify Plan Reviewer or PE) | Amend Plan (Y/N) | Description of Review / Amendment | Affected Page(s) | PE Certification (Y/N) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## SPILL RESPONSE COORDINATORS

| | |
|---|---|
| **Primary SPC: David Low** | **Alternate: Steven Wells** |
| **Work Phone: 701-842-3315** | **Work Phone: 701-842-3315** |
| **Mobile Phone: 701-300-1206** | **Mobile Phone: 701-260-3954** |

## SPCC INSPECTION AND DOCUMENTATION SCHEDULE

| Description | Schedule | Documentation |
|---|---|---|
| Tank Inspections | Monthly using Targa Tank Integrity Management Plan | Checklist kept in Appendix B of SPCC plan for three years after inspection. |
| Employee Training | Annually from date of hire for oil-handling employees. | Dated attendance sheet kept in Appendix A of SPCC plan. |
| Secondary Containment Documentation | As needed. | Documentation of containment drainage kept in Appendix E of SPCC plan. |

## CERTIFICATION OF THE APPLICABILITY OF THE SUBSTANTIAL HARM CRITERIA

FACILITY NAME: Targa Resources Partners, LP – Little Missouri Gas Plant
FACILITY LOCATION: Township 149N, Range 98W, Section 30, SE/4
McKenzie County, ND

1. Does the facility transfer oil over water to or from vessels ***and*** does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?
   ☐ YES ☒ NO

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?
   ☐ YES ☒ NO

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1]) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (59 FR 14713, March 29, 1994) and the applicable Area Contingency Plan.
   ☐ YES ☒ NO

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to 40 CFR 112 Appendix C or a comparable formula [1]) such that a discharge from the facility would shut down a public drinking water intake[2]?
   ☐ YES ☒ NO

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?
   ☐ YES ☒ NO

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Signature — Senior V.P. Engineering and Operations (Title)

Steve Hopson (Name (please type or print)) — 10/23/13 (Date)

[1] If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

[2] For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

# 1.0 GENERAL INFORMATION

The Spill Prevention, Control, and Countermeasures (SPCC) Plan has been developed for the Little Missouri Gas Plant (hereinafter referred to as "Facility") in accordance with the regulatory requirements found in the Environmental Protection Agency's (EPA) 40 CFR §112, Oil Pollution Prevention; specifically sections §112.1-7 of Subpart A and §112.9 of Subpart B where applicable. SPCC regulations apply to owners or operators of non-transportation related onshore and offshore facilities engaged in drilling, producing, gathering, storing, processing, refining, transferring, distributing, or consuming oil and oil products that meet each of the following criteria:

- Due to their location, could reasonably be expected to discharge oil in quantities that may be harmful into or upon navigable waters of the United States or adjoining shorelines and;
- Has an aggregate aboveground storage capacity greater than 1,320 gallons (31bbl), excluding containers less than 55 gallons and/or has an underground storage capacity greater than 42,000 gallons.

This SPCC Plan covers only the EPA-regulated portions of the Facility.

## 1.1 Plan Availability

A copy of this SPCC Plan is maintained at the following locations and is available for on-site review upon request of the EPA Regional Administrator (a distribution list is provided in Section 1.1.1):

- Targa Corporate Office - Houston (electronic copy)
- Facility (if normally attended at least four hours per day, else at the Little Missouri Gas Plant location below)
- Targa Web-Based Portal

### 1.1.1 Plan Distribution List *§112.3(e)*

| PLAN DISTRIBUTION LIST | |
|---|---|
| **COPY NUMBER** | **PLAN HOLDER** |
| 1 | Targa Corporate Office (Electronic Copy)<br>Attn: Environmental<br>1000 Louisiana; Suite 4300<br>Houston, TX 77002 |
| 2 | Little Missouri Gas Plant<br>1939 125th Avenue NW<br>Watford City (McKenzie County), North Dakota 58854 |
| 3 | Web-Based Portal |

## 1.2 Deviations to the SPCC Rule

Any deviations to the rule will be identified in this Plan along with reasoning for the non-

conformance, a detailed description of the alternative method, and how that method will achieve equivalent environmental protection.

*Self-Certified Plans*

The Amended SPCC rule allows self-certification, provided certain conditions are met (*§112.3(g*). Deviations from the rule in areas pertaining to Facility security provisions (112.7(g)), requirements for prevention of premature departures of vehicles during loading and unloading, inspection of truck and train drains (112.7(h)(2) and 112.7(h)(3), inspection/evaluation of field-constructed aboveground containers for brittle fracture (112.7(i)), and all secondary containment requirements are not permitted in self-certified plans unless certified by a Professional Engineer that they provide equivalent environmental protection measures sufficient to prevent a discharge.

## 1.3 Plan Review and Update Process

**Five Year Review**

In accordance with §112.5(b), Targa will complete a formal review and evaluation of this SPCC Plan at least once every five (5) years and document the review on the Log of Plan Review and Amendments. This review will be conducted by the Facility's Spill Response Coordinator with assistance from the Regional Environmental Coordinator ("REC") as needed and will include review of the following:

- Accuracy of the Plan with current operations and procedures.
- Accuracy of the Plan with current SPCC Regulations.
- Applicability of new prevention and control technology that may significantly reduce the likelihood of a spill event from the Facility if such technology has been field-proven at the time of review.
- Capacity and structural integrity of secondary containment systems.
- SPCC inspection documentation and records.

**Facility Changes Requiring Plan Revision**

Whenever there is a change in the Facility design, construction, operation or maintenance which materially affects the Facility's potential for a discharge of oil into or upon the navigable waters of the United States or adjoining shorelines, the SPCC Plan will be amended. Changes that require revision to the Plan may include, but are not limited to:

- Commissioning or decommissioning of containers.
- Replacement, reconstruction, or movement of containers.
- Reconstruction, replacement, or installation of piping systems.
- Construction or demolition that might alter secondary or tertiary containment structures and/or drainage systems.
- Revision of standard operating or maintenance procedures at the Facility.

The Spill Response Coordinator is responsible for notifying the Corporate Office of such changes to the Facility. Revisions and amendments to the Plan will be performed by the Corporate Office. The Plan shall be amended within six (6) months and fully implemented as soon as possible but no later than six (6) months after the preparation of the amendments. Any

amendments to the Plan shall be documented on the Log of Plan Review and Amendments.

**Certification of Revisions**

All amendments which could materially affect the Facility's potential for a discharge into navigable waters of the United States or adjoining shores (technical amendments) must be certified by a Registered Professional Engineer ("PE") or self-certified. Plans certified by a Professional Engineer, or portions of a self-certified plan certified by a Professional Engineer, must be re-certified by a Professional Engineer if amended. Self-certified plans must be amended if the Facility undergoes a significant change and do not require Professional Engineer re-certification. Non-technical amendments such as changes to personnel, telephone references, and other non-technical text changes do not require recertification by a PE.

## 1.4 Spill Reporting to Regional Administrator

The information found in Appendix D, "Submittal of Information to Regional Administrator for Qualified Discharge(s)" must be submitted to the EPA Regional Administrator within 60 days of a discharge event(s) which meets one of the following conditions:

- The Facility has a single discharge event greater than 1,000 gallons of oil or oil products into or upon navigable waters of the United States or adjoining shorelines **or:**
- The Facility has two (2) discharge events greater than 42 gallons of oil or oil products into or upon navigable waters of the United States or adjoining shorelines in a 12 month period.

The Corporate Houston Office, with assistance from the Regional Environmental Coordinator will submit such reports to the EPA. A copy of this report will also be sent to the appropriate state agency(ies) in charge of oil pollution control activities.

## 1.5 Contact List and Phone Numbers

The contact list and phone number reference for the facility is provided in Appendix C.

## 1.6 Notification Data Sheet

A spill notification data sheet is provided in Appendix D.

## 1.7 Personnel, Training and Discharge Prevention

The facility provides the following training to oil-handling personnel prior to assignment of job responsibilities:

- Operation and maintenance of equipment to prevent oil discharges;
- Oil discharge procedure protocols;
- Applicable oil spill prevention laws, rules and regulations;
- General facility operations; and,
- The contents of the facility SPCC Plan and applicable pollution control laws, rules and regulations.

The facility conducts prevention briefings for oil-handling personnel at least once a year to assure adequate understanding of the SPCC Plan for the facility. These briefings include known previous discharges and spills, discussion of potential discharges or component failures, and precautionary measures.

Documentation of this training is maintained for a period of three (3) years with the

SPCC Plan. The training documents are also kept electronically in the Computer Based Training system or on log sheets kept in field office files.

## 1.8 Prevention, Response and Cleanup

**Prevention**

The facility discharge prevention measures, including procedures for routine handling of products (loading, unloading, facility transfers, etc.) include, but are not limited to, containment, employee training, spill response equipment, security measures, and periodic inspections.

**Countermeasures**

The Facility discharge discovery, response and cleanup capabilities include trained oil-handling employees, on-site spill control equipment and contract environmental response companies. The resources available to the facility for discharge cleanup and response are provided in the Contact List in Appendix C. In addition to available resources in the contact list, spill response equipment is staged at each facility regulated by 40 CFR 112. If a spill occurs, personnel (or contractors hired to clean up material) will promptly clean up spilled material and collect it properly. The contract resources available to the Facility for discharge cleanup are provided in Appendix C: Emergency Response Notification List.

**Disposal**

The Facility will dispose of all recovered materials in accordance with all applicable local, state and federal guidelines.

## 1.9 Impracticability

The containment and/or diversionary structures or equipment to prevent a discharge are practicable at the Facility.

## 1.10 Conformance with Other Requirements

If there are any State or local regulations that are more stringent than the Federal regulations, a description of conformance with these regulations is described below:

- **North Dakota:** Oil spill/release reporting is specified under NDAC 33-16-02.1-11. North Dakota has not established specific minimum quantities for mandatory reporting. Instead, they require all spills which may potentially impact waters of the state, either surface water or ground water, to be reported. As soon as possible, the owner, operator, or person responsible for a spill must notify the North Dakota Department of Health or the North Dakota Hazardous Materials Emergency Assistance and Spill Reporting Number and provide all relevant information about the spill.

# 2.0 FACILITY INFORMATION

## 2.1 Facility and Owner/Operator Information *§112.7(a)(3)*

| | |
|---|---|
| Facility Name: | Little Missouri Gas Plant |
| Location: | Township 149N, Range 98W, Section 30, SE/4 |
| County: | McKenzie |
| Facility Phone: | N/A |
| Latitude: | 47.6951° |
| Longitude: | -103.2619° |
| Nearest Receiving Water: | Spring Creek, adjacent to the western fence line |
| Landside Directions: | From Watford City, drive south on US-85 for approximately 5 miles and turn left onto CR 37. Continue on CR37 for 0.5 miles and turn right onto 125th Avenue. Drive 1.75 miles and site is on the right. |
| Owner/Operator: | Targa Resources, LP |
| Mailing Address: | 1000 Louisiana, Ste 4300<br>Houston, TX 77002 |
| Telephone: | 713-584-1420 |

## 2.2 Facility Description

The Facility is a gas compression facility (lube oil, methanol, condensate, produced water and waste water containing oil). The facility is roughly rectangular in shape, running 1300 feet north-to-south and 1,000 feet east-to-west. Along the east side (parallel to 125th Avenue) and extending along much of the northern/southern borders, the site has a six foot chain link fence topped by barbed wire. The remainder of the site is enclosed by a four foot tall, four strand barbed-wired fence. The main entrance at the southwest corner of the facility has a security guard posted. The site slopes to the west, toward Spring Creek.

- Located within the Facility fenced compound are two 400-barrel aboveground storage tanks (ASTs) storing produced water, twelve 60,000-gal natural gas liquids (NGL) pressurized bullet tanks, three pressurized propane bullet tanks, three lube oil ASTs, one glycol AST, three heat transfer oil ASTs (including overflow tank), one engine coolant tank, two methanol tanks, ten engines, six rotary screw compression units, multiple 55-gal drums containing oil in three portable storage areas, and related gas processing equipment. Note, only containers storing oil products are SPCC-regulated.
- The Facility is manned during normal business hours, and is accessible 24-hours via access codes. Offloading from trucks does not occur at the Facility. Bulk storage containers, as defined within §112.2, exist at the Facility.
- This Plan covers only the subject Facility.

## 2.3 Facility Layout and Diagram

The facility is shown in the attached facility diagrams (Figures 1 and 2). The information shown on the drawing includes:

- Process equipment, operating equipment and electrical equipment that contain oil
- Loading/unloading racks, if applicable. By rule definition, a rack is a fixed structure (such as platform, gangway) necessary for loading or unloading a tank truck or tank car, which is located at a facility subject to 40 CFR Part 112. A loading/unloading rack includes a loading or unloading arm and may include any combination of the following: piping

assemblages, valves, pumps, shut-off devices, overfill sensors, or personnel safety devices.

- Loading/unloading areas subject to general secondary containment requirements (40 CFR Part 112.7 (c))
- Fixed aboveground storage tanks
- Transfer stations and connecting lines
- Completely buried and bunkered tanks
- Drum and portable container storage areas
- Contents of all SPCC regulated containers

## 2.4 Storage Container and Potential Spills

| Tank ID | Content | Major Potential Source of Spill | Total Capacity (Gal) | Dis-charge Rate (GPM) | Flow Direction | Secondary Containment Volume (Gallons)/ Dimensions | Secondary Containment Construction | Inv. Control ID |
|---|---|---|---|---|---|---|---|---|
| **ABOVEGROUND FIXED CONTAINERS (SPCC REGULATED)** | | | | | | | | |
| T-2 | Lube oil | Complete tank failure | 700 | 700 | West | 900 gal 8' x 5' x 3'' (no displacement) | Steel wall | 4 |
| T-3 | Lube oil | Complete tank failure | 1,000 | 1,000 | West | 1350 gal 10' x 6' x 3' (no displacement) | Steel wall | 4 |
| T-5 | Heat transfer oil | Complete tank failure | 1,200 | 1,200 | West | None (For emergency overflow only) | NA | 4 |
| T-6 | Dehy. Vent Conden-sate | Complete tank failure | 1,200 | 1,200 | West | 2000 gal 29.33' x 11' x 0.83' (no displacement) | Concrete basin | 4 |
| TK-950 | Produced water | Complete tank failure | 16,800 | 16,800 | West | 28,753 gal 59.58' x 35.5' x 1.92' (after displacement) | HDPE lined steel wall | 2 |
| TK-951 | Produced water | Complete tank failure | 16,800 | 16,800 | West | 28,753 gal 59.58' x 35.5' x 1.92' (after displacement) | HDPE lined steel wall | 2 |
| V-950 | Heat transfer oil | Complete tank failure | 1,000 | 1,000 | West | 2692 gal 20' x 6' x 3' (no displacement) | Steel wall | 4 |
| U | Used lube oil | Complete tank failure | 300 | 300 | West | 750 gal 8' diam. x 2' high (no displacement) | Steel walled stock tank | 4 |

| Tank ID | Content | Major Potential Source of Spill | Total Capacity (Gal) | Dis-charge Rate (GPM) | Flow Direction | Secondary Containment Volume (Gallons)/ Dimensions | Secondary Containment Construction | Inv. Control ID |
|---|---|---|---|---|---|---|---|---|
| **ABOVEGROUND FIXED CONTAINERS (NON-SPCC REGULATED)** | | | | | | | | |
| *T-1* | *Engine coolant* | *Complete tank failure* | *500* | *500* | *West* | *900 gal 8' x 5' x 3'' (no displacement)* | *Steel wall* | *4* |
| *TK-970* | *TEG* | *Complete tank failure* | *500* | *500* | *West* | *1810 gal 29.33' x 11' x 0.75' (no displacement)* | *Concrete basin* | *4* |
| *V-900 -V-911* | *NGL* | *Complete tank failure* | *60,000* | *60,000* | *West* | *NA* | *None* | *4* |
| *V-960A, 960B, 960C* | *Propane* | *Complete tank failure* | *1,000* | *1,000* | *West* | *NA* | *None* | *4* |
| *V-970* | *Methanol* | *Complete tank failure* | *1,000* | *1,000* | *West* | *1810 gal 29.33' x 11' x 0.75' (no displacement)* | *Concrete basin* | *4* |
| *M* | *Methanol* | *Complete tank failure* | *500* | *500* | *West* | *1213 gal 6' x 9.83' x 2.75' (no displacement)* | *Steel wall* | *4* |
| **MOBILE AND PORTABLE CONTAINER AREAS *(Less Than 1,000-Gallon Capacity)*** | | | | | | | | |
| 1 | Oil | Complete drum failure | 55 | 55 | West | 60 gal 4' x 4' x 0.5'' (no displacement) | Plastic tray | 4 |
| 2 | Oil | Complete drum failure | 55 | 55 | West | 60 gal 4' x 4' x 0.5'' (no displacement) | Plastic tray | 4 |
| 3 | Oil | Complete drum failure | 55 | 55 | West | 60 gal 4' x 4' x 0.5'' (no displacement) | Plastic tray | 4 |
| **BUNKERED AND COMPLETELY BURIED TANKS** | | | | | | | | |
| NA | | | | | | | | |
| **OTHER SOURCES OF SPILLS** | | | | | | | | |
| NA | | | | | | | | |
| **PROCESS FLOW-THROUGH AND OIL-FILLED EQUIPMENT** | | | | | | | | |
| H-410 | Heat trans-fer oil | Complete tank failure | 1,000 | 1,000 | West | 2693 gal 20' x 6' x 3' (no displacement) | Steel wall | 4 |
| Trans-former 1 | Oil | Rupture | ~500 | 500 | West | Active Spill Response | Active Spill Response | 4 |

| Tank ID | Content | Major Potential Source of Spill | Total Capacity (Gal) | Dis-charge Rate (GPM) | Flow Direction | Secondary Containment Volume (Gallons)/ Dimensions | Secondary Containment Construction | Inv. Control ID |
|---|---|---|---|---|---|---|---|---|
| Trans-former 2 | Oil | Rupture | ~500 | 500 | West | Active Spill Response | Active Spill Response | 4 |
| Engine #1 | Lube Oil | Rupture | <55 | <55 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #2 | Lube Oil | Rupture | <55 | <55 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #3 | Lube Oil | Rupture | 140 | 140 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #4 | Lube Oil | Rupture | 140 | 140 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #5 | Lube Oil | Rupture | 72 | 72 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #6 | Lube Oil | Rupture | 72 | 72 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #7 | Lube Oil | Rupture | 66 | 66 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #8 | Lube Oil | Rupture | 66 | 66 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #9 | Lube Oil | Rupture | <55 | <55 | West | >500 gal | Skid/Bldg confines | 4 |
| Engine #10 | Lube Oil | Rupture | 140 | 140 | West | >500 gal | Skid/Bldg confines | 4 |
| 6 x Rotary Screw Compress. | Lube Oil | Rupture | 50-150 | 50-150 | West | >500 gal | Skid/Bldg confines | 4 |

Oil-filled operational equipment is equipment that includes an oil storage container (or multiple containers and associated piping intrinsic to the operation of the equipment) in which the oil is present solely to support the function of the apparatus or the device. It is not considered a bulk storage container, and does not include oil-filled manufacturing equipment (flow-through process).
Examples of oil-filled equipment at this facility include:

- Engines (note, only engines with lube oil capacity >55 gallons are SPCC regulated)
- Oil Heaters
- Electrical Transformers.

| TRUCK LOADING/UNLOADING RACK | |
|---|---|
| NA | **No Loading/Unloading Racks; See Section 2.9** |

**NOTES:**

1.) The material and construction of bulk storage containers are compatible with the material stored and conditions of storage such as pressure and temperature.
2.) All bulk storage container installations are constructed so that secondary containment is provided for the entire capacity of the largest container and sufficient freeboard to contain precipitation.
3.) Diked areas are sufficiently impervious to contain discharged oil.
4.) Visible discharges, which result in a loss of product from containers, will be promptly corrected and any accumulations of oil in the diked areas will be promptly removed.
5.) Inventory Control ID – See Section 2.5.4

## 2.5 Bulk Storage Containers

The following controls apply to bulk aboveground storage containers at the facility:

- Secondary containment structures for bulk storage containers are identified in the Regulated Bulk Oil Storage Container and Potential Spills table in Section 2.4.
- All bulk storage container installations are constructed so that a means of secondary containment is provided for the entire capacity of the largest single container plus sufficient freeboard to contain precipitation.
- The Facility uses the National Oceanic and Atmospheric Administration's 24-hour, 25-year storm event to determine the amount of additional freeboard capacity required.
- Where bulk containers are manifolded together such that the loss of one (1) results in the loss of all, the combined storage capacity of the manifolded containers will be used to determine secondary containment and freeboard capacity.
- Secondary containment diked areas are sufficiently impervious to contain discharged oil from reaching navigable waters or adjoining shorelines before cleanup begins.
- Details concerning the construction of fixed secondary containment systems are provided in the Regulated Bulk Oil Storage Container and Potential Spills table in Section 2.4.
- Visible discharges, which result in any accumulations of oil in the diked area(s) are promptly removed and disposed of according to the waste disposal procedures described in Section 1.8.
- Secondary containment volume calculations, where secondary containment is present for SPCC regulated products, are provided in Regulated Bulk Oil Storage Container and Potential Spills table in Section 2.4, with details in Figure 3.
- Drainage from secondary containment areas, where secondary containment is present, is discussed in Section 2.7.

### 2.5.1 Mobile or Portable Storage Containers

When mobile or portable storage containers are present they are will be stored in one of several portable storage areas. Mobile containers will normally be 55 gallon drums, but may include leased tanks (e.g. <1000 gallons) and totes. In addition to controls listed in Section 2.5, the following apply to mobile or portable containers:

- These containers are generally located in dedicated storage areas or areas with existing secondary containment which are positioned or located so as to prevent a spill from reaching navigable waters or adjoining shorelines.
- These containers are located where they will not be subject to periodic flooding or washout.
- Dedicated mobile or portable storage container areas if present would be identified on the Facility Diagram (Figure 2).
- Containers that may be temporarily located outside the dedicated storage area are positioned or located so as to prevent a spill from reaching navigable waters or adjoining shorelines until they can be returned to the dedicated storage area.

### 2.5.2 Buried or Bunkered Storage Tanks

The facility does not have completely buried metallic storage tanks that were installed on or after January 10, 1974.

### 2.5.3 Bulk Containers with Internal Heating Coils

The facility does not have bulk storage tanks with internal heating coils.

### 2.5.4 Bulk Container Inventory Control

Container installations shall be engineered with at least one of the following devices. Check all that apply to the facility. Inventory control identification should be noted (1, 2, 3, 4, or 5) in the Regulated Bulk Oil Storage Container and Potential Spills table in Section 2.4.

☐ 1. High Liquid Level alarms with signals or audible alarms or loading operations at small tanks that are attended and constantly monitored during the loading operations.

☒ 2. High liquid level pump cutoff device set to stop flow at predetermined container content level.

☐ 3. Direct audible or code signal communication between the container gauges and the pumping station.

☒ 4. Fast response system for determining the liquid level shall be used for each bulk storage container (direct vision gauge). A person must be present to monitor gauges and the tank. Fluid levels in drums used for oil storage and not equipped with direct visual gauges shall be visually gauged prior to transfer of oil.

☐ 5. Not Applicable

## 2.6 Inspections, Tests and Records

### 2.6.1 Bulk Storage Container Inspection

For the bulk storage containers, at the Facility, the following integrity management program is in effect:

- The outside of all bulk storage containers and their associated supports and foundations are inspected routinely during normal Facility walk-through for signs of deterioration, discharges, or accumulation of oil inside secondary containment areas.
- These routine Facility walk-through inspections will not be documented unless a corrective action must be taken.
- Documented visual external inspections for all bulk storage containers and their associated supports and foundations is conducted monthly and noted on the Storage Container Visual Inspection Log (Appendix B). *The Facility may use logs or forms that are kept under usual and customary business practices, in lieu of the above reference form.*
- Liquid level sensing devices (overfill prevention) are tested to ensure proper operation.
- Inspections for oil discharges within diked areas occur during the regular rounds of the operator. Any oil in the dike will be cleaned up in a timely manner.

- In the event that a field-constructed aboveground container undergoes a repair, alteration, reconstruction, or a change in service, the container will be evaluated for the risk of discharge or failure due to brittle fracture or other catastrophe.
- Inspection forms are maintained at the Facility or the Regional or Local Field Office. A summary of the inspection requirements applicable to the Facility is provided in the Targa Integrity Management Plan. Any future versions of the Targa Integrity Management Plan will govern the inspection requirements at this facility provided revisions to the plan meet the minimum requirements set forth in the current version.

### 2.6.2 Bulk Storage Container Integrity Testing

- The integrity testing program for bulk storage containers includes a combination of visual inspections and at least one (1) of the following alternate testing techniques: hydrostatic, radiographic, ultrasonic, and/or acoustic emissions for containers subject to quantitative integrity testing requirements presented in the Targa Integrity Management Plan. Any future versions of the Targa Integrity Management Plan will govern the integrity testing requirements at this facility provided revisions to the plan meet the minimum requirements set forth in the current version. Integrity testing for transformers and similar oil-filled operational equipment is limited to monthly visual inspections.
- Field-erected aboveground bulk storage containers will be integrity tested on a regular schedule and when material repairs are made in accordance with API 653.
- Small shop-built containers will follow testing standards set forth in the Targa Integrity Management Plan. *Note: Inspection schedule will be based on the risk-based integrity management program evaluation of each bulk container.*
- The Facility chooses to deviate from the integrity testing requirements of elevated shop-built containers up to 30,000 gallons and single-use containers such as drums, totes, and other small portable containers. These containers are elevated such that all sides of the container are visible during inspections and any problems that may occur will be quickly identified. These routine monthly inspections, as further described in the subsection above, will provide equivalent environmental protection for integrity testing of such containers. It is understood that adoption of such a policy will require Plan amendment and PE certification of the Plan.
- Comparative records will be kept at the Regional or Local Field Office.

### 2.6.3 In-Service Piping and Transfer Equipment

- All buried piping is integrity tested at the time of installation, modification, construction, relocation or replacement. Documentation of this integrity testing is required.
- All aboveground valves and piping (including flange joints, valve glands and bodies, catch pans, pipe supports, locking of valves and metal surfaces) are examined by facility operators during their regular rounds.

## 2.7 Facility Drainage

### 2.7.1 Facility Diked Drainage

- Drainage of stormwater from the Facility's diked storage areas, where present, is restrained by manually operated, open-and-closed designed valves, pumps or ejectors.
- Bypass valves, where present, are normally kept closed and are resealed by Facility personnel following drainage.

- The contents of the diked storage areas, where present, are inspected by Facility personnel prior to each draining event to ensure that only oil-free water (no product sheen) is discharged.
- Secondary containment contents are not generally released to the environment. If oil or oil sheen is observed in a diked storage area, vacuum trucks or other appropriate means will be used to remove any and all oil before drainage.
- Each drainage event and associated inspection is recorded on the Secondary Containment Drainage Event Log found in Appendix E. *The Facility may use logs or forms that are kept under usual and customary business practices, in lieu of the above referenced log.*

### 2.7.2 Facility Undiked Area Drainage

- With the exception of transformers/oil-filled equipment/uncontained transfer areas, the Facility does not have the potential to discharge oil into undiked areas given the secondary containment provisions noted in Section 2.4. Drainage improvements at the facility convey stormwater run-off from the active areas as sheet flow southwest of the facility.
- Catchment basins, where present, are not located in areas subject to periodic flooding.

### 2.7.3 Effluent Treatment Facilities

- The Facility does not treat drainage water prior to discharge. All wastewater is trucked offsite for treatment.

## 2.8 Transfer Operations, Pumping, and In-Plant Processes

### 2.8.1 Buried Piping

- The Facility has buried piping installed or replaced after August 16, 2002. The Facility employs the following:
  - New or replaced buried piping is cathodically protected against corrosion and provided with protected wrapping and coating.
  - If a section of buried line is exposed, it is inspected for signs of deterioration and corrective actions are taken as indicated by the magnitude of the damage.
  - Integrity and leak testing of buried piping is performed at the time of installation, modification, construction, relocation, and/or replacement.
  - *Note: Aboveground piping, which passes through dikes and roadways, is not considered to be buried piping.*

### 2.8.2 Out-of-Service Piping

- Connections are capped or blank-flanged at the transfer point and marked as to origin when the piping is not in service or in standby service for extended periods (i.e. greater than six (6) months).

### 2.8.3 Aboveground Valves and Piping

- The Facility has aboveground piping installed or replaced after August 16, 2002. The Facility employs the following:

  - All pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction.
  - Aboveground valves and piping and appurtenances are regularly examined during normal Facility walk-through for general condition and necessity for corrective action.
  - The following items are included in the examination:
    - Flange joints,
    - Expansion joints,
    - Valve glands and bodies,
    - Piping supports,
    - Metal surfaces,
    - Catch pans, and
    - Valve locks and/or seals.

- These weekly Facility walk-through inspections are not documented unless a corrective action must be taken.
- Integrity testing for on-site, in-service piping will follow applicable Targa standards.
- Documented visual inspections of all regulated aboveground valves and piping and appurtenances is conducted annually and noted on the Storage Container Visual Inspection Log (Appendix B). *The Facility may use logs or forms that are kept under usual and customary business practices, in lieu of the above reference form.*

## 2.9 Tank Truck and Tank Car Loading Racks

- Tank truck loading/unloading rack(s) are not present at the Facility.
- Rail car loading/unloading rack(s) are not present at the Facility
- Truck loading/unloading areas are present at this Facility. The loading of natural gas liquids, lube oil into bulk storage tanks, or unloading of condensate and produced water at the Facility is not considered a loading rack. If a loading arm or other appurtenances are not present at this location, then by definition per 40 CFR 112.7(h) a loading rack does not exist. However, depending on the location, size, and likelihood of contamination of a navigable waterway due to a spill while loading or unloading trucks/railcars at this Facility, containment may be present at the loading/unloading areas even if not required by the regulation. Loading/unloading areas, not defined as a loading/unloading rack, are required to meet the general secondary containment requirements of §112.7(c). Loading and unloading areas are identified on Figure 2. Secondary containment is not required at the loading/unloading areas; however, in accordance with 40 CFR 112.7(c)(vii) spill control equipment including spill pans, sorbent materials, and/or spill control boom also provide spill control for the loading/unloading areas.
- In order to prevent premature vehicular departure, the facility has warning signs in the loading areas and at loading racks, if present. The facility also requires that truck drivers chock their wheels prior to loading.
- Drain and outlets on tank trucks and tank cars are checked for leakage before loading/unloading or departure and, if necessary, are tightened, adjusted or replaced.

## 2.10 Vehicle Warnings

- Warning signs, where appropriate, are posted at appropriate locations throughout the Facility to prevent vehicles from damaging aboveground piping and appurtenances.

- Bumper guards, where appropriate, are provided in critical vehicular access areas to protect aboveground piping and/or other oil transfer operations.

### 2.11 Facility Security - *§112.7(g)*

**Fencing**

- Along the east edge of the property line of the facility and extending westward on the north and southern sides is a 6-ft tall chain link fence topped by barbed wire. A 4-ft tall, 4-strand barbed wire fence encircles the remainder of the Facility.
- The entrance gates are locked when the Facility is unattended.

**Lighting**

- Facility lighting is commensurate with the operations and the type and location of the Facility to assist in the discovery of discharges and to prevent discharges occurring through acts of vandalism.
- Area lights illuminate active areas of the Facility.

**Valves**

- All drain valves from containment areas, when present, are locked in the closed position, or are secured/inaccessible to unauthorized personnel, to prevent unauthorized opening.
- Valves which permit direct outward flow of a container's contents are locked, or are secured/inaccessible to unauthorized personnel, so that they remain closed when in non-operating or standby status.
- Keys for all locks are maintained in the Facility office.

**Starter Controls**

- Starter controls, if present, on all oil pumps in non-operating or standby status are locked in the off position and located at a site accessible only to authorized personnel.

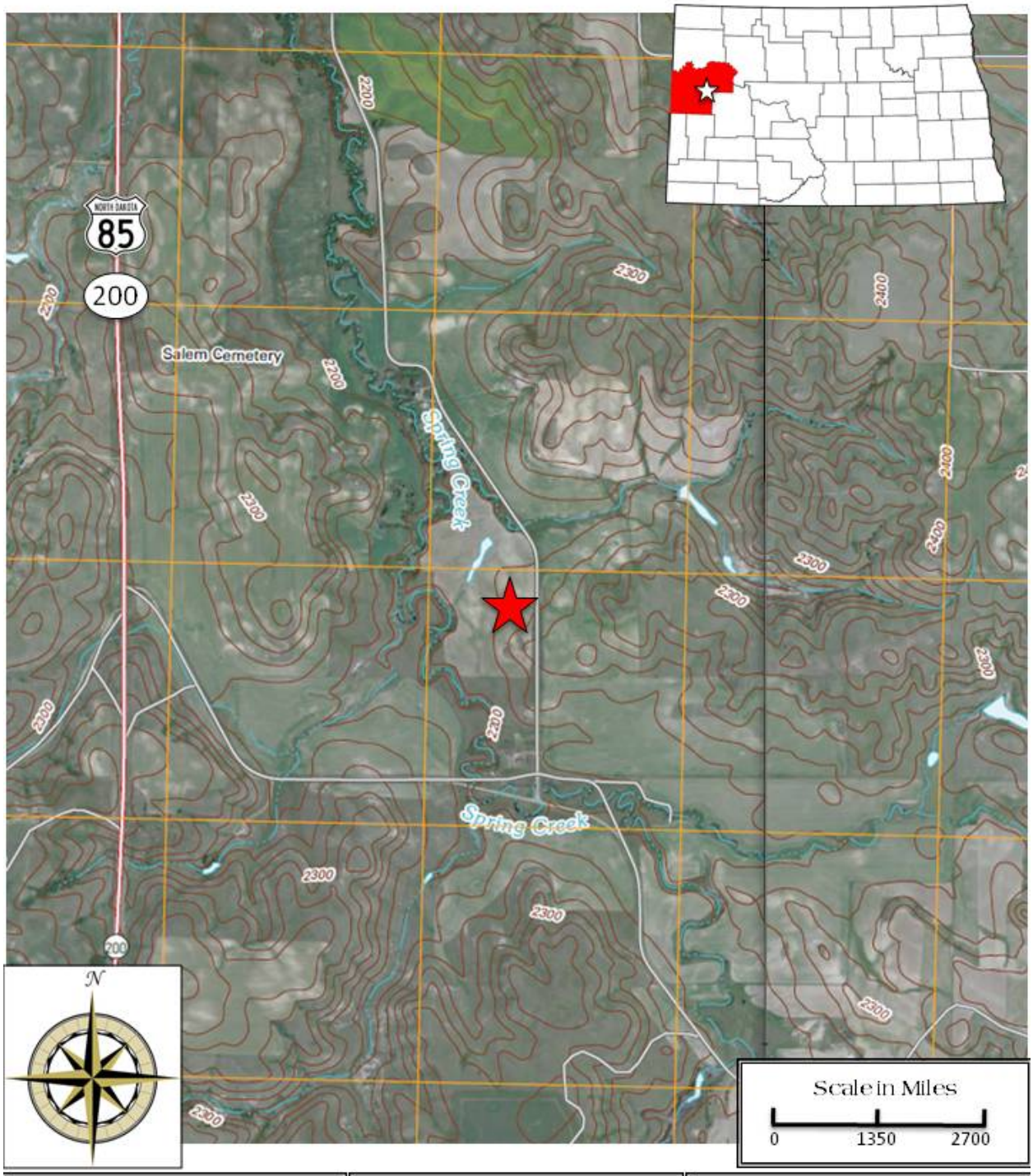
**Out-of-Service Piping**

- The Facility securely caps or blank flanges the loading/unloading connections of Facility piping when not in service or when in standby service for an extended period of time (i.e. greater than six (6) months), or when piping is emptied of liquid content either by draining or by inert gas pressure.

# FIGURES

**Figure 1 – Site Location Map**

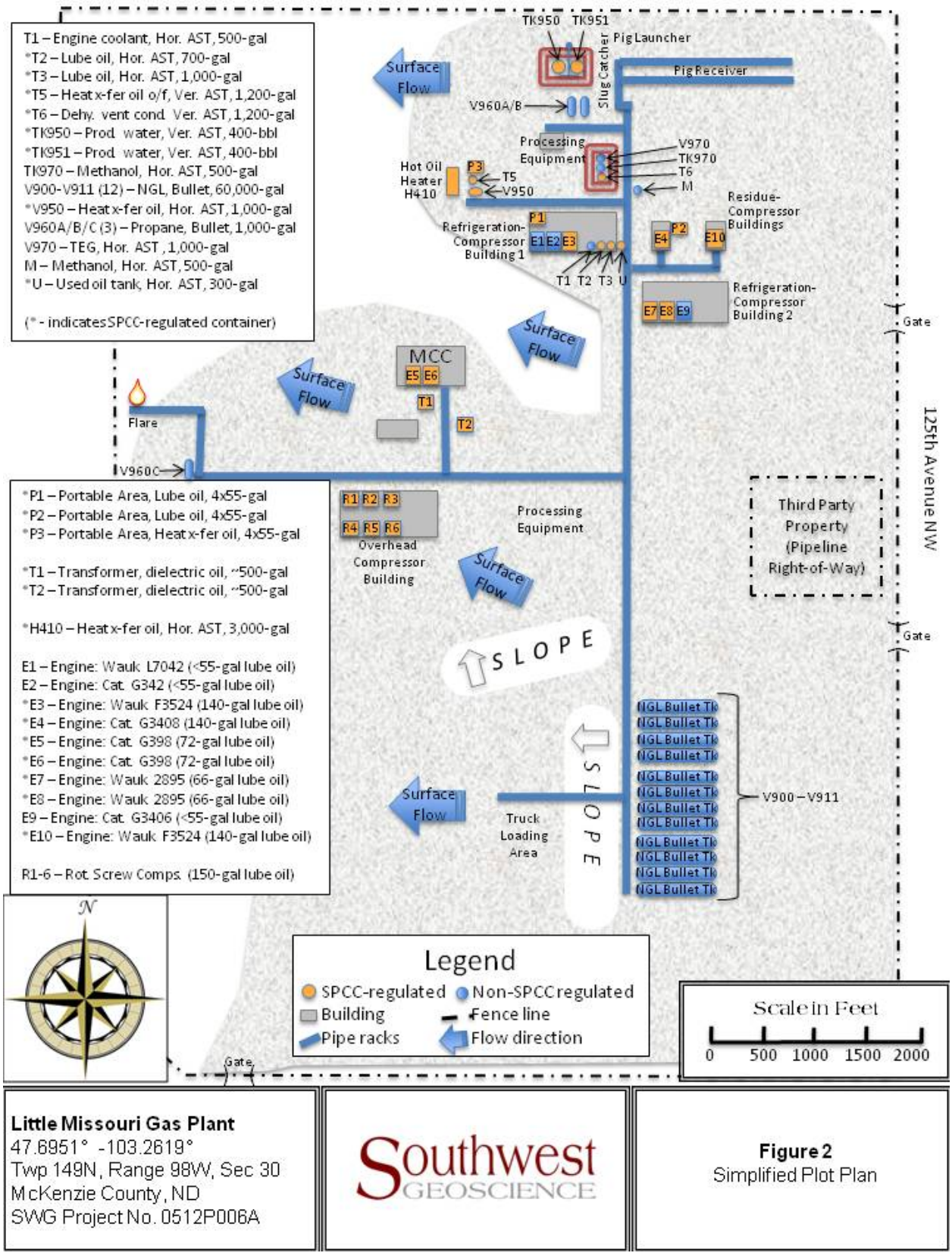
**Figure 2 – Simplified Site Plan**




**Little Missouri Gas Plant**
47.6951° -103.2619°
Twp 149N, Range 98W, Sec 30
McKenzie County, ND
SWG Project No. 0512P006A

Southwest GEOSCIENCE

**Figure 1**
USGS 7.5-Minute Series
ND Tepee Buttes & Lone Butte
Contour Interval – 10 Feet
2011




**Little Missouri Gas Plant**
47.6951° -103.2619°
Twp 149N, Range 98W, Sec 30
McKenzie County, ND
SWG Project No. 0512P006A

Southwest GEOSCIENCE

**Figure 2**
Simplified Plot Plan

# Facility: Little Missouri Gas Plant

## T-2 Containment Area

### Containment Volume

If containment is odd shaped it's area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 8.00 | 5.00 | 3.00 | 120.00 | **897.6** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| T-2 | 4.50 | 6.00 | 95.38 | **713.4** |

### Sufficient Freeboard

**Freeboard not required. Tank located indoors.**

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 8.0 | 5.0 | 0.000 | 0.0 | **0.0** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 897.6 | 0.0 | **897.6** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 713.4 | 0.0 | **713.4** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **2.384** |

# Facility: Little Missouri Gas Plant

## T-3 Containment Area

### Containment Volume

If containment is odd shaped it's area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 12.00 | 6.00 | 3.00 | 216.00 | **1,615.7** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| T-3 | 4.00 | 10.75 | 135.02 | **1,009.9** |

### Sufficient Freeboard

**Freeboard not required. Tank located indoors.**

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| | | | | |
| 12.0 | 6.0 | 0.000 | 0.0 | **0.0** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 3.0 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 1,615.7 | 0.0 | **1,615.7** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 1,009.9 | 0.0 | **1,009.9** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **1.875** |

# Facility: Little Missouri Gas Plant

## T-6 / TK-970 / V-970 Containment Area

### Containment Volume

If containment is odd shaped its area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 29.33 | 11.00 | 0.83 | 267.78 | **2,003.0** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| T-6 | 5.85 | 6.00 | 161.19 | **1,205.7** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 29.3 | 11.0 | 0.292 | 94.1 | **703.9** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 1.0 | 4.00 | 0.8 | 10.4 | 78.0 |
| 1.0 | 4.0 | 0.8 | 10.4 | 78.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| | | | Total: | 156.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 2,003.0 | 156.0 | **1,847.1** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 1,205.7 | 703.9 | **1,909.6** |

### Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **No** |

### Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **0.858** |

# Facility: Little Missouri Gas Plant

## TK-950 / TK-951 Containment Area

### Containment Volume

If containment is odd shaped it's area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 59.58 | 35.50 | 1.92 | 4060.97 | **30,376.1** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| TK-950 | 12.00 | 20.00 | 2,260.80 | **16,910.8** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 59.6 | | 0.292 | 813.2 | **6,082.5** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 1.0 | 12.0 | 1.9 | 217.0 | 1,623.5 |
| 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| | | | Total: | 1,623.5 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 30,376.1 | 1,623.5 | **28,752.5** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 16,910.8 | 6,082.5 | **22,993.3** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **1.535** |

# Facility: Little Missouri Gas Plant

## V-950 Containment Area

### Containment Volume

If containment is odd shaped its area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 20.00 | 6.00 | 3.00 | 360.00 | **2,692.8** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| V-950 | 3.50 | 14.00 | 134.63 | **1,007.0** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 20.0 | 6.0 | 0.292 | 35.0 | **261.8** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.00 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 2,692.8 | 0.0 | **2,692.8** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 1,007.0 | 261.8 | **1,268.8** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **1.413** |

# Facility: Little Missouri Gas Plant

## Used Oil Containment Area

### Containment Volume

If containment is odd shaped its area will be calculated using AutoCAD.

Area ($ft^2$) or

| Diameter (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|
| 8.00 | 2.00 | 100.53 | **752.0** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| U | 3.00 | 6.00 | 42.39 | **317.1** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Diameter (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|
| 8.0 | 0.292 | 14.66 | **109.7** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.00 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 752.0 | 0.0 | **752.0** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 317.1 | 109.7 | **426.7** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **1.135** |

# Facility: Little Missouri Gas Plant

## Portable Storage Area Containment

### Containment Volume

If containment is odd shaped its area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 4.00 | 4.00 | 0.50 | 8.00 | **59.8** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| Drum | 1.88 | 2.75 | 7.59 | **56.8** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 4.0 | 4.0 | 0.292 | 4.7 | **34.9** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.00 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 59.8 | 0.0 | **59.8** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 56.8 | 34.9 | **91.7** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **No** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **0.766** |

# Facility: Little Missouri Gas Plant

## H-410 Containment Area

### Containment Volume

If containment is odd shaped it's area will be calculated using AutoCAD.

Area ($ft^2$) or

| Length (ft) | Width (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 20.0 | 6.0 | 3.0 | 219.38 | **2693** |

### Largest Tank Volume

Area x Height = Volume

| Tank ID | Diameter (ft) | Height/ Length (ft) | Tank Volume ($ft^3$) | Tank Volume (gallons) |
|---|---|---|---|---|
| H-410 | | | | **1,000** |

### Sufficient Freeboard

Sufficient Freeboard is determined to be 3.5 inches for a 25 year, 24 hour rainfall event.

| Width (ft) | Length (ft) | Height (ft) | Volume ($ft^3$) | Volume (gallons) |
|---|---|---|---|---|
| 120sf | | 0.292 | 35 | **261** |

### Displacement

Displacement is the volume occupied by other tanks in the containment area.

| Number of Tanks | Tank Diameter (ft) | Height/ Length (ft) | Volume Displaced ($ft^3$) | Volume displaced (gallons) |
|---|---|---|---|---|
| 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| | | | Total: | 0.0 |

### Effective Containment Volume

Containment Volume - Displacement Volume = Effective Containment Volume

| Containment Volume (gallons) | Displacement (gallons) | Effective Volume (gallons) |
|---|---|---|
| 2693 | 0.0 | **2,693** |

### Containment Volume Needed

Largest Tank Volume + Sufficient Freeboard = Containment Volume Needed

| Largest Tank Volume (gallons) | Sufficient Freeboard (gallons) | Containment Volume Needed (gallons) |
|---|---|---|
| 1,000 | 261 | **1,261** |

## Containment Adequacy

| | |
|---|---|
| Is the Effective Containment Volume Greater than the Containment Volume Needed? | **Yes** |

## Containment Height Needed

| | |
|---|---|
| The **needed** containment height in feet using the 25 year, 24 rainfall event | **1.406** |

# APPENDIX A

## SPCC Personnel Training Program and Documentation

**EMPLOYEE TRAINING**

**PROGRAM OUTLINE**

*Little Missouri Gas Plant*

Listed below is the outline used to administer the SPCC training required under Title 40 of the CFR Part 112. The on-site spill prevention coordinator or competent designee will present each of the topics listed below at a scheduled training session to personnel working at the Little Missouri Gas Plant. The on-site spill prevention coordinator or designee shall receive annual spill prevention refresher training from the Targa Corporate Environmental Manager.

***Pollution Control Laws, Rules and Regulations***

The SPCC regulation was promulgated on December 11, 1973 under the authority of Section 311 of the Clean Water Act.

Section 311 of the Clean Water Act authorizes the President to issue regulations establishing procedures, methods and equipment to prevent discharges of oil from vessels and on-shore facilities.

40 CFR 112 requires facilities with aboveground petroleum storage capacity greater than 1,320 gallons (considering only containers with capacities of 55 gallons or greater), establish procedures, methods and equipment to prevent and control spills of petroleum product from the storage facilities.

The SPCC Plan prepared for the Little Missouri Gas Plant is intended to address the requirements of 40 CFR 112. The main elements of the SPCC rules that are covered by the Plan include: a description of the tanks used to store petroleum product, the spill control features associated with the tanks and associated transfer facilities, potential spills that may happen at the facility, the facility spill history, a description of the spill response procedures, security features of the facility and the tanks, an inspection program for the tanks, and a personnel training program.

***Operation and Maintenance of Equipment***

The following features regarding the tanks and spill control equipment will be described by the Site Manager:

- Operation of any tank liquid level measure devices;
- Operation of the transfer devices (pumps, hosing, piping) associated with the tanks;
- Operation of locks on the tank fill ports or pumps;
- Location, use and disposal of sorbents used to contain small spills;
- Response actions and reporting requirements for large volume spills; and
- Inspection of the tanks and related record keeping requirements.

***Spill Prevention Briefing***

The following spill prevention training will be discussed by the Site Manager:

- Potential spills at the facility and precautionary measures that can be taken to avoid the spills; and
- Any malfunctioning components associated with the tanks and what repairs have been or are scheduled to be made.

# EMPLOYEE TRAINING LOG

Little Missouri Gas Plant

Course Description: Spill Prevention Control and Countermeasure Plan

Instructor: _____

| DATE | NAME | TIME | SIGNATURE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# APPENDIX B

# INSPECTIONS, TESTING AND RECORDS

## SPCC INSPECTION FORM
## MONTHLY
## <FACILITY>

| ☑ If Yes and Insert Work Order Number. | SPCC REGULATED TANKS AND EQUIPMENT INSPECTION | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bulk Storage Containers, Supports, and Foundations[1,2] | Secondary Containments[1,2] | Above Ground Piping – Supports, Valves (glands/bodies), & Flanges[1] | Oil Transfer Equipment[1] | Liquid Level Sensing Devices (Overfill Protection)[1] | Buried Piping[1] | Emergency Generator and Fire Pump Diesel Tanks | Transformers/Oil Filled Equipment |
| Leakage is detected at seam connections, corrosion or gaskets. | | | | | | | | |
| Leakage is detected at ancillary equipment, gauges and instrumentation. | | | | | | | | |
| Leakage is detected from pumps, piping and fittings. | | | | | | | | |
| Leakage is accumulating in area drains or ditches. | | | | | | | | |
| Leakage is accumulating in diked area, if applicable. | | | | | | | | |
| Corrosion present, coating damaged, or other visible signs of deterioration. | | | | | | | | |
| ALL OK | | | | | | | | |

Notes:
1.) Inspection only applies to the SPCC regulated components of the facility (See Section 2.4 of SPCC Plan).
2.) If deficiencies are noted during visual inspection of tanks or secondary containment, provide additional details below.
3.) NA – Insert for inspections items not applicable to the inspection item or facility in general

Check ☑ appropriate boxes as indicated. If leakage is noted, please write in the work order number in the appropriate box.

COMMENTS:

Inspector _____ Date _____

Supervisor _____ Date _____

# APPENDIX C

# TARGA EMERGENCY RESPONSE NOTIFICATION LIST

**EMERGENCY RESPONSE NOTIFICATION LIST**

| Contact | Primary | Alternate |
|---|---|---|
| ***Designated Persons Accountable For Oil Spill Prevention and/or Facility Response Coordinator*** | | |
| David Low, Area Manager (Spill Prevention Coordinator) | 701-842-3315 | 701-300-1206 |
| Steven Wells, Gas Plant Supervisor (Alternate SPC) | (701) 842-3315 | (701) 260-3954 |
| Galen Steffan, Field Operations (Alternate SPC) | (701) 842-3315 | (701) 871-1540 |
| ***Federal, State and Local Agencies (as necessary):*** | | |
| National Response Center | (800) 424-8802 | (202) 267-2675 |
| U.S. EPA Region (Region 8) | (800) 227-8917 | (303) 312-6312 |
| OSHA | (800) 321-6742 | |
| State Emergency Response Commission (SERC)<br>(North Dakota Department of Emergency Services) | (701) 328-8100 | |
| North Dakota Department of Health Water Quality Division<br>See also: https://www.dmr.nd.gov/oilgas/spills/reportspill.asp | (701) 328-5210 | (701) 328-5166 |
| North Dakota Hazardous Materials Emergency Assistance and Spill Reporting | (800) 472-2121 | |
| North Dakota Industrial Commission Oil and Gas Division | (701) 328-8020 | |
| Local Emergency Planning Committee (LEPC)<br>- Dunn County<br>- McKenzie County<br>- Fort Berthold Reservation | As appropriate:<br>(701) 573-4612<br>(701) 444-6853<br>(701) 627-4805 | |
| Watford City Volunteer Fire Department | 911 | (701) 444-2934 |
| Watford City Police Department | 911 | (701) 444-2400 |
| McKenzie County Sheriff | (701) 444-3654 | |
| Dunn County Sheriff | (701) 573-4449 | |
| McKenzie County Hospital, 516 North Main, Watford City | (701) 842-3000 | |
| Mercy Medical Center, Williston | (701) 774-7400 | |
| ***Additional Company Contacts:*** | | |
| Targa Resources, LLC., Pipeline Emergency No. (Badlands) | (866) 957-3133 | |
| Zachary Stornant, Environmental Specialist | (713) 584-1186 | (832) 339-3277 |
| David McQuade, Environmental Manager | (713) 584-1420 | (281) 630-6974 |
| ***Cleanup Contractors (as necessary):*** | | |
| Strata Corporation | (800) 373-5259 | (701) 842-4000 |
| Garner Environmental Services | (701) 577-1200 | (800) 424-1716 |
| United States Environmental Services | (888) 279-9930 | (701) 872-2122 |

## APPENDIX D

## SPILL REPORTING FORM AND SUBMITTAL OF INFORMATION TO REGIONAL ADMINISTRATOR FOR QUALIFIED DISCHARGE(S)

**Targa Resources Partners, LP – Little Missouri Gas Plant**
**Spill Response Notification Form**

## SPILL RESPONSE NOTIFICATION FORM

**NOTE: INITIAL NOTIFICATION SHOULD NOT BE DELAYED PENDING COLLECTION OF ALL INFORMATION**

**Date of Last Update November 2011**

**Reporter's Last Name:** _____ **First:** _____
**Position:** _____
**Phone Number: Day:** _____ **Evening:** _____
**Company:** Targa Resources Partners LP
**Organization Type:** Gas Plant
**Address:** _____ **City:** _____ **State:** _____ **Zip:**
**Were Materials Discharged?** ( Y / N ) **Confidential?** ( Y / N )
**Meeting Federal Obligations to Report?** ( Y / N ) **Date Called**: _____
**Calling for Responsible Party?** ( Y / N ) **Time Called**: _____

## INCIDENT DESCRIPTION

**Location:** _____
**Substance Spilled:** _____
**Amount Spilled:** _____
**Source of Incident:** _____
**Cause of Incident:** _____
_____
**Number of and Nature of Injuries (if any):** _____
_____
**Date of Incident:** _____ **Time of Incident:** _____**AM/PM**
**Incident Address/Location**_____
**Nearest City:** _____ **State:** _____ **County:** _____ **Zip:** _____
**Distance from City:** ___ **Direction from City:** _____ **Units of Measure:** ____
**Container Type:** _____
**Tank Storage Capacity** _____ **Unit of Measure:** gallons
**Facility Oil Storage Capacity:** _____ **Unit of Measure:** _____
**Latitude:** _____
**Longitude:** _____

**Note: Spill Prevention Coordinator to fill out form**

**SPILL RESPONSE NOTIFICATION FORM (Continued)**

**Date of Last Update November 2011**

**MATERIAL INFORMATION**

| CHRIS* Code | Product Name | Discharged Quantity | Unit of Measure | Material Discharged in Water? Yes/No | Quantity | Unit of Measure |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

* CHRIS - Chemical Hazard Response Information System Codes:

| | | | |
|---|---|---|---|
| OSX | = Fuel Oil | OIL | = Crude Oil |
| ODS | = Diesel Fuel | OMN | = Cutter Stock Oil |
| OTF | = Transformer Oils | ASR | = Asphalt Blending Stocks |

**RESPONSE ACTION**

**Actions Taken to Correct, Control or Mitigate Incident:**

_____

_____

_____

**IMPACT**

**Number of Injuries:** _____ **Number of Deaths:** _____

**Were there Evacuations?** ( Y / N ) **Number Evacuated:** _____

**Was there any Damage?** ( Y / N ) **Damage in Dollars (approx.):** _____

**Medium Affected:** _____

**Description:** _____

**Additional Information about Medium:** _____

_____

**SPILL RESPONSE NOTIFICATION FORM (Continued)**

**Date of Last Update November 2011**

**ADDITIONAL INFORMATION**

**Any additional information about the incident not already recorded elsewhere in the report:**

_____

_____

**CALLER NOTIFICATIONS**

**EPA?** ( Y / N ) **USCG?** ( Y / N ) **State?** ( Y / N ) **Other?** ( Y / N )

**Describe:** _____

**Log:**

**Name of EPA Contact:** _____ **Follow Up Required:** ( Y / N )

**Reference Report Number:** _____

**Date/Time Called:** _____/_____

**Name of USCG/NRC Contact:** _____ **Follow Up Required:** ( Y / N )

**Reference Report Number:** _____

**Date/Time Called:** _____/_____

**Name of State Contact:** _____ **Follow Up Required:** ( Y / N )

**Reference Report Number:** _____

**Date/Time Called:** _____/_____

**Other Contact:**_____ **Name:** _____

**Follow Up Required:** ( Y / N )

**Reference Report Number:** _____

**Date/Time Called:** _____/_____

# APPENDIX E

# CONTAINMENT DRAINAGE RECORDS

**TARGA RESOURCES – LITTLE MISSOURI GAS PLANT**
**CONTAINMENT AREA DRAINAGE DOCUMENTATION**

| Date of Inspection | Date of Drainage | Oil Removal Required? (Yes/No) | Inspector's Signature | Comments (Indicate which containment area was inspected/drained) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

Saddle Butte Pipeline, LLC

# MASTER STORMWATER POLLUTION PREVENTION PLAN
## (Little Missouri Plant)

For construction located in
McKenzie County, North Dakota

This plan is prepared in compliance with Code of Federal Regulations (CFR) Title 40 Part 122 and is within the jurisdiction of the Environmental Protection Agency (EPA) implementing the North Dakota Pollutant Discharge Elimination System (NDPDES) and Clean Water Act (CWA)

Prepared By:

Kadrmas Lee & Jackson
Engineers Surveyors Planners

PO Box 290
Dickinson, ND 58602-290

September 2010

KLJ Project #3710275

# TABLE OF CONTENTS


1.0 INTRODUCTION....3

2.0 GUIDELINES FOR COMPLIANCE....4
- Is Coverage Required....4
- Inspections and Documentation....4
- Terminating Permit Coverage....5
- Plan Review, Revisions, and Records....5

3.0 SITE DESCRIPTION....6
- Total Area of Site Disturbance....6
- Description of Terrain and Vegetation....6

4.0 STANDARD CONSTRUCTION PRACTICES....7
- Temporary Measures during Construction....7
- Pipeline Construction....7
- Road Construction....8
- Building Construction and Landscaping....8

5.0 BEST MANAGEMENT PRACTICES (BMP'S)....10
- Operational Controls....10
- Spill Prevention and Control Practices....10
- Material Handling and Management Practices....10
- Maintenance and Inspections....11

6.0 FINAL STABILIZATION....13

7.0 SWPPP CERTIFICATION....14

LOCATION MAPS(S)....APPENDIX A
INSPECTION FORM....APPENDIX B
BMP PICS....APPENDIX C

## 1.0 INTRODUCTION

In accordance with NDPDES the following areas associated with storm water discharges from construction activity, shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) prior to beginning any construction. The SWPPP and related revisions are subject to review by the EPA. The objectives of the plan are to identify potential sources of sediment or other pollution from construction activity and to ensure practices are implemented to control pollutants in storm water from construction site runoff both during construction and after completion.

This document represents Saddle Butte Pipelines' Master SWPPP. This SWPPP establishes a program by which sediments and other potential pollutant impacts to receiving waters from construction activities can be substantially reduced or eliminated. The information and guidelines provided in this Master SWPPP will apply to all portions of facility construction on the Little Missouri Plant. Specific areas of concern will be identified where needed.

This Master SWPPP includes:

- Guidelines for compliance
- Site description
- Standard construction practices
- Best Management Practices (BMP's)
- Final stabilization

## 2.0 GUIDELINES FOR COMPLIANCE

**Is Coverage Required**
NDR10-0000 applies to all areas within the jurisdiction of North Dakota. It applies to stormwater discharges associated with large and small construction activities as defined in NDR10-0000 part I-A-2a & 2b, respectively. It also applies to stormwater discharges from support activities related to construction sites such as concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and embankment material borrow areas. Presently, oil & gas exploration is exempt for projects that involve less than five acres of soil disturbance.

Stormwater discharges that will not be covered under permit NDR10-0000 include:

- Stormwater discharges associated with industrial facilities from any source other than construction activities
- Post construction discharges from industrial activity that happen after final stabilization is achieved
- The placement of fill into waters of the state requiring authorizations
- Discharges to waters with a total maximum daily load (TMDL) allocation, that is not included in the SWPPP and in accordance with the requirements of the approved TMDL
- Stormwater discharges that will or could violate water quality standards

**Notice of Intent (NOI) – Obtaining Coverage and Authorization**
Saddle Butte will provide the following information to the North Dakota Department of Health to obtain authorization under the general permit number NDR10-0000:

- Owner name, mailing address and phone number
- Project contact name and phone number
- Project/site name, location (street address, section, township, range, or latitude and longitude), and county
- Brief description of construction activity
- Anticipated starting and completion date for the construction activity
- Estimated Total area of disturbance in acres
- Name of receiving water(s) or the name of the municipal storm sewer system and receiving water(s)
- List of contractors/subcontractors working at the site (if known)
- The signature of the applicant(s), owner (and operator if co-applicants) signed in accordance with Part IV-E of NDR10-0000

**Inspections and Documentation**
During construction, personnel familiar with permit conditions and the proper installation and operation of control measures shall perform inspections to monitor all disturbed areas, areas used for storage of materials exposed to precipitation, storm water control measures and locations where vehicles enter or exit the site. Inspections will take place at least once every 14 calendar days and within 24 hours after any storm and/or snow melt event greater than a 0.50 inch. If weather conditions prevent inspections, they will take place on the next possible day.

Inspections will be documented. Records of maintenance and inspection activity will include:

- Date, time and name of person(s) conducting inspections.
- Assessment of effectiveness of BMP's and whether repair or maintenance is warranted (Deficiencies shall be corrected as soon as possible).
- Descriptions of corrective actions taken.
- Dates of rainfall events of ½ inch or greater in a 24 hour period.
- Documentation that the SWPPP has been amended in response to deficiencies found during inspections, if necessary.

**Terminating Permit Coverage**
Compliance with the conditions in this plan is required until the permittee has submitted a Notice of Termination (NOT). Within 30 days of final stabilization the NOT will be submitted identifying the project, reason why the permit is no longer needed and signed in accordance with Part IV-E of NDR10-0000.

A NOT will not be submitted until stormwater discharges associated with construction activities are eliminated and final stabilization is achieved in accordance with Part II-E, or when transfer of ownership is submitted and approved in accordance with Part 1-F of NDR10-0000.

**Plan Review, Revisions and Records**
The plan will be signed in accordance with Part IV-E of NDR10-0000. Copies of the NOI permit authorization letter and SWPPP will be retained at offices of Kadrmas, Lee & Jackson, Inc. in Dickinson, North Dakota.

The plan will be amended whenever there is a change to design, construction, operation or maintenance which could have a significant effect on the potential for the discharge of pollutants to the waters of the state.

The plan will be amended if it is found to be ineffective in controlling pollutants present in stormwater.

The plan will be made available, upon request, to the North Dakota Department of Health or United States Environmental Protection Agency.

Copies of the SWPPP and all documentation required by NDR10-0000 will be retained for at least three years from the date of final stabilization of the site.

## 3.0 SITE DESCRIPTION

This plan covers a plant construction area as indicated in the accompanying maps. The maps shall show the general topography and nearby waterways.

**Total Area of Site Disturbance**
The construction project occurs within a 39.92 acre site. The project is estimated to begin in September 2010 and be fully stabilized by December 2011. The total area disturbed by all construction activities with the area for the plant is estimated at 22.5 acres.

**Description of Terrain and Vegetation**
The land largely consists of rolling hills and low areas surrounding, and including Spring Creek. All flow direction can be determined from the Quad Maps in Appendix C. Description of the soil types by legal description are as follows:

**Sections 30, T. 149N, R. 98W**
Rhoades-Daglum complex – 0.32 (medium) water erodibility, 6 (low) wind erodibility
Korchea Loam – 0.28 (medium) water erodibility, 4L (medium) wind erodibility
Zahl-Cabba-Williams complex – 0.28 (medium) water erodibility, 4L (medium) wind erodibility

## 4.0 STANDARD CONSTRUCTION PRACTICES

Saddle Butte has construction sites that consist of a system of pipeline, buildings, roads, and various landscaping. Soil disturbing activities will consist primarily of clearing and grubbing: removal, salvage and replacement of topsoil and various landscaping.

**Temporary Measures during Construction**
Temporary measures are defined herein as practices and procedures used to minimize and eliminate erosion, surface water runoff and stream contamination by one or more of the following methods:

- **The timing of construction so that the environmental damage is minimized.** For example, working on dry snow covered, frozen ground generally is less damaging to the vegetation and soil than working during a thaw or during or immediately after a rainfall. Contractors will monitor the weather closely to obtain maximum benefit from this measure.
- **Construction of temporary dikes or holding ponds using straw bales.** These measures are intended to hold back silt and slow down water velocity. They should be inspected within 24-hours after a rainfall and during prolonged storms or spring thaws. Any repairs should be made within 24 hours after inspection.
- **Utilization of excavated spoils to form a diversion dike upstream of the excavated trench.** This procedure must be well planned and closely monitored. If a spoils windrow is used as a temporary diversion on a side hill with a slope of more than 2.5 percent, additional erosion protection will be considered. For example, water should not be channeled parallel to a spoils windrow for distances greater than 300 feet. Openings should be provided at approximately 300-foot intervals to allow controlled water crossing of the spoils pile and trench. Failure to do so could cause massive erosion and silting problems.
- **Stream crossings and steep slopes will be backfilled on the same day as they are trenched.** In cases where it is not possible to backfill immediately, trench blocks shall be installed. Every effort will be made to minimize rutting. Construction will be planned to avoid potential rutting (e.g. after a rain).
- **Best temporary management practices for managing overland flow include sedimentation control practices such as:** Filter fabric fence, straw bale fence, mulching, and/or geotextile products. Water Bars shall be constructed to redirect overland flow away from disturbed areas.
- **In the event a trench is excavated and left open (not backfilled) during a period when surface runoff takes place;** sediment traps should be installed at 150 to 300-foot intervals within the trench. These sediment traps can consist of: Filter fabric barriers, Straw bales and/or trench blocks constructed with earth. The actual location of these traps and the frequency of the traps will be very site specific depending upon the general location and slope of the open trench and the potential for runoff.

**Pipeline Construction**
Pipeline construction is necessary for the collection and transference of oil and gas products from remote production locations to processing and disposal facilities. Surface disturbance should be kept minimal and site reclamation begins as soon as possible after the start of construction.

The following guidelines will be used at the extent practical when siting pipelines:

- Gathering lines will follow road rights-of-way.
- Stream crossings will be minimized if roadways cannot be followed. If it is necessary to cross a stream, measures will be taken to minimize stream disturbance and proper erosion controls will be used to prevent sediment runoff into stream.
- Pipeline routes will follow topography to keep pipeline grades will be kept at a minimum when possible.
- Soil and vegetation disturbance will be kept to a minimum.

The following guidelines will be used to the extent practical during pipeline construction:

- In areas where it is necessary to have severe grades, silt fence, fiber rolls, straw bales or other adequate sediment controls will be used to reduce runoff velocities and prevent erosion and sedimentation.
- When feasible, pipeline locations will avoid highly erosive soils and wetlands. However if it is necessary to construct pipelines in these areas, erosion control methods and wetland pipeline construction techniques will be used to minimize the disturbance to these areas.
- Vegetated buffer strips will be maintained between streams, wetlands, and/or floodplains and pipelines to slow runoff, provide area for runoff to permeate soil, and filter sediment. Other permanent methods (geotextile, riprap, matting, etc.) will be used instead of or in addition to vegetated buffer strips, provided the watercourse is not altered or diverted.
- Contractors will be familiar with construction techniques or employ erosion control specialists providing erosion control.
- Surface disturbance will be minimized.

**Road Construction**
The following guidelines will be used to the extent practical during road construction:

- When feasible, road locations will avoid highly erosive soils and wetlands. However if it is necessary to construct roads in these areas, erosion control methods and wetland road construction techniques will be used to minimize the disturbance to these areas.
- No known hazardous or toxic materials will be used in roadbed construction.
- Vegetated buffer strips will be maintained between streams, wetlands, and/or floodplains and roads to slow runoff, provide area for runoff to permeate soil, and filter sediment. Other permanent methods (geotextiles, riprap, matting, etc.) may be used instead of or in addition to vegetated buffer strips, provided the watercourse is not altered or diverted.
- Measures will be taken to prevent construction materials (dirt, boulders, rock, grass, trees, etc.) from being deposited into water bodies. However, if these materials inadvertently enter the water body, they will be removed immediately.
- Road will be surfaced with scoria or similar material as soon as leveling and grading is complete to prevent erosion.
- Contractors will be familiar with construction techniques providing erosion control.

**Building Construction and Landscaping**
The following guidelines will be used to the extent practical during building construction and landscaping:

- All slope grades will be kept to a minimum and proper construction techniques will be used to control erosion. In order to maintain sheet flow and minimize rills and/or gullies,

there will be no unbroken slope length of greater than 75 feet for slopes with a grade of 3:1 or steeper.

- Buildings will be constructed a sufficient distance away from stream beds, wetlands or flood lands to allow for a vegetative buffer to prevent soil from entering the water bodies. When pads and/or pits are constructed near water bodies, measures will be taken to protect that surface water quality. Where sufficient area is not available, other erosion control methods will be used in addition to or instead of vegetative buffers provided the water is not altered or diverted.
- Measures will be taken to prevent construction materials (dirt, boulders, rock, grass, trees, etc.) form being deposited into water bodies. However, if these materials inadvertently enter the water body, they will be removed immediately.
- Temporary soil stockpiles will have effective sediment controls.
- Contractors will be familiar with construction techniques providing erosion control.

## 5.0 BEST MANAGEMENT PRACTICES (BMP'S)

**Operational Controls**
Vehicular traffic will be minimized as much as possible to reduce dust and prevent soil erosion. If sediment is tracked onto paved surfaces, it will be cleaned up and properly disposed of as soon as possible.

All waste materials, including sanitary wastes, will be removed to an appropriate licensed disposal/recycling facility. Personnel will be instructed regarding the correct disposal of trash and construction debris. Individuals who manage day-to-day site operations will be responsible for verifying that these procedures are followed. No wastes will be discharged into the waters of the state.

**Spill Prevention and Control Practices**
All employees of the current facility manager/operator must be trained to implement spill prevention practices for work with and around oil sources. All operations personnel shall use common sense and rely on spill prevention practices at all times to minimize the potential for a release of oil.

For example, the following "common sense" practices are recommended:

- Keep container lids securely fastened at all times
- Do not leave portable sources unattended
- Return portable sources to their storage location after use
- Use pads, drip pans, and funnels when transferring petroleum products from a portable container
- Protect oil sources from damage by moving equipment
- Keep berms closed at all times except when discharging clean storm water from the berm area
- All spills, regardless of size, shall be immediately reported and cleaned up
- The source of any spill shall be immediately corrected to prevent reoccurrence
- Any portable sources should be placed away from water sources

For spills involving oil products in which 42 gallons or more are discharged offsite you must contact the North Dakota Department of Health, Environmental Health Section (minor spill) at 1-701-328-5210 or 1-701-328-5166. For spills that cannot be immediately contained by onsite or contracted personnel you must contact North Dakota Division of Emergency Management at 1-800-472-2121 (24-hour hotline).

All vehicles and equipment will be checked for leaking oil or other fluids daily. Leaks will be repaired immediately. Vehicles or equipment unfit for use will be removed from the project site immediately.

**Material Handling and Management Practices**
The following good housekeeping practices will be followed, to reduce the risk of spills or other runoff contamination:

- Materials on site will be kept in their original containers and labeled accordingly.
- Partially empty containers will be used at another site, recycled, or returned to the manufacturer.
- Manufacturers' recommendations for proper use and disposal will be followed.

- Vehicles and equipment will be fueled and lubricated a sufficient distance (at least 100 feet) from any drainage pattern.

**Maintenance and Inspections**
Inspections will be conducted to monitor the condition of storm water discharge outlets and effectiveness of BMPs. Inspections will be suspended when the ground is frozen and no sediment displacement is expected.

Following are some guidelines when conducting inspections:

- Inspect disturbed areas and areas used for storage of materials exposed to precipitation for evidence of, or the potential for pollutants entering the drainage system.
- Inspect all erosion and sediment control measures in the plan to ensure they are implemented, maintained and operating effectively to minimize erosion and prevent stormwater contamination from construction materials.
- Check all vehicles and equipment on site for oil or other fluid leakage.
- Observe any drainage near the site to ensure no contamination is occurring.
- Inspect chemical storage containers present to ensure they are not leaking.
- Check reseeded soil for washouts and bare spots.
- If site is near a paved road, check entrances and exits for evidence of offsite sediment tracking.

All erosion and sediment control measures identified in this plan will be maintained in effective operating condition. If site inspections identify BMPs not operating effectively, maintenance will be arranged and accomplished within 24 hours of discovery or as soon as practical. The following maintenance should be implemented for each specific BMP:

### Silt Fence

Silt fence should be inspected for signs the fabric has pulled off the stakes, a stake is broken, or for when the bottom "lip" of the fence is no longer trenched impairing the fence's ability to hold or trap sediment. The fence should be immediately repaired when these symptoms are noted and sediment should be cleaned from the fence when it has the potential for pushing over the fence or material failure. Silt fence fabric will deteriorate over time from sun and wind. Fraying and tearing of the fabric indicates time for replacement.

### Straw Bales

Straw bales inspected for the integrity of staking and the occurrence of gaps between the bales. Staking should be replaced or reinforced when the strength and integrity of the bale appears to be compromised. Bales may need to be retrenched or set tighter together to eliminate gaps for fast water bypass. When sediment accumulates to over half the bale height the sediment should be removed to allow for room for additional sediment collection.

### Straw Erosion Wattles

Straw wattle should be inspected for signs of excessive sediment collection (sediment covers more than 50% of wattle), erosion beneath the wattle, wash out, or tearing. Where necessary, wattles may need to be retrenched or have staking added in order to maintain its proper positioning. Wattles will need to be replaced when compressed or when significantly torn. If there is excessive sediment collection, remove the accumulated sediment and place new wattle in the previous wattle's trench.

### Rock Armoring
Rock armoring is designed to slowly collect sediment over time and typically requires little maintenance. Rock armoring should be inspected for settling, under wash, outwash and sediment collection. Should any of these conditions occur additional armoring may be added.

### Check Dams
Check dams should be routinely inspected for excessive leaking due to tears or damage and sediment accumulation. Any damage to a dam should be immediately repaired. Accumulated sediment should be removed when the overall accumulation exceeds a depth of 2 feet. This will allow sufficient space for additional sediment accumulation.

### Soil Retention Blankets
Soil retention blankets should be inspected for good ground contact with minimal folds, or tears. The blankets should be replaced and/or re-staked to prevent movement and alteration from wind or other forces.

### Mulch
Mulched areas should be inspected for continuing uniform coverage. Where bare soil is noted, mulch should be re-applied.

### Rock Socks
Rock socks should be placed perpendicular with flow, maintenance including reorienting features to best catch sediment. Excessive sediment should be removed to allow sufficient room for future sediment accumulation. Socks will need replaced or repaired if torn.

### Sediment Traps
Sediment traps should be maintained to allow sufficient area for sediment accumulation. Water outlet structures and pipes should be kept free of debris.

There may be several different BMPs or combinations of which are used during construction. A guideline for the proper implementation is shown in Appendix C.

## 5.0 FINAL STABILIZATION

All sites must be inspected and maintained until they reach final stabilization. A Notice of Termination (NOT) will be submitted within 30 days after final stabilization is complete, or another owner has assumed control over all areas that are not stabilized.
Final stabilization will be achieved when:

- All soil disturbing activities are complete and all soils are stabilized with a uniform perennial vegetative cover with a density of 70 percent of preexisting levels over the entire surface area, or other equivalent means necessary to prevent soil failure in erosive conditions.
- All drainage ditches, constructed to drain water from the site are stabilized to prevent erosion.
- All temporary erosion control and sediment control BMPs are removed and any areas disturbed during removal are reseeded immediately.
- For soil disturbing activities on land used for agricultural purposes, final stabilization will be accomplished by returning the disturbed land to its pre-disturbance use.

## 6.0 SWPPP CERTIFICATION

Certification Instructions:

The SWPPP must be signed by a responsible corporate officer, a general partner, a principal executive officer or a ranking elected official of the owner(s).

The SWPPP may be signed by a duly authorized representative of the owner described above only if:

- The authorization is made in writing by a person described above and submitted to the Department; and
- The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters.

Certification:

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein. Based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

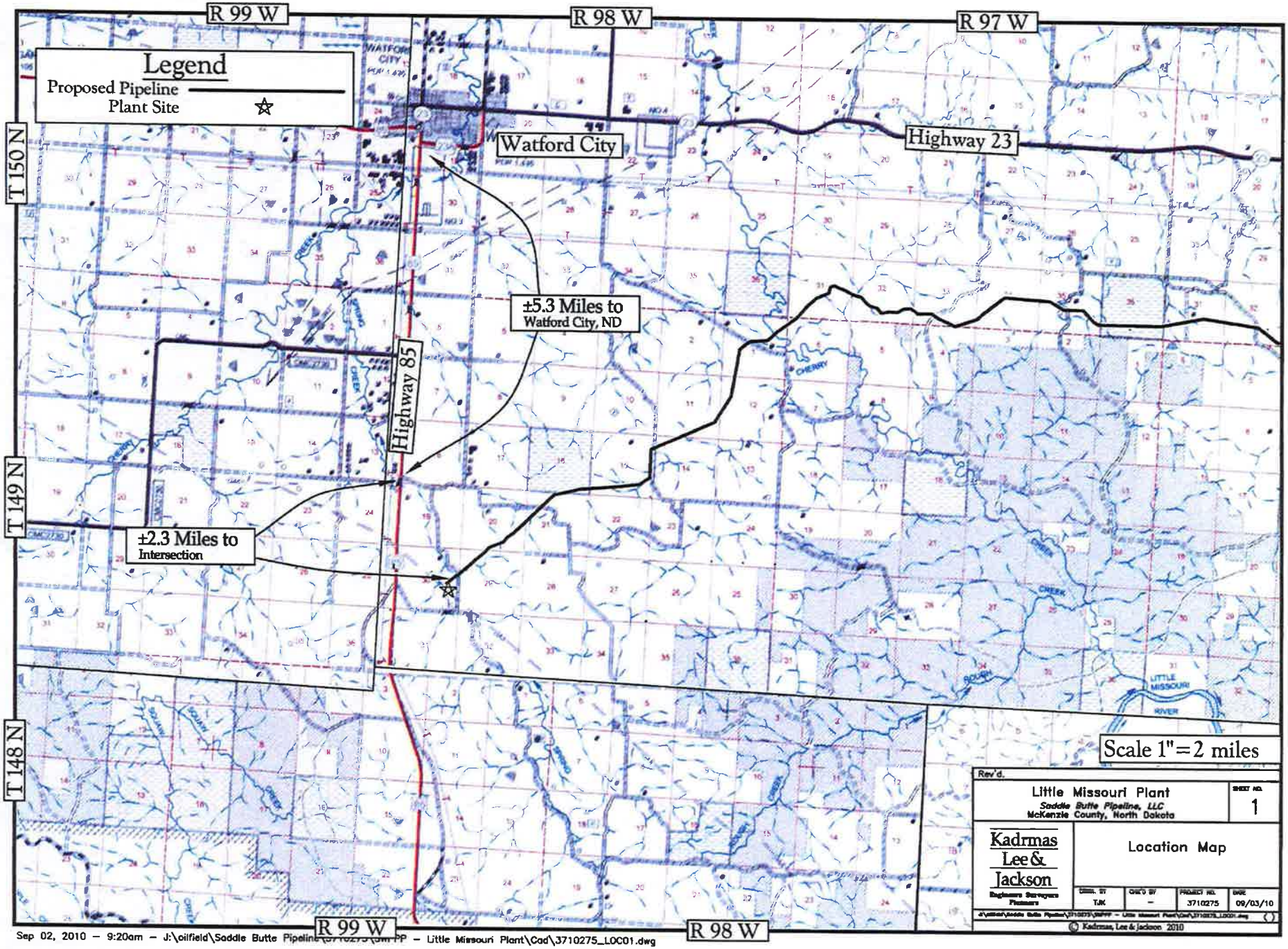
SADDLE BUTTE PIPELINE, LLC

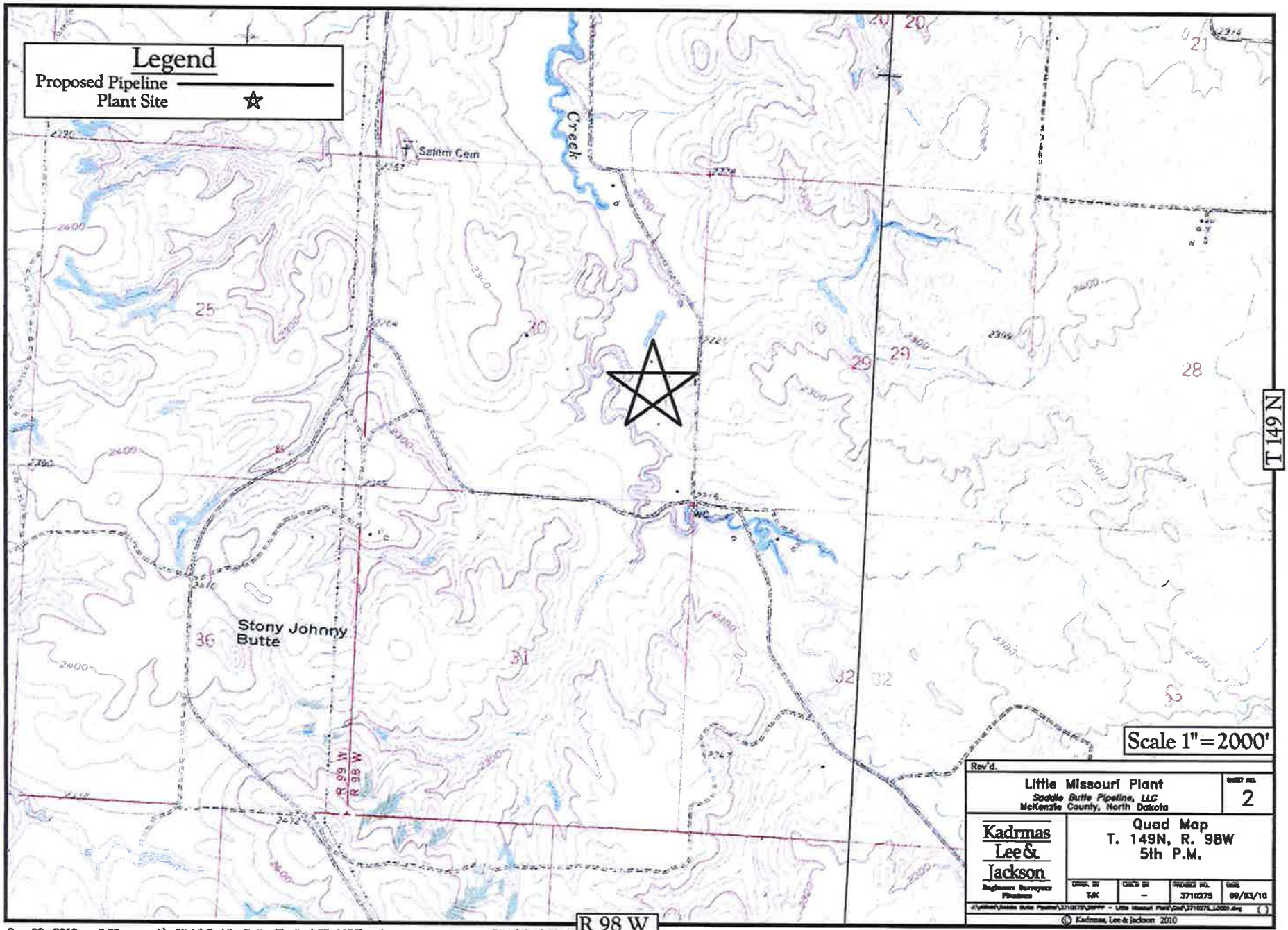
Name: David C. Peters

Title: Project Manager

Signature

Date: 9-7-2010


R 99 W
R 98 W
R 97 W
Legend
Proposed Pipeline
Plant Site
Watford City
Highway 23
T 150 N
T 149 N
T 148 N
Highway 85
±5.3 Miles to
Watford City, ND
±2.3 Miles to
Intersection
LITTLE MISSOURI RIVER
Scale 1"=2 miles
Rev'd.
Little Missouri Plant
Saddle Butte Pipeline, LLC
McKenzie County, North Dakota
SHEET NO.
1
Kadrmas Lee & Jackson
Engineers Surveyors Planners
Location Map
DRWN. BY
TJK
CHK'D BY
-
PROJECT NO.
3710275
DATE
09/03/10
© Kadrmas, Lee & Jackson 2010
Sep 02, 2010 – 9:20am – J:\oilfield\Saddle Butte Pipeline\3710275\SMPP – Little Missouri Plant\Cad\3710275_LOC01.dwg




Sep 02, 2010 – 9:22am – J:\oilfield\Saddle Butte Pipeline\3710275\SWPPP – Little Missouri Plant\Cad\3710275_LOC01.dwg

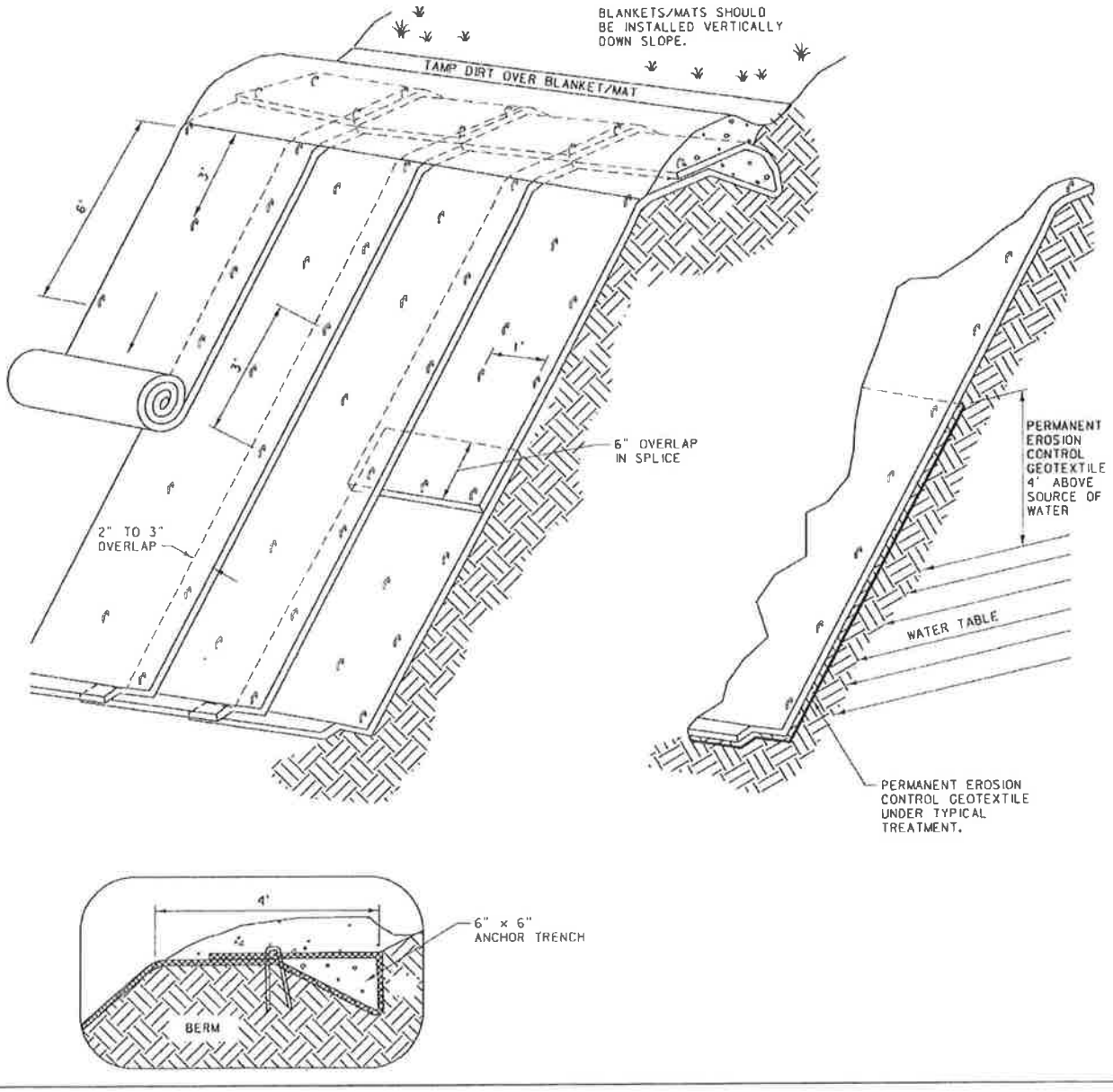
## SADDLE BUTTE PIPELINE, LLC

**Database of Inspections for Pipeline in Grasslands Gathering System - McKenzie County, ND**

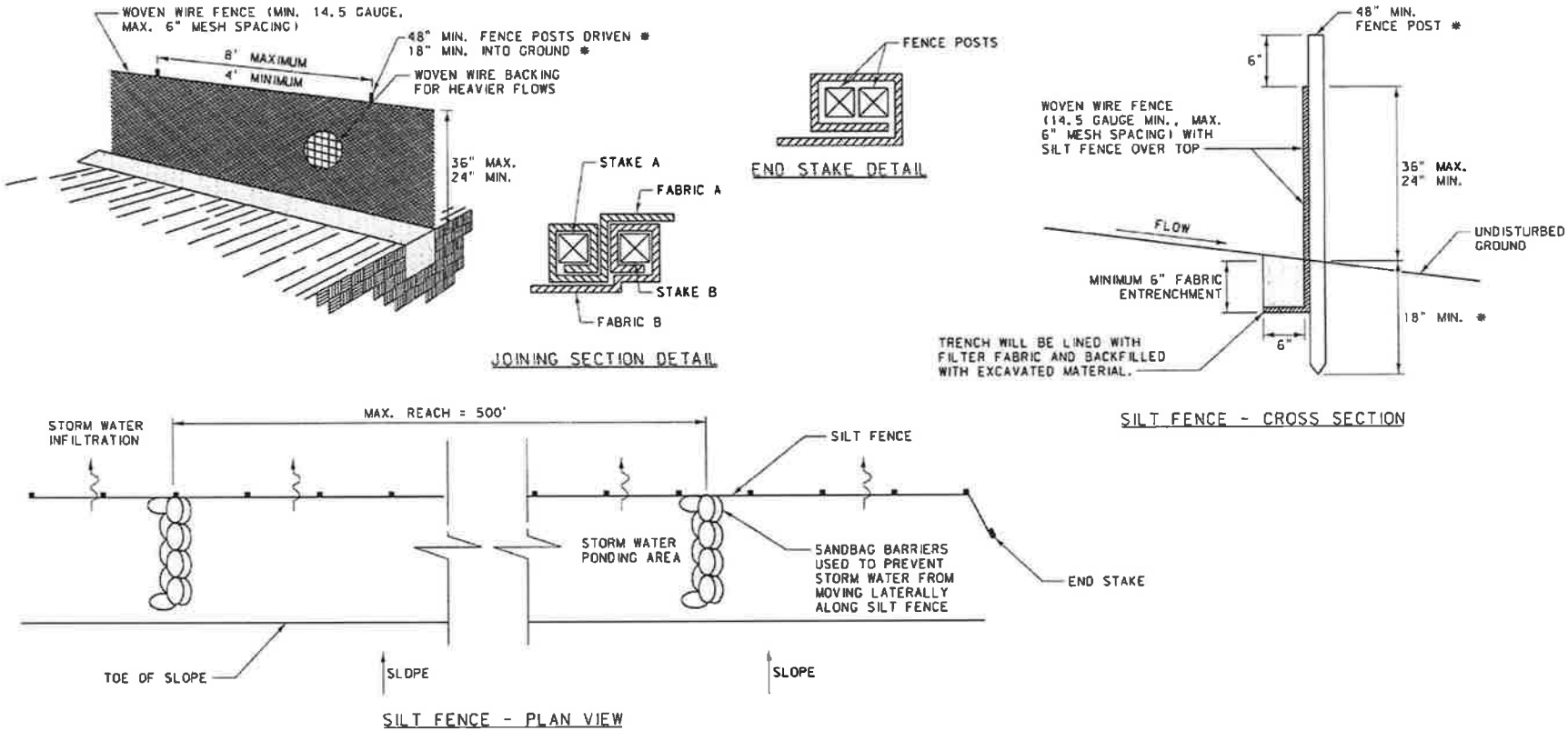
**Inspection Date:** **Reason for Inspection:**

| Location | Time | Inspector | Trench excavated (Y or N) | Trench backfilled (Y or N) | Disturbed Area Condition | Erosion or Offsite Sediment Runoff | BMP's Condition | Observations, Comments and Required Maintenance or Repairs |
|---|---|---|---|---|---|---|---|---|
| Lincoln Road Plant | | | | | | | | |
| NB Facilities | | | | | | | | |
| Office Control Room | | | | | | | | |
| Pipeline | | | | | | | | |
| Roads | | | | | | | | |
| Yard/Storage | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

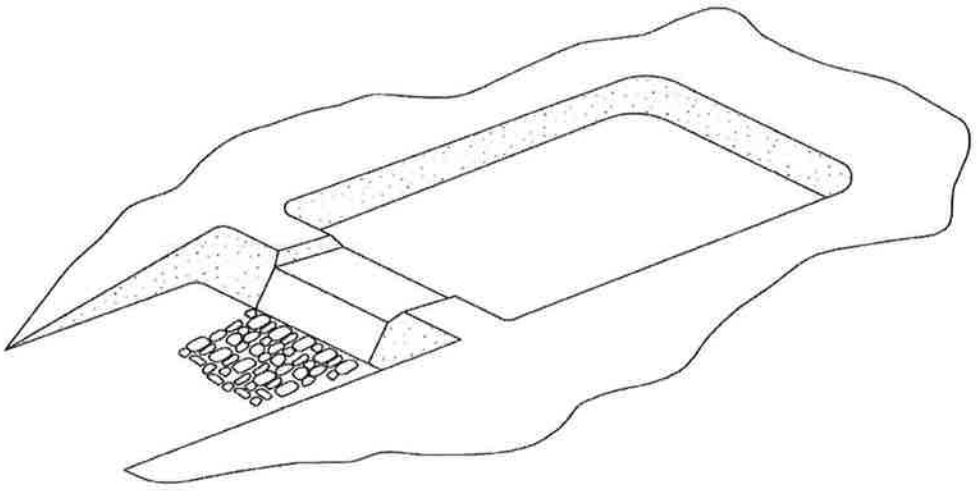
# Soil Retention Blankets



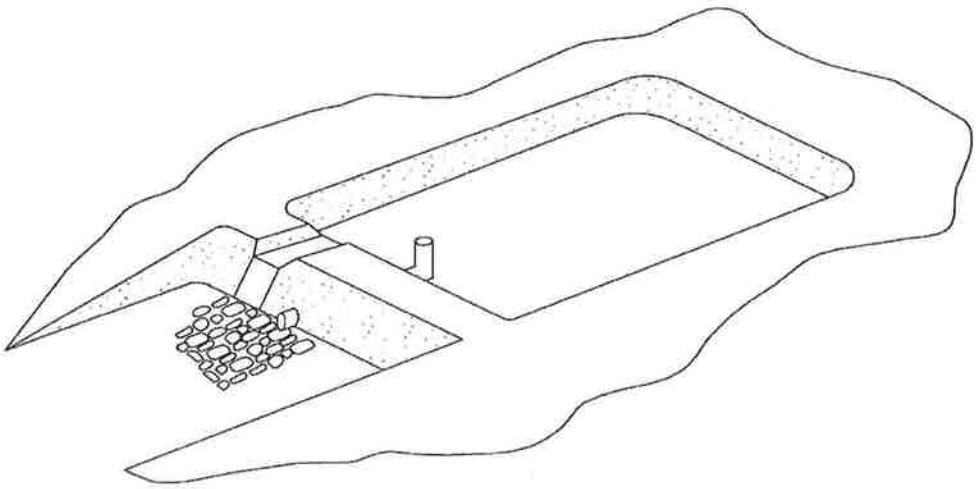
# Silt Fence


WOVEN WIRE FENCE (MIN. 14.5 GAUGE, MAX. 6" MESH SPACING)
48" MIN. FENCE POSTS DRIVEN * 18" MIN. INTO GROUND *
8' MAXIMUM
4' MINIMUM
WOVEN WIRE BACKING FOR HEAVIER FLOWS
36" MAX. 24" MIN.
STAKE A
FABRIC A
STAKE B
FABRIC B
JOINING SECTION DETAIL
FENCE POSTS
END STAKE DETAIL
48" MIN. FENCE POST *
6"
WOVEN WIRE FENCE (14.5 GAUGE MIN., MAX. 6" MESH SPACING) WITH SILT FENCE OVER TOP
36" MAX. 24" MIN.
FLOW
UNDISTURBED GROUND
MINIMUM 6" FABRIC ENTRENCHMENT
18" MIN. *
6"
TRENCH WILL BE LINED WITH FILTER FABRIC AND BACKFILLED WITH EXCAVATED MATERIAL.
SILT FENCE - CROSS SECTION
STORM WATER INFILTRATION
MAX. REACH = 500'
SILT FENCE
STORM WATER PONDING AREA
SANDBAG BARRIERS USED TO PREVENT STORM WATER FROM MOVING LATERALLY ALONG SILT FENCE
END STAKE
TOE OF SLOPE
SLOPE
SLOPE
SILT FENCE - PLAN VIEW

# Sediment Traps

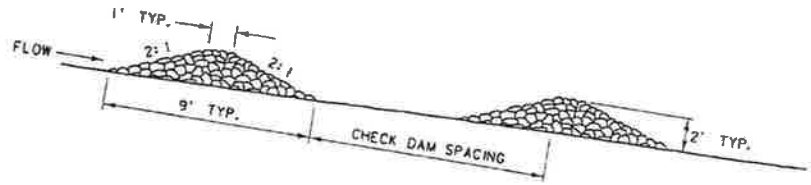


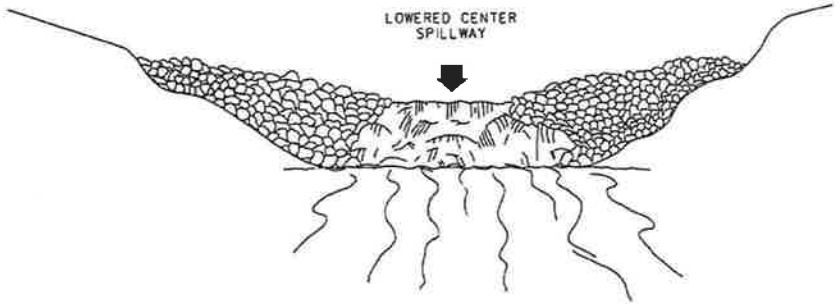
TYPICAL SEDIMENT TRAP WITH SPILLWAY TYPE OUTFALL



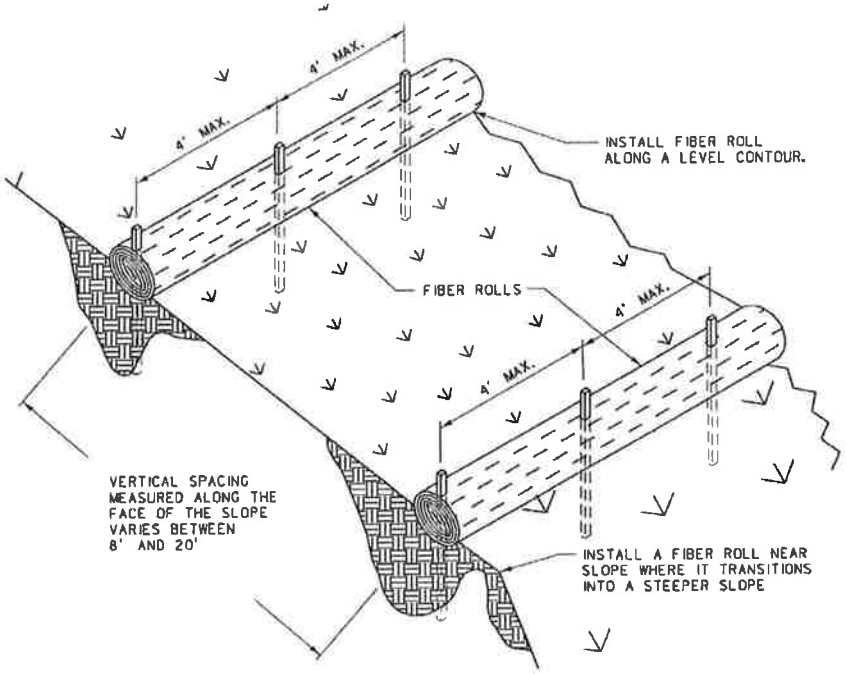
TYPICAL SEDIMENT TRAP WITH RISER PIPE TYPE OUTFALL

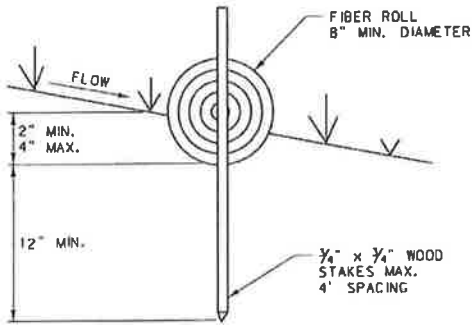
# Check Dams


1' TYP.
FLOW
2:1
2:1
9' TYP.
CHECK DAM SPACING
2' TYP.

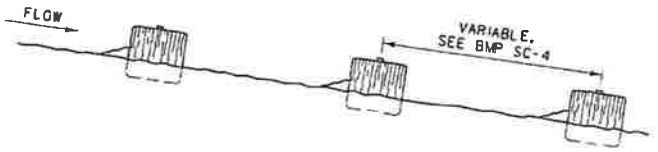

LOWERED CENTER
SPILLWAY

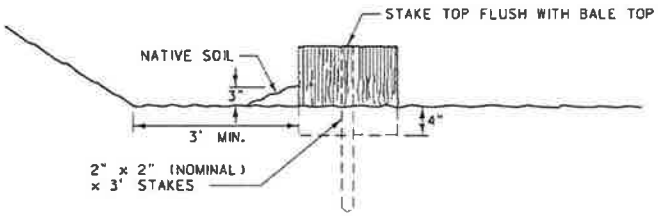
# Straw Erosion Wattles (Fiber Rolls)

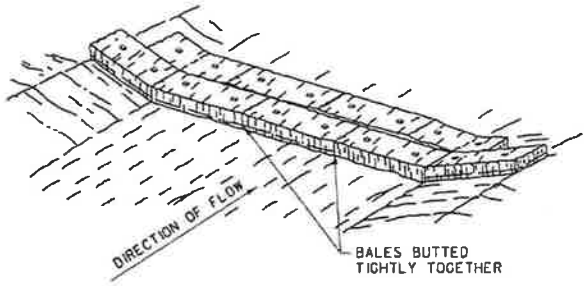


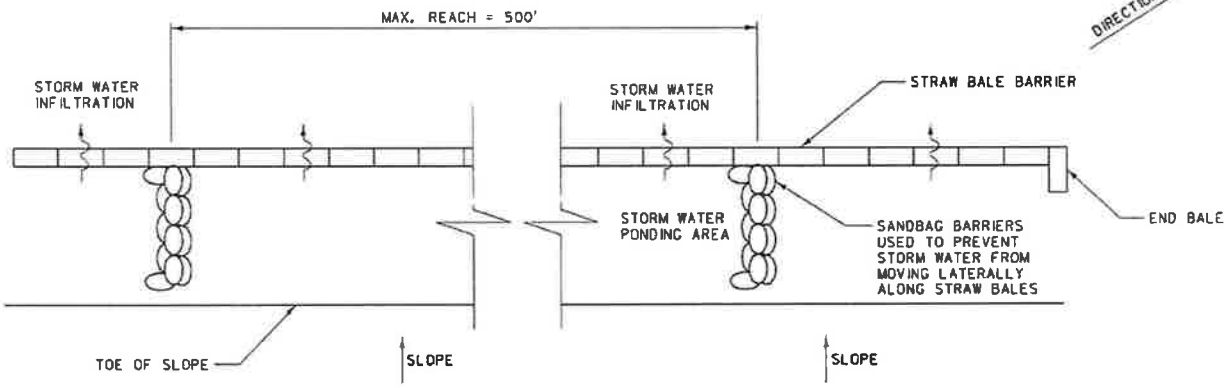



# Straw Bales


FLOW
VARIABLE,
SEE BMP SC-4


STAKE TOP FLUSH WITH BALE TOP
NATIVE SOIL
3"
3' MIN.
4"
2" x 2" (NOMINAL)
x 3' STAKES


DIRECTION OF FLOW
BALES BUTTED
TIGHTLY TOGETHER


MAX. REACH = 500'
STORM WATER
INFILTRATION
STORM WATER
INFILTRATION
STRAW BALE BARRIER
STORM WATER
PONDING AREA
SANDBAG BARRIERS
USED TO PREVENT
STORM WATER FROM
MOVING LATERALLY
ALONG STRAW BALES
END BALE
TOE OF SLOPE
SLOPE
SLOPE

# Appendix J:
# State and County Permits, and Deeds

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL
# PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

I. **General Information**:

A. **Permit to Construct Number**: PTC10041

B. **Source**:

1. Name: Little Missouri Gas Plant
2. Location: Sec. 30, T149N, R98W
   McKenzie County
3. Source Type: Natural Gas Processing Plant
4. Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Waukesha L7042GSIU natural gas-fired compressor engine rated at 900 bhp (4SRB) | 1 | 1 | Catalytic Converter |
| Waukesha L7042G natural gas-fired compressor engine rated at 900 bhp (4SRB) | 2 | 2 | Catalytic Converter |
| Caterpillar G342 natural gas-fired compressor engine rated at 265 bhp (4SRB) | 3 | 3 | Catalytic Converter |
| Waukesha F3524GSI natural gas-fired compressor engine rated at 840 bhp (4SRB) | 4 | 4 | Catalytic Converter |
| Caterpillar G3304 natural gas-fired compressor engine rated at 95 bhp (4SRB) | 5 | 5 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp | 6 | 6 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp | 7 | 7 | Catalytic Converter |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Hot oil heater rated at 8.0 MMBtu/hr and fired on natural gas | 8 | 8 | None |
| Hot oil heater rated at 8.0 MMBtu/hr and fired on natural gas | 9 | 9 | None |
| Ethylene glycol (EG) dehydration unit rated at 30 MMscfd | 10 | 10 | None |
| 500 gallon methanol storage tank | 11 | 11 | None |
| Emergency flare | 12 | 12 | None |
| Fugitive leaks | F1 | F1 | None |

* Only one Caterpillar G398 engine may operate at any time.

C. **Owner/Operator (Permit Applicant)**:

1. Name: Saddle Butte Pipeline
2. Address: 1970 E 3rd Ave, Suite 205
   Durango, CO 81301
3. Application Date: September 2010

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the major source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Minor source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Waukesha L7042GSIU engine rated at 900 bhp | 1 | 1 | NOx<br>CO<br>Opacity | 3.96 lb/hr<br>5.95 lb/hr<br>20% (40%**) |
| Waukesha L7042G engine rated at 900 bhp | 2 | 2 | NOx<br>CO<br>Opacity | 1.98 lb/hr<br>3.96 lb/hr<br>20% (40%**) |
| Caterpillar G342 engine rated at 265 bhp | 3 | 3 | NOx<br>CO<br>Opacity | 1.17 lb/hr<br>1.75 lb/hr<br>20% (40%**) |
| Waukesha F3524GSI engine rated at 840 bhp | 4 | 4 | NOx<br>CO<br>Opacity | 3.70 lb/hr<br>3.70 lb/hr<br>20% (40%**) |

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Caterpillar G3304 engine rated at 95 bhp | 5 | 5 | NOx<br>CO<br>Opacity | 0.42 lb/hr<br>0.63 lb/hr<br>20% (40%**) |
| Caterpillar G398 engine rated at 700 bhp | 6 | 6 | NOx<br>CO<br>Opacity | 3.08 lb/hr<br>4.63 lb/hr<br>20% (40%**) |
| Caterpillar G398 engine rated at 700 bhp | 7 | 7 | NOx<br>CO<br>Opacity | 3.08 lb/hr<br>4.63 lb/hr<br>20% (40%**) |
| Hot oil heater rated at 8.0 MMBtu/hr | 8 | 8 | Opacity | 20% (40%**) |
| Hot oil heater rated at 8.0 MMBtu/hr | 9 | 9 | Opacity | 20% (40%**) |
| Emergency flare | 13 | 13 | Opacity | 20% (60%**) |

* If applicable, the engines must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ.

** Permissible for not more than one six-minute period per hour.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engines shall be constructed to at least 1.5 times the nearby building height and at least 24 feet for EU 1-4, 15 feet for EU 5 and at least 30 feet for EU 6-7.

D. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at those emission points directed by the Department using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A.1. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

| Emission Unit Description | EP | Pollutant/ Parameter | Number of Runs | Length of Runs | EPA Ref. Method(s) |
|---|---|---|---|---|---|
| Waukesha engine rated at 900 bhp | 1 | NOx<br>CO | 3<br>3 | 60 min<br>60 min | 7E<br>10 |
| Waukesha engine rated at 900 bhp | 2 | NOx<br>CO | 3<br>3 | 60 min<br>60 min | 7E<br>10 |
| Caterpillar engine rated at 265 bhp | 3 | NOx<br>CO | 3<br>3 | 60 min<br>60 min | 7E<br>10 |
| Waukesha engine rated at 840 bhp | 4 | NOx<br>CO | 3<br>3 | 60 min<br>60 min | 7E<br>10 |
| Caterpillar engine | 5 | NOx | 3 | 60 min | 7E |

| Emission Unit Description | EP | Pollutant/ Parameter | Number of Runs | Length of Runs | EPA Ref. Method(s) |
|---|---|---|---|---|---|
| rated at 95 bhp | | CO | 3 | 60 min | 10 |
| Caterpillar engine | 6 | NOx | 3 | 60 min | 7E |
| rated at 700 bhp | | CO | 3 | 60 min | 10 |
| Caterpillar engine | 7 | NOx | 3 | 60 min | 7E |
| rated at 700 bhp | | CO | 3 | 60 min | 10 |

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

   The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

   a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

      All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be

made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

E. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

F. **Flaring Restrictions**:

1. Flaring may not be used to burn waste gas for the purpose of increasing or maintaining well production without prior approval from the Department. When it is necessary to operate the flare during emergency, malfunction or maintenance, all precautions shall be taken to minimize emissions and maintain compliance with the applicable ambient air quality standards as outlined in NDAC 33-15-02 and the opacity standard of 20% not to exceed 60% for more than one six-minute period per hour.

2. The flare must be equipped and operated with an automatic ignitor or a continuous burning pilot which must be maintained in good working order as outlined in NDAC 33-15-07-02.

3. The presence of a flame shall be monitored using a thermocouple or any other equivalent device approved by the Department.

G. **40 CFR 60, Subpart KKK**: The facility must comply with all applicable requirements of 40 CFR 60, Subpart KKK – Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing.

H. **40 CFR 60, Subpart JJJJ**: If applicable, the facility must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. Currently, EPA Region 8 is the implementing and enforcement authority. Until the Department receives delegation of this rule, the permittee shall submit all documentation required by this subpart to both the Department and EPA Region 8. The address for submittals to EPA is as follows:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

I. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. Please send all documentation to EPA at the address listed above.

J. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

K. **Air Pollution from Vehicles and Other Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08 – Control of Air Pollution from Vehicles and Other Internal Combustion Engines.

L. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

M. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

N. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

O. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

P. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

Q. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

R. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

S. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

T. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

U. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

V. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

W. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

X. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

Y. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

Z. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

AA. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 9/28/2010

By James L Semerad
for Terry L. O'Clair, P.E.
Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL
# PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

I. **General Information**:

A. **Permit to Construct Number**: PTC11032

B. **Source**:

1. Name: Little Missouri Gas Plant
2. Location: Sec. 30, T149N, R98W
   McKenzie County
3. Source Type: Natural Gas Processing Plant
4. Existing Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Waukesha L7042GSIU natural gas-fired compressor engine rated at 900 bhp (4SRB) | 1 | 1 | Catalytic Converter |
| Waukesha L7042G natural gas-fired compressor engine rated at 900 bhp (4SRB) | 2 | 2 | Catalytic Converter |
| Caterpillar G342 natural gas-fired compressor engine rated at 265 bhp (4SRB) | 3 | 3 | Catalytic Converter |
| Waukesha F3524GSI natural gas-fired compressor engine rated at 840 bhp (4SRB) | 4 | 4 | Catalytic Converter |
| Caterpillar G3304 natural gas-fired compressor engine rated at 95 bhp (4SRB)* | 5 | 5 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp** | 6 | 6 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp** | 7 | 7 | Catalytic Converter |
| Hot oil heater rated at 3.8 MMBtu/hr and fired on natural gas*** | 8 | 8 | None |
| Hot oil heater rated at 3.8 MMBtu/hr and fired on | 9 | 9 | None |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| natural gas*** | | | |
| Ethylene glycol (EG) dehydration unit rated at 30 MMscfd | 10 | 10 | None |
| 500 gallon methanol storage tank | 11 | 11 | None |
| Emergency flare | 12 | 12 | None |
| Fugitive leaks | F1 | F1 | None |

* Engine to be removed from the facility.
** Only one Caterpillar G398 engine may operate at any time.
*** The facility was originally permitted for hot oil heaters rated at 8.0 MMBtu/hr; heaters rated at 3.8 MMBtu/hr were installed.

5. New Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Caterpillar G3408TA natural gas-fired compressor engine rated at 335 bhp (4SRB) | 5 | 5 | Catalytic Converter |
| EG dehydration unit rated at 30 MMscfd | 13 | 13 | None |

C. **Owner/Operator (Permit Applicant):**

1. Name: Saddle Butte Pipeline
2. Address: 858 Main Ave, Suite 301
   Durango, CO 81301
3. Application Date: March 17, 2011

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the major source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Minor source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Caterpillar G3408TA engine rated at 335 bhp | 1 | 1 | NOx<br>CO<br>Opacity | 0.74 lb/hr<br>1.48 lb/hr<br>20% (40%**) |

* If applicable, the engine must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ.

** Permissible for not more than one six-minute period per hour.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engine shall be constructed to at least 1.5 times the nearby building height.

D. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at those emission points directed by the Department using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A.1. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

| Emission Unit Description | EP | Pollutant/ Parameter | Number of Runs | Length of Runs | EPA Ref. Method(s) |
|---|---|---|---|---|---|
| Caterpillar engine rated at 335bhp | 1 | NOx | 3 | 60 min | 7E |
| | | CO | 3 | 60 min | 10 |

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

E. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

F. **40 CFR 60, Subpart KKK**: The facility must comply with all applicable requirements of 40 CFR 60, Subpart KKK – Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing.

G. **40 CFR 60, Subpart JJJJ**: If applicable, the facility must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. Currently, EPA Region 8 is the implementing and enforcement authority. Until the Department receives delegation of this rule, the permittee shall submit all documentation required by this subpart to both the Department and EPA Region 8. The address for submittals to EPA is as follows:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

H. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. Please send all documentation to EPA at the address listed above.

I. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

J. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

K. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

L. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

M. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

N. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

O. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

P. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

Q. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08-01 – Internal Combustion Engine Emissions Restricted.

R. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

S. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

T. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

U. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

V. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

W. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and

copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

X. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

Y. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

Z. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 4/12/11

By _____
Terry L. O'Clair, P.E.
Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

May 1, 2012

Mr. David Waitt
Saddle Butte Pipeline, LLC
858 Main Avenue, Ste 301
Durango, CO 81301

Re: Air Pollution Control
Permit to Construct

Dear Mr. Waitt:

Pursuant to the Air Pollution Control Rules of the State of North Dakota, the Department of Health has completed final review of your application to obtain a Permit to Construct for modification of the existing Little Missouri Gas Plant.

Based on the results of the documents reviewed, this Department hereby issues the enclosed North Dakota Air Pollution Control Permit to Construct No. PTC12013. A public comment period was held regarding this project from March 28, 2012 to April 27, 2012 and no comments were received by the Department.

Please advise the Department within 15 days after completing the project to allow for an inspection by the Department.

**In addition, within 12 months after commencing operation of the new equipment, a permit application for a Title V Permit to Operate must be submitted to the Department.**

Note that the above-referenced permit addresses only air quality requirements applicable to your facility. Other divisions (Water Quality, Waste Management and Municipal Facilities) within the Environmental Health Section may have additional requirements. Contact information for the various divisions is listed at the bottom of this letter.

If you have any questions regarding air quality, please contact me at (701)328-5188.

Sincerely,

Craig D. Thorstenson
Environmental Engineer
Division of Air Quality

CDT:saj
Enc:
xc/enc: Mike Owens, EPA (email)

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL
# PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

I. **General Information**:

A. **Permit to Construct Number**: PTC12013

B. **Source**:

1. Name: Saddle Butte Pipeline, LLC
2. Location: Little Missouri Gas Plant
   Sec. 30, T149N, R98W
   McKenzie County
3. Source Type: Natural Gas Processing Plant
4. Existing Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Waukesha L7042GSIU natural gas-fired compressor engine rated at 900 bhp (4SRB) | 1 | 1 | Catalytic Converter |
| Caterpillar G342 natural gas-fired compressor engine rated at 265 bhp (4SRB) | 3 | 3 | Catalytic Converter |
| Waukesha F3524GSI natural gas-fired compressor engine rated at 840 bhp (4SRB) | 4 | 4 | Catalytic Converter |
| Caterpillar G3408TA natural gas-fired compressor engine rated at 335 bhp (4SRB) | 5 | 5 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 6 | 6 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 7 | 7 | Catalytic Converter |
| Hot oil heater rated at 3.8 MMBtu/hr and fired on natural gas | 8 | 8 | None |
| Ethylene glycol (EG) dehydration unit rated at 30 MMscfd | 10 | 10 | None |
| 500 gallon methanol storage tank | 11 | 11 | None |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Process flare | 12 | 12 | None |
| EG dehydration unit rated at 30 MMscfd | 13 | 13 | None |
| Fugitive leaks | F1 | F1 | None |

* Only one Caterpillar G398 engine may operate at any time.

5. New Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| 2,000 gallon methanol storage tank | 18 | 18 | Submerged Fill Pipe |
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | 19 | Catalytic Converter |
| Natural gas-fired compressor engine rated at a maximum capacity of 850 bhp* | 20 | 20 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 | 21 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 22 | 22 | Catalytic Converter |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | 23 | Catalytic Converter |
| Natural gas-fired compressor engine rated at a maximum capacity of 300 bhp** | 24 | 24 | Catalytic Converter |
| One natural gas-fired hot oil heater rated at approximately 6 million Btu/hr | 25 | 25 | None |
| One natural gas-fired hot oil heater rated at approximately 2 million Btu/hr | 26 | 26 | None |
| One natural gas-fired glycol regenerator reboiler rated at approximately 0.818 million Btu/hr | 27 | 27 | None |
| NGL storage tank with a capacity of approximately 500 gallons | 28 | 28 | None |

* EU 20 may not operate when both EU 4 and EU 19 are operating.
** EU 24 may not operate when both EU 3 and EU 23 are operating.

C. **Owner/Operator (Permit Applicant)**:

1. Name: Saddle Butte Pipeline
2. Address: 858 Main Ave, Suite 301
   Durango, CO 81301
3. Application Date: March 2, 2012

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders

now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the major source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Minor source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | 19 | NOx<br>CO<br>Opacity | 1.85 lb/hr<br>3.70 lb/hr<br>20% (40%**) |
| Natural gas-fired compressor engine rated at a maximum capacity of 850 bhp | 20 | 20 | NOx<br>CO<br>Opacity | 1.85 lb/hr<br>3.70 lb/hr<br>20% (40%**) |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 | 21 | NOx<br>CO<br>Opacity | 0.69 lb/hr<br>1.38 lb/hr<br>20% (40%**) |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 22 | 22 | NOx<br>CO<br>Opacity | 0.69 lb/hr<br>1.38 lb/hr<br>20% (40%**) |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | 23 | NOx<br>CO<br>Opacity | 0.64 lb/hr<br>1.29 lb/hr<br>20% (40%**) |
| Natural gas-fired compressor engine rated at a maximum capacity of 300 bhp | 24 | 24 | NOx<br>CO<br>Opacity | 0.64 lb/hr<br>1.29 lb/hr<br>20% (40%**) |
| One natural gas-fired hot oil heater rated at approximately 6 million Btu/hr | 25 | 25 | Opacity | 20% (40%**) |
| One natural gas-fired hot oil heater rated at approximately 2 million Btu/hr | 26 | 26 | Opacity | 20% (40%**) |
| One natural gas-fired glycol regenerator reboiler rated at approximately 0.818 million Btu/hr | 27 | 27 | Opacity | 20% (40%**) |

* If applicable, the engine must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ and 40 CFR 63, Subpart ZZZZ.

** Permissible for not more than one six-minute period per hour.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engines shall be constructed to at least 1.5 times the nearby building height. A nearby building is any building located a distance of less than five times the building height from the stack.

D. **Operational Restrictions:** The engines are subject to the following operational restrictions:

1. Emission unit (EU) 6 and EU 7 shall not operate at the same time.

2. EU 20 may not operate when both EU 4 and EU 19 are operating.

3. EU 24 may not operate when both EU 3 and EU 23 are operating.

E. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at those emission points directed by the Department using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A.1. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

| Emission Unit Description | EP | Pollutant/ Parameter |
|---|---|---|
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | NOx<br>CO |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 or 22* | NOx<br>CO |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | NOx<br>CO |

* Only one of the engines (either EU 21 or EU 22) is required to be tested.

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing

the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

F. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

G. **40 CFR 60, Subpart JJJJ**: If applicable, the facility must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

H. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the following address:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

I. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

J. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

K. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

L. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

M. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

N. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

O. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial

application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

P. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

Q. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08-01 – Internal Combustion Engine Emissions Restricted.

R. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

S. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

T. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

U. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

V. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

W. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

X. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

Y. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

Z. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 5/1/12

By Terry O'Clair

Terry L. O'Clair, P.E.
Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

November 13, 2013

Ms. Jessica Keiser
Targa Badlands LLC
1000 Louisiana, Suite 4300
Houston, TX 77002

Re: Air Pollution Control
Revised Permit to Construct
Compliance Inspection Report

Dear Ms. Keiser:

Pursuant to the Air Pollution Control Rules of the State of North Dakota, the Department of Health has completed its final review of your application to revise Permit to Construct No. 12013 for the existing Little Missouri Gas Plant.

Based on the results of the documents reviewed, this Department hereby issues the enclosed North Dakota Air Pollution Control Revised Permit to Construct No. PTC12013. The two changes include EU20's conversion from a backup to full-time engine and the cancellation of EU24's construction.

Please advise the Department within 15 days after installing EU20 to allow for an inspection by the Department.

Note that the above-referenced permit addresses only air quality requirements applicable to your facility. Other divisions (Water Quality, Waste Management and Municipal Facilities) within the Environmental Health Section may have additional requirements. Contact information for the various divisions is listed at the bottom of this letter.

Also included is an inspection report that was conducted at the Little Missouri Gas Plant on October 17, 2013. At the time of the inspection, all operating units appeared to be in compliance.

If you have any questions regarding air quality, please contact me at (701) 328-5188.

Sincerely,

Tim Jahraus
Environmental Scientist
Division of Air Quality

TMJ:saj
Enc:

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL
# PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

I. **General Information**:

A. **Permit to Construct Number**: PTC12013, Revision 1

B. **Source**:

1. Name: Targa Badlands LLC
2. Location: Little Missouri Gas Plant
   Sec. 30, T149N, R98W
   McKenzie County
3. Source Type: Natural Gas Processing Plant
4. Existing Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Waukesha L7042GSIU natural gas-fired compressor engine rated at 900 bhp (4SRB) | 1 | 1 | Catalytic Converter |
| Caterpillar G342 natural gas-fired compressor engine rated at 265 bhp (4SRB) | 3 | 3 | Catalytic Converter |
| Waukesha F3524GSI natural gas-fired compressor engine rated at 840 bhp (4SRB) | 4 | 4 | Catalytic Converter |
| Caterpillar G3408TA natural gas-fired compressor engine rated at 335 bhp (4SRB) | 5 | 5 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 6 | 6 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 7 | 7 | Catalytic Converter |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Hot oil heater rated at 3.8 MMBtu/hr and fired on natural gas | 8 | 8 | None |
| Ethylene glycol (EG) dehydration unit rated at 30 MMscfd | 10 | 10 | None |
| 500 gallon methanol storage tank | 11 | 11 | None |
| Process flare | 12 | 12 | None |
| EG dehydration unit rated at 30 MMscfd | 13 | 13 | None |
| Fugitive leaks | F1 | F1 | None |

* Only one Caterpillar G398 engine may operate at any time.

5. New Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| 2,000 gallon methanol storage tank | 18 | 18 | Submerged Fill Pipe |
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | 19 | Catalytic Converter |
| Waukesha model F3524GSI compressor engine rated at a maximum capacity of 840 bhp | 20 | 20 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 | 21 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 22 | 22 | Catalytic Converter |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | 23 | Catalytic Converter |
| One natural gas-fired hot oil heater rated at approximately 6 million Btu/hr | 25 | 25 | None |
| One natural gas-fired hot oil heater rated at approximately 2 million Btu/hr | 26 | 26 | None |
| One natural gas-fired glycol regenerator reboiler rated at approximately 0.818 million Btu/hr | 27 | 27 | None |
| NGL storage tank with a capacity of approximately 500 gallons | 28 | 28 | None |

C. **Owner/Operator (Permit Applicant):**

1. Name: Saddle Butte Pipeline
2. Address: 858 Main Ave, Suite 301
   Durango, CO 81301
3. Application Date: March 2, 2012

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the major source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Minor source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | 19 | NOx<br>CO<br>Opacity | 1.85 lb/hr<br>3.70 lb/hr<br>20% (40%**) |
| Natural gas-fired compressor engine rated at a maximum capacity of 850 bhp | 20 | 20 | NOx<br>CO<br>Opacity | 1.85 lb/hr<br>3.70 lb/hr<br>20% (40%**) |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 | 21 | NOx<br>CO<br>Opacity | 0.69 lb/hr<br>1.38 lb/hr<br>20% (40%**) |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 22 | 22 | NOx<br>CO<br>Opacity | 0.69 lb/hr<br>1.38 lb/hr<br>20% (40%**) |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | 23 | NOx<br>CO<br>Opacity | 0.64 lb/hr<br>1.29 lb/hr<br>20% (40%**) |
| One natural gas-fired hot oil heater rated at approximately 6 million Btu/hr | 25 | 25 | Opacity | 20% (40%**) |
| One natural gas-fired hot oil heater rated at approximately 2 million Btu/hr | 26 | 26 | Opacity | 20% (40%**) |
| One natural gas-fired glycol regenerator reboiler rated at approximately 0.818 million Btu/hr | 27 | 27 | Opacity | 20% (40%**) |

* If applicable, the engine must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ and 40 CFR 63, Subpart ZZZZ.

** Permissible for not more than one six-minute period per hour.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engines shall be constructed to at least 1.5 times the nearby building height. A nearby building is any building located a distance of less than five times the building height from the stack.

D. **Operational Restrictions:** Emission unit (EU) 6 and EU 7 shall not operate at the same time.

E. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at those emission points directed by the Department using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A.1. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

| Emission Unit Description | EP | Pollutant/ Parameter |
|---|---|---|
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | NOx<br>CO |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 or 22* | NOx<br>CO |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | NOx<br>CO |

* Only one of the engines (either EU 21 or EU 22) is required to be tested.

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. If the permittee is unable to conduct the performance test on

the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

   The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

   a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

      All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

   b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

F. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

G. **40 CFR 60, Subpart JJJJ**: If applicable, the facility must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

H. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the following address:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

I. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

J. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

K. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

L. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

M. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

N. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

O. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

P. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

Q. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08-01 – Internal Combustion Engine Emissions Restricted.

R. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

S. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

T. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and

can cause the emission of air contaminants in violation of applicable rules and regulations.

U. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

V. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

W. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

X. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

Y. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

Z. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 11/13/13

By Terry O'Clair
Terry L. O'Clair, P.E.
Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

October 23, 2014

FILE

Ms. Melanie Roberts
Targa Badlands LLC
1000 Louisiana, Ste 4300
Houston, TX 77002-5036

Re: Air Pollution Control
Permit to Construct

Dear Ms. Roberts:

Pursuant to the Air Pollution Control Rules of the State of North Dakota, the Department of Health has completed final review of your application dated to modify the Little Missouri Gas Plant in McKenzie County, North Dakota.

Based on the results of the documents reviewed, this Department hereby issues the enclosed North Dakota Air Pollution Control Permit to Construct Nos. PTC14059 (for the Little Missouri Gas Plant) and PTC14061 (for the Smokey Gathering System CDP). Permit to Construct No. PTC14061 establishes emission limits and stack height requirements for existing emission units to demonstrate compliance with the ambient air quality standards.

Please advise the Department within 15 days after completing the project to allow for an inspection by the Department.

Note that the above-referenced permit addresses only air quality requirements applicable to your facility. Other divisions (Water Quality, Waste Management and Municipal Facilities) within the Environmental Health Section may have additional requirements. Contact information for the various divisions is listed at the bottom of this letter.

If you have any questions regarding air quality, please contact me at (701)328-5188.

Sincerely,

Craig D. Thorstenson
Environmental Engineer
Division of Air Quality

CDT:saj
Enc:

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL
# PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

## I. General Information:

A. **Permit to Construct Number**: PTC14059

B. **Source**:

1. Name: Little Missouri Gas Plant
2. Location: Sec. 30, T149N, R98W
   McKenzie County, North Dakota
3. Source Type: Natural Gas Processing Plant
4. Existing Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Waukesha L7042GSIU natural gas-fired compressor engine rated at 900 bhp (4SRB) | 1 | 1 | Catalytic Converter |
| Caterpillar G342 natural gas-fired compressor engine rated at 265 bhp (4SRB) | 3 | 3 | Catalytic Converter |
| Waukesha F3524GSI natural gas-fired compressor engine rated at 840 bhp (4SRB) | 4 | 4 | Catalytic Converter |
| Caterpillar G3408TA natural gas-fired compressor engine rated at 335 bhp (4SRB) | 5 | 5 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 6 | 6 | Catalytic Converter |
| Caterpillar G398 natural gas-fired compressor engine rated at 700 bhp* | 7 | 7 | Catalytic Converter |
| Hot oil heater rated at 3.8 MMBtu/hr and fired on natural gas** | 8 | 8 | None |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Ethylene glycol (EG) dehydration unit rated at 30 MMscfd | 10 | 10 | None |
| 500 gallon methanol storage tank | 11 | 11 | None |
| Process flare | 12 | 12 | None |
| EG dehydration unit rated at 30 MMscfd | 13 | 13 | None |
| Fugitive leaks | F1 | F1 | None |
| 2,000 gallon methanol storage tank | 18 | 18 | Submerged Fill Pipe |
| Waukesha Model F3524GSI natural gas-fired compressor engine rated at 840 bhp | 19 | 19 | Catalytic Converter |
| Waukesha model F3524GSI compressor engine rated at a maximum capacity of 840 bhp | 20 | 20 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 21 | 21 | Catalytic Converter |
| Waukesha Model 2895G natural gas-fired compressor engine rated at 313 bhp | 22 | 22 | Catalytic Converter |
| Caterpillar Model G3406TA natural gas-fired compressor engine rated at 292 bhp | 23 | 23 | Catalytic Converter |
| One natural gas-fired hot oil heater rated at approximately 6 million Btu/hr | 25 | 25 | None |
| One natural gas-fired hot oil heater rated at approximately 2 million Btu/hr | 26 | 26 | None |
| One natural gas-fired glycol regenerator reboiler rated at approximately 0.818 million Btu/hr | 27 | 27 | None |
| NGL storage tank with a capacity of approximately 500 gallons | 28 | 28 | None |
| One natural gas-fired hot oil heater rated at approximately 7.9 million Btu/hr | 29 | 29 | None |

* Only one Caterpillar G398 engine may operate at any time.

** To be removed upon startup of the new equipment outlined below.

5. New Equipment at the Facility: New equipment to be added includes additional natural gas processing equipment with the capability of processing approximately 40 million standard cubic feet of natural gas per day. New emission units will consist of the following:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 30 | 30 | Oxidation Catalyst |
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 31 | 31 | Oxidation Catalyst |
| One natural gas-fired regeneration gas heater rated at approximately 5.7 million Btu/hr | 32 | 32 | None |
| One natural gas-fired hot oil heater rated at approximately 4.3 million Btu/hr | 33 | 33 | None |
| Emergency flare | 34 | 34 | None |

C. **Owner/Operator (Permit Applicant)**:

1. Name: Targa Badlands LLC
2. Address: 1000 Louisiana Street, Suite 4300
   Houston, TX 77002-5036
3. Application Date: July 28, 2014

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from the operation of the new source unit(s) identified in Item I.B of this Permit to Construct (hereafter referred to as "permit") are as follows. Source units not listed are subject to the applicable emission limits specified in the North Dakota Air Pollution Control Rules.

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 30 | 30 | $NO_x$<br>CO<br>Opacity | 1.52 lb/hr<br>0.86 lb/hr<br>20%(40%**) |
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 31 | 31 | $NO_x$<br>CO<br>Opacity | 1.52 lb/hr<br>0.86 lb/hr<br>20%(40%**) |
| One natural gas-fired regeneration gas heater rated at approximately 5.7 million Btu/hr | 32 | 32 | Opacity | 20%(40%**) |

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| One natural gas-fired hot oil heater rated at approximately 4.3 million Btu/hr | 33 | 33 | Opacity | 20%(40%**) |
| Emergency flare | 34 | 34 | Opacity | 20%(60%**) |

* If applicable, an engine must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ and 40 CFR 63, Subpart ZZZZ.

** Permissible for not more than one six-minute period per hour.

Emission limits from certain existing emission units are as follows:

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Waukesha L7042GSIU engine rated at 900 bhp | 1 | 1 | $NO_x$<br>CO<br>Opacity | 1.98 lb/hr***<br>7.93 lb/hr***<br>20%(40%**) |
| Caterpillar G342 engine rated at 265 bhp | 3 | 3 | $NO_x$<br>CO<br>Opacity | 0.58 lb/hr***<br>2.33 lb/hr***<br>20%(40%**) |
| Waukesha F3524GSI engine rated at 840 bhp | 4 | 4 | $NO_x$<br>CO<br>Opacity | 1.85 lb/hr***<br>3.70 lb/hr<br>20%(40%**) |
| Caterpillar G3408TA engine rated at 335 bhp | 5 | 5 | $NO_x$<br>CO<br>Opacity | 0.74 lb/hr***<br>1.48 lb/hr***<br>20%(40%**) |
| Caterpillar G398 engine rated at 700 bhp | 6 | 6 | $NO_x$<br>CO<br>Opacity | 3.08 lb/hr<br>6.17 lb/hr***<br>20%(40%**) |
| Caterpillar G398 engine rated at 700 bhp | 7 | 7 | $NO_x$<br>CO<br>Opacity | 3.08 lb/hr<br>6.17 lb/hr***<br>20%(40%**) |
| Waukesha F3524GSI engine rated at 840 bhp | 20 | 20 | $NO_x$<br>CO<br>Opacity | 1.85 lb/hr<br>1.85 lb/hr***<br>20%(40%**) |

* If applicable, an engine must also comply with NOx, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ and 40 CFR 63, Subpart ZZZZ.

** Permissible for not more than one six-minute period per hour.

*** Emission limit changed with this permit action.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engines shall be constructed to at least 1.5 times the nearby building height. A nearby building is any building located a distance of less than five times the building height from the stack. In addition, the following emission points shall meet minimum stack heights as follows:

| Emission Unit Description | EU | EP | Minimum Stack Height (feet) |
|---|---|---|---|
| Waukesha L7042GSIU engine rated at 900 bhp | 1 | 1 | 46.0 |
| Caterpillar G342 engine rated at 265 bhp | 3 | 3 | 46.0 |
| Waukesha F3524GSI engine rated at 840 bhp | 4 | 4 | 24.5 |
| Caterpillar G342 engine rated at 335 bhp | 5 | 5 | 46.0 |
| Waukesha Model F3524GSI engine rated at 840 bhp | 19 | 19 | 24.5 |
| Waukesha Model F3524GSI engine rated at 840 bhp | 20 | 20 | 24.5 |
| Waukesha Model 2895G engine rated at 313 bhp | 21 | 21 | 40.0 |
| Waukesha Model 2895G engine rated at 313 bhp | 22 | 22 | 40.0 |
| Caterpillar Model G3406TA engine rated at 292 bhp | 23 | 23 | 40.0 |
| Caterpillar Model G3516B engine rated at 1,380 bhp and manufactured in 2014 | 30 | 30 | 50.0 |
| Caterpillar Model G3516B engine rated at 1,380 bhp and manufactured in 2014 | 31 | 31 | 50.0 |

D. **Emissions Testing**:

1. Initial Testing: Within 180 days after initial startup, the permittee shall conduct emissions tests at those emission points directed by the Department using an independent testing firm, to determine the compliance status of the facility with respect to the emission limits specified in Condition II.A.1. Emissions testing shall be conducted for the pollutant(s) listed below in accordance with EPA Reference Methods listed in 40 CFR 60, Appendix A. Test methods other than those listed below may be used upon approval by the Department.

| Emission Unit Description | EP | Pollutant/ Parameter |
|---|---|---|
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 30 | $NO_x$<br>CO |
| Caterpillar Model G3516B natural gas-fired compressor engine rated at 1,380 bhp and manufactured in 2014 | 31 | $NO_x$<br>CO |

A signed copy of the test results shall be furnished to the Department within 60 days of the test date. The basis for this condition is NDAC 33-15-01-12 which is hereby incorporated into this permit by reference. To facilitate preparing for and conducting such tests, and to facilitate reporting the test results to the Department, the owner/operator shall follow the procedures and formats in the Department's Emission Testing Guideline.

2. Notification: The permittee shall notify the Department using the form in the Emission Testing Guideline, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the

Department. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department at least five days prior to the scheduled test date and coordinate a new test date with the Department.

3. Sampling Ports/Access: Sampling ports shall be provided downstream of all emission control devices and in a flue, conduit, duct, stack or chimney arranged to conduct emissions to the ambient air.

   The ports shall be located to allow for reliable sampling and shall be adequate for test methods applicable to the facility. Safe sampling platforms and safe access to the platforms shall be provided. Plans and specifications showing the size and location of the ports, platform and utilities shall be submitted to the Department for review and approval.

4. Other Testing:

   a) The Department may require the permittee to have tests conducted to determine the emission of air contaminants from any source, whenever the Department has reason to believe that an emission of a contaminant not addressed by the permit applicant is occurring, or the emission of a contaminant in excess of that allowed by this permit is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. A signed copy of the test results shall be furnished to the Department within 60 days of the test date.

      All tests shall be made and the results calculated in accordance with test procedures approved by the Department. All tests shall be made under the direction of persons qualified by training or experience in the field of air pollution control as approved by the Department.

   b) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

F. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

G. **40 CFR 60, Subpart JJJJ**: If applicable, the facility must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

H. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the following address:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

I. **40 CFR 60, Subpart OOOO**: The owner/operator must comply with all applicable requirements of 40 CFR 60, Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the above address.

J. **40 CFR 63, Subpart HH**: The owner/operator must comply with all applicable requirements of 40 CFR 63, Subpart HH – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the above address.

K. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

L. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

M. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

N. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

O. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

P. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

Q. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

R. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

S. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08-01 – Internal Combustion Engine Emissions Restricted.

T. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

U. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

V. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

W. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

X. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

Y. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

Z. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

AA. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become,

upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

BB. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 10/23/14

By _____
Terry L. O'Clair, P.E.
for Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

October 23, 2014

FILE

Ms. Melanie Roberts
Targa Badlands LLC
1000 Louisiana, Ste 4300
Houston, TX 77002-5036

Re: Air Pollution Control
Permit to Construct

Dear Ms. Roberts:

Pursuant to the Air Pollution Control Rules of the State of North Dakota, the Department of Health has completed final review of your application dated to modify the Little Missouri Gas Plant in McKenzie County, North Dakota.

Based on the results of the documents reviewed, this Department hereby issues the enclosed North Dakota Air Pollution Control Permit to Construct Nos. PTC14059 (for the Little Missouri Gas Plant) and PTC14061 (for the Smokey Gathering System CDP). Permit to Construct No. PTC14061 establishes emission limits and stack height requirements for existing emission units to demonstrate compliance with the ambient air quality standards.

Please advise the Department within 15 days after completing the project to allow for an inspection by the Department.

Note that the above-referenced permit addresses only air quality requirements applicable to your facility. Other divisions (Water Quality, Waste Management and Municipal Facilities) within the Environmental Health Section may have additional requirements. Contact information for the various divisions is listed at the bottom of this letter.

If you have any questions regarding air quality, please contact me at (701)328-5188.

Sincerely,

Craig D. Thorstenson
Environmental Engineer
Division of Air Quality

CDT:saj
Enc:

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# AIR POLLUTION CONTROL PERMIT TO CONSTRUCT

Pursuant to Chapter 23-25 of the North Dakota Century Code, and the Air Pollution Control Rules of the State of North Dakota (Article 33-15 of the North Dakota Administrative Code), and in reliance on statements and representations heretofore made by the owner designated below, a Permit to Construct is hereby issued authorizing such owner to construct and initially operate the source unit(s) at the location designated below. This Permit to Construct is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Health and to any conditions specified below:

## I. General Information:

A. **Permit to Construct Number**: PTC14061

B. **Source**:

1. Name: Smokey Gathering System CDP
2. Location: SW ¼, NW ¼, Sec. 29, T149N, R98W McKenzie County, North Dakota
3. Source Type: Compressor Station
4. Existing Equipment at the Facility:

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| Caterpillar G3512LE natural gas-fired compressor engine (4SLB) rated at 1,004 bhp manufactured April 19, 2001 | 1 | 1 | Oxidation Catalyst |
| NG 8.1 NA natural gas-fired generator engine (4SRB) rated at 118 bhp manufactured in 2011 | 2 | 2 | None |
| Two 400 bbl water/slop storage tanks | 5-6 | 4-5 | Submerged Fill Pipe |
| Caterpillar G3516TALE natural gas-fired compressor engine (4SLB) rated at 1,340 bhp manufactured July 15, 2008 | 7 | 6 | Oxidation Catalyst |
| Tri-ethylene glycol (TEG) reboiler rated at 0.675 MM Btu/hr and fired on condenser overhead gas or natural gas | 8 | 7 | None |

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment |
|---|---|---|---|
| TEG dehydration unit rated at 22 MM scfd | 9 | 7 | Condenser & Reboiler* |
| Waukesha L7042GL natural gas-fired compressor engine (4SLB) rated at 1,480 bhp manufactured August 28, 1992 | 10 | 8 | Oxidation Catalyst |
| Fugitive emissions | FUG | FUG | None |

* Emissions from the TEG dehydration unit flash tank are combusted as fuel or recycled back into the process. Emissions from the regenerator are controlled by a condenser and by combusting gases exiting the condenser in the TEG reboiler firebox.

This permit does not authorize the installation/operation of any new equipment at the facility. The permit changes existing emission limits and establishes minimum stack heights for existing equipment.

C. **Owner/Operator (Permit Applicant)**:

1. Name: Targa Badlands LLC
2. Address: 1000 Louisiana Street, Suite 4300
   Houston, TX 77002-5036
3. Application Date: July 28, 2014

II. **Conditions**: This Permit to Construct allows the construction and initial operation of the above-mentioned new or modified equipment at the source. The source may be operated under this Permit to Construct until a Permit to Operate is issued unless this permit is suspended or revoked. The source is subject to all applicable rules, regulations, and orders now or hereafter in effect of the North Dakota Department of Health and to the conditions specified below.

A. **Emission Limits**: Emission limits from certain existing emission units are as follows:

| Emission Unit Description | EU | EP | Pollutant / Parameter | Emission Limit* |
|---|---|---|---|---|
| Caterpillar G3512LE engine | 1 | 1 | $NO_x$<br>CO<br>Opacity | 2.21 lb/hr***<br>0.33 lb/hr***<br>20%(40%**) |
| Caterpillar G3516TALE engine | 7 | 6 | $NO_x$<br>CO<br>Opacity | 2.95 lb/hr****<br>0.39 lb/hr****<br>20%(40%**) |
| Waukesha L7042GL engine | 10 | 8 | $NO_x$<br>CO<br>Opacity | 3.26 lb/hr***<br>0.62 lb/hr***<br>20%(40%**) |

* If applicable, an engine must also comply with $NO_x$, CO and VOC emission limits established in 40 CFR 60, Subpart JJJJ and 40 CFR 63, Subpart ZZZZ.

** Permissible for not more than one six-minute period per hour.

*** Emission limit changed with this permit action.

**** New lb/hr emission limit established with this permit action.

B. **Fuel Restriction**: All equipment at the facility is restricted to combusting only natural gas containing no more than 2 grains of sulfur per 100 standard cubic feet.

C. **Stack Heights**: The stack heights of the engines shall be constructed to at least 1.5 times the nearby building height. A nearby building is any building located a distance of less than five times the building height from the stack. In addition, the following emission points shall meet minimum stack heights as follows:

| Emission Unit Description | EU | EP | Minimum Stack Height (feet) |
|---|---|---|---|
| Caterpillar G3512LE engine | 1 | 1 | 50.0 |
| Caterpillar G3516TALE engine | 7 | 6 | 50.0 |
| Waukesha L7042GL engine | 10 | 8 | 50.0 |

D. **Like-Kind Engine Replacement**: This permit allows the permittee to replace the existing compressor engine with a like-kind engine. Replacement is subject to the following conditions:

1. The Department must be notified within 10 days after change-out of the engine.

2. The replacement engine shall operate in the same manner, provide no increase in throughput and have equal or less emissions than the engine it is replacing.

3. The date of manufacture of the replacement engine must be included in the notification. The facility must comply with any applicable federal standards (e.g. NSPS, MACT) triggered by the replacement.

4. The replacement engine is subject to the same state emission limits as the existing engine in addition to any NSPS or MACT emission limit that is applicable. Testing shall be conducted to confirm compliance with the NOx and CO emission limits within 180 days after start-up of the new engine using EPA Reference Methods in 40 CFR 60, Subpart A.

E. **40 CFR 60, Subpart JJJJ**: The owner/operator must comply with all applicable requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

F. **40 CFR 63, Subpart ZZZZ**: The compressor engines are subject to 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the following address:

U.S. EPA Region 8
1595 Wynkoop Street
Mail Code 8ENF – AT
Denver, CO 80202-1129

G. **40 CFR 60, Subpart OOOO**: The owner/operator must comply with all applicable requirements of 40 CFR 60, Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the above address.

H. **40 CFR 63, Subpart HH**: The owner/operator must comply with all applicable requirements of 40 CFR 63, Subpart HH – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities. For this subpart, EPA Region 8, not the North Dakota Department of Health, is the implementing and enforcement authority. All documentation required by this subpart must be submitted to EPA at the above address.

I. **Organic Compounds Emissions**: The permittee shall comply with all applicable requirements of NDAC 33-15-07 – Control of Organic Compounds Emissions.

J. **Construction**: Construction of the above described facility shall be in accordance with information provided in the permit application as well as any plans, specifications and supporting data submitted to the Department. The Department shall be notified ten days in advance of any significant deviations from the specifications furnished. The issuance of this Permit to Construct may be suspended or revoked if the Department determines that a significant deviation from the plans and specifications furnished has been or is to be made.

Any violation of a condition issued as part of this permit to construct as well as any construction which proceeds in variance with any information submitted in the application, is regarded as a violation of construction authority and is subject to enforcement action.

K. **Startup Notice**: A notification of the actual date of initial startup shall be submitted to the Department within 15 days after the date of initial startup.

L. **Permit Invalidation**: This permit shall become invalid if construction is not commenced within eighteen months after issuance of such permit, if construction is

discontinued for a period of eighteen months or more; or if construction is not completed within a reasonable time.

M. **Fugitive Emissions**: The release of fugitive emissions shall comply with the applicable requirements in NDAC 33-15-17.

N. **Annual Emission Inventory/Annual Production Reports**: The owner/operator shall submit an annual emission inventory report or an annual production report, upon request, on forms supplied or approved by the Department.

O. **Source Operations**: Operations at the installation shall be in accordance with statements, representations, procedures and supporting data contained in the initial application, and any supplemental information or application(s) submitted thereafter. Any operations not listed in this permit are subject to all applicable North Dakota Air Pollution Control Rules.

P. **Alterations, Modifications or Changes**: Any alteration, repairing, expansion, or change in the method of operation of the source which results in the emission of an additional type or greater amount of air contaminants or which results in an increase in the ambient concentration of any air contaminant, must be reviewed and approved by the Department prior to the start of such alteration, repairing, expansion or change in the method of operation.

Q. **Air Pollution from Internal Combustion Engines**: The permittee shall comply with all applicable requirements of NDAC 33-15-08-01 – Internal Combustion Engine Emissions Restricted.

R. **Recordkeeping**: The owner/operator shall maintain any compliance monitoring records required by this permit or applicable requirements. The owner/operator shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report or application. Support information may include all calibration and maintenance records and all original strip-chart recordings/computer printouts for continuous monitoring instrumentation, and copies of all reports required by the permit.

S. **Nuisance or Danger**: This permit shall in no way authorize the maintenance of a nuisance or a danger to public health or safety.

T. **Malfunction Notification**: The owner/operator shall notify the Department of any malfunction which can be expected to last longer than twenty-four hours and can cause the emission of air contaminants in violation of applicable rules and regulations.

U. **Operation of Air Pollution Control Equipment**: The owner/operator shall maintain and operate all air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.

V. **Transfer of Permit to Construct**: The holder of a permit to construct may not transfer such permit without prior approval from the Department.

W. **Right of Entry**: Any duly authorized officer, employee or agent of the North Dakota Department of Health may enter and inspect any property, premise or place at which the source listed in Item I.B of this permit is located at any time for the purpose of ascertaining the state of compliance with the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

X. **Other Regulations**: The owner/operator of the source unit(s) described in Item I.B of this permit shall comply with all State and Federal environmental laws and rules. In addition, the owner/operator shall comply with all local burning, fire, zoning, and other applicable ordinances, codes, rules and regulations.

Y. **Permit Issuance**: This permit is issued in reliance upon the accuracy and completeness of the information set forth in the application. Not withstanding the tentative nature of this information, the conditions of this permit herein become, upon the effective date of this permit, enforceable by the Department pursuant to any remedies it now has, or may in the future have, under the North Dakota Air Pollution Control Law, NDCC Chapter 23-25. Each and every condition of this permit is a material part thereof, and is not severable.

Z. **Odor Restrictions**: The owner/operator shall not discharge into the ambient air any objectionable odorous air contaminant which is in excess of the limits established in NDAC 33-15-16.

FOR THE NORTH DAKOTA
DEPARTMENT OF HEALTH

Date 10/23/14

By James J Semerad
Terry L. O'Clair, P.E.
for Director
Division of Air Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

August 16, 2010

North Dakota Pollutant Discharge Elimination System (NDPDES)
General Permit for Stormwater Discharges from Construction Activity
NOTICE OF COVERAGE

Permittee(s)

Owner Contact: Jim Nichols
Saddle Butte Pipeline LLC
1970 East 3rd Ave, Suite 205
Durango, CO 81301

Operator Contact: Matt Cook
Sunland Construction
PO Box 249
Aztec NM 87410

Coverage under the 2009 reissued construction general permit (NDR10-0000) is identified as follows:

| Permit ID: | Site Name: |
|---|---|
| **NDR103419** | **Grasslands Gathering** |

Please remember to update the Stormwater Pollution Prevention (SWPP) plan as appropriate for site conditions. The best management practices (BMPs) and temporary structures must be inspected, maintained and adjusted until the site is stabilized following construction activities. Once the site is stabilized as outlined in the general permit, you may end permit coverage by filing a termination notice. Cities or counties may impose additional requirements and/or specific BMPs for construction affecting their storm drainage system. Please check with the local officials to be sure all local stormwater management considerations are addressed.

Additional Information

The permit conditions, forms and related information may be found on our web site at:

www.ndhealth.gov/wq/Storm/Construction/ConstructionHome.htm

Should you have any questions on the permit, please contact a stormwater staff person listed below.

Randy Kowalski
Division of Water Quality
701.328.5239
rkowalsk@nd.gov

cc: Tyson Kubas, Kadrmas Lee & Jackson Inc

SADDLE BUTTE PIPELINE, LLC

January 19 2012

Mr. Keith Hinnenkamp
North Dakota Department of Health
Division of Air Quality
918 E Divide, 2nd Floor
Bismarck, ND 58501-1947

Re: Compliance Status
SBP Little Missouri Gas Plant (PTC11032)
Saddle Butte Pipeline, LLC

Dear Mr. Hinnenkamp:

Saddle Butte Pipeline, LLC (SBP) is herein submitting the compliance status for the SBP Little Missouri Gas Plant as requested in your November 30, 2011 letter and subsequent phone conversations with SBP. Below is a review and status of the facility compliance activities.

**Permit History**

The original Permit to Construct (PTC10041) was issued on September 28, 2010. The Permit was modified to add an additional engine and dehydrator to the facility. The modified permit (PTC11032) was issued on April 12, 2011. The facility started up on July 8, 2011. A notification of startup was submitted to your Department by phone and email shortly thereafter. A request to further modify the facility by adding additional engines, change flare operations, and add additional burners was submitted to the Department in November 2011.

**Current Facility Configuration**

The following permitted equipment has been installed and is currently operating at the facility:

| EP | Description |
|---|---|
| 1 | 900 hp Waukesha L7042GSIU Compressor Engine |
| 3 | 265 hp Caterpillar G342 Compressor Engine |
| 4 | 840 hp Waukesha F3524GSI Compressor Engine |
| 5 | 335 hp Caterpillar G3408TA Compressor Engine |
| 6 | 700 hp Caterpillar G398 Electric Generator[1] |
| 7 | 700 hp Caterpillar G398 Electric Generator[1] |

[1] These units are not yet operational due to part availability. SBP expects they will be operational in March 2012.

858 MAIN AVENUE, SUITE 301 • DURANGO, COLORADO • 81301
PHONE 970-375-3150 • FAX 970-828-2070

| | |
|---|---|
| 8 | 3.80 MMBtu/hr Hot Oil Heater |
| 10 | 30 MMScfd Ethylene Glycol Dehydrator |
| F1 | Flare |

**Performance Testing**

All the engines on site require performance testing to be completed within 180 days of startup. SBP is currently in the process of obtaining quotes from stack testing firms. Testing is planned to occur in late February, 2012. Notification of testing will be submitted at least 30 days prior to testing and the results will be furnished to the Department within 60 days of the testing date.

**Leak Detection and Repair Program**

The Little Missouri Gas Plant is subject to a Leak Detection and Repair (LDAR) per 40 CFR 60 Subpart KKK. Initial tagging and monitoring occurred the week of January 9, 2012. The first semiannual report will be submitted February, 2012.

**Other Federal Regulations**

None of the operating engines onsite are subject to 40 CFR 60 Subpart JJJJ. All units onsite are subject to 40 CFR 63 Subpart ZZZZ area source requirements. SBP will submit initial notification for each subject unit to EPA Region 8 within 30 days. Nothing further is required by Subpart ZZZZ until 2013 when new emission and testing requirements take effect.

Please feel free to contact me at (970) 828-2075 if you have any questions or require additional information.

Sincerely,
SADDLE BUTTE PIPELINE, LLC

David Wait
Vice President, Engineering

GAW:bh

TARGA

1000 Louisiana, Suite 4300
Houston, TX 77002
713.584.1000
www.targaresources.com

September 18, 2013

Mr. Tim Jahraus
North Dakota Department of Health
Division of Air Quality
918 E Divide, 2nd Floor
Bismarck, ND 58501-1947

**RE: Targa Badlands LLC**
**Little Missouri Gas Plant Expansion**
**Startup Notification for PTC 12013**

Dear Mr. Jahraus,

Targa Badlands LLC submitting this 15-day notification for the startup of equipment associated with the PTC 12013. The equipment was started up on September 10, 2013.

Please let me know if you have any questions or need additional information. I can be reached by phone at 713-584-1082 or by email at jpedderson@targaresources.com. Thank you.

Sincerely,

Jeff Pedderson
Sr. Environmental Specialist

Cc: David Low, Targa Badlands

# WARRANTY DEED

Return to:
Karen Rudolf
Saddle Butte Pipeline, LLC
1970 E. 3rd Ave
Durango, CO 81301

OFFICIAL SEAL McKENZIE COUNTY ORGANIZED APRIL 1905 STATE OF NORTH DAKOTA

404407

Return to:
SADDLE BUTTE PIPELINE LLC
1970 E 3RD AVE STE 205
DURANGO CO 81301

County Recorder
McKenzie County
Watford City ND 58854
Page 1 of 2

COUNTY RECORDER, MCKENZIE COUNTY, ND

I certify that this instrument was filed and recorded, 404407
Ann M Johnsrud, County Recorder Fee $13.00
By Jodi Hansen, Deputy Jul 06, 2010 03:30 PM

COUNTY RECORDER ★ McKENZIE COUNTY ★ STATE OF NORTH DAKOTA

Delinquent Taxes and Special Assessments, or Installments of Special Assessments, paid and transfer entered this 6 day of July, 2010.
Frances M. Olson County Auditor
by Renae Hoffmann Deputy

THIS Deed is made this 3rd day of June, 2010, from **Peter E. Rauser and Donna Rauser (Husband and Wife)**, whose address is **P.O. Box 132, Watford City, ND 58854** ("Grantor," whether one or more), to **Saddle Butte Pipeline, LLC** (SBP LLC), whose address is 1970 East 3rd Ave, Suite 205, Durango, Colorado 81301 ("Grantee"). The parties agree as follows:

WITNESSETH, that the Grantor(s), for and in consideration of the sum of one dollar and other valuable consideration to them in hand paid by SBP LLC, the receipt whereof is hereby acknowledged, hereby convey unto SBP LLC, its successors and assigns, forever, all that tract or parcels of land lying and being in **McKenzie County**, state of **North Dakota**, and more specifically described as follows, to wit:

**Township 149 North, Range 98 West of the Fifth Principal Meridian,**
**Sec 30: NE4SE4** (containing 40 acres, more or less)

hereinafter referred to as the Property;

Excepting and reserving to the Grantor(s) herein, their successors and assigns, all oil, oil rights, natural gas, natural gas rights, and other fluid minerals that may be within or under the property of land herein described.

BK
15

TO HAVE AND TO HOLD THE SAME, together with all the hereditaments and appurtenances running with or related to the Property, to SBP LLC, its successors and assigns, forever; and the Grantor(s), for their heirs, executors, and administrators, do covenant with SBP LLC, its successors and assigns, that the Grantor(s), are well seised in fee of the Property that the Grantor(s) have good right to sell and convey the Property in manner and form provided above; that the Property is free from all encumbrances, whatsoever; and that the Grantor(s) shall warrant and defend SBP LLC's quiet and peaceable possession and use of the Property against all persons lawfully claiming interest in the whole or any part of the Property.

IN WITNESS WHEREOF, the Grantor has executed this Grant as of the date first above written.

**GRANTOR:**

Peter E Rauser
**Peter E. Rauser**

Donna Rauser
**Donna Rauser**

**I certify that the full consideration paid for the property described in this deed is** $60,000.00.

**Grantee or Agent** am **Date** 6-23-10

STATE OF North Dakota )
) ss.
COUNTY OF McKenzie )

On this 3rd day of June, 2010, before me personally appeared **Peter E. Rauser**, known to me to be the persons/person named in and who executed the foregoing instrument, and acknowledged to me that he/she/they executed the same.

(Seal)
DEAN MOSTAD
Notary Public
State of North Dakota
My Commission Expires Feb. 15, 2014

Notary Public

STATE OF North Dakota )
) ss.
COUNTY OF McKenzie )

On this 3rd day of June, 2010, before me personally appeared **Donna Rauser**, known to me to be the persons/person named in and who executed the foregoing instrument, and acknowledged to me that he/she/they executed the same.

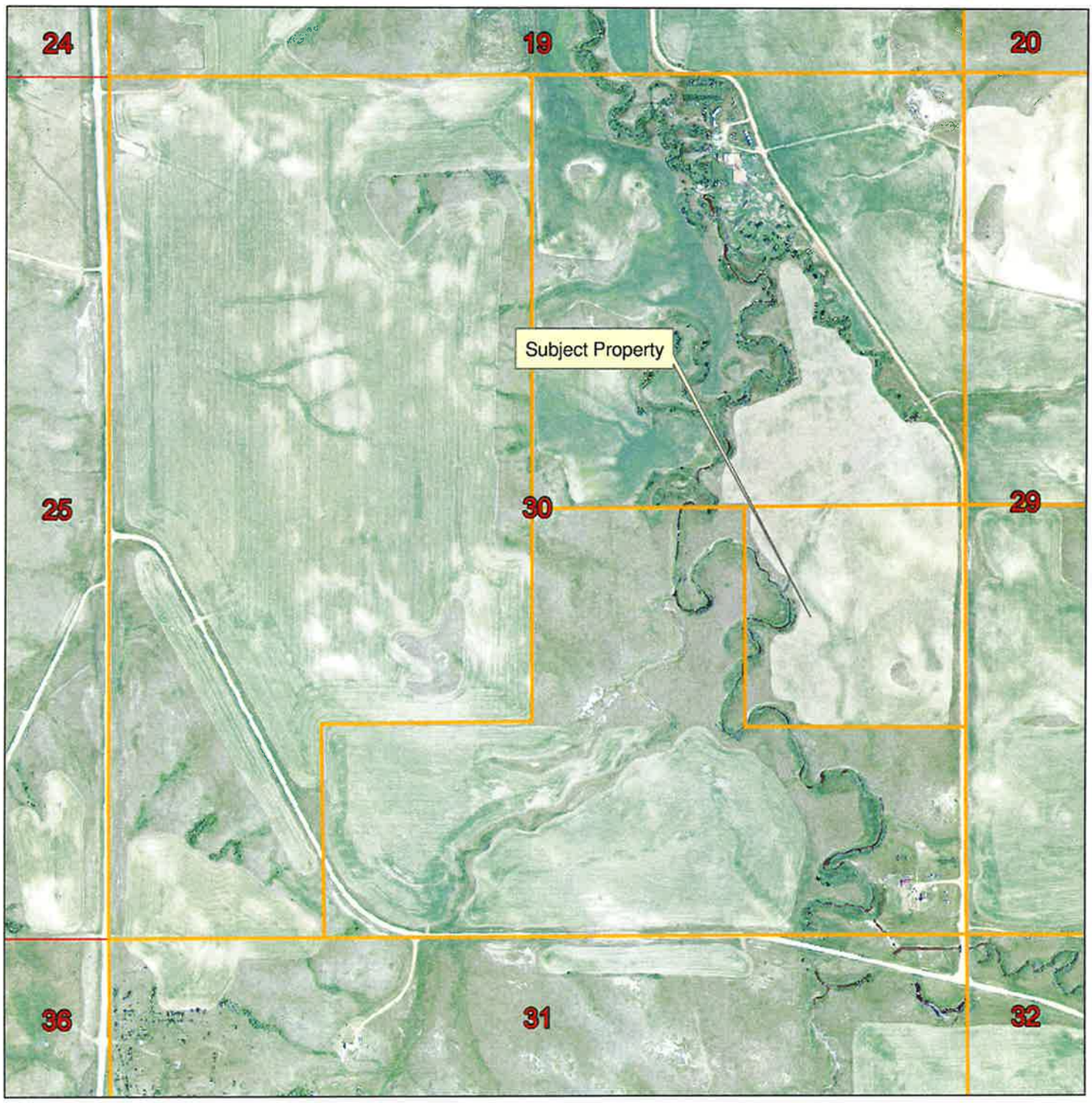
(Seal)
DEAN MOSTAD
Notary Public
State of North Dakota
My Commission Expires Feb. 15, 2014

Notary Public

SADDLE BUTTE PIPELINE, LLC

# Exhibit A

## T149N, R98W




0 1,320 2,640 5,280 Feet

N
W E
S

# LAND USE AGREEMENT

This Land Use Agreement ("Agreement") is entered into as of the 3rd day of June, 2010 by and between **Peter E. Rauser and Donna Rauser**, of **P.O. Box 132, Watford City, ND 58554**, hereinafter referred to as "Grantee" (whether one or more), and **Saddle Butte Pipeline, LLC**, of **1970 East 3rd Ave, Suite 205, Durango, CO 81301**, hereinafter referred to as the "Grantor" (whether one or more) for the purpose of allowing Grantee to use the following described land for the sole purpose of farming in accordance with the terms of this Agreement.

Said real property is situated in **McKenzie County, North Dakota**, and described as follows:

**Township 149 North, Range 98 West of the Fifth Principal Meridian**
**Section 30: NE4SE4,** containing 40 acres, more or less.
Hereinafter the "lands".

WHEREAS:

1) Grantor has purchased above mentioned land for the purposes of creating facilities relating to the Oil and Gas industry.

2) Grantor does not see the immediate need to use all of the above mentioned land for its facilities.

3) Grantor sees advantages to allowing continued farming practices on lands not utilized by the facilities, insofar as any and all farming practices are 100% at the risk of said Grantee(s), and that such continued practices do not interfere with Grantor's use of the land nor cause safety or other operational concerns relating to the facilities.

4) It is the Grantors intention to allow farming of its unused land in NE4SE4 Sec 30 T149N-R98W by Grantees. Any assignment of Grantee's rights hereunder shall be approved by Grantor, in its sole discretion.

5) This agreement shall have a period of 10 years from the date set forth above and is renewable by January 31st, on each 10 year cycle at the election of Grantor.

6) Grantee will make a reasonable attempt to farm lands not being utilized by the above mentioned facilities, annually. Failure to do so will result in termination of this Agreement.

7) Grantee assumes 100% of risk of farming upon said land, and in no case whatsoever, will Grantor be liable for costs, expenses or damages resulting from Grantee's use, access or operations on such lands.

8) This agreement can be cancelled, in writing, by either party at any time.

404408

Return to:
SADDLE BUTTE PIPELINE LLC
1970 E 3RD AVE STE 205

DURANGO CO 81301

County Recorder
McKenzie County
Watford City ND 58854
Page 1 of 3

16

File No. B63242

HAVE SIGNED, NOTARIZED AND RETURN TO
NORTH DAKOTA GUARANTY & TITLE CO. FOR
OUR FILE. NOT FOR RECORDING

SELLER'S/OWNER'S AFFIDAVIT

STATE OF North Dakota
COUNTY OF McKenzie

THE UNDERSIGNED, being first duly sworn, deposes and says: that the seller(s)/owner(s) is the undisputed owner(s) in fee simple of that certain real property located in the County of McKenzie and State of North Dakota, together with all improvements appurtenant thereto, described more fully as:

The Northeast Quarter of the Southeast Quarter (NE¼SE¼) of Section Thirty (30), Township One Hundred Forty-nine (149) North, Range Ninety-eight (98) West of the Fifth Principal Meridian, McKenzie County, North Dakota.

with an address of: rural lands ,

That the undersigned affiant does make and execute this affidavit knowingly, willingly and voluntarily for the purpose of inducing the NORTH DAKOTA GUARANTY AND TITLE CO. and the TITLE INSURANCE COMPANIES to issue a policy of title insurance insuring the title to the above described property, and that the statements contained herein are true and correct to the best of your affiant's knowledge, information and belief.

Your affiant, whether one or more, is over the age of eighteen years of age and is fully and legally competent to sell the above described property without restriction and that they have entered into an agreement to sell the same to the purchasers which agreement was based upon the good-faith, arms-length negotiations between the parties, and that the purchase price agreed upon by the parties is the reasonably equivalent value of the said property as of the date of said agreement.

Your affiant states further that the property owned by them is free and clear of all mortgage liens except those heretofore disclosed on the abstract of title to the above described property. Your affiant further states that there are no parties claiming a leasehold interest in the above described property except as noted herein to wit:

To the best of your affiant's knowledge, information and belief, there are no improvements made upon the above described property within the last ninety (90) days which have not been fully paid for by the affiant and that no person or persons have filed a mechanic's lien notice or mechanic's lien against the property for improvements made thereon and not paid for nor are there any material-men or laborers who are effecting improvements to said property at this time.

Your affiant states further that there have been no judgments filed or transcribed in any court in this state or any other state wherein your affiant is a judgment debtor therein nor are there any pending actions in existence in this state or any other state wherein your affiant is a party thereto which may result in a monetary award and judgment against this affiant. Your affiant further states that to the best of his knowledge, information and belief there are no unrecorded contracts for sale, liens, encumbrances or easements which affect the marketability of title to said property except that which is disclose herein:

Your affiant states that the seller(s)/owner(s) herein identified is not presently a debtor in any bankruptcy proceeding and should such a proceeding be filed in the future, said seller hereby waives any claim or cause of action he, or the trustee in bankruptcy may have with respect to this subject property or the purchasers thereof and the undersigned verily states that this sales transaction is made for full value and in good faith.

**If the seller/owner herein is a corporate entity or partnership, then the affiant herein states that he/she has the authority to execute this affidavit in behalf of said corporation or partnership and that the corporation or partnership does have the legal and corporate authority to enter into a contract for the sale of the above described property and to execute deeds of conveyance with respect thereto without restriction or impairment.**

Notice is hereby given to affiant that there may be discounts applicable in the title insurance premiums. Discounts may apply on a sale or a refinance transaction for which there was a prior title insurance policy, with any title insurance company.

Peter E. Rauser
Peter E. Rauser

Donna Rauser
Donna Rauser

Subscribed and Sworn to me this 3rd day of June, 2010

Notary Public
County of McKenzie State of North Dakota
My Commission expires

DEAN MOSTAD
Notary Public
State of North Dakota
My Commission Expires Feb. 15, 2014

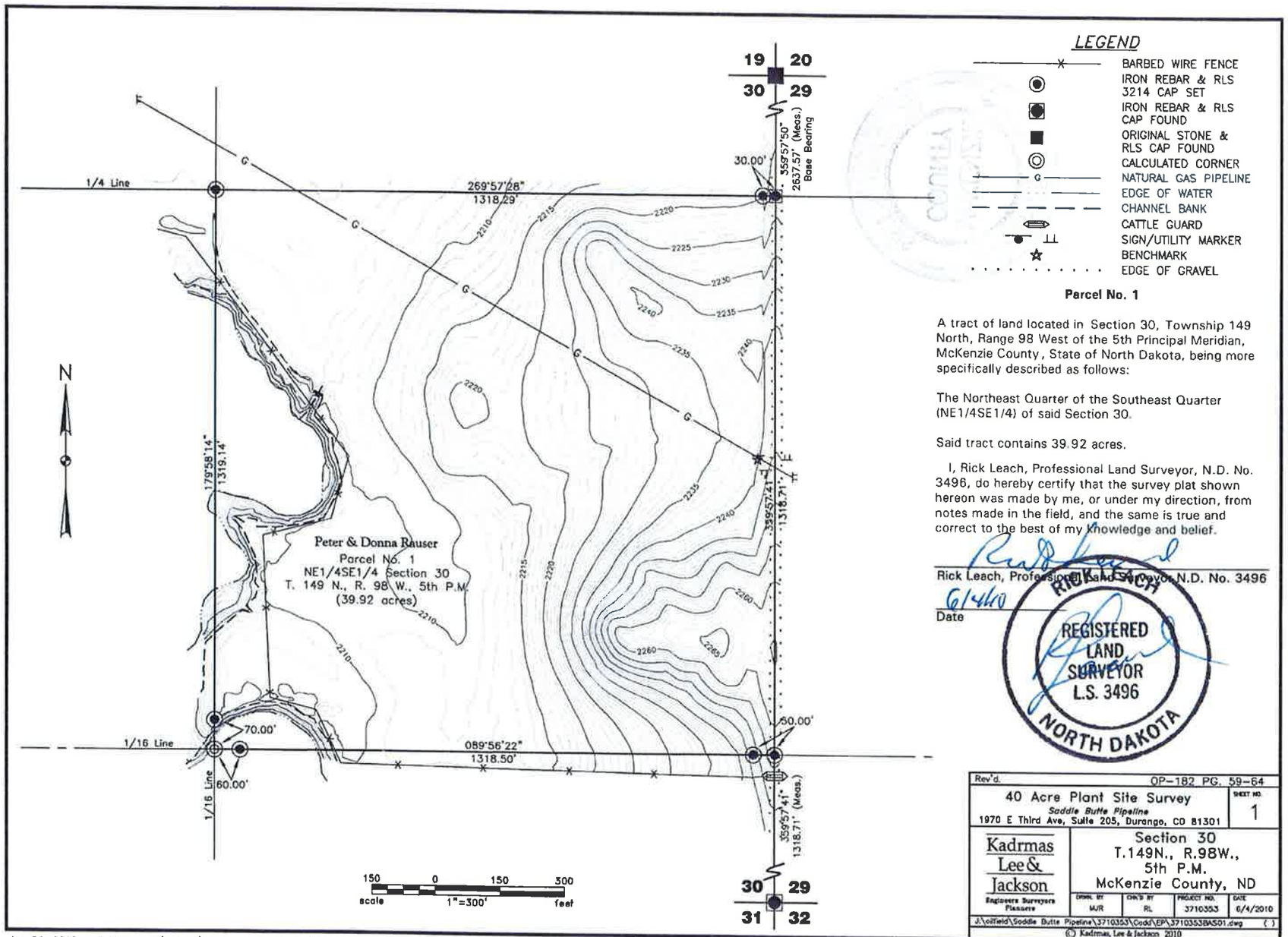
Subscribed and Sworn to me this _____ day of _____, 20 _____

Notary Public
County of _____ State of _____
My Commission expires

404409

County Recorder
McKenzie County
Watford City ND 58854
Page 1 of 3

3pg
26




**Parcel No. 1**

A tract of land located in Section 30, Township 149 North, Range 98 West of the 5th Principal Meridian, McKenzie County, State of North Dakota, being more specifically described as follows:

The Northeast Quarter of the Southeast Quarter (NE1/4SE1/4) of said Section 30.

Said tract contains 39.92 acres.

I, Rick Leach, Professional Land Surveyor, N.D. No. 3496, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.

Rick Leach, Professional Land Surveyor, N.D. No. 3496

6/4/10
Date

RICK LEACH
REGISTERED LAND SURVEYOR
L.S. 3496
NORTH DAKOTA

| | |
|---|---|
| Rev'd. | OP-182 PG. 59-64 |
| 40 Acre Plant Site Survey<br>*Saddle Butte Pipeline*<br>1970 E Third Ave, Suite 205, Durango, CO 81301 | SHEET NO. 1 |
| Kadrmas Lee & Jackson<br>Engineers Surveyors Planners | Section 30<br>T.149N., R.98W.,<br>5th P.M.<br>McKenzie County, ND |
| DRWN. BY MJR | CHK'D BY RL |
| PROJECT NO. 3710353 | DATE 6/4/2010 |
| J:\oilfield\Saddle Butte Pipeline\3710353\Cadd\EP\3710353BAS01.dwg | |
| © Kadrmas, Lee & Jackson 2010 | |

Jun 04, 2010 - 8:41am - J:\oilfield\Saddle Butte Pipeline\3710353\Cadd\EP\3710353BAS01.dwg

# GENERAL WARRANTY DEED

**Return to:**
**Linda Selser**
**Saddle Butte Pipeline, LLC**
**858 Main Ave., Suite 301**
**Durango, CO 81301**

OFFICIAL SEAL McKENZIE COUNTY ORGANIZED APRIL 1905 STATE OF NORTH DAKOTA

425989

Return to:
SADDLE BUTTE PIPELINE LLC
ATTN ALEXANDER DAWSON
858 MAIN AVE STE 301
DURANGO CO 81301

County Recorder
McKenzie County
Watford City ND 58854
Page 1 of 4

COUNTY RECORDER, MCKENZIE COUNTY, ND

I certify that this instrument was filed and recorded, 425989

Ann M Johnsrud, County Recorder Fee $19.00

By Ann M. Johnsrud Nov 16, 2011 03:06 PM

COUNTY RECORDER McKENZIE COUNTY STATE OF NORTH DAKOTA

Delinquent Taxes and Special Assessments, or Installments of Special Assessments, paid and transfer entered this 16 day of Nov., 2011.

Linda Selser County Auditor

by Alexa Hoffmann Deputy

THIS Deed is made this 29th day of October, 2011, from **Vicky Stenehjem,** whose address is Box 916, Watford City, ND 58854 and **Ardis Burkholder,** whose address is 225 Alice Street, Box 183, Gresham, NE 68367, ("Grantor," whether one or more), to **Saddle Butte Pipeline, LLC** ("Saddle Butte"), whose address is 858 Main Avenue, Suite 301, Durango, Colorado 81301. The parties agree as follows:

WITNESSETH, that the Grantor, for and in consideration of the sum of Ten Dollars ($10.00) and other valuable consideration to them in hand paid by Saddle Butte, the receipt whereof is hereby acknowledged, hereby grant, transfer and convey via General Warranty Deed unto Saddle Butte, its successors and assigns forever, all of Grantor's rights, title and interest unto that tract or parcels of land lying and being in **McKenzie County**, **State of North Dakota**, and more specifically described as follows, to wit:

New T1 2163

**Township 149 North, Range 98 West of the Fifth Principal Meridian,**
**Section 30: SE1/4SE1/4 PT,** more accurately described in attached "Exhibit A".

hereinafter referred to as the Property;

This Agreement shall in no way transfer or convey to Saddle Butte any interest in and to any oil, gas, or mineral rights associated with the Property, and all such rights shall be expressly reserved unto the Grantor.

x 4p 19

This General Warranty Deed may be executed in multiple counterparts, each of which shall constitute an original and all of which, when construed together, shall constitute one and the same instrument.

TO HAVE AND TO HOLD THE SAME, together with all the appurtenances running with or related to the Property, to Saddle Butte, its successors and assigns, forever; and the Grantor(s), for their heirs, executors, and administrators, do covenant with Saddle Butte, its successors and assigns, that the Grantor(s) have good right to sell and convey the Property in manner and form provided above; that the Property is free from all encumbrances, whatsoever; and that the Grantor(s) shall warrant and defend Saddle Butte's possession and use of the Property against all persons lawfully claiming interest in the whole or any part of the Property.

IN WITNESS WHEREOF, the Grantor has executed this Warranty Deed as of the date first above written.

**GRANTOR:**

Vicky Stenehjem

**I hereby certify that a statement of full consideration paid has been filed with the North Dakota State Board of Equalization.**

**Signed** am J **Date** 11-16-11

STATE OF ARIZONA )
) ss.
COUNTY OF Maricopa )

On this 28 day of October, 2011, before me personally appeared **Vicky Stenehjem**, known to me to be the persons/person named in and who executed the foregoing instrument, and acknowledged to me that he/she/they executed the same.

(Seal)

OFFICIAL SEAL
RICHARD A. EISLER
NOTARY PUBLIC - State of Arizona
MARICOPA COUNTY
My Comm. Expires March 15, 2014

Notary Public

**GRANTOR:**

**Ardis Burkholder**

STATE OF Nebraska )
) ss.
COUNTY OF York )

On this 29 day of October, 2011, before me personally appeared **Ardis Burkholder**, known to me to be the persons/person named in and who executed the foregoing instrument, and acknowledged to me that he/she/they executed the same.

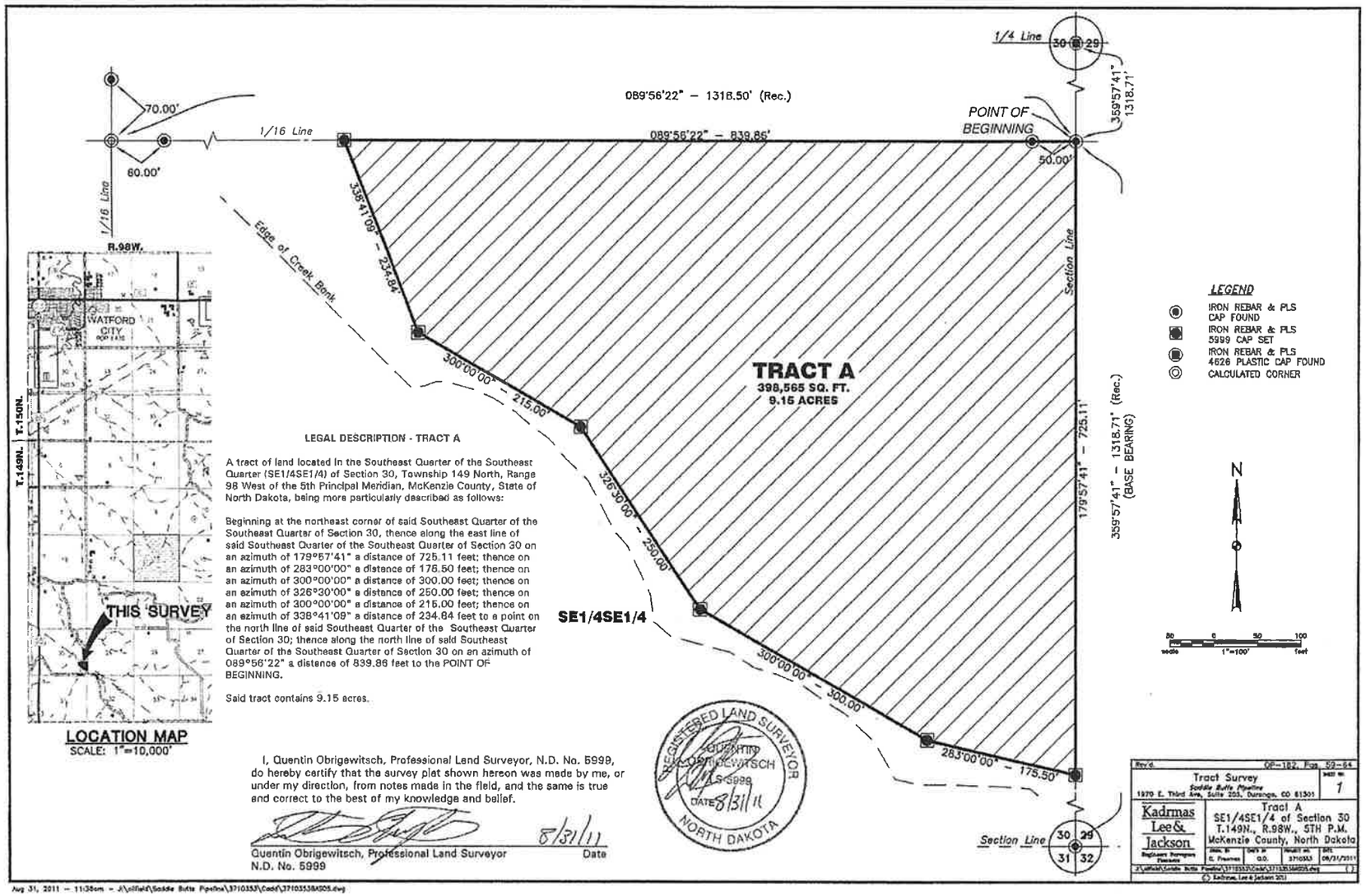
(Seal)

GENERAL NOTARY - State of Nebraska
RITA L. PFLASTERER
My Comm. Exp. Dec. 19, 2011

Notary Public

County Recorder
McKenzie County
Watford City ND 58854

425989




LEGAL DESCRIPTION - TRACT A

A tract of land located in the Southeast Quarter of the Southeast Quarter (SE1/4SE1/4) of Section 30, Township 149 North, Range 98 West of the 5th Principal Meridian, McKenzie County, State of North Dakota, being more particularly described as follows:

Beginning at the northeast corner of said Southeast Quarter of the Southeast Quarter of Section 30, thence along the east line of said Southeast Quarter of the Southeast Quarter of Section 30 on an azimuth of 179°57'41" a distance of 725.11 feet; thence on an azimuth of 283°00'00" a distance of 175.50 feet; thence on an azimuth of 300°00'00" a distance of 300.00 feet; thence on an azimuth of 326°30'00" a distance of 250.00 feet; thence on an azimuth of 300°00'00" a distance of 215.00 feet; thence on an azimuth of 338°41'09" a distance of 234.84 feet to a point on the north line of said Southeast Quarter of the Southeast Quarter of Section 30; thence along the north line of said Southeast Quarter of the Southeast Quarter of Section 30 on an azimuth of 089°56'22" a distance of 839.86 feet to the POINT OF BEGINNING.

Said tract contains 9.15 acres.

I, Quentin Obrigewitsch, Professional Land Surveyor, N.D. No. 5999, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.

Quentin Obrigewitsch, Professional Land Surveyor — Date 8/31/11
N.D. No. 5999

REGISTERED LAND SURVEYOR
QUENTIN OBRIGEWITSCH
LS-5999
DATE 8/31/11
NORTH DAKOTA

Rev'd | QP-182, Pgs. 59-64

Tract Survey
Saddle Butte Pipeline
1970 E. Third Ave, Suite 205, Durango, CO 81301

SHEET NO. 1

Kadrmas Lee & Jackson
Engineers Surveyors Planners

Tract A
SE1/4SE1/4 of Section 30
T.149N., R.98W., 5TH P.M.
McKenzie County, North Dakota

DRAWN BY: C. Fournier | DATE BY: G.O. | PROJECT NO.: 3710353 | DATE: 09/31/2011

J:\oilfield\Saddle Butte Pipeline\3710353\Cadd\3710353SS505.dwg

© Kadrmas, Lee & Jackson 2011

Aug 31, 2011 - 11:38am - J:\oilfield\Saddle Butte Pipeline\3710353\Cadd\3710353SS505.dwg

County Recorder
McKenzie County
Watford City ND 58854

425989

Page 4 of 4

# GENERAL WARRANTY DEED

459388

Return to:

MCKENZIE COUNTY GUARANTY & TITLE CO
PO BOX 510

WATFORD CITY ND 58854

County Recorder
McKenzie County
Watford City ND 58854
Page 1 of 8

COUNTY RECORDER, MCKENZIE COUNTY, ND

I certify that this instrument was filed and recorded, 459388

Ann M Johnsrud, County Recorder Fee $41.00

By Katie R Paulson, deputy Nov 07, 2013 11:31 AM

COUNTY RECORDER
McKENZIE COUNTY
STATE OF NORTH DAKOTA

**After recording return to:**

Mary O'Black
Targa Badlands LLC
1000 Louisiana, Suite 4300
Houston, Texas 77002

W13-0935

THE STATE OF NORTH DAKOTA §
§
COUNTY OF MCKENZIE §

THIS General Warranty Deed is made this 4th day of November, 2013, from **VICKY STENEHJEM** who is joined herein by her husband, **GLENN O. STENEHJEM**, whose address is 521 2nd Avenue SE, Watford City, North Dakota 58854, and **ARDIS BURKHOLDER,** an unmarried individual, whose address is 225 Alice Street, Gresham, Nebraska 68367, (collectively, **"GRANTOR")** to **TARGA BADLANDS LLC**, a Delaware limited liability company, whose address is 1000 Louisiana, Suite 4300, Houston, Texas 77002 **("GRANTEE")**.

Now Therefore, the GRANTOR, for and in consideration of the sum of TEN AND NO/100 DOLLARS ($10.00) and other good and valuable consideration in hand paid by GRANTEE, the receipt and sufficiency of which is hereby acknowledged has GRANTED, SOLD and CONVEYED and by these presents does GRANT, SELL and CONVEY unto the said GRANTEE, its successors and assigns forever, all of the following described property, situated in McKenzie County, State of North Dakota (collectively, the "**Property**"), to-wit:

39.91 acres of land, more or less, located in McKenzie County, North Dakota as more particularly described in Exhibit A attached hereto and made a part hereof for all purposes, together with all improvements thereon and associated rights of way, permits, utilities and utility capacity (if any), and any and all interests of any type owned by GRANTOR in such real property including, without limitation, any easements, adjacent streets, alleys, strips, gores and other appurtenances to such real property (collectively, the "**Property**") except that GRANTOR for GRANTOR and GRANTOR's heirs, successors and assigns reserves from this conveyance all oil, gas and other minerals that are in and under, and that may be produced from the Property but GRANTOR on behalf of GRANTOR and GRANTOR's heirs, successors and assigns waives the right to enter upon the surface of the Property for any purposes including, without limitation, entries for exploration, development or production of oil, gas and/or other minerals or for any purposes incident thereto.

This conveyance is made and accepted subject to all validly existing restrictions, easements, conditions, leases, reservations, exceptions, and ordinances that affect the Property; and taxes for 2013 and subsequent years (the "**Permitted Exceptions**").

TO HAVE AND TO HOLD subject as aforesaid, the Property and premises, together with all and singular the rights and appurtenances thereto in anywise belonging, unto said GRANTEE, its successors and assigns, forever, and GRANTOR hereby bind GRANTOR and GRANTOR's successors and assigns, to Warrant and Forever Defend all and singular the above described Property and premises unto the said GRANTEE and its successors and assigns, against the claims and demands of all persons lawfully claiming or to claim the same or any part hereof, subject, however to the Permitted Exceptions.

I CERTIFY THAT A REPORT OF THE FULL CONSIDERATION PAID FOR THE PROPERTY DESCRIBED IN THIS DEED HAS BEEN FILED WITH THE NORTH DAKOTA STATE BOARD OF EQUALIZATION.

SIGNED: GRANTEE OR AGENT:

TARGA BADLANDS LLC

MMO By: _____

Name: Michael A. Heim

Title: President + COO

DATE: 10/31/2013

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

459388

County Recorder

McKenzie County
Watford City ND 58854

Page 2 of 8

EXECUTED AND DELIVERED effective as of the 4th day of November, 2013.

**"GRANTOR"**

**VICKY STENEHJEM**

**GLENN O. STENEHJEM**

**ARDIS BURKHOLDER**

GRANTEE'S ADDRESS:

Targa Badlands LLC
1000 Louisiana, Suite 4300
Houston, Texas 77002
Attention: Vice President Land and ROW

EXECUTED AND DELIVERED effective as of the 4th day of November, 2013.

**"GRANTOR"**

**VICKY STENEHJEM**

**GLENN O. STENEHJEM**

**ARDIS BURKHOLDER**

GRANTEE'S ADDRESS:

Targa Badlands LLC
1000 Louisiana, Suite 4300
Houston, Texas 77002
Attention: Vice President Land and ROW

## ACKNOWLEDGEMENTS

THE STATE OF NORTH DAKOTA §
§
COUNTY OF MCKENZIE §

On this 4 day of November, in the year 2013 before me personally appeared VICKY STENEHJEM and husband, GLENN O. STENEHJEM, known to me (or proved to me on the oath of _____ _____) to be the persons who are described in and who executed the within instrument, and acknowledged to me that those persons executed the same.

(Seal)

TERI JO WOLFF
Notary Public
State of North Dakota
My Commission Expires September 13, 2017

_____
Notary Public in and for the State of North Dakota

_____
Printed Name
My Commission Expires: _____

THE STATE OF NEBRASKA §
§
COUNTY OF LANCASTER §

On this ____ day of November, in the year 2013 before me personally appeared ARDIS BURKHOLDER, known to me (or proved to me on the oath of _____) to be the persons who are described in and who executed the within instrument, and acknowledged to me that those persons executed the same.

(Seal)

_____
Notary Public in and for the State of Nebraska

_____
Printed Name
My Commission Expires: _____

## ACKNOWLEDGEMENTS

THE STATE OF NORTH DAKOTA §
§
COUNTY OF MCKENZIE §

On this ____ day of November, in the year 2013 before me personally appeared VICKY STENEHJEM and husband, GLENN O. STENEHJEM, known to me (or proved to me on the oath of _____ _____) to be the persons who are described in and who executed the within instrument, and acknowledged to me that those persons executed the same.

_____
Notary Public in and for the State of North Dakota

(Seal)

_____
Printed Name
My Commission Expires: _____

THE STATE OF NEBRASKA §
§
COUNTY OF LANCASTER §

On this 4th day of November, in the year 2013 before me personally appeared ARDIS BURKHOLDER, known to me (or proved to me on the oath of R. Kent Radke) to be the persons who are described in and who executed the within instrument, and acknowledged to me that those persons executed the same.

R K Radke
Notary Public in and for the State of Nebraska

(Seal)

R Kent Radke
Printed Name
My Commission Expires: GENERAL NOTARY - State of Nebraska R KENT RADKE My Comm. Exp. Sept. 13, 2014

County Recorder
McKenzie County
Watford City ND 58854

459388

Page 6 of 8

Delinquent Taxes and Special Assessments, or Installment of Special Assessments, paid and transfer entered this 7th day of November, 20 13.

Linda Svihovec County Auditor
by Brad Sollers Deputy

OFFICIAL SEAL McKENZIE COUNTY ORGANIZED APRIL 1905 STATE OF NORTH DAKOTA

# EXHIBIT A TO GENERAL WARRANTY DEED
# LEGAL DESCRIPTION LAND

## *VICKY STENEHJEM & ARDIS BURKHOLDER*

*NW1/4SW1/4 OF SECTION 29, TOWNSHIP 149 NORTH, RANGE 98 WEST*
*OF THE 5TH PRINCIPAL MERIDIAN, MCKENZIE COUNTY, NORTH DAKOTA*
*EXHIBIT "A"*

TARGA BADLANDS, LLC
40 ACRE SITE

DESCRIPTION: SURVEY

A tract of land located in the Northwest Quarter of the Southwest Quarter (NW1/4SW1/4) of Section 29, Township 149 North, Range 98 West of the 5th Principal Meridian, McKenzie County, State of North Dakota, being more specifically described as follows:

The Northwest Quarter of the Southwest Quarter of Section 29, Township 149, Range 98 West.

Said tract contains 39.91 acres.

459388

Page 7 of 8

County Recorder
McKenzie County
Watford City ND 58854

NOTES:

1. Survey is based on North Dakota State Plane System, NAD83 (98), North Zone, International Foot. Azimuths shown are grid azimuths, distances shown are grid distance. Combined scale factor = 1.0001439 to go from grid distance to ground distance.

REGISTERED LAND SURVEYOR
QUENTIN OBRIGEWITSCH
LS-5999
DATE 10/29/13
NORTH DAKOTA

I, Quentin Obrigewitsch, Professional Land Surveyor, N.D. PLS No. 5999, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief. The field survey was performed by Kirk J. Jorgenson on July 25, 2013.

10/29/13
Date

Quentin Obrigewitsch, Professional Land Surveyor
N.D. PLS No. 5999

FIELD BOOK: OP-341 PGS. 64-70

SHEET 2 OF 2

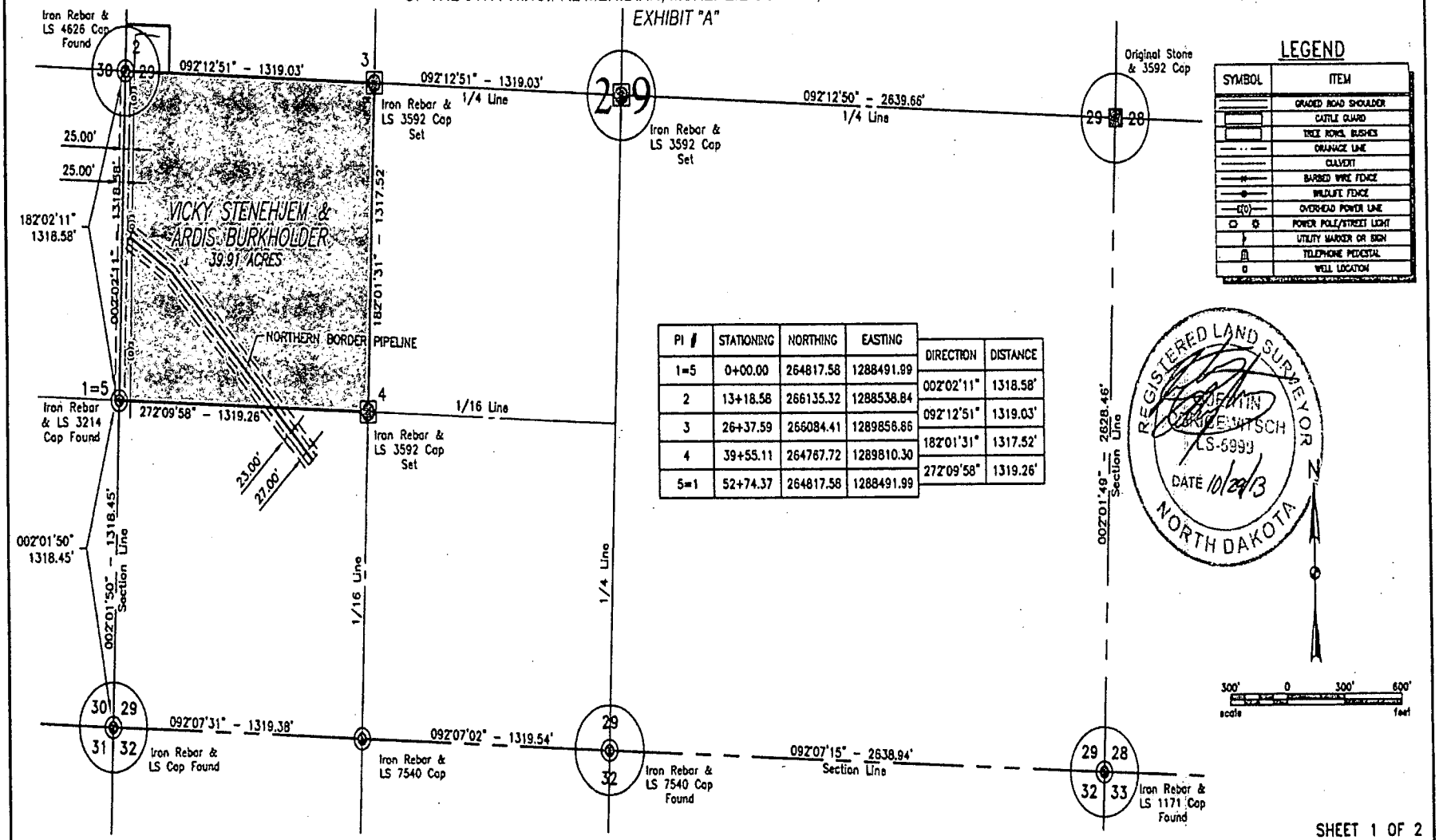
| | | | |
|---|---|---|---|
| KLJ | TARGA<br>1000 Louisiana, Suite 4300<br>Houston, TX 77002 | TARGA GAS PLANT OFFICE 39.91 ACRE SITE<br>MCKENZIE COUNTY, NORTH DAKOTA | DWG NO. 40 ACRE SITE<br>JOB NO. 3713835 |
| DRAWN BY: MATT BAAB | ORIGINAL DATE: 7/29/2013<br>REV. DATE: 10/29/2013 | A TRACT OF LAND LYING IN<br>NW1/4SW1/4 SEC. 29, T.149N., R.98W. | SCALE: NONE<br>PARCEL NUMBER 29-149-98-NW4SW4 |

© KLJ 2013

Oct 29, 2013 – 10:35am – J:\oilfield\Targa\3713835 – Gas Plant Office 40 Acre Tract\Cad\Easement\Current Drawings\Targa Crossland 40 Acre Site_Easement_7-26-2013.dwg
LAYOUT: NW4SW4_29-149-98 (2)

# VICKY STENEHJEM & ARDIS BURKHOLDER

NW1/4SW1/4 OF SECTION 29, TOWNSHIP 149 NORTH, RANGE 98 WEST
OF THE 5TH PRINCIPAL MERIDIAN, MCKENZIE COUNTY, NORTH DAKOTA
EXHIBIT "A"




## LEGEND

| SYMBOL | ITEM |
|---|---|
| | GRADED ROAD SHOULDER |
| | CATTLE GUARD |
| | TREE ROWS, BUSHES |
| | DRAINAGE LINE |
| | CULVERT |
| | BARBED WIRE FENCE |
| | WILDLIFE FENCE |
| | OVERHEAD POWER LINE |
| | POWER POLE/STREET LIGHT |
| | UTILITY MARKER OR SIGN |
| | TELEPHONE PEDESTAL |
| | WELL LOCATION |

| PI # | STATIONING | NORTHING | EASTING |
|---|---|---|---|
| 1=5 | 0+00.00 | 264817.58 | 1288491.99 |
| 2 | 13+18.58 | 266135.32 | 1288538.84 |
| 3 | 26+37.59 | 266084.41 | 1289856.86 |
| 4 | 39+55.11 | 264767.72 | 1289810.30 |
| 5=1 | 52+74.37 | 264817.58 | 1288491.99 |

| DIRECTION | DISTANCE |
|---|---|
| 002°02'11" | 1318.58' |
| 092°12'51" | 1319.03' |
| 182°01'31" | 1317.52' |
| 272°09'58" | 1319.26' |

REGISTERED LAND SURVEYOR
JUSTIN KUBISTSCH
LS-5999
DATE 10/29/13
NORTH DAKOTA

SHEET 1 OF 2

NOTE:
Survey is based on North Dakota State Plane System, NAD83 (96), North Zone, International Foot. Azimuths shown are grid azimuths, distances shown are grid distances. Combined scale factor = 1.0001439 to go from grid distance to ground distance.

FIELD BOOK: OP-341 PGS. 64-70

KLJ
TARGA
1000 Louisiana, Suite 4300
Houston, TX 77002

DRAWN BY: M. BAAB
ORIGIN DATE: 7/25/2013
REV. DATE: 10/29/2013

TARGA GAS PLANT OFFICE 39.91 ACRE SITE
MCKENZIE COUNTY, NORTH DAKOTA

A TRACT OF LAND LYING IN
NW1/4SW1/4 OF SEC. 29, T.149N., R.98W.

DWG NO. 40 ACRE SITE
JOB NO. 3713855
SCALE: 1"=600'
PARCEL NUMBER 29-149-98-NW4SW4

Oct 29, 2013 - 10:45am - J:\oilfield\Targa\3713855 - Gas Plant Office 40 Acre Tract\Cad\Easement\Current Drawings\Targa Grassland 40 Acre Site_Easement_7-26-2013.dwg

© KLJ 2013

LAYOUT: NW4SW4_29-149-98 (1)

## APPLICATION FOR A ZONE CHANGE

**McKenzie County, ND Building and Planning**

Fee: $750.00

Industrial: $750.00
Commercial: $750.00
Agricultural: $250.00
Recreational: $250.00
All Residential: $500.00

McKENZIE COUNTY
Building & Planning Department

*The planning staff is available to discuss this application and answer questions. Once a complete application is received, it will be reviewed by the planning administrator or his designee and then scheduled for a public hearing with the Planning and Zoning Commission, who will make a recommendation to the board of County Commissioners. A second public hearing will be scheduled with the Board of County Commissioners who will make the final decision.*

Date: 3 Nov 2014

Name of Applicant: Targa Badlands LLC Phone: 701-225-6246

Local Agent: Melissa Kilde Phone: 701-527-0009

Address: 1260 W Villard, Dickinson ND 58601

Engineer/Architect/Surveyor: Patrick Perkins Phone: 713-376-5894

Address: 1939 125th Ave NW, Watford City ND 58854

Owner on Record: Targa Badlands LLC Phone: 701-225-6246

Address: 1260 W Villard, Dickinson ND 58601

Existing Zoning: Agricultural Proposed Zoning: Industrial

Surrounding Land Use: Industrial and Agricultural

Legal Description: Section: 29 and 30 Township: 149 Range: 98

Total Acreage:

1. Please provide a one paragraph narrative description of the development project:
*Example: "The project is to construct a housing development in a Residential zoning district. Proposed are X number of units on X number of lots. This application for a Zone Change is requested because the proposed use is not allowed in the existing zoning district. Additional required applications are also requested and included in this development application package."*

Targa owns and operates a gas plant in Sections 29 and 30 of T149N, R98W. It was previously zoned Industrial but was recently rezoned Agricultural. The gas plant is currently operational and planned to continue indefinitely, therefore, we request that the property owned by Targa in Sections 29 and 30 be rezoned back to Industrial so it is an allowed use under the Zoning Ordinances.

2. Has the Zoning Board granted any variance, conditional use, or special permit concerning this property?

| | | | |
|---|---|---|---|
| Applicant | ☒Yes | ☐No | ☐Not Applicable |
| **Office Only** | **☐Yes** | **☐No** | **☐Not Applicable** |

*If so, please describe:*

Conditional Use Permit for bulk storage tanks in Section 30

3. Is any variance from the Zoning Ordinances requested?

| | | |
|---|---|---|
| Applicant | ☐Yes | ☒No |
| **Office Only** | **☐Yes** | **☐No** |

*If so, please describe:*

4. Are all other necessary development application included in a bound application package?

| | | | |
|---|---|---|---|
| Applicant | ☒Yes | ☐No | ☐Not Applicable |
| **Office Only** | **☐Yes** | **☐No** | **☐Not Applicable** |

*If not applicable please explain:*

5. Are the following items attached to the application
   a. Sketch plan displaying lot and building configuration?
   b. Certified survey map or subdivision site plan (if applicable)?

| | | | |
|---|---|---|---|
| Applicant | ☒Yes | ☐No | ☐Not Applicable |
| **Office Only** | **☐Yes** | **☐No** | **☐Not Applicable** |

*If not applicable please explain:*

6. List all contiguous land holdings in the same ownership:
   T149N, R98W, Sec 29: NW/4SW/4, IT 2145 in SW/4NW/4
   T149N, R98W, Sec 30: NE/4SE/4, IT2163 in SE/4SE/4, IT 2790 in E/2NE/4
7. If applicant is not owner of record, attach letter from owner of record concurring with proposed zoning.

IN THE EVENT OF CORPORATE OWNERSHIP: a list of all directors, officers, stockholders of each corporation owning more than five per cent (5%) of any class of stock must be attached.

Attached

Acknowledgement

I hereby certify under penalty of perjury and the laws of the State of North Dakota that the information submitted herein, on all other forms, documents, plans or any other information submitted as part of this application to be true, complete, and accurate to the best of my knowledge. Should any information or representation submitted in connection with this application be incorrect or untrue, I understand and approval based thereon may be rescinded and other enforcement action taken. The signing of this application signifies approval for representatives of McKenzie County to be present on the property for routine monitoring and inspection during the approval and development process.

Targa Badlands LLC

Signature of Applicant: _____ Date: 3 Nov 2014

by Norman L Winter, Asst VP for Land & ROW

Fees are non-refundable

*Please submit all documents back to the McKenzie County Building & Planning Department*

***REQUIRED ITEMS***

1. _ *Narrative that addresses the criteria below.*
2. _ *Ten (10) copies of the Plat of Survey labeled "Change of Zone":*
    a. *Legal Description*
    b. *Vicinity Map showing surrounding properties*
    c. *Current zoning district*
    d. *Requested zoning district*

***CRITERIA FOR RECCOMMENDATION AND DECISIONS***

*Recommendations of the commission and the decisions of the board shall be made a matter of public record in accordance with the North Dakota Century Code. The recommendations and decisions shall specifically find that such changes and reclassifications of zoning districts meet the following criteria:*

- _ *The approval or denial of the application shall be based upon standards and criteria which shall be set forth in the comprehensive plan, zoning ordinance or other appropriate county ordinances or regulations, and particular consideration shall be given to the effects of any proposed zone change upon the delivery of public services, including school districts;*
- _ *The comprehensive plan is considered for compliance and conformance with the goals, policies and objective3s as outlined in the plan and other evidence gathered through the public hearing process;*
- _ *The proposed change will maintain the purposes and objectives of zoning and secure the public health, safety and general welfare;*
- _ *The approval or denial shall be in writing and accompanied by a reasoned statement that explains the criteria and standards considered relevant, states the relevant facts relied upon, and explains the rationale for the decision based upon the applicable provisions of the comprehensive plan, relevant ordinances and statuary provisions, pertinent constitutional principles and factual information contained in the record*

APPLICATION FOR A TEXT AMENDMENT

McKenzie County, ND Building and Planning

Fee: $350.00

__X__ *McKenzie County Comprehensive Plan*

_____ *McKenzie County Zoning Ordinance*

Date: 3 Nov 2014

MCKENZIE COUNTY
Building & Planning Department

Name of Applicant: Targa Badlands LLC Phone: _____

1. Description of Amendment:
   Amend the McKenzie County Comprehensive Plan to reflect the land owned by Targa in T149, R98W, Sec 29 and 30, is zoned Industrial.

2. Element(s) of document to be amended (please include page numbers):

3. Please include the following submittal Requirements:

| Applicant | Office | |
|---|---|---|
| ☒ | ☐ | Cover letter with narrative describing the purpose of the proposed amendment |
| ☒ | ☐ | Legal description or a copy of the deed of the real property to be affected by such change |
| ☒ | ☐ | Copy of the County Assessor's Map identifying subject property and all adjacent properties within 200' |
| ☒ | ☐ | Location Map locating the parcel in the county |

Signature of Applicant: Targa Badlands LLC
by Norman L Winter, Asst VP for Land & ROW Date: 3 Nov 2014

*Please submit all documents back to the McKenzie County Building & Planning Department*

# McKENZIE COUNTY APPROACH PERMIT

Permit TBOS2114RJ

## PERMIT TO CONSTRUCT AN APPROACH TO A COUNTY MAINTAINED ROAD

Revised Application Effective May 12, 2014

Tarpon Badlands of 1260 W Villard, Dickinson, ND 58601

Approach Owner — Address, City, State & Zip

| | Road where approach will be located | Section | Township (N) | Range (W) | Approach Type | If Multifamily, how many units? OR How many trucks per day? | For Official Use Only (Fee) |
|---|---|---|---|---|---|---|---|
| Approach 1 | | 29 | 149 | 98 | | | 500.00 |
| Approach 2 | | 30 | 149 | 98 | | | 500.00 |
| | | | | | | | Total Fee: 1,000 |

**APPROACH USE**

Farm / Field Access (FF)
Limited use. Access to farm land or a field.

Residential- Single Family (SF)
Moderate use. Access to a single family home or farm.

Residential- Multi Family (MF)
High use. Access to muliple homes, farms, temporary housing including work camps.

Commercial (CM)
High truck use. Access to a commercial/industrial instalation.

Oil Pad (OP)
Moderate! truck use. Access to an Oil Pad.

Site Name: _____

Email Address: RJohnston@Tarpanresources.com

_____
**Printed Name of Authorized Agent of the Contractor or Approach Owner** — Telephone Number

WHERE SHOULD THE APPROVED PERMIT BE SENT TO:

R. Patrick Johnston — 281 622-9548
**Approach Owner or Agent Name for Approach Owner** — **Telephone Number**

1260 W Villard, Dickinson, ND 58601
**Address**

**Address**

**City, State & Zip Code**

The Contractor must comply with all terms and conditions stated herein, especially the minimum engineering standards. Failure to comply with this CONDITIONAL CONSENT shall cause the consent to be rescinded and the Contractor must remove the approach from the right-of-way immediately or be responsible for the costs incurred by the County in removing the same. The County specifically reserves the right to remove the approach from right-of-way for non-compliance and reimbursement will be made to the County by the Contractor for doing the same.

PERMIT APPROVED

MAY 21 2014

Approval Stamp

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

13771

*Description of Work:*

Gas Plant Radio Tower

1939 125th Ave NW

Watford City, ND 58854

*Required Inspections*

- Footings/Foundation
- Final

*Date Issued:* 1/15/14

Call 701.444.3616 ext. 1045 for Inspections, no later than 24 hours in advance

*McKenzie County Community Development Department*
*201 5th Street NW*
*Watford City, ND 58854* *mckenziecounty.net*
***Building Department** * Phone: 701-444-3616 ext. 1045*
***Planning Division** * Phone: 701-444-6494 * Fax: 701-444-4113*

Permit No: 13771

# COMMERCIAL BUILDING APPLICATION

**(ALL INFORMATION IS REQUIRED)**

**Plan Submittal Requirements:** You must submit **Two (2) sets** of adequate plans and specifications. Plans and specifications must be drawn to scale, must clearly indicate the location, nature, and extent of the work proposed and must show in detail that it will conform to the provisions of the International Building Code.

**Plans Shall Include:**

1. **A site plan** with the location of the proposed building and all existing buildings. It must include distances between buildings, to property lines, streets, roads, alleys, etc. If required, a handicap accessible route and parking space(s) must also be shown on the site plan.
2. **A dimensioned floor plan** showing interior and exterior walls, opening location and size, operating windows, door swings, door hardware, exit sign locations, and handicapped toilet rooms.
3. **Identification of the use of each room or area** of the building, with a list of materials or supplies to be used or stored, and a description of any product to be **manufactured or service to be performed.**
4. **A dimensioned typical section** through the structure showing footings, foundation, walls, floor, ceilings, roof materials, and details. The roof and floor framing plans must show size and spacing all members.
5. **Materials specification** as appropriate, for example, roofing materials, sheetrock type and thickness, door type and rating, etc.
6. An attached **Commercial Plan Checklist** must be completed. Any missing items on the checklist must be accompanied by an explanation.

Received: RECEIVED DEC 11 2013

**Other Submittal Requirements:**

1. A completed ADA Form
2. The address of the property must be **recorded.**
3. A copy of an approved **Road Approach Permit** must be submitted.
4. A copy of an approved **Septic Permit** must be submitted.
5. **List of utility providers. (Sewer, Gas, Water, Electrical)**
6. A **Subcontractor List** must be submitted.

pjohnston@lonestarlandservices.com
Patrick Johnston

## 1. PROJECT INFORMATION

| | |
|---|---|
| Project Title: | Gas Plant - Radio Tower |
| Address: | 1939 125th Ave NW Watford City ND 58854 |
| Legal Description: | SE 1/4 Section 30, T 149N, Rng 98W Parcel Number: |
| Owner of Property: | Targa Badlands LLC |
| Owner Address: | 1260 West Villard, Dickinson, ND 58601 Phone Number(s): 281-622-9548 |

## 2. CONTRACTOR INFORMATION

| | |
|---|---|
| Company: | ~~TBD~~ BHI |
| Name of Jobsite Supervisor: | Jimmi Glen jglenn@bhico.com |
| Phone Number: | (435) 789-5252 (M) 435-650 9152 |
| ND Contractor License Number: | 39609 |

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | ☒ New Construction | ☐ Alteration | ☐ Addition | ☐ Demolition |
|---|---|---|---|---|
| Location of Work: (ie: Floor, Level) | | SF of Work Being Done: | | |

Describe **in detail** work being done:

## 4. FEE INFORMATION

| | Name & Lic. No. | Bid Amount |
|---|---|---|
| General Contractor | | |
| | **Total Project Cost:** | |

| | | | |
|---|---|---|---|
| Building Permit Fee:<br>Plan Review Fee (65%):<br>Other Fees: | Paid: | Credit Card<br>Check | |
| Total Permit Fee: | | Cash | Received By: |

A member of the Building Inspections Division will notify you when the permit has been created. All permits must be picked up and **a signature is required.** You will be required to post an address sign as well as a copy of the approved permit in a conspicuous place prior to any inspections. Any information that the applicant has set forth in this application that is false or misleading may result in the rejection of the application. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature _____ Date _____

## 5. ZONING/ASSESING INFORMATION (for office use only)

| ☐ New | ☐ Addition | ☐ Alteration | ☐ Demolition | ☐ Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |

| Zoning: | Average Depth of Lot: | Lot Area (sq ft): |
|---|---|---|
| Easement: | | |
| Front Yard Setback | Side Yard Setbacks | Rear Yard Setback |
| | | |
| Area of Main: | Finished Area: | Finished Area Alt / Add: |
| # Required Parking Spaces | Area Required Parking: | Total Area: |
| **Zoning Approval Signature:** | | **Date:** |

## 6. BUILDING CODE INFORMATION (for office use only)

| | |
|---|---|
| Occupancy Classification: | Change of Occupancy: |
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |
| | |

## PROJECT REVIEW

| |
|---|
| Reviewed By: |
| Project Title: |
| Address: |
| Comments: |

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

**ADAAG CONFORMANCE STATEMENT**
**NORTH DAKOTA DEPARTMENT OF COMMERCE/DCS**
**SFN 19701 (01/06)**
(This form must be submitted for new construction, alternations and additions to buildings and facilities subject to the Americans with Disabilities Act)

| **AMERICAN WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) CONFORMANCE STATEMENT** | |
|---|---|
| Name & Building Address | Owner<br>City/County |
| Date Construction to Start | Projected Completion Date |
| Type of Construction<br>New Building ☐ Sq. Ft. _____<br>Addition ☐ Sq. Ft. _____<br>Alteration ☐ Sq. Ft. _____ | |
| Describe Alteration: | |
| Type of Occupancy/Use (Refer to Occupancies and Divisions defined in the International Building Code): | |
| I certify, to the best of my professional judgement, that the plans and specifications for the above referenced building or facility conforms with the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities as adopted in North Dakota Century Code Section 54-21.3-04.1. | |
| _____<br>Name of Design Professional | _____<br>Firm |
| _____<br>Signature | _____<br>Phone Number Date |

**Send To: Division of Community Services**
**1600 East Century Avenue, Suite 2**
**~~PO Box 2057~~**
**Bismarck, ND 58502-2057**

# McKenzie County Building Department

**Project:** Gas Plant Radio Tower

**Permit # 13771**

**Date: November 26, 2013**

## PLAN REVIEW COMMENTS:

The following corrections to the submitted plans, and/or additional documentation are required prior to a Qualified Certificate of Occupancy being issued. Please make these corrections and re-submit to the McKenzie County Building Department, County Courthouse, Ste. 699 (Second Floor) 201 5th Street NW Watford City.

Provide engineering approval of the radio hut. May be stamped drawing or letter.

e-mailed 12/12 Sent to inspector e-mail 12/12/13

**Reviewed By: Kendall Phillips**

These sheets are a part of the plans and shall remain attached thereto.

Rechecked and approved: _____

I certify that this structure will be constructed as amended in these correction sheets.

Signed (Owner or Applicant) _____

December 6, 2013

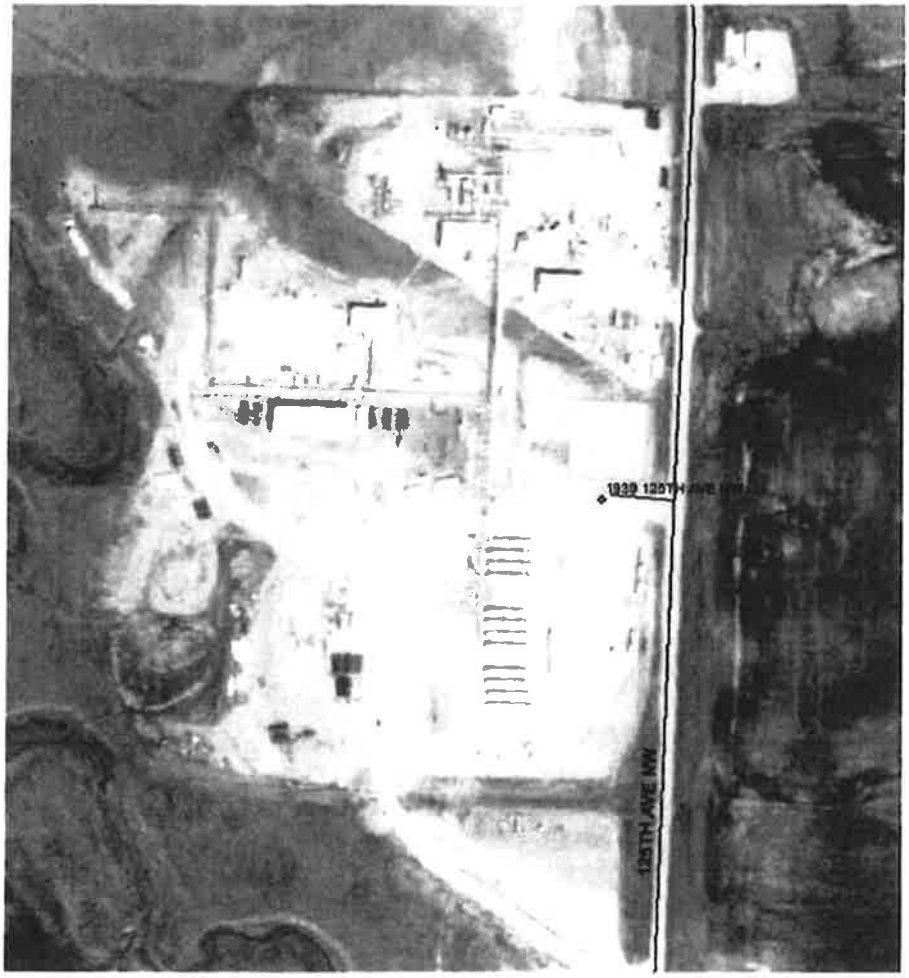
To Whom It May Concern:

The county records show that physical address for:

1939 125th Ave NW

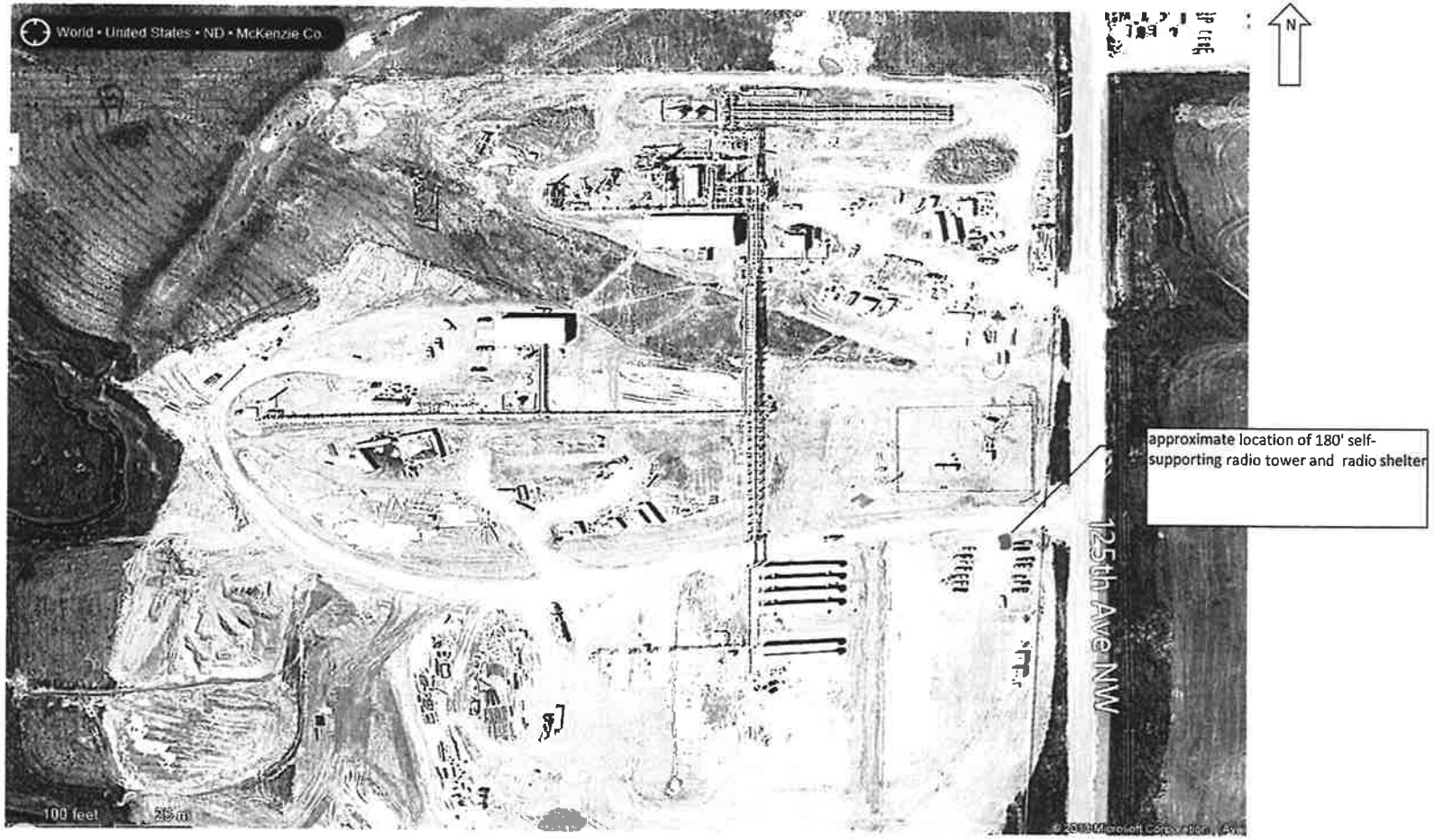
Watford City, ND 58854

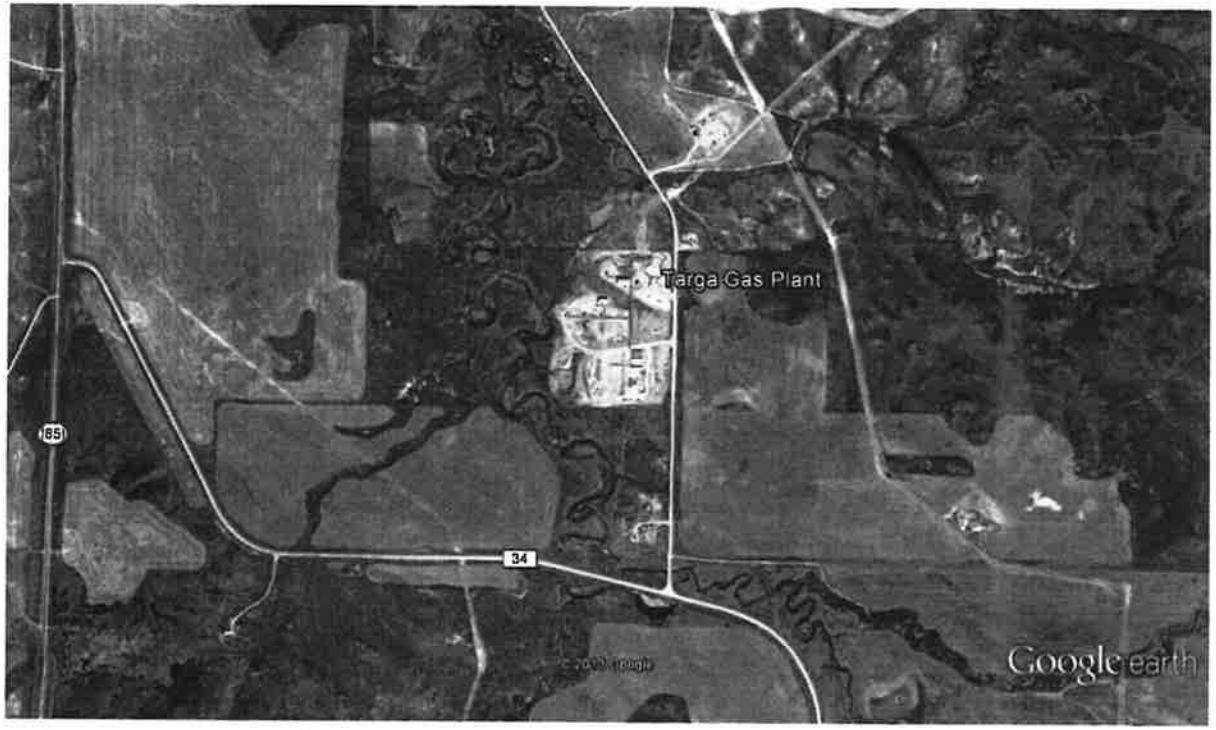
is shown in the Aerial Imagery below.




Sincerely,

Aaron Chisholm
GIS Specialist
McKenzie County, ND
(701) 444-7417


World • United States • ND • McKenzie Co
N
approximate location of 180' self-supporting radio tower and radio shelter
125th Ave NW
100 feet
25 m




Google earth miles 1
km 1

## MATERIAL LIST

| ITEM | QTY | DBI# | VENDOR # | DESCRIPTION |
|---|---|---|---|---|
| 1 | 1 | 6795 | D-J/D60096 | ALUMINUM JOINER DOOR, 5'X7', HINGE LEFT, (3) S.S. HINGES, POLY INSULATION, 3 POINT LOCK, LORI DEADBOLT WITH ARROW CYLINDER, HASP FOR PAD LOCK & REINFORCE FOR DOOR CLOSER, ALUMINUM DRIP CAP, CARPET THRESHOLD, AND ALARM BRACKET |
| 2 | 1<br>2 | 3657<br>5117 | W-232A-UNV-ES81<br>F032/741/CCO | METALUX COOPER W-232A-UNV-ES81-(1' WRAPAROUND, 2 LAMP 4' SSE LISTED ELECTRONIC BALLAST T8 (ELECTRONIC BALLAST)<br>4' FLORESCENT LIGHT BULBS |
| 3 | 2 | 5638 | LEV 1451-2 | LEV 15 AMP 120V 1-POLE GROUNDING BROWN SWITCH |
| 4 | 3 | 3555 | LEV BR20 BR | LEV BR20 BRN DUPLEX RCPT NEMA5-20R |
| 5 | 1<br>1<br>1 | 3565<br>3733<br>3129 | HUB OPTR1SW<br>ICAR E9UVCRN<br>CAR E9801 | 15A-125V WEATHER RESISTANT SMART LOCK PRO GFCI WHITE<br>ICAR E9UVCRN 1G VERT WP CLR COVER<br>CAR E9801 BLANK 1G BOX W/MNT |
| 6 | 1<br>1 | 3707<br>3672 | BAB VXBR1000G<br>75A 48PK 120 | EXTERIOR LIGHT w/GLOBE & GUARD, VAPOR PROOF, 100 WALL BRK<br>75W 120V LIGHT BULBS |
| 7 | 1<br>1 | 3719<br>1469 | STLT1D<br>" | BAB MOTION SENSOR<br>STEEL ENTRANCE PLATE PAINTED 1/2" 4X1 PLATE |
| 8 | 1<br>1<br>1 | 5478<br>1964<br>1965 | W12A2-A05XPXXXJ<br>SG-1 12002<br>RG-1 120020 | HARD T TON, 5 KW HEAT, BEIGE<br>SUPPLY GRILL 17 X 5<br>RETURN GRILL 17 X 10 |
| 9 | 1 | 1975 | 3054-D | THERMOSTAT HONEYWELL, TH5220D1003 |
| 10 | 1<br>1<br>1 | 3042<br>3047<br>1451 | SOD OC124M100<br>QOC24US<br>" | LOAD CENTER 24 CIRCUITS 100 AMP MAIN<br>LOAD CENTER COVER<br>STEEL ENTRANCE PLATE PAINTED 1-1/2" |
| 11 | 1 | 7202 | SES40120/240 | ERICO SURGE PROTECTION SES40 -- 120/240 SURGE PROTECTION |
| 12 | 2 | 1553 | CK109-576 / BG76 | CABLE ENTRY PORT (8-4" PORTS 2X4) |
| 13 | 1 | 4692 | 55053-503 | STANDARD 19" CHATSWORTH RACK |

## SCHEDULE - PANEL

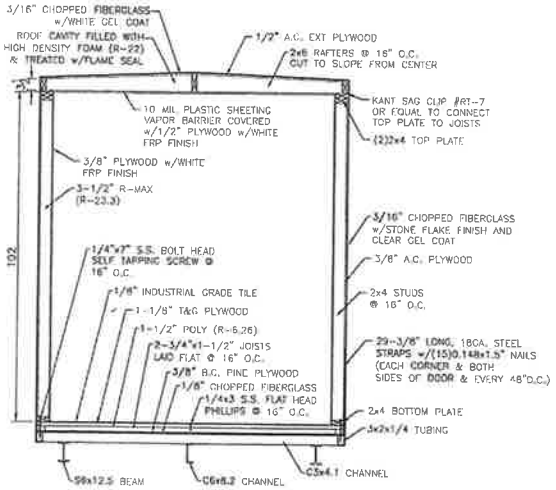
PANEL QA 120/240V 1 PHASE 100 AMP MAIN BREAKER SURFACE MOUNT

| DESCRIPTION | # | I | LOAD | I | # | DESCRIPTION |
|---|---|---|---|---|---|---|
| LIGHTS | 1 | | | | 2 | HVAC |
| SURGE ARRESTOR | 3 | | | | 4 | |
| | 5 | | | | 6 | GFCI RECEPTACLE |
| SPARE | 7 | | | | 8 | RECEPTACLES |
| SPARE | 9 | | | | 10 | SPARE |
| SPARE | 11 | | | | 12 | SPARE |
| SPARE | 13 | | | | 14 | |
| SPARE | 15 | | | | 16 | |
| | 17 | | | | 18 | |
| | 19 | | | | 20 | |
| | 21 | | | | 22 | |
| | 23 | | | | 24 | |
| PHASE LOAD | | | | | | |
| TOTAL LOAD | | | | | | |

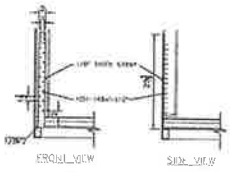
(*) INDICATES CONTINUOUS LOADS TAKEN AT 125%
(**) 5.3 kw HEAT LOAD GREATER THAN 4.0 kw A/C LOAD

SHIP LOOSE LIST

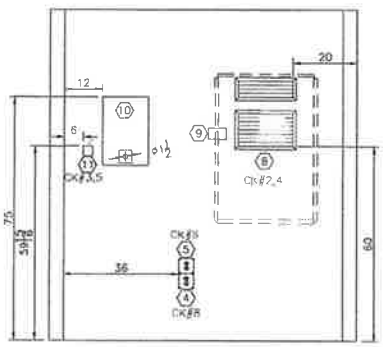
1. (4) HOLD DOWN PLATES
2. (8) 1/8" SHIM PLATES
3. (8) 1/4" SHIM PLATES
4. (1) LIGHT COVER
   (2) BULBS

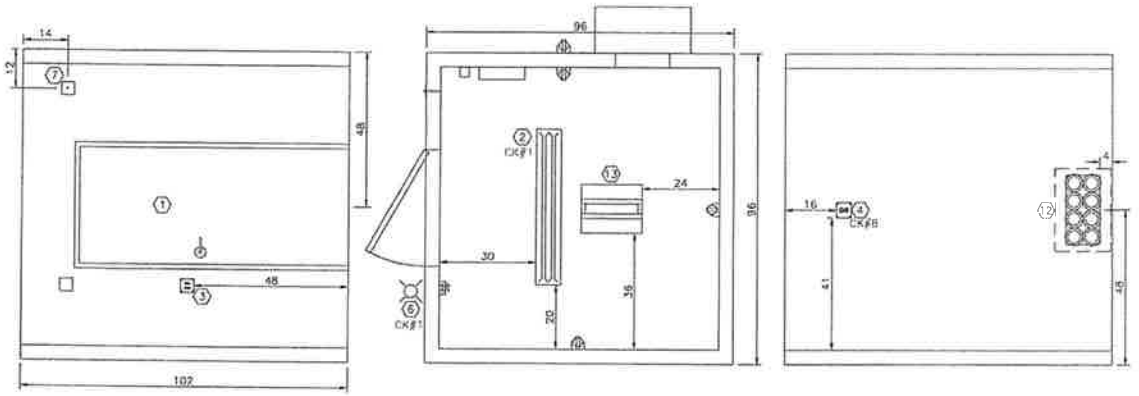


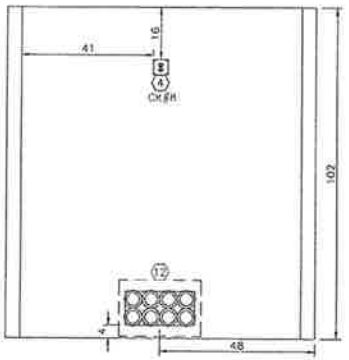

CONSTRUCTION DETAIL




STRAP DETAIL
SCALE: 3/4"=1'-0"




FLOOR PLAN

## APPLICABLE CODES:

IBC - 2009 EDITION WITH AMENDMENTS
IMC - 2009 EDITION WITH AMENDMENTS
NEC - 2011 EDITION WITH AMENDMENTS
IECC - 2009 EDITION

MAXIMUM FLOOR LIVE LOAD: 125 PSF
MAXIMUM ROOF LIVE LOAD: 30 PSF
OCCUPANCY/ USE GROUP TYPE: U
CONSTRUCTION TYPE: VB

MINIMUM BUILDING SETBACK REQUIREMENTS: 15'

SEISMIC ZONE: Sds = 0.11
SITE CLASS = D
DESIGN CAT. = A

MAXIMUM WIND LOAD: 100 MPH - EXP C

THIS BUILDING IS NOT FOR HUMAN OCCUPANCY

DATA PLATA AND STATE INSIGNIA LOCATED ON THE SHELTER LOAD CENTER.

DUPONT BUILDING, INC.
100 HITA DRIVE
BELL CITY, LA. 70630
337 / 905-5221
FAX: 337 / 905-5268

CUSTOMER: BHI NORTH DAKOTA

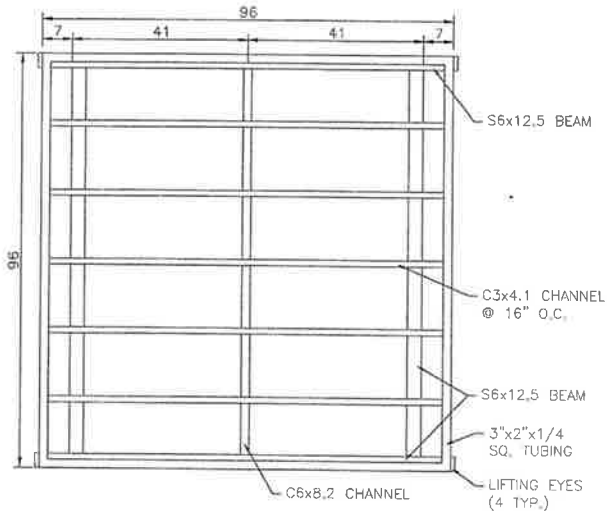
SIZE: 8' X 8' X 8'6"

SHEET TITLE: FLOOR PLAN

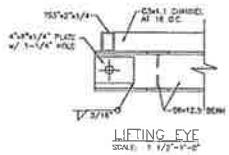
REV | DATE | DESCRIPTION

JOB NO: 13190
DRAWING NO: 13190
DRAWN: K. KIFFE
RELEASE DATE: 11/26/2013

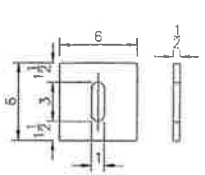
SHEET NO: 1 OF 4



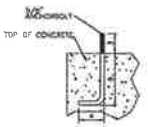

8' X 8' SKID PLAN



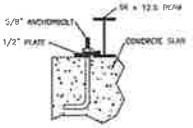
LIFTING EYE



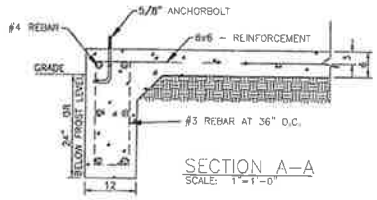

6"x6"x1/2" HOLD DOWN PLATE



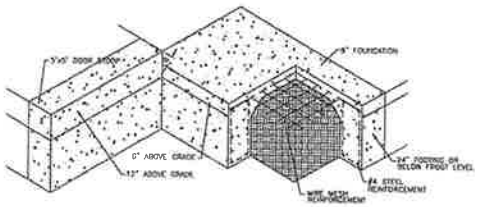

ANCHORBOLT DETAIL



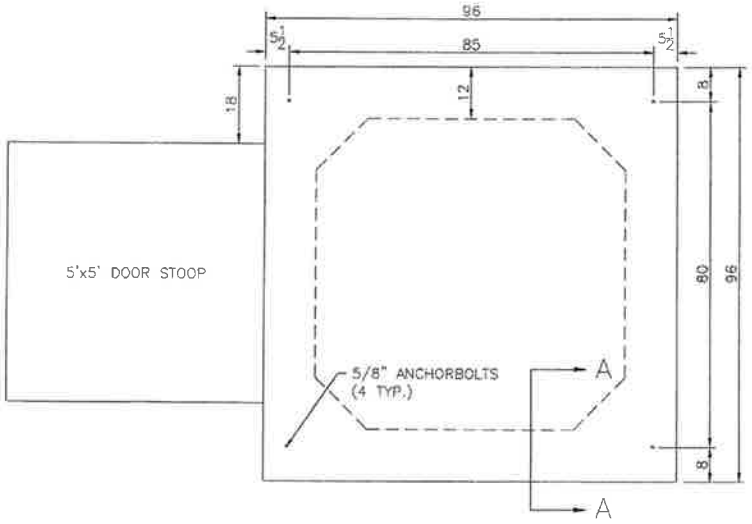

TIE-DOWN DETAIL




SECTION A-A




CONCRETE FOUNDATION
CORNER DETAIL




8' X 8' SUGGESTED FOUNDATION

DUPONT BUILDING, INC.
100 RIVA DRIVE
BELL CITY, LA. 70630
337 / 905-5328
FAX: 337 / 905-5288

BHI
NORTH DAKOTA

SIZE
8' X 8' X 8'6"

SHEET TITLE
SKID & FOUNDATION DETAILS

| REV | DATE | DESCRIPTION |
|---|---|---|

JOB NO.
13190

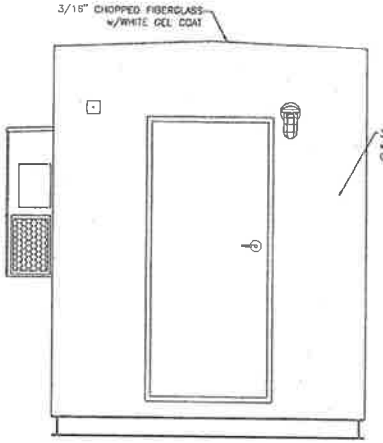
DRAWING NO.
13190

DRAWN BY
K. KIFFE

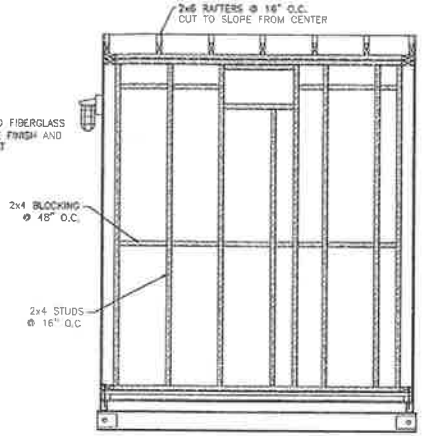
RELEASE DATE
11/26/2013

SUBMITTED BY (DRAFT)

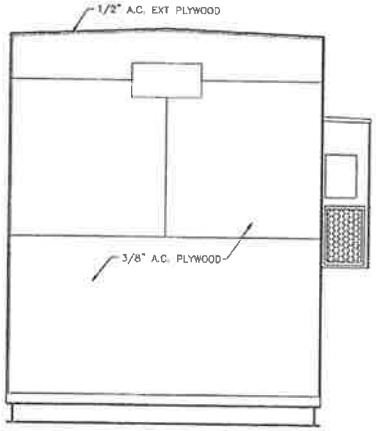
SHEET NO.
2
OF
4



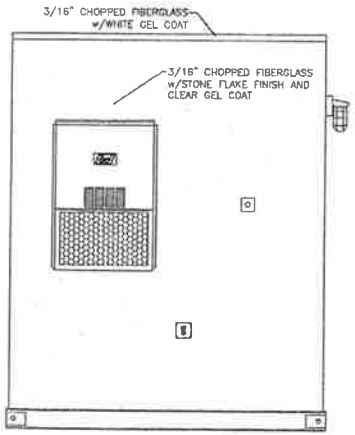

FRONT VIEW




RIGHT VILW




REAR VIEW



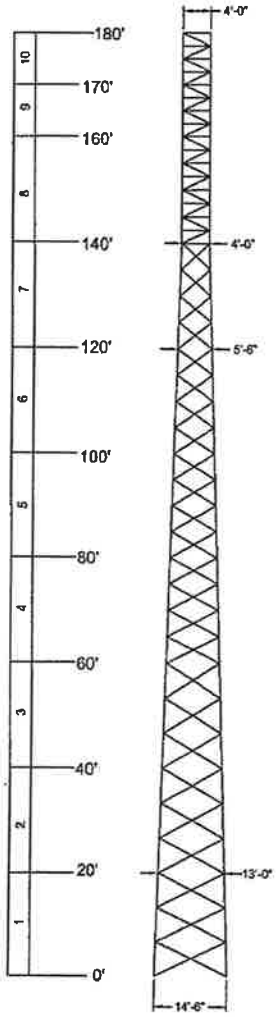

LEFT VIEW

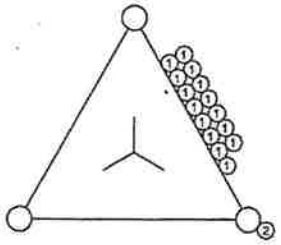
DUPONT BUILDING, INC.
100 RITA DRIVE
BELL CITY, LA. 70630
337 / 905-5528
FAX 337 / 905-5529

BHI
NORTH DAKOTA

8' X 8' X 8'6"
ELEVATIONS

| | |
|---|---|
| JOB NO | 13190 |
| DRAWING NO | 13190 |
| DRAWN BY | K. KIFFE |
| RELEASE DATE | 11/26/2013 |
| SHEET NO | 3 of 4 |



PLAN VIEW

MEMBER INFORMATION

| SECTION | ELEVATION | FACE SIZE | LEG DIA. | DIAGONALS | GIRTS | # OF BAYS |
|---|---|---|---|---|---|---|
| 1 | 0' - 20' | 14'-6" | Ø3 1/2" | L 2 1/2" x 3/16" | N/A | 3 - X |
| 2 | 20' - 40' | 13'-0" | Ø3 1/4" | L 2 1/2" x 3/16" | N/A | 3 - X |
| 3 | 40' - 60' | 11'-6" | Ø3 1/4" | L 2" x 3/16" | N/A | 3 - X |
| 4 | 60' - 80' | 10'-0" | Ø2 3/4" | L 1 3/4" x 3/16" | N/A | 4 - X |
| 5 | 80' - 100' | 8'-6" | Ø2 3/4" | L 1 3/4" x 3/16" | N/A | 4 - X |
| 6 | 100' - 120' | 7'-0" | Ø2 1/2" | L 1 1/2" x 3/16" | N/A | 4 - X |
| 7 | 120' - 140' | 5'-6" | Ø2 1/2" | L 1 1/2" x 3/16" | N/A | 4 - X |
| 8 | 140' - 160' | 4'-0" | Ø1 3/4" | S.R. Ø1" | S.R. Ø7/8" | 8 - Z |
| 9 | 160' - 170' | 4'-0" | Ø1 1/2" | S.R. Ø1" | S.R. Ø7/8" | 4 - Z |
| 10 | 170' - 180' | 4'-0" | Ø1 1/2" | S.R. Ø7/8" | S.R. Ø7/8" | 4 - Z |

ANTENNA INFORMATION

| ELEVATION | ANTENNA | LINE |
|---|---|---|
| 150' | (5) TYP. YAGI | (5) 7/8" |
| 160' | (5) 15' TYP. OMNI/WHIP | (5) 7/8" |
| 170' | (2) 6' HP DISH | (2) 7/8" |
| 180' | (3) 6' HP DISH | (3) 7/8" |

50% INCREASE IN ANTENNA LOADING IS INCLUDED IN ANTENNA INFORMATION CHART ABOVE.

PLAN VIEW REF:
1) 7/8" FEED LINES
2) STEP BOLTS

CHI S. LEE
REGISTERED
PROFESSIONAL
3937
ENGINEER
NORTH DAKOTA

12-13

DESIGN NOTES:
1) TOWER LEGS ARE CONSTRUCTED OF SOLID ROUND BAR MATERIAL.
2) SOLID ROUND 0.75" AND LARGER ASTM A-572 GRADE : 50 KSI MIN.
3) SOLID ROUND 0.625" AND SMALLER IS ASTM A-36 GRADE : 36 KSI MIN.
4) ALL ANGLE MATERIAL IS ASTM A-529 : 50 KSI MIN.
5) ALL BRACE AND FLANGE BOLTS ARE A325-X
6) THIS TOWER IS DESIGNED FOR STEP BOLTS UP ONE LEG FOR CLIMBING WITH SAFETY CLIMB DEVICE.
7) (6) #1 1/4" x 5'-0" LONG (F1554-GR.105) ANCHOR BOLTS PER LEG.
8) THIS TOWER IS DESIGNED FOR A 90 M.P.H. WIND SPEED WITH NO ICE AND A 50 M.P.H. WIND SPEED WITH 0.50" IN ICE IN ACCORDANCE WITH THE TIA/EIA-222-G STANDARD.
9) STRUCTURE CLASS II; TOPO CAT. 1; EXPOSURE C.

BASE REACTIONS:(FACTORED)

| | |
|---|---|
| TOTAL SHEAR | = 14 KIPS |
| AXIAL LOAD | = 50 KIPS |
| UPLIFT / LEG | = 184 KIPS |
| COMP. / LEG | = 203 KIPS |
| O.T. MOMENT | = 2435 FT-K |

APPROX. WEIGHT
18.06 KIPS

PROPRIETARY STATEMENT: THIS DRAWING IS THE PROPERTY OF ALLSTATE TOWER INC. IT IS NOT TO BE REPRODUCED OR COPIED IN ANYWAY WITHOUT PRIOR WRITTEN CONSENT OF ALLSTATE TOWER INC.

| REV # | DESCRIPTION | DATE | BY |
|---|---|---|---|
| | | | |

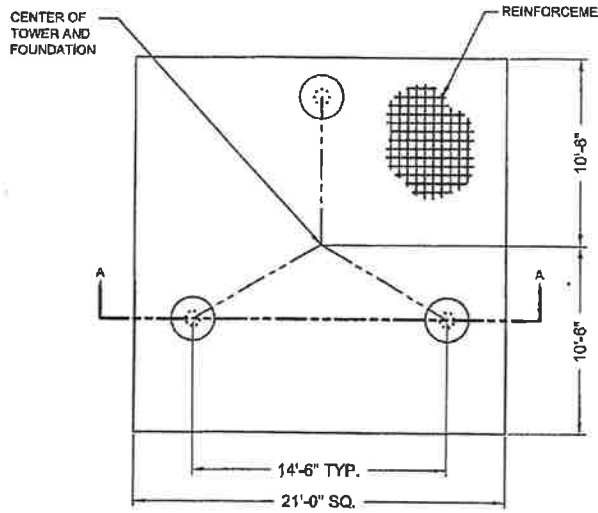
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN: INCHES
TOLERANCE BANDS: .X ±1/32"±0 ANGLES +/- 2° .XX ±3/32"±0 .XXX +/-1/16"±0 HOLES +/- 1/16"±0

SCALE: NTS
DRAWN BY: R. DUPONT
DATE: 12/3/2013

ALLSTATE TOWER INC.
P.O. BOX 39
HENDERSON, KY 42419
PHONE: (270) 830-8612
FAX: (270) 826-8475
WWW.ALLSTATETOWER.COM

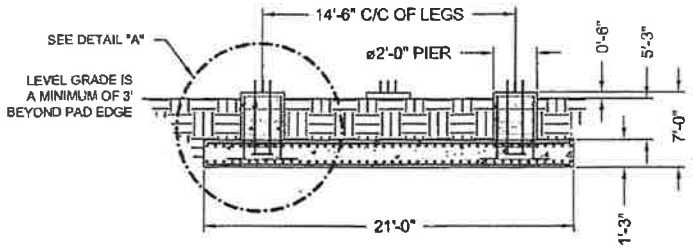
DESCRIPTION:
TOWER OVERVIEW
BHI
180' SELF SUPPORT TOWER
LITTLE MISSOURI PLANT, McKENZIE CO., ND

FILE NAME: 43585F - SD
SHEET: A

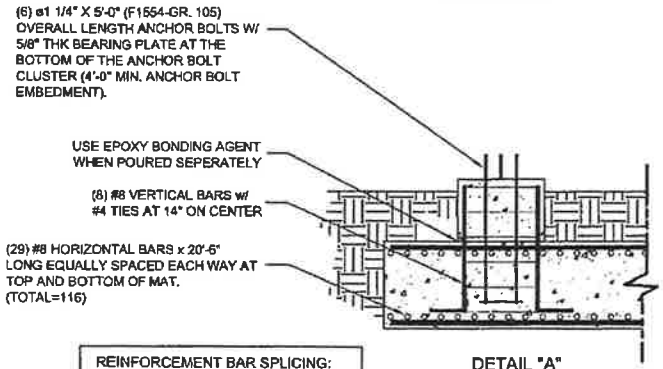



PLAN VIEW

TOTAL VOLUME OF CONCRETE = 22.4 YD $^3$




SECTION A-A




DETAIL "A"

**REINFORCEMENT BAR SPLICING:**

1. ALL LAP SPLICES SHALL CONFORM TO ACI 318 REQUIREMENTS.
2. REFER TO CHART BELOW WHEN REINFORCMENT BAR SPLICING IS NECESSARY.

| REINFORCING BAR SIZE | LAP SPLICE LENGTH |
|---|---|
| 3 | 15" |
| 4 | 17" |
| 5 | 21" |
| 6 | 26" |
| 7 | 30" |
| 8 | 36" |
| 9 | 45" |
| 10 | 58" |
| 11 | 71" |

**FOUNDATION INSTALLATION/DESIGN NOTES:**

1. THIS FOUNDATION IS DESIGNED TO MEET ALL STANDARDS SET FORTH BY ACI 318: AMERICAN CONCRETE INSTITUTE, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ANSI/TIA/EIA 222-G: STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.
2. THIS FOUNDATION IS DESIGNED UTILIZING THE GEOTECHNICAL REPORT PERFORMED BY INTERTEC; DATED 8-24-10; # BM-10-07606. THE FOUNDATION CONTRACTOR SHALL INSTALL THE FOUNDATIONS IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT.
3. ALL WORK PERFORMED FROM THESE DRAWINGS SHOULD BE BY QUALIFIED CONTRACTORS EXPERIENCED IN TOWER FOUNDATION CONSTRUCTION.
4. ALL FOOTING EXCAVATIONS SHALL BE MANUALLY CLEANED PRIOR TO PLACING CONCRETE. COMPACT THE EXPOSED SOIL SURFACE AND ANY GRANULAR FILL UNDER THE FOUNDATION TO 90% OF THE MODIFIED PROCTOR DENSITY.
5. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AFTER 28 DAYS. COPIES OF THE CONCRETE CYLINDER TEST REPORTS SHALL BE SENT TO THE RESIDENT ENGINEER / INSPECTOR.
6. MINIMUM CONCRETE COVER FOR REINFORCING BARS SHALL BE 3".
7. FIELD BENDING OR WELDING OF REINFORCEMENT BARS IS NOT PERMITTED.
8. PROVIDE CHAMFERS AT ALL EXPOSED CORNERS OF CONCRETE.
9. BACKFILL NEAR AND AROUND THE FOUNDATIONS SHALL BE A WELL GRADED FILL MATERIAL PLACED IN 8" THICK LAYERS THAT HAS BEEN COMPACTED TO 90% OF THE MODIFIED PROCTOR DENSITY PER ASTM D1557.
10. SOME DETAIL HAS BEEN PURPOSELY OMITTED TO CLARIFY ILLUSTRATION.

CHI S. LEE
REGISTERED
PROFESSIONAL
3937
ENGINEER
NORTH DAKOTA
12-3-13

PROPRIETARY STATEMENT: THIS DRAWING IS THE PROPERTY OF ALLSTATE TOWER INC. IT IS NOT TO BE REPRODUCED OR COPIED IN ANYWAY WITHOUT PRIOR WRITTEN CONSENT OF ALLSTATE TOWER INC

| REV # | DESCRIPTION | DATE | BY |
|---|---|---|---|
| | | | |

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN: INCHES

TOLERANCE BANDS:
.X ±.02" / .0 ANGLES +/- 2°
.XX +/-.10" / .0
.XXX +/-1/16" / .0 HOLES = Ø1/16" / .0

SCALE: NTS

DRAWN BY: W.MILLER

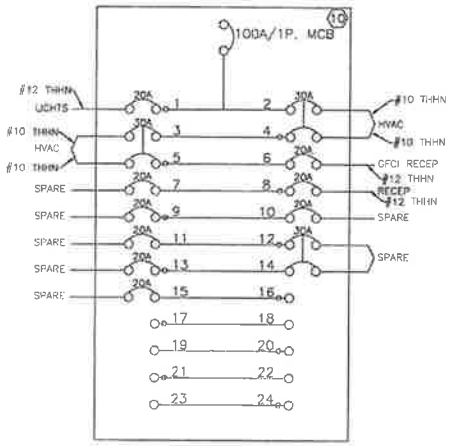
DATE: 10/8/2013

DESCRIPTION: PAD & PIER FOUNDATION DESIGN
RNS
GAS PLANT, MCKENZIE CO., ND

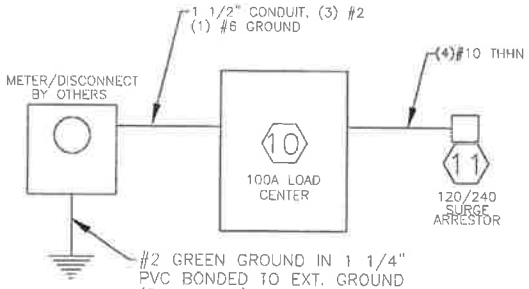
FILE NAME: AB3472R1 43585F

SHEET: B

ALLSTATE TOWER INC.
P.O. BOX 22
HENDERSON, KY 42419
PHONE: (270) 830-9512
FAX: (270) 830-9475
WWW.ALLSTATETOWER.COM




PANEL SCHEMATIC




WIRING DIAGRAM

# BUILDING SPECIFICATIONS

## GENERAL REQUIREMENTS

1. ALL WORK SHALL CONFORM TO THE 2009 INTERNATIONAL BUILDING CODE w/AMENDMENTS, 2009 INTERNATIONAL MECHANICAL CODE w/AMENDMENTS, 2011 NATIONAL ELECTRICAL CODE w/ AMENDMENTS, & 2009 INTERNATIONAL ENERGY CONSERVATION CODE.
2. DESIGN LOADS
DEAD LOADS: ROOF 8 PSF FLOOR 10 PSF
LIVE LOADS: ROOF 30 PSF FLOOR 125 PSF
LATERAL LOADS: WIND: SPEED-100 MPH (EXPOSURE C)
SEISMIC: Sds=0.11, SITE CLASS D, DESIGN CAT. A
OCCUPANCY/USE GROUP TYPE: IBC=U
CONSTRUCTION TYPE: IBC=VB
MIN BUILDING SETBACK REQUIREMENTS: IBC=15'
THIS BUILDING IS NOT FOR HUMAN OCCUPANCY

## SITE WORK

1. CLEARING AND EARTHWORK:
CLEAR FROM SITE ALL VEGETATION, TOP 6" +/- OF SOIL AND ALL OTHER UNDESIRABLE MATERIALS. VERIFY ALL EXISTING UNDERGROUD UTILITIES BEFORE STARTING WORK. MINIMUM ALLOWABLE SOIL BEARING PRESSURE IS 1500 PSF.

## CONCRETE

1. REINFORCING:
ASTM A-615 GRADE 40, DETAILS TO MEET ACI 318 STANDARDS AND IBC SECTION 1907.
2. BUILDING FOUNDATION CONCRETE MIX DESIGN:
PER IBC SECTION 1905
COMPRESSIVE STRENGTH=3000 PSI AT 28 DAYS
CEMENT=5.7 SACK MIN PER CUBIC YARD(TYPE II PER ASTM C-150)
POTABLE WATER=6.0 GALLONS MAX PER 94 LBS OF CEMENT
AGGREGATES PER IBC SECTION 1903.3
MAXIMUM SLUMP=5 INCHES
3. MIXING AND PLACING:
COMPLY WITH IBC SECTION 1907
4. CURING:
COMPLY WITH IBC SECTION 1905.11
5. REMOVAL OF FORMWORK:
COMPLY WITH IBC SECTION 1906.2
6. TESTING:
COMPLY WITH IBC SECTION 1903
7. THE STANDARDS FOR THE FOUNDATION MAY BE ALTERED BY A LOCAL ENGINEER TO MEET LOCAL BUILDING DEPARTMENT AND SOIL REQUIREMENTS AS LONG AS THE CHANGES ARE EQUAL TO OR MORE STRINGENT THAN THE REQUIREMENTS IN THIS PACKAGE.

## STRUCTURAL STEEL

1. STRUCTURAL STEEL:
PER LATEST AISC CODES AND IBC CHAPTER 22. ROLLED SECTIONS, PIPES AND PLATES-ASTM A-36, F=36 K.S.I. GALVANIZING TO CONFORM WITH ASTM A153
2. BOLTS AND PAIN ANCHORS:
TYPICAL ASTM A-307 OR A36. STAINLESS STEEL ASTM F593, FY-60 K.S.I. UNLESS NOTED OTHERWISE. RETIGHTEN ALL BOLTS BEFORE CLOSING IN.
3. WELDING:
COMPLY WITH AWS'S LATEST EDITION OF THE AMERICAN WELDING SOCIETY.
WELDING RODS: E-60 OR E-70 SERIES LOW HYDROGEN OR WIRE WELDER MILLERMATIC 250 OR EQUAL.

## WOOD

1. LUMBER:
COMPLY WITH NTC LUMBER CONSTRUCTION STANDARDS LATEST EDITION FOR STRESS GRADE LUMBER CONSTRUCTION. ALL TYPICAL FRAMING LUMBER SHALL BE GRADE STAMPED 2x6'S AND 2x8'S: SOUTHERN PINE NO.2, 2x6'S: SOUTHERN PINE NO.2, AND 2x4'S: SOUTHERN PINE STUD GRADE OR BETTER; MOISTURE CONTENT IS NOT TO EXCEED 19%, GRADE STAMP SHALL BE VISIBLE ON EVERY PIECE OF LUMBER IN PLACE (EXCLUDING BLOCKING) DOUBLE UP STUDS AT JAMES OF OPENING UP TO 4'0". HEADER (2) 2x6'S FOR OPENINGS UP TO 4'0"
2. PLYWOOD:
PER U.S. PRODUCT STANDARD PS1-83.
ROOF AND WALL SHEATHING-
EXTERIOR A.C. PLYWOOD WITH EXTERIOR GLUE AND INTERIOR B.C. PLYWOOD WITH EXTERIOR GLUE, 15/32" AND 11/32" THICK WITH IDENTIFICATION INDEX 32/16" AND 20/0 FOR SPANS TO 32" AND 20" FLOOR SHEATHING APA RATED STURD-I-FLOOR WITH EXTERIOR GLUE, 23/32" THICK, IDENTIFICATION INDEX 24"O.C. LAY UP WITH FACE GRAIN PERPENDICULAR TO SUPPORTS. PLYWOOD TO BE CONTINUOS OVER 2 SPANS MINIMUM. STAGGER JOINTS. NO PANEL LESS THAN 24" WIDE.
3. CONNECTIONS:
NAILS BY DUO-FAST OR EQUAL. SEE FASTENING SCHEDULE.

USE OF MACHINE NAILING IS PERMITTED SUBJECT TO THE NAILHEADS NOT PENETRATING THE OUTER PLY MORE THAN WOULD BE NORMAL FOR A HAND HAMMER AND THE MINIMUM ALLOWABLE EDGE DISTANCED ARE MAINTAINED.

## FASTENING SCHEDULE

CONNECTION: (NAILS BY DUO-FAST OR EQUAL)
1. ROOF JOIST TO TOP PLATES: KANT-SAG CLIPS
2. STUD TO TOP AND SOLE PLATES: (2) #33G
3. DOUBLE TOP PLATES: #33G @16"O.C. FACE NAIL
4. TOP PLATE SPLICES: NO SPLICES
5. DOUBLE STUDS: #33G @ 24"O.C. FACE NAIL
6. BUILT UP CORNER STUDS: #33G @ 24"O.C.
7. 1/2" PLYWOOD ROOF SHEATHING: #66G RING SHANK NAILS @ 6" O.C. AT PANEL EDGES AND 12" O.C. INTERMEDIATE.
8. 3/8" PLYWOOD FLOOR SHEATHING: #16BG NAILS AT 6"O.C.
(NOTE: WHERE PLYWOOD IS INSTALLED ON EACH SIDE OF FRAMING MEMBER-NAILS TO BE STAGGERED)
9. 3/8" PLYWOOD WALL SHEATHING: #62G @ 6" OC AT PANEL EDGE AND 12" OC. INTERMEDIATE.
10. SOLE PLATED TO 2" X 3" STEEL TUBING OF STEEL SKID: 1/4"ø x7" STAINLESS STEEL BOLTS WITH 1 1/2"ø WASHER AT 16" O.C.
11. FLOOR-WOOD PANEL SYSTEM TO 2" STEEL ANGLES OF STEEL SKID: 1/4"ø x3 1/4" FLAT HEAD STAINLESS STEEL BOLTS AT 16" O.C.
12. 1/2" POLYBOARD : GLUE AND NAIL
GLUE: LIQUID NAIL (OR EQUAL)-1/4"ø BEAD CONTINUOUS AT 16" SPACING.
NAIL: #B44G BRADS AT 8" O.C. ON 16" ROWS

COMMENTS: #33G-.131"ø x3" SMOOTH SHANK
#62G-.086"ø x13/4" SMOOTH SHANK
#66G-.086"ø x13/4" RING SHANK
#B44G-.40"ø x11/4" BRAD

## THERMAL AND MOISTURE PROTECTION

1. INSULATION:
BATT FIBERGLASS WITH KRAFT FACE. PER ASTM C 665-84,
ROOF: HIGH DENSITY SPRAY FOAM (R-22) TREATED w/FLAME SEAL
WALLS: 3-1/2" R-MAX (R-23.3)
FLOOR: 1 1/2" POLY (R-6.26) POLYSTYRENE 1.0 PCF PER ER-5770 BY NOVA CHEMICAL OR EQUAL (FLAME SPREAD 25 OR LESS SMOKE DEVELOPED RATING OF 450 OR LESS WHEN TESTED IN ACCORDANCE W/ UBC STANDARD 8-1 (ASTM E 84)
2. FIBERGLASS COATING:
RESIN-POLYTE POLYESTER RESIN #33-091 BY REICHOLD.
FIBERGLASS REINFORCEMENT-GLASS FIBER STRANDS #352 ROVING BY OWNES CORNING CORP.
FIBERGLASS MATT-CHOPPED STRAND MAT #M723, 3/4 OZ. BY OWENS CORNING CORP.
CATALYST-MI-POINT 90 (MENTHYL ETHYL KEYTONE PEROXITE) BY WITCO CORP.
MIX RESIN WITH 1.25% OF CATLYST. SPRAY ON COAT OF RESIN 1/16" THICK, FOLLOW WITH CHOPPED FIBERGLASS REINFORCEMENT (UNIFORM APLICATION OF 1/16" THICK) AND SPRAY FINAL COAT OF RESIN 1/16" THICK. ALOW TO CURE AT 250° F. AT ALL CORNERS USE FIBERGLASS MAT IN LIEU OF CHOPPED FIBERGLASS. ALL WORK PER MANUFACTURER'S RECOMMENDATIONS.

## DOORS

1. METAL DOORS AND FRAMES:
#AF-150 ALUMINUM AS MANUFACTURED BY JR&J CO. FRAME 3/16" THICK. DOOR .188" THICK. EXTERIOR SKIN & .10" THICK INTERIOR SKIN WITH 1" INSULATION BETWEEN SKINS. COMPLETE WITH HINGES AND LEVEL HANDLE LATCH. FIT TO RECEIVE HARDWARE PREPARED ON HARDWAE SCHEDULE.
2. HARDWARE: ARROW CYLINDER

## FINISHES:

1. VINYL COMPOSITION TILE:
12"x12"x1/8" STANDARD EXCELON AS MANUFACTURED BY ARMSTRONG (OR EQUAL). INSTALL WITH ALTERNATING PATTERN.
2. BASE: WOOD TRIM
3. FRP FINISH:
3/8" B/C PINE PLYWOOD w/WHITE FRP FINISH WHITE TEXTURED FIBERGLASS (FRP) LAMINATED TO PLYWOOD BY NUDO PRODUCTS OR EQUAL. USDA ACCEPTED, CLASS-FIRE RATING C AND A (FLAME SPREAD RATING 25 AND 195)
4. PAINTING:
A. GENERAL:
PREPARATION, APPLICATION, WORKMANSHIP, COMPLETION & ACCEPTANCE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS & APPLICATION PROVISIONS OF "PAINTING SPECIFICATION MANUAL" BY P.D.C.A. FOR TYPE I STANDARD JOB AT FINISHED AREAS.
PAINT: FIBERGLASS COATING & NOT GALVANIZED STEEL. (DO NOT PAINT GRILLS, LIGHTS & ELECTRICAL PANELS.)

B. PAINT:
DUNN-EDWARDS (SIMILAR BY FRAZEE, PITTSBURG, OR FULLER O'BRIEN, OR EQUAL) TYPICAL THREE-COAT ASSEMBLIES (INCLUDING MANUFACTURER'S PRIME COAT WHEN IN GOOD CONDITIONS.)
EXTERIOR AND INTERIOR:
METAL FINISHED: 1st COAT #2-7 CAL-ALUM,2nd COAT 42-23 LOCKOTE, AND 3rdCOAT 60SER RANCHO H&T.
FIBERGLASS: 1st COAT 42-43 LOCKOTE, 2nd COAT 60 SER RANCHO H&T (3rd COAT NOT REQUIRED)

## SPECIALTIES

1. FIRE EXTINGUISHERS: 10 LBS.
U.L. LISTED DRY CHEMICAL FIRE EXTINGUISHER CLEAN GUARD.

## MECHANICAL

1. HVAC UNIT:
BARD W12A2-A05KPXXXJ, 1 TON, NEW REFRIGERANT, 1PH, 5KW HEAT STRIP, 29 MBH AT 95° COOLING COMPRESSOR 4,7 RLA,0,D, FAN=1,8FLA, I.D. FAN=2.5FLA, MINIMUM OUTSIDE AIRE, 50 CFM. (OR EQUAL)

2. CONTROLS:
THERMOSTAT HONEYWELL, TH5220D1003

## ELECTRICAL

1. GENERAL:
FURNISH AND INSTALL A COMPLETE ELECTRICAL SYSTEM AS DEPICTED FROM THE PLANS AND SPECIFICATIONS HERIN. ALL MATERIALS AND WORKMANSHIP CONFORM TO THE 2011 NEC, NFPA 101, AND LOCAL CODES AND ORDINCES AND UTILITY COMPLY WITH REQUIREMENTS. ALL INTERIOR ELECTRICAL WORK TO BE EXPOSED.
2. MATERIAL AND METHODS:
EMT FITTINGS COMPRESSION TYPE. SET SCREW TYPE NOT PERMITTED. WIRE TO BE 600V COPPER WITH THW, THWN, THH, OR XHHW INSULATION, MINIMUM #12 AWG. ALUMINUM CONDUCTORS NOT PERMITTED. WIRING DEVICES SPECIFICATION GRADE MINIMUM 20 AMPS FOR SWITCHED AND 20 AMPS FOR RECEPTACLES. COVER PLATES EQUAL TO BRYANT SERIES 7000. ALL CONDUITS EXPOSED. NON-METALLIC CONDUIT MAY BE USED ONLY IN OR UNDER SLABS AND IN CONCRETE OR MASONRY WALLS. WHEN BELOW GRADE AND NOT UNDER SLAB, SHALL BE 24" DEEP WITH 3" CONCRETE CAP.
3. DISTRUBITION:
PANELBOARDS EQUAL TO SQUARE "D" NQO WITH FULL SIZED BREAKERS. CIRCUIT BREAKERS AMBIENT COMPENSATED. ALL PANELS TO HAVE TYPED DIRECTORY CARDS IDENTIFYING ALL CIRCUITS. ALL EQUIPMENT (PANELS,DISCONNECT,SWITCHES,ETC.) TO HAVE ENGRAVED MICARTA NAMEPLATES. DISCONNECT SWITCHES SHALL BE GENERAL DUTY TYPE, WITH NUMBER OF POLES AS REQUIRED. SWITCHES SHALL BE FUSIBLE AS RECOMMENDED BY AIR CONDITIONING MANUFACTURE. SWITCH SIZE SHALL BE TYPE NEMA III R WHERE LOCATED OUTSIDE.
4. LIGHT FIXTURES:
FURNISH AND INSTALL ALL LIGHTING FIXTURES COMPLETE WITH LAMP AND ACCESSORIES. CATALOG NUMBERS ARE TO ESTABLISH A LEVEL OF QUALITY. SUBSTITUTIONS OF SIMILAR FIXTRUES BY ANOTHER MANUFACTURER IS ACCEPTABLE. MOUNTING TYPE AND VOLTAGE OF ALL FIXTURES IS THE RESPONSIBILITY OF THE CONTRACTOR.
5. DUPONT BUILDING RESERVES THE RIGHT TO INSTALL ADDITIONAL BREAKERS INTO THE SERVICE PANEL UP TO 6 POSITIONS, AS LONG AS AMPACITY PULL IS NOT GREATER THAN THE TOTAL LOAD COVERAGE OF THE MAIN BREAKER.
6. ALL WIRING WILL BE IN ACCORDANCE WITH AMPACITY TABLE 310-15(b)(2)A OF THE 2011 NEC.
310-16 AND THE AMPACITY ADJUSTMENT FACTORS OF TABLE

DUPONT BUILDING, INC.
100 RITA DRIVE
BELLCITY, LA. 70630
(337) 735-3666
FAX:337 905-5268

BHI
NORTH DAKOTA

CUSTOMER

SIZE 8' X 8' X 8'6"

SHEET TITLE NOTES

| REV | DATE | DESCRIPTION |
|---|---|---|

JOB NO. 13190
DRAWING NO. 13190
DRAWN K. KIFFE
RELEASE DATE 11/26/2013
SHEET NO 3 OF 4

# McKenzie County Building Permit Fee Worksheet

Permit #: 13771
Name: Gas Plant Radio Tower
Address:
Subdivision:

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| 3 | | x | | = | 0 |
| 4 | | x | | = | 0 |
| 5 | | x | | = | 0 |
| 6 | | x | | = | 0 |

TOTAL AREA: 0

**BASEMENT:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| 3 | | x | | = | 0 |
| 4 | | x | | = | 0 |

TOTAL AREA: 0

**GARAGE:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |

TOTAL AREA: 0

**DECK OR COVERED PATIO:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |

TOTAL AREA: 0

**STAND ALONE GARAGE:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |

TOTAL AREA: 0

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | | |
|---|---|---|---|---|---|---|---|
| Valuation of main floor | N/A | VB | $0.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | N/A | N/A | $0.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of garage * Private Garages use Utility, miscellaneous | N/A | VB | $0.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of deck/covered patio | N/A | N/A | $0.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | 0.00 Hours req'd for inspection | | Value of Structure | = | $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building

* Authorized Adjustment ☐ Authorized Adjustment

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by George Williams (gwilliams@Forsgren.com / 801-403-8152) or Jason VonWeller (jvonweller@Forsgren.com / 801-837-6234).

Adjustment % (+/-): 0%

| Reasoning for Adjustment *Required | |
|---|---|

**TOTAL BUILDING VALUATION: $0.00**

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $25.00 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $16.25 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $416.25 |
| PREPAID DEPOSIT | $0.00 |
| **AMOUNT DUE** | $416.25 |

Calculated By: Kendall Phillips Date: 12/13/2013

Signature: _____

NTA INC.

ENGINEERS
PLANNERS
CONSULTANTS

305 NORTH OAKLAND AVENUE • P.O. BOX 490 • NAPPANEE, INDIANA 46550
WEB: WWW.NTAINC.COM

PHONE: 574-773-7975
FAX: 574-773-2732

December 10, 2013

Industrial Buildings Commission
Suite 210
505 Huntmar Park Drive
Herndon, Virginia 22070
Attn: Mr. Kevin Egilmez

Re: DuPont Building
Model: 13194 for ND

Dear Mr. Egilmez,

Please find enclosed (1) copy of the above referenced model. These plans have been found in compliance with all the applicable IBC Codes and Regulations as evidenced by the NTA, Inc. approval stamp on each page.

Should you have any questions or comments, please contact me at your earliest convenience.

Sincerely,

William Tegeler
Manager Commercial Building Services
NTA, Inc.

Enclosures

CC: DuPont Building

PM

Patrick M. McGuire, PE, SE
PO Box 10192
South Bend, IN 46680
574-367-8305 pat@patmcguirepe.com

REGISTERED PROFESIONAL ENGINEER
PATRICK M McGUIRE PE-7311
Date: 12/06/13
NORTH DAKOTA

Patrick M. McGuire

## Calculation Index

| | |
|---|---|
| Date: | 12/06/13 |
| | |
| Client: | Dupont Building Inc |
| | 100 Rita Dr. |
| | Sweetlake, La. 70630 |
| | |
| Project: | 13194 - 8' x 8' x 8'-6" ND State Approval |
| | |
| | |
| Pages | |
| 1.1-1.10 | Loads, diaphragms, shearwalls & strapping |
| 2.1-2.3 | Roof Rafter & Fastening Design |
| 3.1-3.3 | Wall Studs & Fastening |
| 4.1-4.3 | Floor |
| 5.1-5.6 | Foundation & Anchor. |
| | |
| | |
| | |

APPROVED BY
DEC 1 0 2013
NTH INC.

Note: these calculations are applicable only to the specific criteria, loads and location as noted. If it is suspected that these calculations have been modified, contact the engineer for an original copy.

Copyright © 2013
Patrick M. McGuire



**8 wide unit gravity loads**

*Note: members & materials in this Section are used to estimate of the dead load of the unit. Do not use any sizes or materials from this Section unless confirmed in the structural design Sections*

$Uw := 8 \cdot ft$ unit width

$Blng := 8 \cdot ft$ unit length

$Sht := 102 \cdot in$ maximum stud height

$Oht := Sht + 6 \cdot in + 3 \cdot in + 1.5 \cdot in + 1.125 \cdot in + .125 \cdot in = 113.75 \cdot in$ over all height

**Roof Dead Load**

$Rm_1 := FG316$ roofing

$Rm_2 := \frac{SP26}{16 \cdot in} = 1.504 \cdot psf$ 2x6's

$Rm_3 := P12 = 1.5\,psf$ ply sheathing

$Rm_4 := 2 \cdot psf$ insulation

$Rm_5 := P12 = 1.5\,psf$ ceiling

$Rm_6 := 1.936 \cdot psf$ misc

$Rdl := Rm_1 + Rm_2 + Rm_3 + Rm_4 + Rm_5 + Rm_6 = 10 \cdot psf$ roof dead load

$REdl := Rdl \cdot \frac{Uw}{2} = 39.999 \cdot plf$ dead load eave reaction

**Wall Dead Load**

$Wm_1 := FG316 + P38 = 2.66\,psf$ sheathing

$Wm_2 := \frac{SP24}{16 \cdot in} + \frac{3 \cdot SP24}{Sht} = 1.407 \cdot psf$ studs & plates

$Wm_3 := P38 = 1.1\,psf$ interior finish

$Wm_4 := 2.1268 \cdot psf$ insulation & misc

$Wdl := \left(Wm_1 + Wm_2 + Wm_3 + Wm_4\right) \cdot Sht = 62 \cdot plf$ wall dead load

APPROVED BY
DEC 1 0 2013
NTA INC.

**Wood Floor Dead Load**

$Fm_1 := O1125 + Tile = 4.6\,psf$ decking & finish

$Fm_2 := \frac{SP23}{16 \cdot in} = 0.683 \cdot psf$ 2x3 runners

Copyright © 2013
Patrick M. McGuire



$Fm_3 := P38 + FG316 = 2.66\,psf$ bottom board

$Fm_4 := 2 \cdot psf$ insulation

$Fm_5 := \frac{4.1 \cdot plf}{16 \cdot in} = 3.075 \cdot psf$ C joists

$Fm_6 := \frac{2 \cdot 4.1 \cdot plf}{Uw} = 1.025 \cdot psf$ 3" TS edge members

$Fm_7 := .957 \cdot psf$ miscellaneous

$Fdl := Fm_1 + Fm_2 + Fm_3 + Fm_4 + Fm_5 + Fm_6 + Fm_7 = 15 \cdot psf$ floor dead load

**Skid Dead Load**

$Sm_1 := \frac{12.5 \cdot plf \cdot (Uw + Bing)}{Bing \cdot Uw} = 3.125 \cdot psf$ S6x12.5 perimeter

$Sm_2 := \frac{3.9 \cdot plf \cdot (Uw + Bing)}{Uw \cdot Bing} = 0.975 \cdot psf$ 3 x 2 x 11 ga tube perimeter

$Sm_3 := \frac{8.2 \cdot plf \cdot 1}{Bing} = 1.025 \cdot psf$ C6x8.2 runners

$Sdl := (Sm_1 + Sm_2 + Sm_3) \cdot 1.171 = 6.001 \cdot psf$ skid dead load

APPROVED BY
DEC 10 2013
NA INC.

**Total Dead Load**

$Tdla := (Rdl + Fdl + Sdl) \cdot Uw \cdot Bing = 1.984 \cdot kip$

$Tdlb := Wdl \cdot (Uw + Bing) \cdot 2 = 1.984 \cdot kip$

$Tdl := Tdla + Tdlb = 3.968 \cdot kip$ Total Dead Load

**Roof Snow**

$RFsn := 30 \cdot psf \cdot \frac{Uw}{2} = 120 \cdot plf$

**Floor Live Load**

$Fll := 120 \cdot psf$ $FLL := Fll \cdot \frac{Uw}{2} = 480 \cdot plf$

Copyright © 2013
Patrick M. McGuire, PE, SE



**Seismic** ASCE 7-05 Simplified Method

$Uw := 8 \cdot ft$ unit width

$Ht := 114 \cdot in$ over all height

$Lng := 8 \cdot ft$ unit length

$CtoC := 82 \cdot in$ center to center chassis

$RoofDL := 40 \cdot plf \cdot Lng \cdot 2 = 0.64 \cdot kip$

$FloorDL := 15 \cdot psf \cdot Uw \cdot Lng = 0.96 \cdot kip$

$WallDL := 62 \cdot plf \cdot (Uw + Lng) \cdot 2 = 1.984 \cdot kip$

$SkidDL := 6 \cdot psf \cdot Uw \cdot Lng = 0.384 \cdot kip$

$TotalDL := RoofDL + WallDL + FloorDL + SkidDL = 3.968 \cdot kip$

**Seismic Shear**

$Fll := 120 \cdot psf$

$S_s := 0.200$ ND worst case

$Rsn := 30 \cdot psf$ Roof Snow

$Snow := if(Rsn > 30 \cdot psf, Rsn \cdot Uw \cdot Lng, 0 \cdot lbf) = 0 \cdot kip$

$W_s := TotalDL + 0.2 \cdot Snow + \frac{Uw \cdot Lng}{4} \cdot Fll = 5.888 \cdot kip$ Seismic Weight

$Fa := 1.4$ $Fo := 1$ site coefficient & one story building

$S_{DS} := \frac{2}{3} \cdot Fa \cdot S_s = 0.187$ $DesCat := DC(S_{DS}) = "B"$

$ItemTable12 := 13$ $System_{ItemTable12} = "LF Wood or Steel"$

$Ro := Rt_{ItemTable12} = 6.5$ Table 12-2

$Vs := \frac{Fo \cdot S_{DS}}{Ro} \cdot W_s = 0.169 \cdot kip$ base shear

$Wroof := 0.2 \cdot Snow + RoofDL + \frac{WallDL}{2} = 1.632 \cdot kip$

$Vr := \frac{Fo \cdot S_{DS}}{Ro} \cdot Wroof = 0.047 \cdot kip$ shear at roof

$Mot := Vr \cdot Ht = 0.445 \cdot ft \cdot kip$ overturning

$UorD := \frac{Mot}{CtoC} = 0.065 \cdot kip$ vertical reactions

$Umax := max\left(\frac{UorD}{Lng} - \frac{.6 \cdot TotalDL}{2 \cdot Lng}, 0 \cdot plf\right) = 0 \cdot plf$ uplift from seismic

APPROVED BY
DEC 10 2013
NP INC.

Copyright © 2012
Patrick M. McGuire



**Wind Pressures ASCE 7-05 Method 2**

$Uw := 8 \cdot ft$ unit width $Lng := 8 \cdot ft$ length

$Ht := 114 \cdot in$ $Mht := \max(Ht, 15 \cdot ft) = 15\,ft$ height & design mean height

$WLht := 102 \cdot in$ stud height $Rht := 9 \cdot in$ roof height

$Vo := 100 \cdot mph$ design wind speed $K_d := 0.85$ directionality factor

$I := 1$ importance factor Category II

$K_z := 0.85$ Exposure C, Table 6-3 $K_{zt} := 1$ topographic factor

$Go := 0.85$ gust effect factor $GCpi := 0.18$ enclosed internal pressure coefficient

$$q_z := 0.00256 \cdot psf \cdot K_z \cdot K_{zt} \cdot K_d \cdot \left(\frac{Vo}{mph}\right)^2 \cdot I = 18.496 \cdot psf$$

**MWFRS - ASCE 7-05 Transverse Wind roof slope < 10 degrees**

$LB_{tr} := \frac{Uw}{Lng} = 1$ $hL_{tr} := \frac{Mht}{Uw} = 1.875$ use Figure 6-6

$Cp_{www} := 0.80$ $Cp_{lww} := -.5$ windward & leeward wall pressures

$Cp_{wwr} := -1.3$ $Cp_{lwr} := -0.7$ windward & leeward roof worst case pressures

APPROVED BY
DEC 1 0 2013
NA INC.

For diaphragm & shear wall design, internal pressures cancel

$$Hr := Go \cdot q_z \cdot \left(Cp_{www} - Cp_{lww}\right) \cdot \left(\frac{WLht}{2} + Rht\right) = 102.19 \cdot plf$$ wind shear to roof diaphragm

$Wmfrs := Go \cdot q_z \cdot \left(Cp_{www} + GCpi\right) = 15.407 \cdot psf$ maximum MWFRS wall pressure

**Components & Cladding Walls - ASCE 7-05**

$a := \max(\min(0.1 \cdot Uw, .4 \cdot Mht), .04 \cdot Uw, 3 \cdot ft) = 3\,ft$

$GCp5_{10} := -1.4 \cdot .9 = -1.26$ $GCp4_{10} := -1.1 \cdot .9 = -0.99$ Figure 6-11A

$GCp5_{500} := -.8 \cdot .9 = -0.72$ $GCp4_{500} := -.8 \cdot .9 = -0.72$ Figure 6-11A

Copyright © 2012
Patrick M. McGuire



$EWA := \frac{WLht^2}{3} = 24.083\,ft^2$ stud effective wind area

$GCp5_{st} := INLG\left(10, \frac{EWA}{ft^2}, 500, GCp5_{10}, GCp5_{500}\right) = -1.139$ log interpolation

$GCp4_{st} := INLG\left(10, \frac{EWA}{ft^2}, 500, GCp4_{10}, GCp4_{500}\right) = -0.929$

$Pcc5 := q_z \cdot (GCp5_{st} - GCpi) = -24.39 \cdot psf$ $Pcc4 := q_z \cdot (GCp4_{st} - GCpi) = -20.518 \cdot psf$

**Components & Cladding Roof - ASCE 7-05**

$GCp3_{10} := -2.8$ $GCp2_{10} := -1.8$ $GCp1_{10} := -1$ Figure 6-11B

$GCp3_{500} := -1.1$ $GCp2_{500} := -1.1$ $GCp1_{500} := -.90$ Figure 6-11B

$EWAr := \frac{Uw^2}{3} = 21.333\,ft^2$ rafter effective wind area

$GCp3_r := INLG\left(10, \frac{EWAr}{ft^2}, 500, GCp3_{10}, GCp3_{500}\right) = -2.471$

$GCp2_r := INLG\left(10, \frac{EWAr}{ft^2}, 500, GCp2_{10}, GCp2_{500}\right) = -1.664$

$GCp1_r := INLG\left(10, \frac{EWAr}{ft^2}, 500, GCp1_{10}, GCp1_{500}\right) = -0.981$

$Pcc3 := q_z \cdot (GCp3_r + GCpi) = -42.37 \cdot psf$ $Pcc2 := q_z \cdot (GCp2_r + GCpi) = -27.456 \cdot psf$

$Pcc1 := q_z \cdot (GCp1_r + GCpi) = -14.808 \cdot psf$

APPROVED BY
DEC 1 0 '2013
NTA INC.

Copyright © 2012
Patrick M. McGuire



**Overturning & Sliding**

Perpendicular governs by inspection

$CtoC := 82 \cdot in$ center to center of out side skid rails

$DL := 3.98 \cdot kip$ total dead load see seismic calcs

$Ho := Go \cdot q_z \cdot \left(Cp_{www} - Cp_{lww}\right) = 20.438 \cdot psf$ horizontal

$Vw := Go \cdot q_z \cdot Cp_{wwr} = -20.438 \cdot psf$ windward roof vertical

$Vl := Go \cdot q_z \cdot Cp_{lwr} = -11.005 \cdot psf$ leeward roof vertical

$Mot := Ho \cdot \frac{Ht^2}{2} + |Vw| \cdot \frac{Uw}{2} \cdot \frac{3 \cdot Uw}{4} + |Vl| \cdot \frac{Uw}{2} \cdot \frac{Uw}{4}$ overturning moment

$Mot = 1.501 \cdot \frac{ft \cdot kip}{ft}$

$UorD := \frac{Mot}{CtoC} = 219.633 \cdot plf$ gross uplift

$Mres := \frac{DL}{Lng} \cdot \frac{CtoC}{2} = 1.7 \cdot \frac{ft \cdot kip}{ft}$ dead load resisting moment

$\frac{Mres}{Mot} = 1.133$ provide anchors to foundation

$Vsliding := Ho \cdot Ht = 194.162 \cdot plf$ maximum sliding load per foot

APPROVED BY
DEC 1 0 '2013
NTA INC.

# Connection Calculator

www.awc.org

*Connection Calculator* available for the **Android OS**.

*Connection Calculator* available for the **iPhone**.

| | | | |
|---|---|---|---|
| **Design Method** | Allowable Stress Design (ASD) | **Main Member Type** | Southern Pine |
| **Connection Type** | Lateral loading | **Main Member Thickness** | 1.5 in. |
| **Fastener Type** | Nail | **Side Member Type** | Steel |
| **Loading Scenario** | Single Shear | **Side Member Thickness** | 18 gage |
| Submit Initial Values | | **Nail Type** | Common Wire |
| | | **Nail Size** | 10d (D = 0.148 in.; L = 3 in.) |
| | | **Load Duration Factor** | C_D = 1.6 |
| | | **Wet Service Factor** | C_M = 1.0 |
| | | **End Grain Factor** | C_eg = 1.0 |
| | | **Temperature Factor** | C_t = 1.0 |
| | | **Diaphragm Factor** | C_di = 1.0 |

**Calculate Connection Capacity**

Connection Yield Mode Descriptions | Limits of Use

Diaphragm Factor Help | Load Duration Factor Help | Technical Help

Show Printable View

## Connection Yield Modes

| | |
|---|---|
| Im | 896 lbs. |
| Is | 320 lbs. |
| II | 362 lbs. |
| IIIm | 393 lbs. |
| IIIs | 198 lbs. |
| IV | 278 lbs. |

| | |
|---|---|
| **Adjusted ASD Capacity** | **198 lbs.** |
| Fastener length exceeds total connection thickness | |

APPROVED BY

DEC 1 0 2013

NTA INC.

- Nail bending yield strength of 90000 psi is assumed.
- The Adjusted ASD Capacity does not apply for toe-nails installed in wood members.
- Length of tapered tip is assumed to be two times the nail diameter for calculating dowel bearing length in the main member.
- The Adjusted ASD Capacity only applies for nails that have been driven flush with the side member surface. It does not apply for nails that have been overdriven into the side member.
- ASTM A36 Steel is assumed for steel side members 1/4 in. thick, and ASTM A653 Grade 33 Steel is assumed for steel side members less than 1/4 in. thick.

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of-the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this on-line Connection Calculator. Those using this on-line Connection Calculator assume all liability from its use.

The Connection Calculator was designed and created by Cameron Knudson, Michael Dodson and David Pollock at Washington State University.

Copyright © 2012
Patrick M. McGuire



**Strapping**

$Bs := 2 \cdot in$ width of strap

$ts := .0451 \cdot in$ thickness of strap 18 ga

$Fy := 33 \cdot ksi$ yield of strap

$Fu := 46 \cdot ksi$ ultimate tensile strength of strap

$dh := 0.2 \cdot in$ maximum hole size in strap

$Ag := Bs \cdot ts = 0.09 \cdot in^2$ gross strap area

$Ae := Ag - \frac{\pi \cdot dh^2}{4} = 0.059 \cdot in^2$ effective area of strap

$\Omega o := 1.67$ AISC D2

$Pas := \frac{\min(Fy \cdot Ag, Fu \cdot Ae)}{\Omega o} = 1619.202 \cdot lbf$ allowable based on steel strength

$Cdw := 1.6$

$No148x15 := 15$ number of .148x1.5" nails

$La148x15 := 124 \cdot lbf \cdot Cdw = 198.4 \cdot lbf$ allowable wind on .141x1.5" nail see separate calc

$Pan := No148x15 \cdot La148x15 = 2976 \cdot lbf$

$Pmax := \min(Pas, Pan) = 1619.202 \cdot lbf$ net allowable on strap

APPROVED BY

DEC 1 0 2013

NA INC.

Patrick M, McGuire, PE, SE
Copyright © 2013
all rights reserved

12/6/2013
LateralLoadsM2100.xmcd

**Lateral Load Resisting System**

Neglect roof slope

$Bw := 96 \cdot in$ $BL := 8 \cdot ft$ Building width & length

$Sht := 114 \cdot in$

$x := 1$ $Adj := if(x > 0, 2, 1) = 2$

$Msg := if(x > 0, "Three sided anaylsis", " ") = "Three sided anaylsis"$

**Wind Loads Transverse** see prevoius calcs for wind pressure calculations

$Hr := 102.2 \cdot plf$ wind shear to roof see previous calcs

$Reo := \frac{Hr \cdot BL}{2} = 408.8\,lbf$ reaction to end wall

$Rmin := 10 \cdot psf \cdot \left(\frac{Sht}{2}\right) \cdot \frac{BL}{2} = 190\,lbf$

$Reg := \max(Rmin, Reo) = 408.8\,lbf$ governing end reaction

**Roof Construction as a Diaphragm** $Rseismic := 0 \cdot lbf$ does not govern

7/16" osb, .099x2.25 nails 6/12, SP framing reference NER-1539 Table 11

$$v_{ew} := \frac{\max(Reg, 0.7 \cdot Rseismic) \cdot Adj}{Bw} = 102.2 \cdot plf$$

$IBCfctr := 1.4$ $SGfctr := 1$

$vrau := 115 \cdot plf \cdot IBCfctr \cdot SGfctr = 161 \cdot plf$ allowable wind unblocked roof diaphragm

$\frac{Reg}{Bw \cdot vrau} = 0.317$ **OK** unblocked

APPROVED BY

DEC 1 0 2013

NH INC.

**Fastening End truss to endwall plate**

$La131 := 106 \cdot lbf$ $Cdw := 1.6$ $Ctn := 0.83$

$Sp131 := \frac{La131 \cdot Cdw \cdot Ctn \cdot Bw}{Reg} = 33.057 \cdot in$ use 12" oc max

**Minimum Wall Construction as a Shearwall**

3/8" osb, .099 nails 6/12, SP framing reference NER-1539 Table 20

$vplf_a := 140 \cdot plf \cdot SGfctr \cdot IBCfctr = 196 \cdot plf$

$\frac{v_{ew}}{vplf_a} = 0.521$ **OK**

**Longitudinal Direction OK by comparison w/ Transverse**

**Maximum Strap Load**

$PupSW := v_{ew} \cdot Sht = 970.9\,lbf$ uplift at end of shear wall

$PupR := (27.5 \cdot psf - .6 \cdot 10 \cdot psf) \cdot \frac{Bw}{2} \cdot \frac{BL}{2} = 344\,lbf$ uplift from roof

$PupCnr := PupSW + PupR = 1314.9\,lbf$ uplift at corner

$PaStrap := 1619 \cdot lbf$ allowable strap tension see separate calcs

$\frac{PupCnr}{PaStrap} = 0.812$ **OK**

APPROVED BY

DEC 1 0 2013

NTR INC.

Copyright © 2012
Patrick M McGuire, PE
All Rights Reserved



**Check Tapered Roof Members**

reference previous calcs & Blodgett

$i := 0 .. 4$

$Uw := 96 \cdot in$ unit width

$Rdl := 10 \cdot psf$ $Rll := 30 \cdot psf$ $Spc := 16 \cdot in$ dead, live & spacing

$Span := Uw - 3.5 \cdot in \cdot 2 = 89 \cdot in$ Roof Member Span

$X_i := \frac{Span}{10} \cdot (1 + i)$ location of bending check points

$Wx := (Rdl + Rll) \cdot Spc = 53.333 \cdot plf$ load on members

$Rx := Wx \cdot \frac{Span}{2} = 197.778\,lbf$ reaction

$Mx_i := Rx \cdot X_i - \frac{Wx \cdot (X_i)^2}{2}$ bending at each check point

**2x6 #2 S.Pine**

$Cd := 1.15$ $Cr := 1.15$

$Fb := 1000 \cdot psi$ $Fv := 175 \cdot psi$ $E := 1400000 \cdot psi$

$Trim := 5.5 \cdot in - 3.5 \cdot in = 2 \cdot in$ maximum amount trimmed for rafter

$d_i := 3.5 \cdot in + \frac{Trim}{5} \cdot (i + 1)$ depth of member at each loaction

$Ix_i := \frac{1.5 \cdot in \cdot (d_i)^3}{12}$ $Sx_i := \frac{1.5 \cdot in \cdot (d_i)^2}{6}$ moment of inertia & section modulus at each location

$Ma_i := Sx_i \cdot Fb \cdot Cd \cdot Cr$ allowable moment at each location

$X_i =$

| |
|---|
| 8.9 |
| 17.8 |
| 26.7 |
| 35.6 |
| 44.5 |

$\cdot in$

$d_i =$

| |
|---|
| 3.9 |
| 4.3 |
| 4.7 |
| 5.1 |
| 5.5 |

$\cdot in$

$Ix_i =$

| |
|---|
| 7.415 |
| 9.938 |
| 12.978 |
| 16.581 |
| 20.797 |

$\cdot in^4$

APPROVED BY
DEC 1 0 2013
NTA INC.

Copyright © 2012
Patrick M McGuire, PE
All Rights Reserved



$Sx_i =$ | 3.802 | 4.622 | 5.522 | 6.502 | 7.562 | $\cdot in^3$

$Ma_i =$ | 419.067 | 509.438 | 608.626 | 716.63 | 833.451 | $\cdot ft \cdot lbf$

$X_i =$ | 8.9 | 17.8 | 26.7 | 35.6 | 44.5 | $\cdot in$

$Mx_i =$ | 1584.2 | 2816.356 | 3696.467 | 4224.533 | 4400.556 | $\cdot in \cdot lbf$

$\frac{Mx_i}{Ma_i} =$ | 0.315 | 0.461 | 0.506 | 0.491 | 0.44 |

**All OK**

$$Va := \frac{1.5 \cdot in \cdot 3.5 \cdot in \cdot Fv \cdot Cd}{1.5} = 704.375\,lbf$$

$$\frac{Rx}{Va} = 0.281$$ **OK**

Check deflection reference Blodgett 4.6-10

$$\Delta := \frac{Span}{10 \cdot E} \cdot \left[ \sum_i \left( \frac{Mx_i \cdot X_i}{Ix_i} \right) \right] = 0.21 \cdot in \qquad \frac{Span}{\Delta} = 423.771$$

$$\Delta - \frac{Span}{240} = -0.161 \cdot in$$ **OK**

Check Wind

$Wu := (27.5 \cdot psf - 0.6 \cdot Rdl) \cdot Spc = 28.667 \cdot plf$ uniform wind uplift on rafter

$Gov := if\left( \frac{Wu}{1.6} > \frac{Wx}{1.15}, \text{"Wind Governs"}, \text{"Gravity Governs "} \right) = \text{"Gravity Governs "}$

$\frac{Wu \cdot Uw}{2 \cdot Spc} = 86 \cdot plf$ Wind uplift at eave

$Rwind := \frac{Wu \cdot Uw}{2} = 114.667 \cdot lbf$ rafter wind reaction

APPROVED BY
DEC 1 0 2013
NA INC.

Copyright © 2012
Patrick M McGuire, PE
All Rights Reserved



**Rafter to exterior plate for uplift**

UaUSP_MRT := 285·lbf — allowable uplift per USP catalog adjusted for (3) P nails minimum

$\frac{Rwind}{UaUSP_MRT} = 0.402$ **OK**

**Rafter Heel to exterior plate for lateral**

Ht := 8.5·ft — wall height

wh := 24.4·psf — C+C wind pressure

$Lt := \frac{Ht}{2} \cdot Spc \cdot wh = 138.267 \cdot lbf$ — lateral at rafter heel

Cdw := 1.6 Ctn := 0.83 — duration & toe nail factors

La131x3tn := 106·lbf·Cdw·Ctn = 140.768·lbf — allowable .131x3 toe-nail

$NoReqd := \frac{Lt}{La131x3tn} = 0.982$ (2) **OK**

APPROVED BY

DEC 1 0 2013

NA INC.

Patrick M. McGuire, PE
Copyright 2013
All Rights Reserved

12/6/2013
Stud2x4No2SP.xmcd

**Stud Check** $Bw := 8 \cdot ft$ $Oh := 0 \cdot in$ building width, overhang

$St := 16 \cdot in$ stud spacing $Tsp := 16 \cdot in$ truss space

$Wht := 8.5 \cdot ft$ wall height $Sht := Wht - 3 \cdot 1.5 \cdot in = 8.125\,ft$ stud height

$Rdl := 10 \cdot psf$ $Rsn := 30 \cdot psf$ $Ru2 := 27.5 \cdot psf$ $Ru3 := 42.4 \cdot psf$ roof loads

$Wm := 15.4 \cdot psf$ max MWFRS $Wcc := 24.4 \cdot psf$ max C & C

---

Stud Properties $Stud := \text{"2x4 \#2 SP 06/13"}$ $b := 1.5 \cdot in$ $d := 3.5 \cdot in$

$Ar := b \cdot d = 5.25 \cdot in^2$ $Sx := \frac{b \cdot d^2}{6} = 3.062 \cdot in^3$

$Ix := \frac{b \cdot d^3}{12} = 5.359 \cdot in^4$ $E := 1400000 \cdot psi$

$Fb := 1100 \cdot psi$ $Ft := 675 \cdot psi$ $Fc := 1450 \cdot psi$ $Emin := 510000 \cdot psi$

---

Check C + C Loads $Cdc := 1.6$ $Cr := 1.15$

$Wh := Wcc \cdot St = 32.533 \cdot plf$ $Mcc := \frac{Wh \cdot Sht^2}{8} = 268.464 \cdot ft \cdot lbf$

$fb := \frac{Mcc}{Sx} = 1051.939\,psi$ $Bc := \frac{fb}{Fb \cdot Cdc \cdot Cr} = 0.52$

$\delta c := \frac{5}{384} \cdot \frac{Wh \cdot .7 \cdot Sht^4}{E \cdot Ix} = 0.298 \cdot in$ $\delta a := \frac{Sht}{120} = 0.813 \cdot in$

$Dc := \frac{\delta c}{\delta a} = 0.366$ $Ceg := .67$ $Non := 2$

APPROVED BY
DEC 1 0 2013
NA INC.

$La131eg := 106 \cdot lbf \cdot Cdc \cdot Ceg \cdot Non = 227.264\,lbf$

$Rc := \frac{Wh \cdot Sht}{2} = 132.167\,lbf$ $Nc := \frac{Rc}{La131eg} = 0.582$

$Gc := \max(Bc, Dc, Nc) = 0.582$

$MaxTrib := \frac{St}{Gc} = 2.293\,ft$ $k := 1 .. 5$

$MO_k := 2 \cdot MaxTrib \cdot k - St$

Patrick M. McGuire, PE
Copyright 2013
All Rights Reserved

12/6/2013
Stud2x4No2SP.xmcd

**Stud Check**

Stud = "2x4 #2 SP 06/13"

Cd := 1.15

| k = | $MO_k$ = | |
|---|---|---|
| 1 | 3.252 | ft |
| 2 | 7.837 | |
| 3 | 12.423 | |
| 4 | 17.008 | |
| 5 | 21.594 | |

maximum openings per # of studs

**Check DL + LL**

$$Pst := (Rdl + Rsn)\cdot Tsp\cdot\left(\frac{Bw}{2} + Oh\right) = 213.333\,lbf$$

$$fc := \frac{Pst}{Ar} = 40.635\,psi \qquad LtoD := \frac{Sht}{d} = 27.857 \qquad co := .8$$

$$FcE := \frac{.822\cdot Emin}{LtoD^2} = 540.218\,psi \qquad FcStar := Fc\cdot Cd = 1667.5\,psi$$

$$Cp := \frac{1 + \left(\frac{FcE}{FcStar}\right)}{2\cdot co} - \sqrt{\left[\left(\frac{1 + \frac{FcE}{FcStar}}{2\cdot co}\right)^2 - \frac{FcE}{FcStar\cdot co}\right]} = 0.299$$

$$Pax := FcStar\cdot Cp\cdot Ar = 2613.655\,lbf \qquad \frac{Pst}{Pax} = 0.082 \qquad OK$$

$$MaxJack := \frac{Pax}{(Rdl + Rsn)\left(\frac{Bw}{2} + Oh\right)}\cdot 2 - St = 31.337\,ft$$

max opening single jack stud

APPROVED BY

DEC 1 0 2013

NH INC.

Patrick M. McGuire, PE
Copyright 2013
All Rights Reserved

12/6/2013
Stud2x4No2SP.xmcd

**Connection Bottom Plate to Floor**

**Stud to Plate/ bottom plate uplift through sheathing**

Cdw := 1.6

$Upw := (Ru2 - .6 \cdot Rdl) \cdot \frac{Bw}{2} = 86 \cdot plf$

uplift from roof

$La099 := 48 \cdot lbf \cdot Cdw = 76.8\,lbf$

allowable .099 nail ESR 1539

$MaxSp099 := \frac{La099}{Upw} = 10.716 \cdot in$

3" oc **OK**

$NoStd099 := \frac{Upw \cdot St}{La099} = 1.493$

minimum 3/stud OK

**Bottom plate to Skid/ floor for lateral**

$La14bolt := 189 \cdot lbf \cdot Cdw = 302.4\,lbf$

allowable 1/4" bolt thru bottom plates into 1/4" steel tube see separate calc

$MaxSp := \frac{La14bolt \cdot 2}{Wcc \cdot Wht} = 34.993 \cdot in$

**Thus 16" oc is OK**

APPROVED BY

DEC 1 0 2013

NA INC.

Copyright © 2012
Patrick M. McGuire



**Floor Loads**

$Uw := 8 \cdot ft$ unit width

$REdl := 40 \cdot plf$

$Wdl := 62 \cdot plf$

$Pdl := REdl + Wdl = 102 \cdot plf$ dead

$Psn := 120 \cdot plf$ snow

$Pu := \frac{27.5 \cdot psf \cdot Uw}{2} = 110 \cdot plf$ gross uplift

$Fdl := 15 \cdot psf$ floor dead

$Fll := 120 \cdot psf$ floor live

$bf := 3.625 \cdot in$ flange width S6x12.5

$db_1 := 7 \cdot in$ distance to bearing 1

$db_2 := db_1 + 41 \cdot in = 48 \cdot in$ distance to bearing 2

$db_3 := db_2 + 41 \cdot in = 89 \cdot in$ distance to bearing 3

APPROVED BY
DEC 1 0 2013
NIA INC.

**Check C3x4.1 substututed for wood joist (next page)**

$Ew := 1600000 \cdot psi$ $Es := 29500000 \cdot psi$

$bj := 1.5 \cdot in$ $dj := 5.5 \cdot in$ wood joist dimensions

$Iw := \frac{bj \cdot dj^3}{12} = 20.797 \cdot in^4$ $Elw := Iw \cdot Ew = 33275 \cdot in^2 \cdot kip$

$S_c := 1.1 \cdot in^3$ $I_c := 1.66 \cdot in^4$

$Mmax := 221 \cdot ft \cdot lbf$ $Elc := Es \cdot I_c = 48970 \cdot in^2 \cdot kip$ **> Elw OK**

$fb_c := \frac{Mmax}{S_c} = 2.411 \cdot ksi$ **OK** **Thus C3x4.1 is OK**

Copyright © 2012
Patrick M. McGuire



**Check C6x8.2 middle runner**

$Span := 8 \cdot ft - 2 \cdot 12 \cdot in = 6\,ft$

$Wmax := 469 \cdot plf$

$MC6 := \frac{Wmax \cdot Span^2}{8} = 2.111 \cdot ft \cdot kip$ $\quad Ixc := 13.1 \cdot in^4$

$Ma := 5.47 \cdot ft \cdot kip$ AISC Table 3-8

$\frac{MC6}{Ma} = 0.386$ OK

$\delta c := \frac{5}{384} \cdot \frac{Wmax \cdot Span^4}{Es \cdot Ixc} = 0.035 \cdot in$ $\quad \frac{Span}{\delta c} = 2034.536$ OK

**Thus C6x8.2 is OK**

APPROVED BY

DEC 1 0 2013

NA INC.

APPROVED BY
DEC 10 2013
NI INC.

## Member Data

**Description:**

Standard Load:
Live Load: 120 PSF
Dead Load: 15 PSF

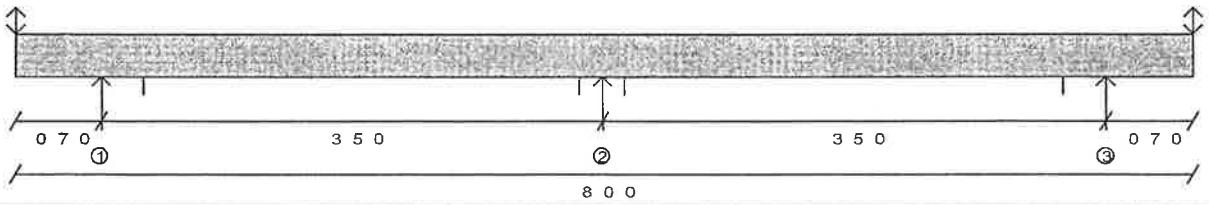
Member Type: Joist
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Glued & Nailed
Filename: KYB1

Application: Floor

Building Code: IBC/IRC

## Other Loads

| Type (Description) | Side | Begin | End | Other Start | End | Dead Start | End | Category |
|---|---|---|---|---|---|---|---|---|
| Point (PLF) | Top | 0' 0.00" | | 120 | | 102 | | Snow |
| Point (PLF) | Top | 8' 0.00" | | 120 | | 102 | | Snow |
| Point (PLF) | Top | 0' 0.00" | | -110 | | 0 | | Wind |
| Point (PLF) | Top | 8' 0.00" | | -110 | | 0 | | Wind |




## Bearings and Reactions

| | Location | Type | Material | Input Length | Min Required | Gravity Reaction | Gravity Uplift | Wind Reaction | Wind Uplift |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0' 7.000" | Wall | Steel | 3.500" | 1.500" | 619# | -- | 619# | -183# |
| 2 | 4' 0.000" | Wall | Steel | 3.500" | 1.500" | 696# | -68# | 525# | -66# |
| 3 | 7' 5.000" | Wall | Steel | 3.500" | 1.500" | 619# | -- | 619# | -183# |

### Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

| | Live | Snow | Wind | Dead |
|---|---|---|---|---|
| 1 | 344#(258plf) | 201#(151plf) | -183#(-137plf) | 210#(157plf) |
| 2 | 683#(513plf) | -81#(-60plf) | 75#(56plf) | 13#(10plf) |
| 3 | 344#(258plf) | 201#(151plf) | -183#(-137plf) | 210#(157plf) |

Design spans

0' 7.000" (left cant) | 3' 5.000" | 3' 5.000" | 0' 7.000" (right cant)

**Product: SP #2 2 x 6 16.0" O.C.**

PASSES DESIGN CHECKS

**Design assumes continuous lateral bracing along the top chord.**
**Design assumes continuous lateral bracing along the bottom chord.**

## Allowable Stress Design

| | Actual | Allowable | Capacity | Location | Loading |
|---|---|---|---|---|---|
| Positive Moment | 172.'# | 906.'# | 19% | 5.71' | Odd Spans D+L |
| Negative Moment | 221.'# | 906.'# | 24% | 4' | Adjacent 2 D+L |
| Shear | 266.# | 962.# | 27% | 3.66' | Adjacent 2 D+L |
| Max. Reaction | 696.# | 3284.# | 21% | 4' | Adjacent 2 D+L |
| LL Deflection | 0.0106" | 0.1139" | L/999+ | 2.12' | Even Spans L |
| TL Deflection | 0.0097" | 0.1708" | L/999+ | 2.29' | Even Spans D+L |
| LL Defl., Lt. | -0.0062" | 0.2000" | 2L/999+ | 0' | Even Spans L |
| TL Defl., Lt. | 0.0069" | 0.2000" | 2L/999+ | 0' | Odd Spans D+0.75(L+S) |
| LL Defl., Rt. | -0.0062" | 0.2000" | 2L/999+ | 8' | Odd Spans L |
| TL Defl., Rt. | 0.0069" | 0.2000" | 2L/999+ | 8' | Even Spans D+0.75(L+S) |

Control: Shear
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
Design assumes a repetitive member use increase in bending stress: 15 %
This member has been designed in accordance with NDS 2005

All product names are trademarks of their respective owners

Copyright (C) 2013 by Simpson Strong-Tie Company Inc. ALL RIGHTS RESERVED.
**Passing is defined as when the member, floor joist, beam or girder shown on this drawing meets applicable design criteria for Loads, Loading Conditions, and Spans listed on this sheet.
The design must be reviewed by a qualified designer or design professional as required for approval. This design assumes product installation according to the manufacturer's specifications.

Copyright © 2012
Patrick M. McGuire



**Foundation Check**

$Uw := 8 \cdot ft$ $CtoC := 82 \cdot in$ unit width, chassis center

$Lng := 8 \cdot ft$ unit length

$Ftw := 12 \cdot in$ footing width

$Rsn := 30 \cdot psf$ roof snow load

$Fll := 120 \cdot psf$ floor live load

$DL := 3980 \cdot lbf$ total dead load see previous calcs

$FNld := \frac{Uw}{2} \cdot (Rsn + Fll) + \frac{DL}{2 \cdot Lng} = 848.75 \cdot plf$ footing line load

$SP := \frac{FNld}{Ftw} = 848.75 \cdot psf$ < 1500 psf **OK**

**Anchorage for uplift** wind governs

$Asp := 48 \cdot in$ maximum anchor trib

$MOT := 1501 \cdot \frac{ft \cdot lbf}{ft} \cdot Asp = 6004 \cdot ft \cdot lbf$ overturning moment from Section 1

$Mres := 1133 \cdot \frac{ft \cdot lbf}{ft} \cdot Asp = 4532 \cdot ft \cdot lbf$ resisting moment from Section 1

$Mnet := MOT \cdot 1.6 - Mres \cdot .9 = 5527.6 \cdot ft \cdot lbf$ net factored overturning

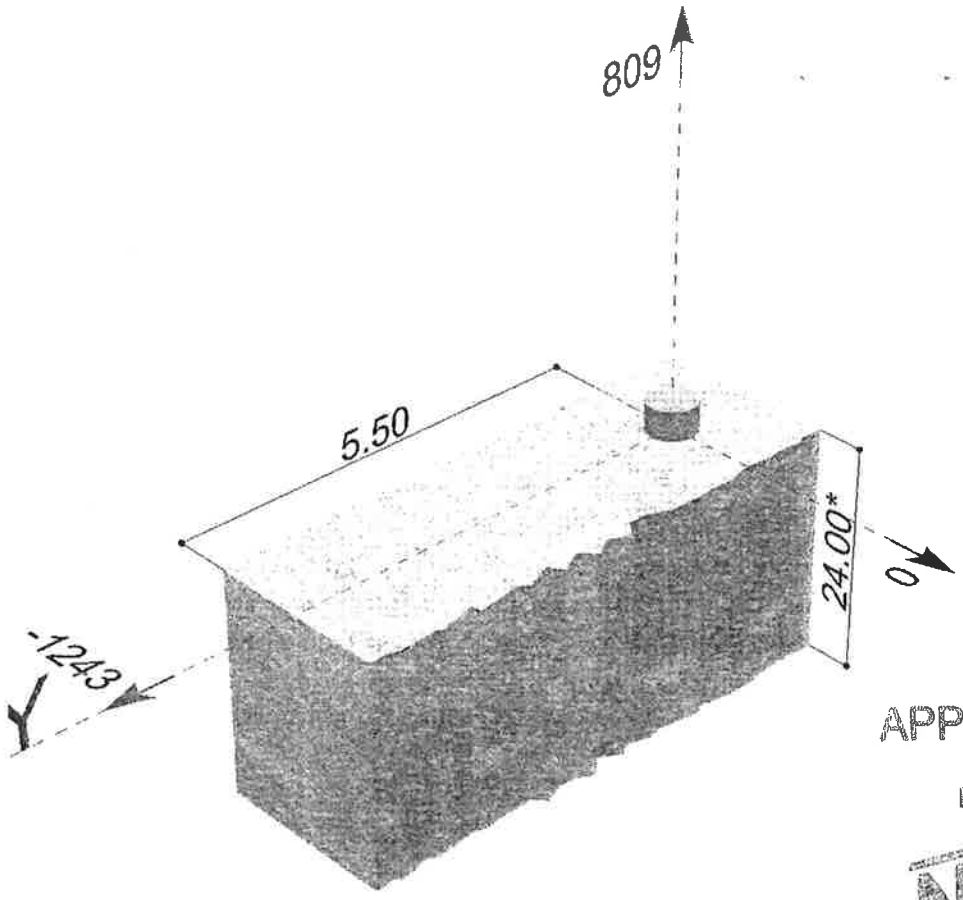
$PUmax := \frac{Mnet}{CtoC} = 808.917 \cdot lbf$ maximum factored anchor uplift

**Anchorage for shear** wind governs

$Vmax := 194.2 \cdot plf \cdot 1.6 \cdot Asp = 1242.88 \cdot lbf$ factored shear

APPROVED BY
DEC 10 2013
NTA INC.

**GEOMETRY:**

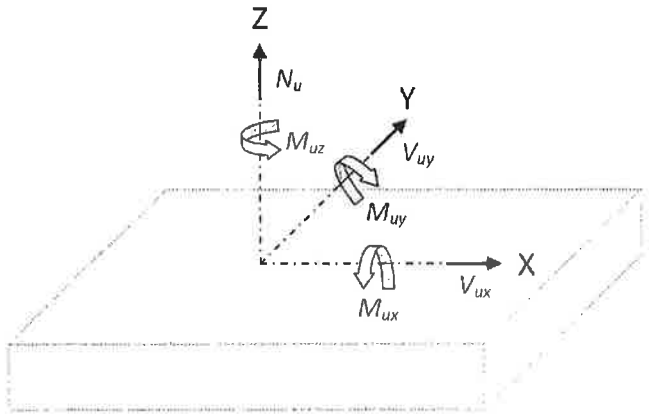



APPROVED BY

DEC 1 0 2013

NTA INC.

**LOAD ACTIONS: [lb], [ft-lb]**




| Design loads / actions | |
|---|---|
| $N_u$ | 809 |
| $V_{ux}$ | 0 |
| $V_{uy}$ | -1243 |
| $M_{ux}$ | 0 |
| $M_{uy}$ | 0 |
| $M_{uz}$ | 0 |

Eccentric profile

$e_x$ = 0.00 inch; $e_y$ = 0.00 inch

## CALCULATIONS:

| | |
|---|---|
| Selected anchor: | J or L-Bolt F1554 Gr 36 - 5/8", Grade 36 (CIP) |
| Effective embedment depth: | $h_{ef}$ = 8.000 inch |
| Approval: | ACI 318 Appendix D<br>Issued: 1/1/2002 |



**Basic principles design:**

| | |
|---|---|
| Design method: | ACI 318-08 (Appendix D) |
| Concrete: | Normal weight concrete, uncracked concrete, $f'_c$ = 3000 psi |
| Load combination: | taken from Section 9.2 |
| Reinforcement: | no reinforcement to limit splitting cracks available<br>none edge reinforcement or < #4 bar |
| | Condition B |
| Stand-off: | not existent |
| CIP Torque (ACI 318 D.8): | Yes |
| Seismic Loads: | No |

**Resulting anchor forces / load distribution:**

| Anchor No. | Tension load | Shear load |
|---|---|---|
| #1 | 809 lb | 1243 lb |
| Maximum | 809 lb | 1243 lb |

APPROVED BY

DEC 1 0 2013

NRI INC.

| | |
|---|---|
| Max. concrete compression strain: | 0.00 ‰ |
| Max. concrete compression stress: | 0 psi |
| Resulting tension force: | 809 lb |
| Resulting compression force: | 0 lb |

| Summary: | Design proof | Demand | Capacity | Status | |
|---|---|---|---|---|---|
| | Tension load | 809 lb | 3101 lb | 0.26 ≤ 1.0 | |
| | Shear load | 1243 lb | 5112 lb | 0.24 ≤ 1.0 | OK |
| | Interaction | - | - | 0.42 ≤ 1.0 | |

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines and must be checked for plausibility.
Powers Fasteners, 2 Powers Lane, Brewster, NY 10509, USA, http://www.powers.com/

**DESIGN PROOF TENSION LOADING:** **Reference**

**Steel strength:**

| | | |
|---|---|---|
| $N_{sa}$ | = 13108 lb | D.5.1 |
| $\Phi * N_{sa}$ | = $\Phi * N_{sa}$ = 0.75 * 13108 lb = 9831 lb | D.5.1.2 |
| $N_{ua}$ | = 809 lb | |
| Design proof: | $N_{ua} / (\Phi * N_{sa})$ = 809 lb / 9831 lb = 0.08 ≤ 1.00 | |

**Concrete strength:**

| | | |
|---|---|---|
| $h_{ef}$ | = 8.000 inch | |
| $k_c$ | = 24.0 | |
| $N_b$ | = $k_c * f_c'^{0.5} * h_{ef}^{1.5}$ = 24.0 * 54.77 * 22.627 = 29745 lb | D.5.2.2 |
| $A_{Nc0}$ | = 576.00 inch² | |
| $A_{Nc}$ | = 420.00 inch² | |
| $\Psi_{ec,N,x}$ | = 1.000 | D.5.2.4 |
| $\Psi_{ec,N,y}$ | = 1.000 | D.5.2.4 |
| $\Psi_{ed,N}$ | = 0.838 | D.5.2.5 |
| $\Psi_{c,N}$ | = 1.25 | D.5.2.6 |
| $\Psi_{cp,N}$ | = 1.000 | D.5.2.7 |
| $\Phi * N_{cb}$ | = $\Phi * (A_{Nc} / A_{Nc0}) * \Psi_{ec,N,x} * \Psi_{ec,N,y} * \Psi_{ed,N} * \Psi_{c,N} * \Psi_{cp,N} * N_b$ | D.5.2.1 |
| | = 0.70 * (420.00 / 576.00) * 1.000 * 1.000 * 0.838 * 1.25 * 1.000 * 29745 lb = 15894 lb | |
| $N_{ua}$ | = 809 lb | |
| Design proof: | $N_{ua} / (\Phi * N_{cbg})$ = 809 lb / 15894 lb = 0.05 ≤ 1.00 | |

APPROVED BY

DEC 1 0 2013

NA INC.

**Pullout / Bond strength:**

| | | |
|---|---|---|
| $\Phi * N_{pn}$ | = $\Phi * \psi_{c,P} * 0.9 * e_h * d_0 * f_c'$ | |
| | = 0.70 * 1.4 * 0.9 * 3 * 0.63 * 0.63 * 3000 = 3101 lb | |
| $N_{ua}$ | = 809 lb | |
| Design proof: | $N_{ua} / (\Phi * N_{pn})$ = 809 lb / 3101 lb = 0.26 ≤ 1.00 | |

**DESIGN PROOF SHEAR LOADING:** Reference

**Steel strength (without lever arm):**

| | | |
|---|---|---|
| $V_{sa}$ | = 7865 lb | D.6.1 |
| $\Phi * V_{sa}$ | = $\Phi * V_{sa}$ = 0.65 * 7865 lb = 5112 lb | D.6.1.2 |
| $V_{ua}$ | = 1243 lb | |
| Design proof: | $V_{ua} / (\Phi * V_{sa})$ = 1243 lb / 5112 lb = 0.24 ≤ 1.00 | |

**Concrete breakout strength, direction y-:**

| | | |
|---|---|---|
| $l_e$ | = 5.00 inch | D.6.2 |
| $d_0$ | = 0.63 inch | |
| $c_{a1}$ | = 5.50 inch | |
| $V_b$ | = $7 * (l_e / d_0)^{0.2} * d_0^{0.5} * f_c'^{0.5} * c_{a1}^{1.5}$ | |
| | = 7 * 1.516 * 0.791 * 54.772 * 12.90 = 5926 lb | |
| $A_{Vc0}$ | = 136.13 inch² | |
| $A_{Vc}$ | = 136.13 inch² | |
| $\Psi_{ed,V}$ | = 1.000 | D.6.2.6 |
| $\Psi_{\alpha,V}$ | = 1.000 | D.6.2.1c |
| $\Psi_{c,V}$ | = 1.400 | D.6.2.7 |
| $\Psi_{h,V}$ | 1.000 | D.6.2.8 |
| $\Phi * V_{cb}$ | = $\Phi * (A_{Vc} / A_{Vc0}) * \Psi_{ed,V} * \Psi_{\alpha,V} * \Psi_{c,V} * \Psi_{h,V} * V_b$ | D.6.2.1 |
| | = 0.70 * (136.13 / 136.13) * 1.000 * 1.000 * 1.400 * 1.000 * 5926 lb = 5807 lb | |
| $V_{ua}$ | = 1243 lb | |
| Design proof: | $V_{ua} / (\Phi * V_{cbg})$ = 1243 lb / 5807 lb = 0.21 ≤ 1.00 | |

APPROVED BY

DEC 10 2013

NRI INC.

**Pryout strength:**

| | | |
|---|---|---|
| $h_{ef}$ | = 8.000 inch | |
| $k_c$ | = 24.0 | |
| $N_b$ | = $k_c * f_c'^{0.5} * h_{ef}^{1.5}$ = 24.0 * 54.77 * 22.627 = 29745 lb | D.5.2.2 |
| $A_{Nc}$ | = 420.00 inch² | |
| $A_{Nc0}$ | = 576.00 inch² | |
| $c_{a,min}$ | = 5.50 inch | |
| $\Psi_{ed,N}$ | = 0.838 | D.5.2.5 |
| $\Psi_{cp,N}$ | = 1.000 | D.5.2.7 |
| $\Psi_{c,N}$ | = 1.250 | D.5.2.6 |
| $k_{cp}$ | = 2.0 | D.6.3.1 |
| $\Phi * V_{cp}$ | = $\Phi * (A_{Nc} / A_{Nc0}) * \Psi_{ed,N} * \Psi_{cp,N} * \Psi_{c,N} * N_b * k_{cp}$<br>= 0.70 * (420.00 / 576.00) * 0.838 * 1.000 * 1.250 * 29745 lb * 2.0 = 31788 lb | |
| $V_{ua}$ | = 1243 lb | |
| Design proof: | $V_{ua} / (\Phi * V_{cp})$ = 1243 lb / 31788 lb = 0.04 ≤ 1.00 | |

**COMBINATION TENSION / SHEAR LOAD:**

**Interaction:**

Design proof: $(N_u / (\Phi * N_n) + V_u / (\Phi * V_n)) / 1.2 = (0.26 + 0.24) / 1.2 = 0.42 \leq 1.0$

**Fastening ok!**

APPROVED BY
DEC 10 2013
NA INC.

**WARNINGS / REMARKS:**

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

14438

*Description of Work:*

Targa No. 3 Compressor Bldg

1939 125th Ave

Watford City, ND

*Required Inspections*

*(Inspector initial and date)*

____ Footing

____ Foundation

____ Footing

____ Final

*Date Issued:* 8/18/2014

Call 701.444.6494 ext. 2 for Inspections, no later than 24 hours in advance

**This Permit Expires 6 Months from Issue Date.**

# McKenzie County Building Permit Fee Worksheet

| | |
|---|---|
| **Permit #:** | 14438 |
| **Name:** | Targa Little Missouri No.3 Compressor Bldg |
| **Address:** | 1939 125th Ave, Watford City |
| **Subdivision:** | |

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| 3 | | x | | = | 0 |
| 4 | | x | | = | 0 |
| 5 | | x | | = | 0 |
| 6 | | x | | = | 0 |
| | | | TOTAL AREA | | 0 |

**BASEMENT:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| 3 | | x | | = | 0 |
| 4 | | x | | = | 0 |
| | | | TOTAL AREA | | 0 |

**GARAGE:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| | | | TOTAL AREA | | 0 |

**DECK OR COVERED PATIO:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| | | | TOTAL AREA | | 0 |

**STAND ALONE GARAGE:**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | x | | = | 0 |
| 2 | | x | | = | 0 |
| | | | TOTAL AREA | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCB modifier)

| | Group | Type | | | | | |
|---|---|---|---|---|---|---|---|
| Valuation of main floor | F-1 Factory and industrial, moderate hazard | VB | $96.58 (Cost/Sqft) | x | 10850.0 (Square Footage) | = | $1,047,922.84 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of garage | U-Utility | VB | $48.85 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| * Private Garages use Utility, miscellaneous | | | | | | | |
| Valuation of deck/covered patio | N/A | N/A | $0.00 (Cost/Sqft) | x | | = | $0.00 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | | | | = | $0.00 (Valuation-Sq. Ft) |
| | | | Hours req'd for inspection | | Value of Structure | | |

* For shell only buildings deduct 20 percent ☐ Shell Building

* Authorized Adjustment ☐ Authorized Adjustment

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by the Building Official

Adjustment % (+/-) 0%

| | |
|---|---|
| Reasoning for Adjustment *Required | |

**TOTAL BUILDING VALUATION** $1,047,922.84

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $5,643.77 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $3,668.45 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $9,312.22 |
| PREPAID DEPOSIT | $0.00 |
| **AMOUNT DUE** | $9,312.22 |

Calculated By: Kendall Phillips Date: 8/18/2014

Signature:

MCKENZIE

**MCKENZIE COUNTY BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1931 125th Ave NW **Permit No.** 14438
**Subdivision** Target Little Missouri **Lot No.** Compressor Bldg **Date** 9/22/14
**Name** Ivan **Phone** _____ **Time** 9:30

☐Complaint ☒Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | CORRECTION REQUESTED | RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other _____ | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other _____ | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☒ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other _____ | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other _____ | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other _____ | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**
☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☒OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**
☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**
Excavation.
Use (2) on bottom lap
5, #4 (double) @ 12" o.c. or less
Verts @ 12" o.c.
12 #5 verts w/ #4 lap @ 12" o.c.
1 Walk wood out top 4 laps
OK to pour stemwall

Signed _____ Inspector

**MCKENZIE COUNTY BUILDING INSPECTION**

201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1939 125th Ave NW  **Permit No.** 19132
Subdivision Nova Cove Planned Community  Lot No. _____  Date 8/19/24
Name Joey  Phone _____  Time 1415

☐Complaint  ☒Initial Inspection  ☐Reinspection  ☐Consultation

| INSPECTIONS TYPE | APPROVED | CORRECTION REQUESTED | RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other _____ | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other _____ | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☒ | ☐ | ☐ |
| 11. Footings | ☒ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other _____ | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other _____ | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other _____ | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☐OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**

36" deep hole w/ 30" piers
4#'s Verts @ 6" O.C. around perimeter
with 4#1 Horizontals @ 12" O.C. in hole
suspended above base by 3"#'s

Signed _____ Inspector

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1431 125th Ave NW **Permit No.** 12138
Subdivision Harold Lot No. 113 Compass Date 9/22/14
Name Jody Phone Time 2:45pm

☐Complaint ☒Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☑ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # ____
☐Work Incomplete
☒OK to proceed without reinspection
☐Other ____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time ____

**Comments:**

Foundation for Compressor (
2 #6 bar rebar @ top + bottom
2 #3 bar rebar doubled @ 1' interval
#3 Vert bar @ 1' interval keyway
cut in each end for cold joint

Ok to pour

Signed [signature] Inspector

Page 1 of 1

*McKenzie County Building& Planning Department*
*201 5th Street NW*
*Watford City, ND 58854 mckenziecounty.net*
*Phone: 701-444-6494*

Permit No: #14438

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

RECEIVED
AUG 05 2014

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Compressor Bldg. | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW ¼ OF SW ¼ | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@opdepc.com |

## 2. OWNER INFORMATION

| | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | (New Construction) | Alteration | Addition | Demolition |
|---|---|---|---|---|

Location of Work: (ie: Floor, Level) GROUND LEVEL

Square Footage of Work Being Done: 10,850 sf

Describe in detail work being done:

Metal Bldg. for compressors.

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

General Contractor Name: OPD Phone #: 281-371-7500

ND License #: 50680

## 5. ZONING/ASSESING INFORMATION (for office use only)

| New ☐ | Addition | Alteration ☐ | Demolition ☐ | Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |

| | | |
|---|---|---|
| Zoning: per approved | Average Depth of Lot: | Lot Area (sq ft): |
| Easement: see site plan | | |
| Front Yard Setback | Side Yard Setbacks | Rear Yard Setback |
| | | |
| Area of Main | Finished Area | Finished Area Alt / Add: |
| # Required Parking Spaces | Area Required Parking: | Total Area: |
| **Zoning Approval Signature:** Walter A Huck | | Date: 8/25/14 |

## 6. BUILDING CODE INFORMATION (for office use only)

| | |
|---|---|
| Occupancy Classification: | Change of Occupancy: |
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |
| | |

## 7. PROJECT REVIEW

| |
|---|
| Reviewed By: |
| Project Title: |
| Address: |
| $1500 Application Submittal Fee is required. ☐ Check Rec'd No. _____ OR ☒ Payment Receipt from Treasurer |
| ☒ Payment scanned to electronic files. Date: 8/18/14 |
| Total Permit Fee Amount $ 9312.22 |

RED DOT BUILDINGS

Better building systems.
*You have our word on it*

# Letter of Certification

| | |
|---|---|
| Date: | June 27, 2014 |
| Customer: | C & H Buildings |
| Project: | Compressor Building |
| Project Address: | Watford City, McKenzie County, North Dakota 58854 |
| Red Dot Job Number: | 14186-03 |

| Building | Type | Width | Length | Eave Height | Roof Slope |
|---|---|---|---|---|---|
| A | DS | 60'-0" | 175'-0" | 32'-4" | 3:12 |

This is to certify that the above described building/buildings has/have been designed for the following loads and deflections:

**Design Notes:**

| | | | |
|---|---|---|---|
| Building Code | 2012 International Building Code | | |
| Dead Load | 2.0 psf – Weight of roof material such as panel, insulation and purlins | | |
| Collateral Load | 3.0 psf | | |
| Live Load | 20 psf – Reducible per applicable building code | | |
| Wind Speed | 120 mph – Ultimate | | |
| Exposure | C | Risk Category | II - Normal |
| Enclosure | Enclosed | | |
| Ground Snow | 30 psf | Importance Factor | 1.10 |
| Seismic | | | |
| Site Class | D | | |
| Design Category | A | Importance Factor | 1.25 |
| $S_S$ | 0.0730 | $S_{DS}$ | 0.0779 |
| $S_1$ | 0.0260 | $S_{D1}$ | 0.0416 |
| $C_S$ | 0.0100 | | |
| Transverse SFRS | OSMF R=3 | | |
| Longitudinal SFRS | OSCBF/OSMF R=3 | | |
| Analysis Procedure | Equivalent Lateral Force | | |

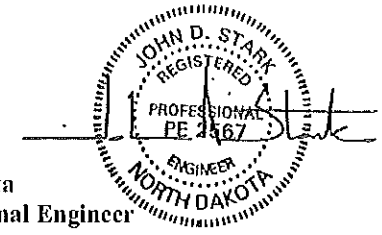
Bridge Crane: (1) 1 Ton Top Running Bridge Crane in Center Module

| Building | Drift – Lateral and Longitudinal | Vertical Frame | | Purlin Deflection | | Girt Deflection | Panel Deflection |
|---|---|---|---|---|---|---|---|
| | | Live Load | Total Load | Live Load | Total Load | | |
| A | H/100 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |

Loads are applied in accordance with the 2006 MBMA Low Rise Systems Manual and/or the 2012 Edition of the International Building Code. Design is in accordance with the applicable sections of the 2005 AISC and 2007 NAUS specifications.

It is the responsibility of the buyer to protect all openings from wind-borne debris during high wind load conditions. All wall framing by others and overhead doors are required to be wind load rated to wind speed and exposure specified above, to ensure "enclosed building" conditions are maintained

This certification is limited to the design of the metal building components and specifically excludes an analysis of the foundation and parts that may be supplied by anyone other than Red Dot Buildings located in Athens, TX. This certification is for design only, no inspection or supervision is implied.




**State of North Dakota**
**Registered Professional Engineer**
**Red Dot Corporation**

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature

8/7/2014
Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

8/18/14

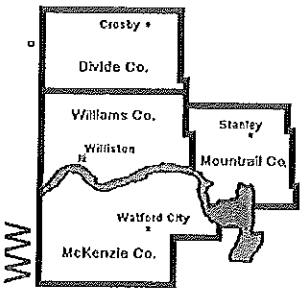
Approved

# Upper Missouri District Health Unit

*"Your Public Health Professionals"*

Date: 8/8/2013

Check #: 575661





WILLIAMS COUNTY
110 W. Bdwy, Ste 101
Williston, ND 58801-6056
Phone 701-774-6400
Fax 701-577-8536
Toll Free 1-877-572-3763


X $100.00 Individual Permit Fee
____ $200.00 Multi-dwelling up to 20 bedrooms
____ $500.00 Multi-dwelling more than 20bedrooms
____ $50.00 Holding Tank
____ $50.00 Rebuilding Fee

AUG 15 2013 MEG

## SEWAGE TREATMENT SYSTEM PLANS PERMIT

OWNER Targa Badlands LLC phone 701-842-3315

INSTALL ADDRESS 1939 125th Ave NW Watford City, ND 58854

MAILING ADDRESS 1939 125th Ave NW Watford City, ND 58854

DIRECTIONS TO PROPERTY From Watford City take US 85 S approx 4.1 miles take a left onto Co. 37. After approx .5 miles take a right and travel approx 1.7 miles to site on left

PURCHASER N/A LENDING INSTITUTION N/A

COUNTY McKenzie TWP T149 RNG 98W SEC 29

SUBD NW 1/4 of SW 1/4 LOT N/A BLOCK N/A

LOT SIZE 40 acres # OF BEDROOMS N/A or # OF EMPLOYEES 15 WELL DEPTH N/A

If you do not include township, range and section and number of bedrooms there will be a delay in processing your permit while we have to contact you. **The building owner, contractor, plumbing contractor, and/or installer are jointly responsible for compliance with U.M.D.H.U.'s Regulations for Individual Sewage Treatment Systems. In addition, it is your responsibility to follow all city, township and county regulations.**

Owner: [signature] Date: 8/8/13

DEPTH TO RESTRICTING LAYER ____ SOIL TYPE Clay Loam

SEPTIC TANK (WORKING CAPACITY) 1,000 GAL.

TREATMENT AREA:

TRENCH IN SQUARE FEET

6" GRAVEL 660 12"GRAVEL 530 18"GRAVEL 440 24"GRAVEL 380

GRAVELLESS PIPE IN LINEAR FEET:

8" 330 10" 220

CHAMBER SYSTEM IN LINEAR FEET:

12" TALL 180 15"TALL 160

MOUND IN SQUARE FEET 240

ISTS PERMIT GOOD FOR 12 MONTHS FROM DATE OF ISSUE.

APPROVED BY: ____ DATE: ____

NOTIFY THIS OFFICE AT LEAST 2 BUSINESS DAYS PRIOR TO INSTALLATION FOR INSPECTION.

# ISTS Plans

List any plan issues: _____

## Setbacks

| | Well <100' | Well >100' | Distribution Device | Treatment Area | Property Lines | Building |
|---|---|---|---|---|---|---|
| Bldg. Sewer | 100 | 50 | ---- | ---- | ---- | ---- |
| Septic tank | 100 | 50 | 5 | 10 | 10 | 10 |
| Distribution Device | 100 | 50 | ---- | ---- | 10 | 20 |
| Treatment area | 100 | 50 | 5 | ---- | 10 | 10 |
| Well <100' | -- | -- | 100 | 100 | n/a | n/a |
| Well >100' | -- | -- | 50 | 50 | n/a | n/a |
| water line | | | | | | |
| (pressure) | -- | -- | 10 | 10 | n/a | n/a |
| (suction) | -- | -- | 50 | 50 | n/a | n/a |
| Surface Water bodies | n/a | n/a | 100 | 100 | n/a | n/a |

## Reminders:

Rock Size: 1 to 3 inches

Cover Material: Straw or Fabric

August 1, 2014

Jerry W. Divin, P.E., M.ASCE
Manager Civil/Structural Department
Optimized Process Designs, LLC
25610 Clay Road
Katy, TX 77493
Jerry.Divin@opdepc.com

RE: Building Foundation, Little Missouri #3, Compressor Building
Watford City, North Dakota

Dear Mr. Divin,

This letter is to state the foundation for the Compressor Building, shown in Drawings S1.0, S1.1, S2.1, and S2.2 dated July 28, 2014 provided to you by EIKON, has been designed based on the metal building foundation reactions provided to EIKON by Red-Dot Buildings on July 22, 2014, for the above referenced building. The building foundation complies with the 2012 International Building Code, Building Risk Category III.

If you have any questions, please feel free to contact us.

Sincerely,

R. Craig McKee

Brad Isbell, P.E.

REGISTERED PROFESSIONAL ENGINEER
BRADLEY J. ISBELL
7199
DATE 8/1/14
NORTH DAKOTA

# CALCULATIONS
# For
# Building Foundation

Targa Little Missouri #3
Compressor Bldg.
Watford City, North Dakota

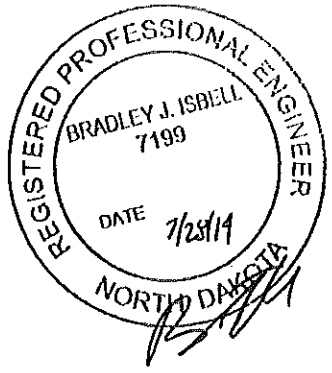
Project #14090

June 28, 2014

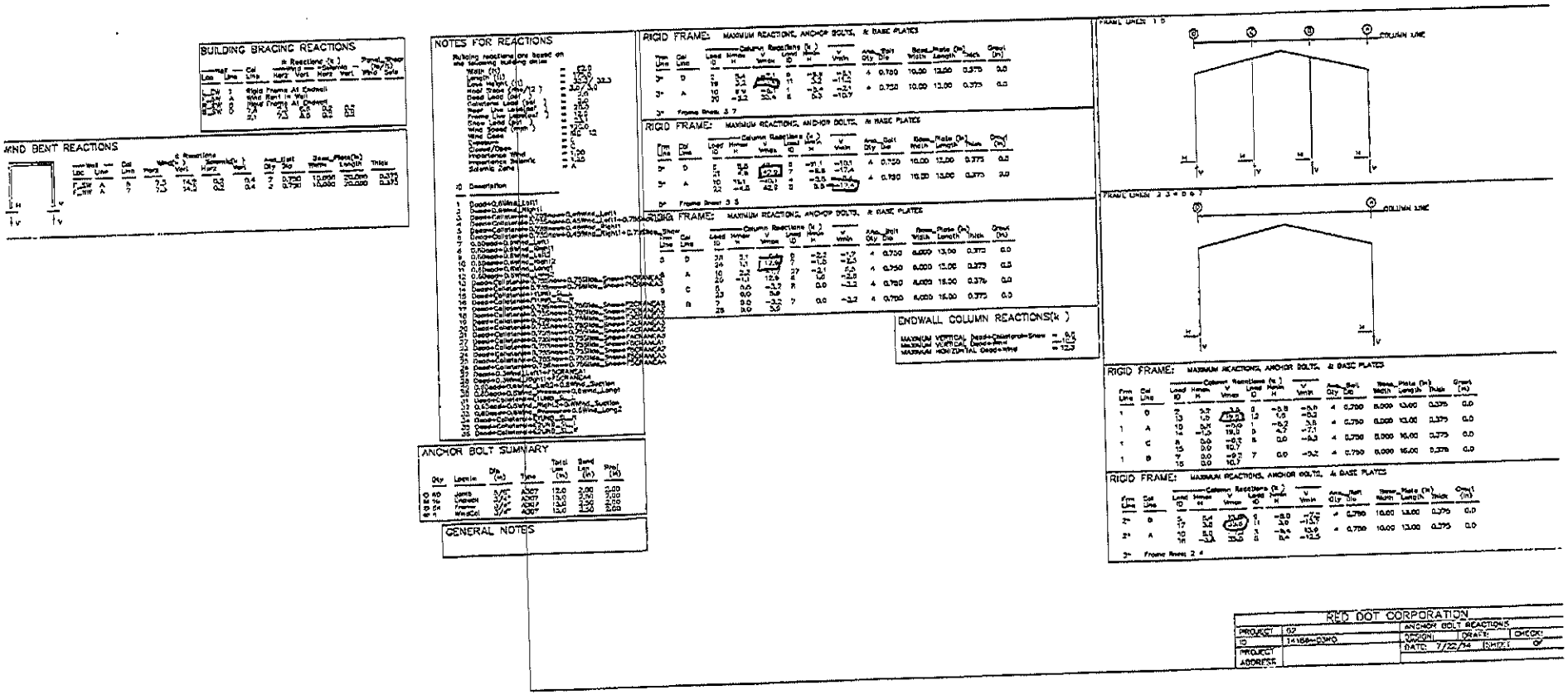
# STRUCTURAL CALCULATIONS
# FOR
## Building Foundation

## Targa Little Missouri #3 Compressor Building

## Watford City, North Dakota



# RED DOT COLUMN REACTION



By: RCM
Date: July 28, 2014

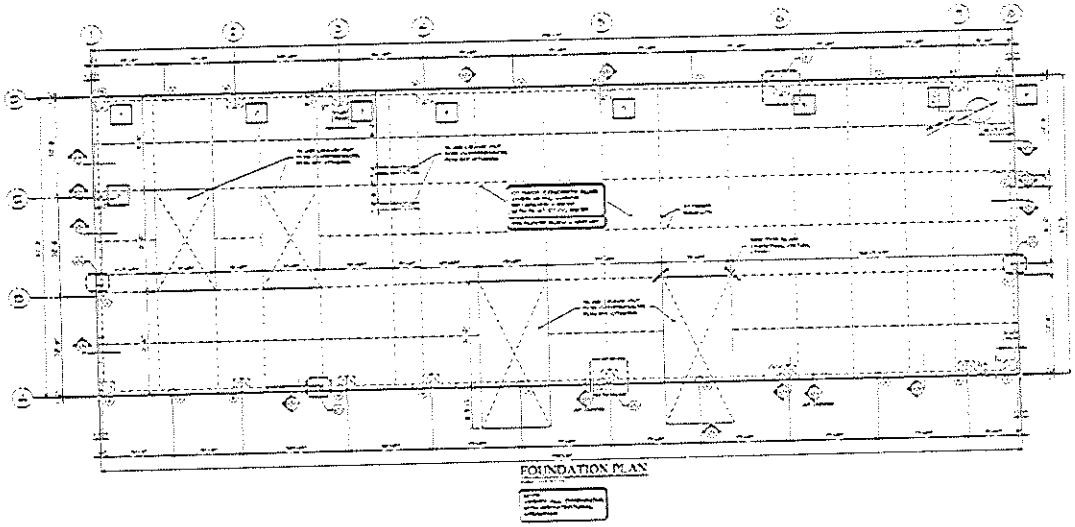
Little Missouri Gas Plant
Compressor Building
Pier Design

EIKON

**PIER REACTIONS:**

| Allowable Pier Loads | | |
|---|---|---|
| ROW | SIZE | CAPACITY (kips) |
| 1 | 30 inch | 91 |
| 2 | 18 inch | 45 |

| Pier # | Rcolumn (kips) | Ppilaster (kips) | TL of Frost Wall (ft) | Pfrostwall (kips) | Ptotal (kips) | Min Pier Diameter |
|---|---|---|---|---|---|---|
| 1 | 19.0 | 5.103 | 16.96 | 14.4 | 39.1 | 18 inch |
| 2 | 35.8 | 5.103 | 16.625 | 14.1 | 55.0 | 30 inch |
| 3 | 33.4 | 5.103 | 18 | 15.3 | 53.8 | 30 inch |
| 4 | 32.5 | 5.103 | 16.5 | 14.0 | 51.6 | 30 inch |
| 5 | 42.9 | 5.103 | 17 | 14.5 | 62.5 | 30 inch |
| 6 | 42.9 | 5.103 | 17 | 14.5 | 62.5 | 30 inch |
| 7 | 33.4 | 5.103 | 13.5 | 11.5 | 50.0 | 30 inch |
| 8 | 12.9 | 5.103 | 15.335 | 13.0 | 31.0 | 18 inch |
| 9 | 9 | 1.701 | 20.67 | 17.6 | 28.3 | 18 inch |
| Typical Interior Grade beam | 0 | 0 | 17 | 14.5 | 14.5 | 18 inch |



By: RCM
Date: July 28, 2014

Little Missouri Gas Plant
Compressor Building
Pier Design

EIKON

| | | |
|---|---|---|
| BORING | B-9 | |
| EXISTING GRADE ELEV | 2265.4 | FT |
| FINAL GRADE ELEV | 2276 | FT |
| DELTA GRADE | 10.6 | FILL |
| ALLOWABLE END BEARING | 5900 | PSF |
| MINIMUM TIP ELEVATION | 2255 | FT |

| | | |
|---|---|---|
| DIAMETER OF PIER | 2.5 | FT |
| PIER DEPTH (BELOW BOTTOM OF BEAM) | 25 | FT |
| BEAM DEPTH | 5 | FT |
| DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| TOP OF PIER ELEV | 2271 | FT |
| TOP OF SKIN FRICTION | 2266 | FT |
| TIP ELEVATION | 2246 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION TIP ELEV OK

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 6.5 | 2265.4 | 2258.9 | 6.5 | 900 | 2 | 450 | 6.5 | 22972.9 |
| 9 | 2258.9 | 2256.4 | 2.5 | 700 | 2 | 350 | 2.5 | 6672.2 |
| 11.5 | 2256.4 | 2253.9 | 2.5 | 1500 | 2 | 750 | 2.5 | 14726.2 |
| 23 | 2253.9 | 2242.4 | 11.5 | 1700 | 2 | 850 | 7.9 | 52739.5 |
| 27 | 2242.4 | 2238.4 | 4 | 1800 | 2 | 900 | 0 | 0.0 |
| 31 | 2238.4 | 2234.4 | 4 | 1800 | 2 | 900 | 0 | 0.0 |
| | | | | | | | | |
| | | | | | | | TOTAL SKIN FRICTION | 97310.8 |
| | | | | | | | TOTAL END BEARING | 28961.6 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 126 |

| | | |
|---|---|---|
| BORING | B-9 | |
| EXISTING GRADE ELEV | 2265.4 | FT |
| FINAL GRADE ELEV | 2276 | FT |
| DELTA GRADE | 10.6 | FILL |
| ALLOWABLE END BEARING | 5900 | PSF |
| MINIMUM TIP ELEVATION | 2255 | FT |

| | | |
|---|---|---|
| DIAMETER OF PIER | 1.5 | FT |
| PIER DEPTH (BELOW BOTTOM OF BEAM) | 25 | FT |
| BEAM DEPTH | 5 | FT |
| DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| TOP OF PIER ELEV | 2271 | FT |
| TOP OF SKIN FRICTION | 2266 | FT |
| TIP ELEVATION | 2246 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION TIP ELEV OK

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 6.5 | 2265.4 | 2258.9 | 6.5 | 900 | 2 | 450 | 6.5 | 13783.7 |
| 9 | 2258.9 | 2256.4 | 2.5 | 700 | 2 | 350 | 2.5 | 4123.3 |
| 11.5 | 2256.4 | 2253.9 | 2.5 | 1500 | 2 | 750 | 2.5 | 8805.7 |
| 23 | 2253.9 | 2242.4 | 11.5 | 1700 | 2 | 850 | 7.9 | 31043.7 |
| 27 | 2242.4 | 2230.4 | 4 | 1800 | 2 | 900 | 0 | 0.0 |
| 31 | 2238.4 | 2234.4 | 4 | 1800 | 2 | 900 | 0 | 0.0 |
| | | | | | | | | |
| | | | | | | | TOTAL SKIN FRICTION | 58386.5 |
| | | | | | | | TOTAL END BEARING | 10426.2 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 68 |

By: RCM
Date: July 28, 2014

Little Missouri Gas Plant
Compressor Building
Pier Design

EIKON

| | | | | | |
|---|---|---|---|---|---|
| | B-11 | | DIAMETER OF PIER | 2.5 | FT |
| BORING | 2265.8 | FT | PIER DEPTH (BELOW BOTTOM OF BEAM) | 25 | FT |
| EXISTING GRADE ELEV | 2276 | FT | BEAM DEPTH | 5 | FT |
| FINAL GRADE ELEV | 10.2 | FILL | DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| DELTA GRADE | | | | | |
| | | | TOP OF PIER ELEV | 2271 | FT |
| ALLOWABLE END BEARING | 6600 | PSF | TOP OF SKIN FRICTION | 2266 | FT |
| MINIMUM TIP ELEVATION | 2255 | FT | TIP ELEVATION | 2246 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION **TIP ELEV OK**

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 6.5 | 2265.8 | 2259.3 | 6.5 | 600 | 2 | 300 | 6.5 | 15315.3 |
| 11.5 | 2259.3 | 2254.3 | 5 | 600 | 2 | 300 | 5 | 11781.0 |
| 18 | 2254.3 | 2247.8 | 6.5 | 1800 | 2 | 900 | 6.5 | 45945.8 |
| 28 | 2247.8 | 2237.8 | 10 | 1800 | 2 | 900 | 1.8 | 12723.5 |
| 31 | 2237.8 | 2234.8 | 3 | 1800 | 2 | 900 | 0 | 0.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | TOTAL SKIN FRICTION | 85765.5 |
| | | | | | | | TOTAL END BEARING | 32397.7 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 118 |

PIER DEPTH BELOW FFE 30 FT

| | | | | | |
|---|---|---|---|---|---|
| | B-11 | | DIAMETER OF PIER | 1.5 | FT |
| BORING | 2265.8 | FT | PIER DEPTH (BELOW BOTTOM OF BEAM) | 25 | FT |
| EXISTING GRADE ELEV | 2276 | FT | BEAM DEPTH | 5 | FT |
| FINAL GRADE ELEV | 10.2 | FILL | DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| DELTA GRADE | | | | | |
| | | | TOP OF PIER ELEV | 2271 | FT |
| ALLOWABLE END BEARING | 6600 | PSF | TOP OF SKIN FRICTION | 2266 | FT |
| MINIMUM TIP ELEVATION | 2255 | FT | TIP ELEVATION | 2246 | FT |

CHECK TIP ELEVATION **TIP ELEV OK**

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 6.5 | 2265.8 | 2259.3 | 6.5 | 600 | 2 | 300 | 6.5 | 9189.2 |
| 11.5 | 2259.3 | 2254.3 | 5 | 600 | 2 | 300 | 5 | 7068.0 |
| 18 | 2254.3 | 2247.8 | 6.5 | 1800 | 2 | 900 | 6.5 | 27567.5 |
| 28 | 2247.8 | 2237.8 | 10 | 1800 | 2 | 900 | 1.8 | 7634.1 |
| 31 | 2237.8 | 2234.8 | 3 | 1800 | 2 | 900 | 0 | 0.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | TOTAL SKIN FRICTION | 51459.3 |
| | | | | | | | TOTAL END BEARING | 11663.2 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 63 |

By: RCM
Date: July 28, 2014

Little Missouri Gas Plant
Compressor Building
Pier Design

EIKON

| | | |
|---|---|---|
| BORING | B-14 | |
| EXISTING GRADE ELEV | 2266.4 | FT |
| FINAL GRADE ELEV | 2276 | FT |
| DELTA GRADE | 9.6 | FILL |
| ALLOWABLE END BEARING | 7400 | PSF |
| MINIMUM TIP ELEVATION | 2250.5 | FT |

| | | |
|---|---|---|
| DIAMETER OF PIER | 2.5 | FT |
| PIER DEPTH (BELOW BOTTOM OF BEAM) | 25 | FT |
| BEAM DEPTH | 5 | FT |
| DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| TOP OF PIER ELEV | 2271 | FT |
| TOP OF SKIN FRICTION | 2266 | FT |
| TIP ELEVATION | 2246 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION **TIP ELEV OK**

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 2 | 2266.4 | 2264.4 | 2 | 0 | 2 | 0 | 0 | 0.0 |
| 6.5 | 2264.4 | 2259.9 | 4.5 | 700 | 2 | 350 | 4.5 | 12370.0 |
| 11.5 | 2259.9 | 2254.9 | 5 | 400 | 2 | 200 | 5 | 7854.0 |
| 14 | 2254.9 | 2252.4 | 2.5 | 1800 | 2 | 900 | 2.5 | 17671.5 |
| 18 | 2252.4 | 2248.4 | 4 | 0 | 2 | 0 | 4 | 0.0 |
| 31 | 2248.4 | 2235.4 | 13 | 1800 | 2 | 900 | 2.4 | 10964.6 |
| | | | | | | | TOTAL SKIN FRICTION | 54860.1 |
| | | | | | | | TOTAL END BEARING | 36324.7 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 91 |

| | | |
|---|---|---|
| BORING | B-14 | |
| EXISTING GRADE ELEV | 2266.4 | FT |
| FINAL GRADE ELEV | 2276 | FT |
| DELTA GRADE | 9.6 | FILL |
| ALLOWABLE END BEARING | 7400 | PSF |
| MINIMUM TIP ELEVATION | 2250 | FT |

| | | |
|---|---|---|
| DIAMETER OF PIER | 1.5 | FT |
| PIER DEPTH (BELOW BOTTOM OF BEAM) | 26 | FT |
| BEAM DEPTH | 5 | FT |
| DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| TOP OF PIER ELEV | 2271 | FT |
| TOP OF SKIN FRICTION | 2266 | FT |
| TIP ELEVATION | 2246 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION **TIP ELEV OK**

| DEPTH | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 2 | 2266.4 | 2264.4 | 2 | 0 | 2 | 0 | 0 | 0.0 |
| 6.5 | 2264.4 | 2259.9 | 4.5 | 700 | 2 | 350 | 4.5 | 7422.0 |
| 11.5 | 2259.9 | 2254.9 | 5 | 400 | 2 | 200 | 5 | 4712.4 |
| 14 | 2254.9 | 2252.4 | 2.5 | 1800 | 2 | 900 | 2.5 | 10602.9 |
| 18 | 2252.4 | 2248.4 | 4 | 0 | 2 | 0 | 4 | 0.0 |
| 31 | 2248.4 | 2235.4 | 13 | 1800 | 2 | 900 | 2.4 | 10178.8 |
| | | | | | | | TOTAL SKIN FRICTION | 32916.0 |
| | | | | | | | TOTAL END BEARING | 13076.9 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 45 |

By: RCM
Date: July 28, 2014

Little Missouri Gas Plant
Compressor Building
Pier Design

EIKON

**UPLIFT CHECK**

| | |
|---|---|
| Uplift (Concrete = 145 PCF) | |
| Thickness of slab | 0 in |
| Net ColumnUplift Force | 17.4 kips |

| | |
|---|---|
| Area of slab to Resist Uplift | 225 ft (15'x15' square) |
| Weight of Slab | 0 pounds (15'x15' square) |
| Weight of Frost Wall | 14500 pounds (20' each side of column) |
| Weight of Pilaster | 4584.25 pounds |
| Weight of Pier | 17759 pounds |
| Total Weight of Concrete | 36825.42711 pounds |

F.S. for Uplift 1.269842315 (0.6*weight of concrete/net uplift) OK

L-PILE compressor.lp7o

LPile Plus for Windows, Version 2013-07.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

© 1985-2013 by Ensoft, Inc.
All Rights Reserved

This copy of LPile is licensed to:

EIKON CONSULTANT GROUP
SANGER, TEXAS

Serial Number of Security Device: 225226298
Company Name Stored in Security Device: EIKON Consultant Group

## Files Used for Analysis

Path to file locations: C:\Users\cmckee\Desktop\Sync Toy\targa\Calculations\COMPRESSOR\
Name of input data file: L-PILE compressor.lp7d
Name of output report file: L-PILE compressor.lp7o
Name of plot output file: L-PILE compressor.lp7p
Name of runtime messeage file: L-PILE compressor.lp7r

## Date and Time of Analysis

Date: July 28, 2014 Time: 11:33:39

## Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

L-PILE compressor.lp7o

## Program Options

Engineering Units of Input Data and Computations:
- Engineering units are US Customary Units: pounds, inches, feet

Analysis Control Options:

| | | |
|---|---|---|
| - Maximum number of iterations allowed | = | 500 |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection | = | 100.0000 in |
| - Number of pile increments | = | 100 |

Loading Type and Number of Cycles of Loading:
- Static loading specified

Computational Options:
- Use unfactored loads in computations
- No computation of pile-head foundation stiffness matrix
- Compute pile response under loading and nonlinear bending properties of pile (if nonlinear properties are specified)
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Input Data Options:
- Analysis does not use p-y modification factors (individual pile or shaft only)
- Analysis assumes zero shear resistance at the pile tip
- Analysis assumes no loading by soil movements acting on pile

Output Options:
- No p-y curves to be computed and reported for user-specified depths
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

## Pile Structural Properties and Geometry

| | | |
|---|---|---|
| Total number of pile sections | = | 1 |
| Total length of pile | = | 30.00 ft |
| Depth of ground surface below top of pile | = | 5.00 ft |

Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile.

| Point | Depth X ft | Pile Diameter in |
|---|---|---|
| 1 | 0.00000 | 30.0000000 |
| 2 | 30.000000 | 30.0000000 |

Input Structural Properties:

Pile Section No. 1:

| | | |
|---|---|---|
| Section Type | = | Drilled Shaft (Bored Pile) |
| Section Length | = | 30.00000 ft |
| Section Diameter | = | 30.00000 in |

## Ground Slope and Pile Batter Angles

| | | |
|---|---|---|
| Ground Slope Angle | = | 0.000 degrees |
| | = | 0.000 radians |
| Pile Batter Angle | = | 0.000 degrees |
| | = | 0.000 radians |

## Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 5.00000 ft |
| Distance from top of pile to bottom of layer | = | 9.60000 ft |
| Effective unit weight at top of layer | = | 115.00000 pcf |
| Effective unit weight at bottom of layer | = | 115.00000 pcf |
| Undrained cohesion at top of layer | = | 1200.00000 psf |
| Undrained cohesion at bottom of layer | = | 1200.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |
| Subgrade k at top of layer | = | 0.0000 pci |
| Subgrade k at bottom of layer | = | 0.0000 pci |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

NOTE: Internal default values for subgrade k will be computed for the above soil layer.

Layer 2 is soft clay, p-y criteria by Matlock, 1970

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 9.60000 ft |
| Distance from top of pile to bottom of layer | = | 11.60000 ft |
| Effective unit weight at top of layer | = | 115.00000 pcf |
| Effective unit weight at bottom of layer | = | 115.00000 pcf |
| Undrained cohesion at top of layer | = | 10.00000 psf |
| Undrained cohesion at bottom of layer | = | 10.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

Layer 3 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 11.60000 ft |
| Distance from top of pile to bottom of layer | = | 16.10000 ft |
| Effective unit weight at top of layer | = | 115.00000 pcf |
| Effective unit weight at bottom of layer | = | 115.00000 pcf |
| Undrained cohesion at top of layer | = | 1200.00000 psf |
| Undrained cohesion at bottom of layer | = | 1200.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |
| Subgrade k at top of layer | = | 0.0000 pci |
| Subgrade k at bottom of layer | = | 0.0000 pci |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

NOTE: Internal default values for subgrade k will be computed for the above soil layer.

Layer 4 is soft clay, p-y criteria by Matlock, 1970

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 16.10000 ft |
| Distance from top of pile to bottom of layer | = | 21.10000 ft |
| Effective unit weight at top of layer | = | 120.00000 pcf |
| Effective unit weight at bottom of layer | = | 120.00000 pcf |
| Undrained cohesion at top of layer | = | 575.00000 psf |
| Undrained cohesion at bottom of layer | = | 575.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

Layer 5 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 21.10000 ft |
| Distance from top of pile to bottom of layer | = | 23.60000 ft |
| Effective unit weight at top of layer | = | 120.00000 pcf |
| Effective unit weight at bottom of layer | = | 120.00000 pcf |
| Undrained cohesion at top of layer | = | 2800.00000 psf |
| Undrained cohesion at bottom of layer | = | 2800.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |
| Subgrade k at top of layer | = | 0.0000 pci |
| Subgrade k at bottom of layer | = | 0.0000 pci |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

NOTE: Internal default values for subgrade k will be computed for the above soil layer.

Layer 6 is soft clay, p-y criteria by Matlock, 1970

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 23.60000 ft |
| Distance from top of pile to bottom of layer | = | 27.60000 ft |
| Effective unit weight at top of layer | = | 85.00000 pcf |
| Effective unit weight at bottom of layer | = | 85.00000 pcf |
| Undrained cohesion at top of layer | = | 10.00000 psf |
| Undrained cohesion at bottom of layer | = | 10.00000 psf |

| | | |
|---|---|---|
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

Layer 7 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 27.60000 ft |
| Distance from top of pile to bottom of layer | = | 40.60000 ft |
| Effective unit weight at top of layer | = | 130.00000 pcf |
| Effective unit weight at bottom of layer | = | 130.00000 pcf |
| Undrained cohesion at top of layer | = | 3500.00000 psf |
| Undrained cohesion at bottom of layer | = | 3500.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |
| Subgrade k at top of layer | = | 0.0000 pci |
| Subgrade k at bottom of layer | = | 0.0000 pci |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

NOTE: Internal default values for subgrade k will be computed for the above soil layer.

(Depth of lowest soil layer extends 10.60 ft below pile tip)

Summary of Soil Properties

| Layer Num. | Soil Type (p-y Curve Criteria) | Layer Depth ft | Effective Unit Wt. pcf | Undrained Cohesion psf | Strain Factor Epsilon 50 | kpy pci |
|---|---|---|---|---|---|---|
| 1 | Stiff Clay w/o Free Water, using k | 5.000 | 115.000 | 1200.000 | default | default |
| | | 9.600 | 115.000 | 1200.000 | default | default |
| 2 | Soft Clay | 9.600 | 115.000 | 10.000 | default | -- |
| | | 11.600 | 115.000 | 10.000 | default | -- |
| 3 | Stiff Clay w/o Free Water, using k | 11.600 | 115.000 | 1200.000 | default | default |
| | | 16.100 | 115.000 | 1200.000 | default | default |
| 4 | Soft Clay | 16.100 | 120.000 | 575.000 | default | -- |
| | | 21.100 | 120.000 | 575.000 | default | -- |
| 5 | Stiff Clay w/o Free Water, using k | 21.100 | 120.000 | 2800.000 | default | default |
| | | 23.600 | 120.000 | 2800.000 | default | default |

| | | | | |
|---|---|---|---|---|
| 6 Soft Clay | | 23.600 | 85.000 | 10.000 |
| default | -- | 27.600 | 85.000 | 10.000 |
| default | -- | 27.600 | 130.000 | 3500.000 |
| 7 Stiff Clay w/o Free Water, using k | | 40.600 | 130.000 | 3500.000 |
| default | default | | | |
| default | default | | | |

## Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

## Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

| Load No. | Load Compute Type | Condition 1 | | Condition 2 | Axial Thrust Force, lbs |
|---|---|---|---|---|---|
| Top y vs. Pile Length | | | | | |
| 1 | 1 No | V = 18500. lbs | M = | 0.0000 in-lbs | 0.0000000 |
| 2 | 1 No | V = 14800. lbs | M = | 0.0000 in-lbs | 30000. |

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

## Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

| | | |
|---|---|---|
| Length of Section | = | 30.00000 ft |
| Shaft Diameter | = | 30.00000 in |
| Concrete Cover Thickness | = | 3.00000 in |
| Number of Reinforcing Bars | = | 10 bars |
| Yield Stress of Reinforcing Bars | = | 60.00000 ksi |

| | | |
|---|---|---|
| Modulus of Elasticity of Reinforcing Bars | = | 29000. ksi |
| Gross Area of Shaft | = | 706.85835 sq. in. |
| Total Area of Reinforcing Steel | = | 7.90000 sq. in. |
| Area Ratio of Steel Reinforcement | = | 1.12 percent |
| Edge-to-Edge Bar Spacing | = | 6.10739 in |
| Maximum Concrete Aggregate Size | = | 0.75000 in |
| Ratio of Bar Spacing to Aggregate Size | = | 8.14 |
| Offset of Center of Rebar Cage from Center of Pile | = | 0.0000 in |

Axial Structural Capacities:

| | | |
|---|---|---|
| Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As | = | 3147.516 kips |
| Tensile Load for Cracking of Concrete | = | -334.148 kips |
| Nominal Axial Tensile Capacity | = | -474.000 kips |

Reinforcing Bar Dimensions and Positions Used in Computations:

| Bar Number | Bar Diam. inches | Bar Area sq. in. | X inches | Y inches |
|---|---|---|---|---|
| 1 | 1.00000 | 0.79000 | 11.50000 | 0.00000 |
| 2 | 1.00000 | 0.79000 | 9.30370 | 6.75953 |
| 3 | 1.00000 | 0.79000 | 3.55370 | 10.93715 |
| 4 | 1.00000 | 0.79000 | -3.55370 | 10.93715 |
| 5 | 1.00000 | 0.79000 | -9.30370 | 6.75953 |
| 6 | 1.00000 | 0.79000 | -11.50000 | 0.00000 |
| 7 | 1.00000 | 0.79000 | -9.30370 | -6.75953 |
| 8 | 1.00000 | 0.79000 | -3.55370 | -10.93715 |
| 9 | 1.00000 | 0.79000 | 3.55370 | -10.93715 |
| 10 | 1.00000 | 0.79000 | 9.30370 | -6.75953 |

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 6.10739 inches between Bars 5 and 6

Spacing to aggregate size ratio = 8.14319

Concrete Properties:

| | | |
|---|---|---|
| Compressive Strength of Concrete | = | 4.50000 ksi |
| Modulus of Elasticity of Concrete | = | 3823.67624 ksi |
| Modulus of Rupture of Concrete | = | -0.50312 ksi |
| Compression Strain at Peak Stress | = | 0.00200 |
| Tensile Strain at Fracture of Concrete | = | -0.0001152 |
| Maximum Coarse Aggregate Size | = | 0.75000 in |

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

| Number | Axial Thrust Force kips |
|---|---|
| 1 | 0.000 |
| 2 | 30.000 |

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

| Bending Max Concrete Curvature Stress rad/in. ksi | Bending Max Steel Moment Stress in-kip ksi | Run Msg | Bending Stiffness kip-in2 | Depth to N Axis in | Max Comp Strain in/in | Max Tens Strain in/in |
|---|---|---|---|---|---|---|
| 0.000001250 | 238.9158389 | | 191132671. | 15.0000882 | 0.0000188 | -0.0000187 |
| 0.0831155 | 0.5383157 | | | | | |
| 0.000002500 | 476.4265140 | | 190570606. | 15.0000886 | 0.0000375 | -0.0000375 |
| 0.1654562 | 1.0766314 | | | | | |
| 0.000003750 | 712.5320255 | | 190008540. | 15.0000890 | 0.0000563 | -0.0000562 |
| 0.2470222 | 1.6149472 | | | | | |
| 0.000005000 | 947.2323731 | | 189446475. | 15.0000895 | 0.0000750 | -0.0000750 |
| 0.3278134 | 2.1532629 | | | | | |
| 0.000006250 | 1180.5275571 | | 188884409. | 15.0000899 | 0.0000938 | -0.0000937 |
| 0.4078299 | 2.6915787 | | | | | |
| 0.000007500 | 1412.4175773 | | 188322344. | 15.0000903 | 0.0001125 | -0.0001125 |
| 0.4870716 | 3.2298946 | | | | | |
| 0.000008750 | 1412.4175773 | | 161419152. | 7.3172219 | 0.0000640 | -0.0001985 |
| 0.2776902 | -5.7176924 | C | | | | |
| 0.0000100 | 1412.4175773 | | 141241758. | 7.3201716 | 0.0000732 | -0.0002268 |
| 0.3167663 | -6.5336502 | C | | | | |
| 0.0000113 | 1412.4175773 | | 125548229. | 7.3231294 | 0.0000824 | -0.0002551 |
| 0.3556929 | -7.3493915 | C | | | | |
| 0.0000125 | 1412.4175773 | | 112993406. | 7.3260956 | 0.0000916 | -0.0002834 |
| 0.3944698 | -8.1649153 | C | | | | |
| 0.0000138 | 1412.4175773 | | 102721278. | 7.3290701 | 0.0001008 | -0.0003117 |
| 0.4330967 | -8.9802208 | C | | | | |
| 0.0000150 | 1412.4175773 | | 94161172. | 7.3320530 | 0.0001100 | -0.0003400 |
| 0.4715732 | -9.7953069 | C | | | | |
| 0.0000163 | 1412.4175773 | | 86918005. | 7.3350443 | 0.0001192 | -0.0003683 |
| 0.5098989 | -10.6101729 | C | | | | |
| 0.0000175 | 1412.4175773 | | 80709576. | 7.3380440 | 0.0001284 | -0.0003966 |
| 0.5480736 | -11.4248176 | C | | | | |
| 0.0000188 | 1412.4175773 | | 75328937. | 7.3410523 | 0.0001376 | -0.0004249 |
| 0.5860970 | -12.2392403 | C | | | | |
| 0.0000200 | 1412.4175773 | | 70620879. | 7.3440692 | 0.0001469 | -0.0004531 |
| 0.6239687 | -13.0534398 | C | | | | |
| 0.0000213 | 1412.4175773 | | 66466710. | 7.3470947 | 0.0001561 | -0.0004814 |
| 0.6616883 | -13.8674153 | C | | | | |
| 0.0000225 | 1412.4175773 | | 62774115. | 7.3501234 | 0.0001654 | -0.0005096 |
| 0.6992551 | -14.6811694 | C | | | | |
| 0.0000238 | 1412.4175773 | | 59470214. | 7.3530375 | 0.0001746 | -0.0005379 |

| | | | | | |
|---|---|---|---|---|---|
| 0.7366571 | -15.4947829 | C | | | |
| 0.0000250 | 1412.4175773 | | 56496703. | 7.3559595 | 0.0001839 | -0.0005661 |
| 0.7739048 | -16.3081793 | C | | | |
| 0.0000263 | 1412.4175773 | | 53806384. | 7.3588897 | 0.0001932 | -0.0005943 |
| 0.8109978 | -17.1213577 | C | | | |
| 0.0000275 | 1412.4175773 | | 51360639. | 7.3618280 | 0.0002025 | -0.0006225 |
| 0.8479359 | -17.9343171 | C | | | |
| 0.0000288 | 1412.4175773 | | 49127568. | 7.3647745 | 0.0002117 | -0.0006508 |
| 0.8847187 | -18.7470567 | C | | | |
| 0.0000300 | 1412.4175773 | | 47080586. | 7.3677292 | 0.0002210 | -0.0006790 |
| 0.9213459 | -19.5595755 | C | | | |
| 0.0000313 | 1412.4175773 | | 45197362. | 7.3706922 | 0.0002303 | -0.0007072 |
| 0.9578171 | -20.3718726 | C | | | |
| 0.0000325 | 1412.4175773 | | 43459002. | 7.3736636 | 0.0002396 | -0.0007354 |
| 0.9941320 | -21.1839470 | C | | | |
| 0.0000338 | 1412.4175773 | | 41849410. | 7.3766433 | 0.0002490 | -0.0007635 |
| 1.0302902 | -21.9957979 | C | | | |
| 0.0000350 | 1412.4175773 | | 40354788. | 7.3796314 | 0.0002583 | -0.0007917 |
| 1.0662915 | -22.8074241 | C | | | |
| 0.0000363 | 1412.4175773 | | 38963244. | 7.3826280 | 0.0002676 | -0.0008199 |
| 1.1021353 | -23.6188248 | C | | | |
| 0.0000375 | 1412.4175773 | | 37664469. | 7.3856331 | 0.0002770 | -0.0008480 |
| 1.1378215 | -24.4299989 | C | | | |
| 0.0000388 | 1412.4175773 | | 36449486. | 7.3886468 | 0.0002863 | -0.0008762 |
| 1.1733497 | -25.2409456 | C | | | |
| 0.0000400 | 1434.4891024 | | 35862228. | 7.3916692 | 0.0002957 | -0.0009043 |
| 1.2087194 | -26.0516637 | C | | | |
| 0.0000413 | 1478.8039644 | | 35849793. | 7.3947002 | 0.0003050 | -0.0009325 |
| 1.2439304 | -26.8621524 | C | | | |
| 0.0000425 | 1523.0864331 | | 35837328. | 7.3977399 | 0.0003144 | -0.0009606 |
| 1.2789823 | -27.6724105 | C | | | |
| 0.0000438 | 1567.3363857 | | 35824832. | 7.4007884 | 0.0003238 | -0.0009887 |
| 1.3138747 | -28.4824372 | C | | | |
| 0.0000450 | 1611.5536988 | | 35812304. | 7.4038457 | 0.0003332 | -0.0010168 |
| 1.3486073 | -29.2922313 | C | | | |
| 0.0000463 | 1655.7382477 | | 35799746. | 7.4069120 | 0.0003426 | -0.0010449 |
| 1.3831797 | -30.1017918 | C | | | |
| 0.0000475 | 1699.8899072 | | 35787156. | 7.4099871 | 0.0003520 | -0.0010730 |
| 1.4175915 | -30.9111177 | C | | | |
| 0.0000488 | 1744.0085509 | | 35774534. | 7.4130712 | 0.0003614 | -0.0011011 |
| 1.4518424 | -31.7202080 | C | | | |
| 0.0000513 | 1832.1461944 | | 35749194. | 7.4192667 | 0.0003802 | -0.0011573 |
| 1.5198598 | -33.3376778 | C | | | |
| 0.0000538 | 1920.1503117 | | 35723727. | 7.4254988 | 0.0003991 | -0.0012134 |
| 1.5872290 | -34.9541918 | C | | | |
| 0.0000563 | 2008.0197801 | | 35698129. | 7.4317679 | 0.0004180 | -0.0012695 |
| 1.6539469 | -36.5697417 | C | | | |
| 0.0000588 | 2095.7535383 | | 35672401. | 7.4380745 | 0.0004370 | -0.0013255 |
| 1.7200105 | -38.1843187 | C | | | |
| 0.0000613 | 2183.3505087 | | 35646539. | 7.4444191 | 0.0004560 | -0.0013815 |
| 1.7854166 | -39.7979138 | C | | | |
| 0.0000638 | 2270.8095970 | | 35620543. | 7.4508021 | 0.0004750 | -0.0014375 |
| 1.8501621 | -41.4105178 | C | | | |
| 0.0000663 | 2358.1296918 | | 35594410. | 7.4572241 | 0.0004940 | -0.0014935 |
| 1.9142437 | -43.0221216 | C | | | |
| 0.0000688 | 2445.3096643 | | 35568141. | 7.4636855 | 0.0005131 | -0.0015494 |
| 1.9776583 | -44.6327156 | C | | | |
| 0.0000713 | 2532.3483678 | | 35541731. | 7.4701867 | 0.0005323 | -0.0016052 |
| 2.0404024 | -46.2422902 | C | | | |
| 0.0000738 | 2619.2446373 | | 35515182. | 7.4767284 | 0.0005514 | -0.0016611 |
| 2.1024728 | -47.8508357 | C | | | |
| 0.0000763 | 2705.9972890 | | 35488489. | 7.4833110 | 0.0005706 | -0.0017169 |
| 2.1638661 | -49.4583422 | C | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.0000788 | 2792.6051199 | | 35461652. | 7.4899351 | 0.0005898 | -0.0017727 |
| 2.2245789 | -51.0647995 | C | | | | |
| 0.0000813 | 2879.0669076 | | 35434670. | 7.4966012 | 0.0006091 | -0.0018284 |
| 2.2846076 | -52.6701973 | C | | | | |
| 0.0000838 | 2965.3814092 | | 35407539. | 7.5033099 | 0.0006284 | -0.0018841 |
| 2.3439488 | -54.2745253 | C | | | | |
| 0.0000863 | 3051.5473615 | | 35380259. | 7.5100616 | 0.0006477 | -0.0019398 |
| 2.4025988 | -55.8777726 | C | | | | |
| 0.0000888 | 3137.5634801 | | 35352828. | 7.5168570 | 0.0006671 | -0.0019954 |
| 2.4605540 | -57.4799286 | C | | | | |
| 0.0000913 | 3223.4284588 | | 35325243. | 7.5236967 | 0.0006865 | -0.0020510 |
| 2.5178108 | -59.0809820 | C | | | | |
| 0.0000938 | 3309.1409693 | | 35297504. | 7.5305813 | 0.0007060 | -0.0021065 |
| 2.5743654 | -60.0000000 | CY | | | | |
| 0.0000963 | 3394.6996608 | | 35269607. | 7.5375113 | 0.0007255 | -0.0021620 |
| 2.6302139 | -60.0000000 | CY | | | | |
| 0.0000988 | 3480.1031587 | | 35241551. | 7.5444874 | 0.0007450 | -0.0022175 |
| 2.6853527 | -60.0000000 | CY | | | | |
| 0.0001013 | 3565.3506210 | | 35213339. | 7.5515102 | 0.0007646 | -0.0022729 |
| 2.7397779 | -60.0000000 | CY | | | | |
| 0.0001038 | 3650.4395470 | | 35184959. | 7.5585804 | 0.0007842 | -0.0023283 |
| 2.7934851 | -60.0000000 | CY | | | | |
| 0.0001063 | 3735.3690120 | | 35156414. | 7.5656986 | 0.0008039 | -0.0023836 |
| 2.8464705 | -60.0000000 | CY | | | | |
| 0.0001088 | 3820.1375422 | | 35127702. | 7.5728655 | 0.0008235 | -0.0024390 |
| 2.8987301 | -60.0000000 | CY | | | | |
| 0.0001113 | 3902.2893827 | | 35076758. | 7.5784533 | 0.0008431 | -0.0024944 |
| 2.9497811 | -60.0000000 | CY | | | | |
| 0.0001138 | 3968.2509000 | | 34885722. | 7.5735997 | 0.0008615 | -0.0025510 |
| 2.9969917 | -60.0000000 | CY | | | | |
| 0.0001163 | 4017.2592454 | | 34557069. | 7.5581740 | 0.0008786 | -0.0026089 |
| 3.0402632 | -60.0000000 | CY | | | | |
| 0.0001188 | 4061.8440135 | | 34205002. | 7.5407965 | 0.0008955 | -0.0026670 |
| 3.0821225 | -60.0000000 | CY | | | | |
| 0.0001213 | 4106.3332951 | | 33866666. | 7.5243407 | 0.0009123 | -0.0027252 |
| 3.1234348 | -60.0000000 | CY | | | | |
| 0.0001238 | 4150.7413723 | | 33541344. | 7.5087617 | 0.0009292 | -0.0027833 |
| 3.1642006 | -60.0000000 | CY | | | | |
| 0.0001263 | 4195.0676778 | | 33228259. | 7.4940090 | 0.0009461 | -0.0028414 |
| 3.2044175 | -60.0000000 | CY | | | | |
| 0.0001288 | 4239.3116371 | | 32926692. | 7.4800363 | 0.0009631 | -0.0028994 |
| 3.2440830 | -60.0000000 | CY | | | | |
| 0.0001313 | 4283.4726677 | | 32635982. | 7.4668005 | 0.0009800 | -0.0029575 |
| 3.2831946 | -60.0000000 | CY | | | | |
| 0.0001338 | 4327.5501797 | | 32355515. | 7.4542619 | 0.0009970 | -0.0030155 |
| 3.3217499 | -60.0000000 | CY | | | | |
| 0.0001363 | 4371.5435749 | | 32084723. | 7.4423838 | 0.0010140 | -0.0030735 |
| 3.3597463 | -60.0000000 | CY | | | | |
| 0.0001388 | 4415.4332948 | | 31822943. | 7.4311189 | 0.0010311 | -0.0031314 |
| 3.3971772 | -60.0000000 | CY | | | | |
| 0.0001413 | 4458.5413718 | | 31564895. | 7.4199735 | 0.0010481 | -0.0031894 |
| 3.4338971 | -60.0000000 | CY | | | | |
| 0.0001438 | 4493.9512426 | | 31262270. | 7.4041799 | 0.0010644 | -0.0032481 |
| 3.4684367 | -60.0000000 | CY | | | | |
| 0.0001463 | 4520.3231733 | | 30908193. | 7.3829118 | 0.0010798 | -0.0033077 |
| 3.5005436 | -60.0000000 | CY | | | | |
| 0.0001488 | 4539.3418604 | | 30516584. | 7.3574638 | 0.0010944 | -0.0033681 |
| 3.5306234 | -60.0000000 | CY | | | | |
| 0.0001588 | 4603.2967006 | | 28997145. | 7.2521784 | 0.0011513 | -0.0036112 |
| 3.6427632 | -60.0000000 | CY | | | | |
| 0.0001688 | 4666.4171650 | | 27652842. | 7.1605607 | 0.0012083 | -0.0038542 |
| 3.7483811 | -60.0000000 | CY | | | | |
| 0.0001788 | 4728.9211404 | | 26455503. | 7.0808265 | 0.0012657 | -0.0040968 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.8475579 | -60.0000000 | CY | 25379879. | 7.0086082 | 0.0013229 | -0.0043396 |
| 0.0001888 | 4790.4521494 | | | | | |
| 3.9394409 | -60.0000000 | CY | 24408117. | 6.9434240 | 0.0013800 | -0.0045825 |
| 0.0001988 | 4851.1131626 | | | | | |
| 4.0242863 | -60.0000000 | CY | 23526464. | 6.8859878 | 0.0014374 | -0.0048251 |
| 0.0002088 | 4911.1494399 | | | | | |
| 4.1025926 | -60.0000000 | CY | 22722493. | 6.8352747 | 0.0014952 | -0.0050673 |
| 0.0002188 | 4970.5452988 | | | | | |
| 4.1742517 | -60.0000000 | CY | 21985941. | 6.7904412 | 0.0015533 | -0.0053092 |
| 0.0002288 | 5029.2841108 | | | | | |
| 4.2391506 | -60.0000000 | CY | 21306114. | 6.7503459 | 0.0016116 | -0.0055509 |
| 0.0002388 | 5086.8347540 | | | | | |
| 4.2970714 | -60.0000000 | CY | 20634005. | 6.7026761 | 0.0016673 | -0.0057952 |
| 0.0002488 | 5132.7086480 | | | | | |
| 4.3454992 | -60.0000000 | CY | 19939945. | 6.6431583 | 0.0017189 | -0.0060436 |
| 0.0002588 | 5159.4606577 | | | | | |
| 4.3844565 | -60.0000000 | CY | 19254079. | 6.5788990 | 0.0017681 | -0.0062944 |
| 0.0002688 | 5174.5337507 | | | | | |
| 4.4162584 | -60.0000000 | CY | 18611146. | 6.5188598 | 0.0018171 | -0.0065454 |
| 0.0002788 | 5187.8568253 | | | | | |
| 4.4428976 | -60.0000000 | CY | 18011682. | 6.4638494 | 0.0018664 | -0.0067961 |
| 0.0002888 | 5200.8731684 | | | | | |
| 4.4645527 | -60.0000000 | CY | 17449323. | 6.4101458 | 0.0019150 | -0.0070475 |
| 0.0002988 | 5212.9853669 | | | | | |
| 4.4808618 | -60.0000000 | CY | 16921758. | 6.3596154 | 0.0019635 | -0.0072990 |
| 0.0003088 | 5224.5929114 | | | | | |
| 4.4921666 | -60.0000000 | CY | 16426363. | 6.3130721 | 0.0020123 | -0.0075502 |
| 0.0003188 | 5235.9030993 | | | | | |
| 4.4985257 | -60.0000000 | CY | 15960109. | 6.2702104 | 0.0020613 | -0.0078012 |
| 0.0003288 | 5246.8857168 | | | | | |
| 4.4957508 | -60.0000000 | CY | 15520290. | 6.2307805 | 0.0021107 | -0.0080518 |
| 0.0003388 | 5257.4981838 | | | | | |
| 4.4979739 | -60.0000000 | CY | 15104828. | 6.1943821 | 0.0021603 | -0.0083022 |
| 0.0003488 | 5267.8088123 | | | | | |
| 4.4990018 | 60.0000000 | CY | 14711320. | 6.1609893 | 0.0022103 | -0.0085522 |
| 0.0003588 | 5277.6860233 | | | | | |
| 4.4960200 | 60.0000000 | CY | 14337636. | 6.1280735 | 0.0022597 | -0.0088028 |
| 0.0003688 | 5287.0033631 | | | | | |
| 4.4996546 | 60.0000000 | CY | 13982355. | 6.0967238 | 0.0023091 | -0.0090534 |
| 0.0003788 | 5295.8168065 | | | | | |
| 4.4910458 | 60.0000000 | CY | 13644611. | 6.0677296 | 0.0023588 | -0.0093037 |
| 0.0003888 | 5304.3424310 | | | | | |
| 4.4971838 | 60.0000000 | CY | 13323277. | 6.0407770 | 0.0024088 | -0.0095537 |
| 0.0003988 | 5312.6568790 | | | | | |
| 4.4998732 | 60.0000000 | CY | 13016816. | 6.0159884 | 0.0024590 | -0.0098035 |
| 0.0004088 | 5320.6235379 | | | | | |
| 4.4901782 | 60.0000000 | CY | 12724438. | 5.9929917 | 0.0025096 | -0.0100529 |
| 0.0004188 | 5328.3583714 | | | | | |
| 4.4964189 | 60.0000000 | CY | 12445274. | 5.9715725 | 0.0025603 | -0.0103022 |
| 0.0004288 | 5335.9110734 | | | | | |
| 4.4995859 | 60.0000000 | CY | 12178202. | 5.9518166 | 0.0026114 | -0.0105511 |
| 0.0004388 | 5343.1860049 | | | | | |
| 4.4931144 | 60.0000000 | CY | 11922462. | 5.9335749 | 0.0026627 | -0.0107998 |
| 0.0004488 | 5350.2049455 | | | | | |
| 4.4930832 | 60.0000000 | CY | 11677539. | 5.9165554 | 0.0027142 | -0.0110483 |
| 0.0004588 | 5357.0711128 | | | | | |
| 4.4978815 | 60.0000000 | CY | 11442733. | 5.9006897 | 0.0027659 | -0.0112966 |
| 0.0004688 | 5363.7809722 | | | | | |
| 4.4999247 | 60.0000000 | CY | 11217114. | 5.8861903 | 0.0028180 | -0.0115445 |
| 0.0004788 | 5370.1933781 | | | | | |
| 4.4897272 | 60.0000000 | CY | 11000379. | 5.8727293 | 0.0028703 | -0.0117922 |
| 0.0004888 | 5376.4351717 | | | | | |
| 4.4921694 | 60.0000000 | CY | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 0.0004988 | 5382.5494734 | 10792079. | 5.8601642 | 0.0029228 | -0.0120397 |
| 4.4971332 | 60.0000000 CY | | | | |
| 0.0005088 | 5388.5170285 | 10591680. | 5.8482544 | 0.0029753 | -0.0122872 |
| 4.4996575 | 60.0000000 CY | | | | |
| 0.0005188 | 5394.1744342 | 10398409. | 5.8361429 | 0.0030275 | -0.0125350 |
| 4.4942812 | 60.0000000 CYT | | | | |
| 0.0005288 | 5399.6389528 | 10212083. | 5.8250232 | 0.0030800 | -0.0127825 |
| 4.4862981 | 60.0000000 CYT | | | | |
| 0.0005388 | 5405.0086901 | 10032499. | 5.8146225 | 0.0031326 | -0.0130299 |
| 4.4927596 | 60.0000000 CYT | | | | |
| 0.0005488 | 5410.2815771 | 9859283. | 5.8049086 | 0.0031854 | -0.0132771 |
| 4.4971966 | 60.0000000 CYT | | | | |
| 0.0006088 | 5439.3056681 | 8935204. | 5.7605752 | 0.0035068 | -0.0147557 |
| 4.4975947 | 60.0000000 CYT | | | | |
| 0.0006688 | 5464.6114620 | 8171382. | 5.7343071 | 0.0038348 | -0.0162277 |
| 4.4942024 | 60.0000000 CYT | | | | |

Axial Thrust Force = 30.000 kips

| Bending Max Concrete Curvature Stress rad/in. ksi | Bending Max Steel Moment Stress in-kip ksi | Run Msg | Bending Stiffness kip-in2 | Depth to N Axis in | Max Comp Strain in/in | Max Tens Strain in/in |
|---|---|---|---|---|---|---|
| 0.000001250 | 238.5370805 | | 190829664. | 22.1441549 | 0.0000277 | -0.000009820 |
| 0.1228246 | 0.7972881 | | | | | |
| 0.000002500 | 476.0283490 | | 190411340. | 18.5847057 | 0.0000465 | -0.0000285 |
| 0.2049308 | 1.3365162 | | | | | |
| 0.000003750 | 712.1277268 | | 189900727. | 17.3986143 | 0.0000652 | -0.0000473 |
| 0.2862661 | 1.8757868 | | | | | |
| 0.000005000 | 946.8239187 | | 189364784. | 16.8056812 | 0.0000840 | -0.0000660 |
| 0.3668263 | 2.4150738 | | | | | |
| 0.000006250 | 1180.1154953 | | 188818479. | 16.4499821 | 0.0001028 | -0.0000847 |
| 0.4466106 | 2.9543718 | | | | | |
| 0.000007500 | 1412.0021066 | | 188266948. | 16.2128923 | 0.0001216 | -0.0001034 |
| 0.5256187 | 3.4936791 | | | | | |
| 0.000008750 | 1412.0021066 | | 161371669. | 10.7124901 | 0.0000937 | -0.0001688 |
| 0.4061512 | -4.8561431 | C | | | | |
| 0.0000100 | 1412.0021066 | | 141200211. | 10.3603147 | 0.0001036 | -0.0001964 |
| 0.4475851 | -5.6520088 | C | | | | |
| 0.0000113 | 1412.0021066 | | 125511298. | 10.0765411 | 0.0001134 | -0.0002241 |
| 0.4883371 | -6.4510910 | C | | | | |
| 0.0000125 | 1412.0021066 | | 112960169. | 9.8428759 | 0.0001230 | -0.0002520 |
| 0.5285320 | -7.2525825 | C | | | | |
| 0.0000138 | 1412.0021066 | | 102691062. | 9.6479365 | 0.0001327 | -0.0002798 |
| 0.5683073 | -8.0555728 | C | | | | |
| 0.0000150 | 1412.0021066 | | 94133474. | 9.4831897 | 0.0001422 | -0.0003078 |
| 0.6077382 | -8.8595624 | C | | | | |
| 0.0000163 | 1412.0021066 | | 86892437. | 9.3403312 | 0.0001518 | -0.0003357 |
| 0.6467365 | -9.6651814 | C | | | | |
| 0.0000175 | 1412.0021066 | | 80685835. | 9.2172261 | 0.0001613 | -0.0003637 |
| 0.6854910 | -10.4711327 | C | | | | |
| 0.0000188 | 1412.0021066 | | 75306779. | 9.1094202 | 0.0001708 | -0.0003917 |
| 0.7239635 | -11.2776902 | C | | | | |
| 0.0000200 | 1412.0021066 | | 70600105. | 9.0132150 | 0.0001803 | -0.0004197 |
| 0.7620873 | -12.0853352 | C | | | | |
| 0.0000213 | 1412.0021066 | | 66447158. | 8.9286486 | 0.0001897 | -0.0004478 |
| 0.8000454 | -12.8927827 | C | | | | |
| 0.0000225 | 1412.0021066 | | 62755649. | 8.8537823 | 0.0001992 | -0.0004758 |

| | | | | | |
|---|---|---|---|---|---|
| 0.8378375 | -13.7000320 C | 59452720. | 8.7846396 | 0.0002086 | -0.0005039 |
| 0.0000238 | 1412.0021066 | | | | |
| 0.8752288 | -14.5087669 C | 56480084. | 8.7225571 | 0.0002181 | -0.0005319 |
| 0.0000250 | 1412.0021066 | | | | |
| 0.9124429 | -15.3173960 C | 53790556. | 8.6666531 | 0.0002275 | -0.0005600 |
| 0.0000263 | 1412.0021066 | | | | |
| 0.9494928 | -16.1258228 C | 51345531. | 8.6160859 | 0.0002369 | -0.0005881 |
| 0.0000275 | 1412.0021066 | | | | |
| 0.9863783 | -16.9340465 C | 49113117. | 8.5701602 | 0.0002464 | -0.0006161 |
| 0.0000288 | 1412.0021066 | | | | |
| 1.0230990 | -17.7420663 C | 47066737. | 8.5274713 | 0.0002558 | -0.0006442 |
| 0.0000300 | 1412.0021066 | | | | |
| 1.0595571 | -18.5505999 C | 45184067. | 8.4877233 | 0.0002652 | -0.0006723 |
| 0.0000313 | 1412.0021066 | | | | |
| 1.0957651 | -19.3595632 C | 43446219. | 8.4512553 | 0.0002747 | -0.0007003 |
| 0.0000325 | 1412.0021066 | | | | |
| 1.1318096 | -20.1683168 C | 42594300. | 8.4177036 | 0.0002841 | -0.0007284 |
| 0.0000338 | 1437.5576261 | | | | |
| 1.1676904 | -20.9768600 C | 42339525. | 8.3867566 | 0.0002935 | -0.0007565 |
| 0.0000350 | 1481.8833920 | | | | |
| 1.2034072 | -21.7851919 C | 42101396. | 8.3581456 | 0.0003030 | -0.0007845 |
| 0.0000363 | 1526.1756209 | | | | |
| 1.2389594 | -22.5933118 C | 41878245. | 8.3316378 | 0.0003124 | -0.0008126 |
| 0.0000375 | 1570.4341964 | | | | |
| 1.2743469 | -23.4012188 C | 41668619. | 8.3070303 | 0.0003219 | -0.0008406 |
| 0.0000388 | 1614.6590017 | | | | |
| 1.3095693 | -24.2089121 C | 41471248. | 8.2841458 | 0.0003314 | -0.0008686 |
| 0.0000400 | 1658.8499190 | | | | |
| 1.3446261 | -25.0163907 C | 41285014. | 8.2628284 | 0.0003408 | -0.0008967 |
| 0.0000413 | 1703.0068298 | | | | |
| 1.3795172 | -25.8236539 C | 41108770. | 8.2426660 | 0.0003503 | -0.0009247 |
| 0.0000425 | 1747.1227200 | | | | |
| 1.4141986 | -26.6310390 C | 40941545. | 8.2233621 | 0.0003598 | -0.0009527 |
| 0.0000438 | 1791.1926059 | | | | |
| 1.4486386 | -27.4387967 C | 40782858. | 8.2053019 | 0.0003692 | -0.0009808 |
| 0.0000450 | 1835.2286284 | | | | |
| 1.4829137 | -28.2463309 C | 40632014. | 8.1883853 | 0.0003787 | -0.0010088 |
| 0.0000463 | 1879.2306646 | | | | |
| 1.5170235 | -29.0536406 C | 40488391. | 8.1725227 | 0.0003882 | -0.0010368 |
| 0.0000475 | 1923.1985904 | | | | |
| 1.5509678 | -29.8607249 C | 40351431. | 8.1576336 | 0.0003977 | -0.0010648 |
| 0.0000488 | 1967.1322808 | | | | |
| 1.5847461 | -30.6675828 C | 40095541. | 8.1304940 | 0.0004167 | -0.0011208 |
| 0.0000513 | 2054.8964518 | | | | |
| 1.6518033 | -32.2806157 C | 39860877. | 8.1064673 | 0.0004357 | -0.0011768 |
| 0.0000538 | 2142.5221603 | | | | |
| 1.7181921 | -33.8927314 C | 39644593. | 8.0851434 | 0.0004548 | -0.0012327 |
| 0.0000563 | 2230.0083748 | | | | |
| 1.7839094 | -35.5039221 C | 39444324. | 8.0661819 | 0.0004739 | -0.0012886 |
| 0.0000588 | 2317.3540487 | | | | |
| 1.8489524 | -37.1141798 C | 39258092. | 8.0492982 | 0.0004930 | -0.0013445 |
| 0.0000613 | 2404.5581204 | | | | |
| 1.9133177 | -38.7234964 C | 39084228. | 8.0342522 | 0.0005122 | -0.0014003 |
| 0.0000638 | 2491.6195125 | | | | |
| 1.9770023 | -40.3318636 C | 38921315. | 8.0208402 | 0.0005314 | -0.0014561 |
| 0.0000663 | 2578.5371320 | | | | |
| 2.0400030 | -41.9392730 C | 38768144. | 8.0088884 | 0.0005506 | -0.0015119 |
| 0.0000688 | 2665.3098694 | | | | |
| 2.1023165 | -43.5457160 C | 38623672. | 7.9982472 | 0.0005699 | -0.0015676 |
| 0.0000713 | 2751.9365989 | | | | |
| 2.1639397 | -45.1511839 C | 38486999. | 7.9887875 | 0.0005892 | -0.0016233 |
| 0.0000738 | 2838.4161773 | | | | |
| 2.2248691 | -46.7556680 C | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.0000763 | 2924.7474444 | | 38357344. | 7.9803971 | 0.0006085 | -0.0016790 |
| 2.2851015 | -48.3591592 | C | | | | |
| 0.0000788 | 3010.9287996 | | 38234017. | 7.9729781 | 0.0006279 | -0.0017346 |
| 2.3446332 | -49.9616505 | C | | | | |
| 0.0000813 | 3096.9599659 | | 38116430. | 7.9664449 | 0.0006473 | -0.0017902 |
| 2.4034612 | -51.5631281 | C | | | | |
| 0.0000838 | 3182.8392220 | | 38004050. | 7.9607220 | 0.0006667 | -0.0018458 |
| 2.4615818 | -53.1635851 | C | | | | |
| 0.0000863 | 3268.5653350 | | 37896410. | 7.9557428 | 0.0006862 | -0.0019013 |
| 2.5189915 | -54.7630117 | C | | | | |
| 0.0000888 | 3354.1370521 | | 37793094. | 7.9514482 | 0.0007057 | -0.0019568 |
| 2.5756867 | -56.3613982 | C | | | | |
| 0.0000913 | 3439.5523501 | | 37693724. | 7.9476903 | 0.0007252 | -0.0020123 |
| 2.6316385 | -57.9589867 | C | | | | |
| 0.0000938 | 3524.8102633 | | 37597976. | 7.9444797 | 0.0007448 | -0.0020677 |
| 2.6868575 | -59.5556337 | C | | | | |
| 0.0000963 | 3609.9104719 | | 37505563. | 7.9418351 | 0.0007644 | -0.0021231 |
| 2.7413565 | -60.0000000 | CY | | | | |
| 0.0000988 | 3694.8514462 | | 37416217. | 7.9397175 | 0.0007840 | -0.0021785 |
| 2.7951313 | -60.0000000 | CY | | | | |
| 0.0001013 | 3779.6317743 | | 37329697. | 7.9380919 | 0.0008037 | -0.0022338 |
| 2.8481780 | -60.0000000 | CY | | | | |
| 0.0001038 | 3864.2500194 | | 37245783. | 7.9369266 | 0.0008235 | -0.0022890 |
| 2.9004926 | -60.0000000 | CY | | | | |
| 0.0001063 | 3948.7047200 | | 37164280. | 7.9361930 | 0.0008432 | -0.0023443 |
| 2.9520711 | -60.0000000 | CY | | | | |
| 0.0001088 | 4032.9943885 | | 37085006. | 7.9358652 | 0.0008630 | -0.0023995 |
| 3.0029093 | -60.0000000 | CY | | | | |
| 0.0001113 | 4117.0963582 | | 37007608. | 7.9359063 | 0.0008829 | -0.0024546 |
| 3.0529992 | -60.0000000 | CY | | | | |
| 0.0001138 | 4197.0501793 | | 36897144. | 7.9337822 | 0.0009025 | -0.0025100 |
| 3.1016197 | -60.0000000 | CY | | | | |
| 0.0001163 | 4260.7525668 | | 36651635. | 7.9219488 | 0.0009209 | -0.0025666 |
| 3.1466001 | -60.0000000 | CY | | | | |
| 0.0001188 | 4308.1250621 | | 36278948. | 7.9006821 | 0.0009382 | -0.0026243 |
| 3.1879821 | -60.0000000 | CY | | | | |
| 0.0001213 | 4352.3660094 | | 35895802. | 7.8786160 | 0.0009553 | -0.0026822 |
| 3.2282356 | -60.0000000 | CY | | | | |
| 0.0001238 | 4396.5209877 | | 35527442. | 7.8576570 | 0.0009724 | -0.0027401 |
| 3.2679247 | -60.0000000 | CY | | | | |
| 0.0001263 | 4440.5893924 | | 35172985. | 7.8377409 | 0.0009895 | -0.0027980 |
| 3.3070468 | -60.0000000 | CY | | | | |
| 0.0001288 | 4484.5706109 | | 34831616. | 7.8188086 | 0.0010067 | -0.0028558 |
| 3.3455995 | -60.0000000 | CY | | | | |
| 0.0001313 | 4528.4640227 | | 34502583. | 7.8008056 | 0.0010239 | -0.0029136 |
| 3.3835801 | -60.0000000 | CY | | | | |
| 0.0001338 | 4572.2689991 | | 34185189. | 7.7836813 | 0.0010411 | -0.0029714 |
| 3.4209861 | -60.0000000 | CY | | | | |
| 0.0001363 | 4615.9849028 | | 33878788. | 7.7673890 | 0.0010583 | -0.0030292 |
| 3.4578147 | -60.0000000 | CY | | | | |
| 0.0001388 | 4659.6110882 | | 33582783. | 7.7518853 | 0.0010756 | -0.0030869 |
| 3.4940634 | -60.0000000 | CY | | | | |
| 0.0001413 | 4703.1469006 | | 33296615. | 7.7371300 | 0.0010929 | -0.0031446 |
| 3.5297293 | -60.0000000 | CY | | | | |
| 0.0001438 | 4745.9753792 | | 33015481. | 7.7226810 | 0.0011101 | -0.0032024 |
| 3.5646904 | -60.0000000 | CY | | | | |
| 0.0001463 | 4782.5921128 | | 32701485. | 7.7048785 | 0.0011268 | -0.0032607 |
| 3.5978771 | -60.0000000 | CY | | | | |
| 0.0001488 | 4811.0060224 | | 32342898. | 7.6824788 | 0.0011428 | -0.0033197 |
| 3.6289355 | -60.0000000 | CY | | | | |
| 0.0001588 | 4880.0209079 | | 30740289. | 7.5693875 | 0.0012016 | -0.0035609 |
| 3.7387824 | -60.0000000 | CY | | | | |
| 0.0001688 | 4943.1187734 | | 29292556. | 7.4667154 | 0.0012600 | -0.0038025 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.8403620 | -60.0000000 | CY | 28003004. | 7.3772570 | 0.0013187 | -0.0040438 |
| 0.0001788 | 5005.5369758 | | | | | |
| 3.9351618 | -60.0000000 | CY | 26843682. | 7.2957124 | 0.0013771 | -0.0042854 |
| 0.0001888 | 5066.7449951 | | | | | |
| 4.0221780 | -60.0000000 | CY | 25796327. | 7.2224538 | 0.0014355 | -0.0045270 |
| 0.0001988 | 5127.0200653 | | | | | |
| 4.1019410 | -60.0000000 | CY | 24846025. | 7.1577915 | 0.0014942 | -0.0047683. |
| 0.0002088 | 5186.6076566 | | | | | |
| 4.1748235 | -60.0000000 | CY | 23979383. | 7.1005862 | 0.0015533 | -0.0050092 |
| 0.0002188 | 5245.4900145 | | | | | |
| 4.2407077 | -60.0000000 | CY | 23185343. | 7.0498930 | 0.0016127 | -0.0052498 |
| 0.0002288 | 5303.6472466 | | | | | |
| 4.2994696 | -60.0000000 | CY | 22452960. | 7.0018042 | 0.0016717 | -0.0054908 |
| 0.0002388 | 5360.6441612 | | | | | |
| 4.3503699 | -60.0000000 | CY | 21765475. | 6.9566888 | 0.0017305 | -0.0057320 |
| 0.0002488 | 5414.1620076 | | | | | |
| 4.3936781 | -60.0000000 | CY | 21077844. | 6.9051742 | 0.0017867 | -0.0059758 |
| 0.0002588 | 5453.8922197 | | | | | |
| 4.4281585 | -60.0000000 | CY | 20374087. | 6.8435205 | 0.0018392 | -0.0062233 |
| 0.0002688 | 5475.5358910 | | | | | |
| 4.4542141 | -60.0000000 | CY | 19691843. | 6.7806499 | 0.0018901 | -0.0064724 |
| 0.0002788 | 5489.1013555 | | | | | |
| 4.4738895 | -60.0000000 | CY | 19054003. | 6.7207874 | 0.0019406 | -0.0067219 |
| 0.0002888 | 5501.8433370 | | | | | |
| 4.4879855 | -60.0000000 | CY | 18456037. | 6.6634281 | 0.0019907 | -0.0069718 |
| 0.0002988 | 5513.7409543 | | | | | |
| 4.4966232 | -60.0000000 | CY | 17895702. | 6.6106958 | 0.0020411 | -0.0072214 |
| 0.0003088 | 5525.2981100 | | | | | |
| 4.4999602 | -60.0000000 | CY | 17369169. | 6.5623119 | 0.0020917 | -0.0074708 |
| 0.0003188 | 5536.4224927 | | | | | |
| 4.4969140 | -60.0000000 | CY | 16873627. | 6.5177397 | 0.0021427 | -0.0077198 |
| 0.0003288 | 5547.2049823 | | | | | |
| 4.4999606 | 60.0000000 | CY | 16405940. | 6.4768677 | 0.0021940 | -0.0079685 |
| 0.0003388 | 5557.5122847 | | | | | |
| 4.4958556 | 60.0000000 | CY | 15963644. | 6.4380817 | 0.0022453 | -0.0082172 |
| 0.0003488 | 5567.3209028 | | | | | |
| 4.4996761 | 60.0000000 | CY | 15543732. | 6.3999799 | 0.0022960 | -0.0084665 |
| 0.0003588 | 5576.3137456 | | | | | |
| 4.4925533 | 60.0000000 | CY | 15145739. | 6.3647507 | 0.0023470 | -0.0087155 |
| 0.0003688 | 5584.9912869 | | | | | |
| 4.4981214 | 60.0000000 | CY | 14768128. | 6.3320369 | 0.0023983 | -0.0089642 |
| 0.0003788 | 5593.4285293 | | | | | |
| 4.5000000 | 60.0000000 | CY | 14408838. | 6.3020065 | 0.0024499 | -0.0092126 |
| 0.0003888 | 5601.4355879 | | | | | |
| 4.4935747 | 60.0000000 | CY | 14067054. | 6.2740482 | 0.0025018 | -0.0094607 |
| 0.0003988 | 5609.2379117 | | | | | |
| 4.4984419 | 60.0000000 | CY | 13741464. | 6.2480360 | 0.0025539 | -0.0097086 |
| 0.0004088 | 5616.8235515 | | | | | |
| 4.4994824 | 60.0000000 | CY | 13430486. | 6.2241693 | 0.0026064 | -0.0099561 |
| 0.0004188 | 5624.0161125 | | | | | |
| 4.4918279 | 60.0000000 | CY | 13133611. | 6.2018940 | 0.0026591 | -0.0102034 |
| 0.0004288 | 5631.0355956 | | | | | |
| 4.4972933 | 60.0000000 | CY | 12849864. | 6.1811120 | 0.0027120 | -0.0104505 |
| 0.0004388 | 5637.8778723 | | | | | |
| 4.4998196 | 60.0000000 | CY | 12578078. | 6.1619780 | 0.0027652 | -0.0106973 |
| 0.0004488 | 5644.4124953 | | | | | |
| 4.4909749 | 60.0000000 | CY | 12317499. | 6.1435364 | 0.0028183 | -0.0109442 |
| 0.0004588 | 5650.6528805 | | | | | |
| 4.4933505 | 60.0000000 | CY | 12067420. | 6.1249501 | 0.0028711 | -0.0111914 |
| 0.0004688 | 5656.6029058 | | | | | |
| 4.4978546 | 60.0000000 | CY | 11827506. | 6.1075464 | 0.0029240 | -0.0114385 |
| 0.0004788 | 5662.4182844 | | | | | |
| 4.4998815 | 60.0000000 | CY | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.0004888 | 5667.9733931 | | 11596877. | 6.0915369 | 0.0029772 | -0.0116853 |
| 4.4911902 | 60.0000000 | CY | | | | |
| 0.0004988 | 5673.3638419 | | 11375166. | 6.0766325 | 0.0030307 | -0.0119318 |
| 4.4904516 | 60.0000000 | CYT | | | | |
| 0.0005088 | 5678.6467705 | | 11161959. | 6.0626479 | 0.0030844 | -0.0121781 |
| 4.4958157 | 60.0000000 | CYT | | | | |
| 0.0005188 | 5683.8198174 | | 10956761. | 6.0495376 | 0.0031382 | -0.0124243 |
| 4.4990095 | 60.0000000 | CYT | | | | |
| 0.0005288 | 5688.8702826 | | 10759093. | 6.0372832 | 0.0031922 | -0.0126703 |
| 4.4993121 | 60.0000000 | CYT | | | | |
| 0.0005388 | 5693.6550750 | | 10568269. | 6.0261620 | 0.0032466 | -0.0129159 |
| 4.4873521 | 60.0000000 | CYT | | | | |
| 0.0005488 | 5698.3545101 | | 10384245. | 6.0157170 | 0.0033011 | -0.0131614 |
| 4.4890082 | 60.0000000 | CYT | | | | |
| 0.0006088 | 5724.3145759 | | 9403392. | 5.9664626 | 0.0036321 | -0.0146304 |
| 4.4879464 | 60.0000000 | CYT | | | | |
| 0.0006688 | 5724.3145759 | | 8559723. | 5.9649251 | 0.0039890 | -0.0160735 |
| 4.4842902 | 60.0000000 | CYT | | | | |

---

## Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

---

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

| Load No. | Axial Thrust kips | Nominal Mom. Cap. in-kip | Max. Comp. Strain |
|---|---|---|---|
| 1 | 0.000 | 5391.194 | 0.00300000 |
| 2 | 30.000 | 5670.268 | 0.00300000 |

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

| Axial (Factored) Load Capacity No. | Resistance Factor for Moment | Bending Stiffness at Ult. Mom. Cap. kip-in^2 | Nominal Moment Capacity in-kip | Ultimate (Factored) Axial Thrust kips | Ultimate Moment in-kip |
|---|---|---|---|---|---|
| 1 | 0.65 | | 5391.194 | 0.000 | |
| 2 | 0.65 | 35233551.288 | 5670.268 | 19.500 | 3504.276 |
| 1 | 0.70 | 37425870.844 | 5391.194 | 0.000 | 3685.674 |
| 2 | 0.70 | 35143384.810 | 5670.268 | 21.000 | 3773.836 |

3969.187 37145016.092

1 0.75 5391.194 0.000

4043.396 34350681.651

2 0.75 5670.268 22.500

4252.701 36682667.172

---

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 18500.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

| Depth X feet | Deflect. y inches | Bending Moment in-lbs | Shear Force lbs | Slope S radians | Total Stress psi* | Bending Stiffness lb-in^2 | Soil Res. Es*h lb/inch | p Soil Spr. Lat. Load lb/inch |
|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.5915 | 6.549E-05 | 18500. | -0.004657 | 0.000 | 1.911E+11 | 0.000 | 0.000 |
| 0.300 | 0.5747 | 66600. | 18500. | -0.004656 | 0.000 | 1.911E+11 | 0.000 | 0.000 |
| 0.600 | 0.5580 | 133200. | 18500. | -0.004654 | 0.000 | 1.911E+11 | 0.000 | 0.000 |
| 0.900 | 0.5412 | 199800. | 18500. | -0.004651 | 0.000 | 1.911E+11 | 0.000 | 0.000 |
| 1.200 | 0.5245 | 266400. | 18500. | -0.004647 | 0.000 | 1.910E+11 | 0.000 | 0.000 |
| 1.500 | 0.5078 | 333000. | 18500. | -0.004641 | 0.000 | 1.908E+11 | 0.000 | 0.000 |
| 1.800 | 0.4911 | 399600. | 18500. | -0.004634 | 0.000 | 1.907E+11 | 0.000 | 0.000 |
| 2.100 | 0.4744 | 466200. | 18500. | -0.004626 | 0.000 | 1.906E+11 | 0.000 | 0.000 |
| 2.400 | 0.4578 | 532800. | 18500. | -0.004617 | 0.000 | 1.904E+11 | 0.000 | 0.000 |
| 2.700 | 0.4412 | 599400. | 18500. | -0.004606 | 0.000 | 1.902E+11 | 0.000 | 0.000 |
| 3.000 | 0.4246 | 666000. | 18500. | -0.004594 | 0.000 | 1.901E+11 | 0.000 | 0.000 |
| 3.300 | 0.4081 | 732600. | 18500. | -0.004581 | 0.000 | 1.899E+11 | 0.000 | 0.000 |
| 3.600 | 0.3916 | 799200. | 18500. | -0.004566 | 0.000 | 1.898E+11 | 0.000 | 0.000 |
| 3.900 | 0.3752 | 865800. | 18500. | -0.004550 | 0.000 | 1.896E+11 | 0.000 | 0.000 |
| 4.200 | 0.3588 | 932400. | 18500. | -0.004533 | 0.000 | 1.895E+11 | 0.000 | 0.000 |
| 4.500 | 0.3426 | 999000. | 18500. | -0.004515 | 0.000 | 1.893E+11 | 0.000 | 0.000 |
| 4.800 | 0.3263 | 1065600. | 18500. | -0.004495 | 0.000 | 1.891E+11 | 0.000 | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5.100 | 0.3102 | 1132200. | 18165. | -0.004474 | 0.000 | 1.890E+11 |
| -186.1145 | 2160.0000 | 0.000 | | | | |
| 5.400 | 0.2941 | 1196388. | 17223. | -0.004452 | 0.000 | 1.888E+11 |
| -337.2239 | 4127.5634 | 0.000 | | | | |
| 5.700 | 0.2781 | 1256205. | 16000. | -0.004429 | 0.000 | 1.887E+11 |
| -342.0084 | 4426.7408 | 0.000 | | | | |
| 6.000 | 0.2622 | 1311591. | 14761. | -0.004404 | 0.000 | 1.885E+11 |
| -346.3368 | 4754.5814 | 0.000 | | | | |
| 6.300 | 0.2464 | 1362487. | 13508. | -0.004379 | 0.000 | 1.884E+11 |
| -350.1751 | 5115.7094 | 0.000 | | | | |
| 6.600 | 0.2307 | 1408845. | 12241. | -0.004352 | 0.000 | 1.883E+11 |
| -353.4834 | 5515.8415 | 0.000 | | | | |
| 6.900 | 0.2151 | 1450623. | 10964. | -0.004266 | 0.000 | 3.586E+10 |
| -356.2155 | 5962.1393 | 0.000 | | | | |
| 7.200 | 0.2000 | 1487783. | 9677.0773 | -0.004119 | 0.000 | 3.585E+10 |
| -358.5085 | 6453.4475 | 0.000 | | | | |
| 7.500 | 0.1854 | 1520298. | 8383.1321 | -0.003967 | 0.000 | 3.584E+10 |
| -360.3499 | 6995.8356 | 0.000 | | | | |
| 7.800 | 0.1714 | 1548142. | 7083.3918 | -0.003813 | 0.000 | 3.583E+10 |
| -361.7280 | 7596.4401 | 0.000 | | | | |
| 8.100 | 0.1580 | 1571298. | 5779.5462 | -0.003657 | 0.000 | 3.582E+10 |
| -362.6306 | 8263.6661 | 0.000 | | | | |
| 8.400 | 0.1451 | 1589755. | 4473.3301 | -0.003498 | 0.000 | 3.582E+10 |
| -363.0449 | 9007.4673 | 0.000 | | | | |
| 8.700 | 0.1328 | 1603506. | 3166.5263 | -0.003337 | 0.000 | 3.581E+10 |
| -362.9572 | 9839.7025 | 0.000 | | | | |
| 9.000 | 0.1211 | 1612554. | 1860.9680 | -0.003176 | 0.000 | 3.581E+10 |
| -362.3530 | 10775. | 0.000 | | | | |
| 9.300 | 0.1099 | 1616905. | 558.5430 | -0.003013 | 0.000 | 3.581E+10 |
| -361.2165 | 11829. | 0.000 | | | | |
| 9.600 | 0.0994 | 1616575. | -432.3476 | -0.002851 | 0.000 | 3.581E+10 |
| -189.2783 | 6856.9942 | 0.000 | | | | |
| 9.900 | 0.0894 | 1613792. | -779.6400 | -0.002688 | 0.000 | 3.581E+10 |
| -3.6619 | 147.4538 | 0.000 | | | | |
| 10.200 | 0.0800 | 1610962. | -792.5835 | -0.002526 | 0.000 | 3.581E+10 |
| -3.5290 | 158.7704 | 0.000 | | | | |
| 10.500 | 0.0712 | 1608085. | -805.0457 | -0.002365 | 0.000 | 3.581E+10 |
| -3.3945 | 171.5990 | 0.000 | | | | |
| 10.800 | 0.0630 | 1605165. | -817.0210 | -0.002203 | 0.000 | 3.581E+10 |
| -3.2585 | 186.2222 | 0.000 | | | | |
| 11.100 | 0.0554 | 1602203. | -828.5041 | -0.002042 | 0.000 | 3.581E+10 |
| -3.1210 | 202.9870 | 0.000 | | | | |
| 11.400 | 0.0483 | 1599200. | -839.4899 | -0.001881 | 0.000 | 3.582E+10 |
| -2.9822 | 222.3196 | 0.000 | | | | |
| 11.700 | 0.0418 | 1596159. | -1371.8310 | -0.001720 | 0.000 | 3.582E+10 |
| -292.7629 | 25209. | 0.000 | | | | |
| 12.000 | 0.0359 | 1589323. | -2416.3067 | -0.001560 | 0.000 | 3.582E+10 |
| -287.5014 | 28827. | 0.000 | | | | |
| 12.300 | 0.0306 | 1578761. | -3440.7445 | -0.001401 | 0.000 | 3.582E+10 |
| -281.6307 | 33161. | 0.000 | | | | |
| 12.600 | 0.0258 | 1564550. | -4443.0271 | -0.001243 | 0.000 | 3.583E+10 |
| -275.1929 | 38375. | 0.000 | | | | |
| 12.900 | 0.0216 | 1546771. | -5421.2538 | -0.001087 | 0.000 | 3.583E+10 |
| -268.2664 | 44661. | 0.000 | | | | |
| 13.200 | 0.0180 | 1525517. | -6373.9076 | -0.000932 | 0.000 | 3.584E+10 |
| -260.9857 | 52223. | 0.000 | | | | |
| 13.500 | 0.0149 | 1500879. | -7300.1084 | -0.000781 | 0.000 | 3.584E+10 |
| -253.5703 | 61224. | 0.000 | | | | |
| 13.800 | 0.0124 | 1472956. | -8199.9886 | -0.000631 | 0.000 | 3.585E+10 |
| -246.3631 | 71689. | 0.000 | | | | |
| 14.100 | 0.0104 | 1441839. | -9075.2107 | -0.000485 | 0.000 | 3.586E+10 |
| -239.8714 | 83308. | 0.000 | | | | |
| 14.400 | 0.008881 | 1407614. | -9929.5989 | -0.000388 | 0.000 | 1.042E+11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| -234.7888 | 95178. | 0.000 | | | | |
| 14.700 | 0.007571 | 1370346. | -10765. | -0.000351 | 0.000 | 1.884E+11 |
| -229.4521 | 109108. | 0.000 | | | | |
| 15.000 | 0.006355 | 1330105. | -11580. | -0.000325 | 0.000 | 1.885E+11 |
| -223.3098 | 126500. | 0.000 | | | | |
| 15.300 | 0.005231 | 1286969. | -12371. | -0.000300 | 0.000 | 1.886E+11 |
| -216.2092 | 148800. | 0.000 | | | | |
| 15.600 | 0.004195 | 1241031. | -13135. | -0.000276 | 0.000 | 1.887E+11 |
| -207.9251 | 178429. | 0.000 | | | | |
| 15.900 | 0.003245 | 1192398. | -13823. | -0.000253 | 0.000 | 1.889E+11 |
| -174.4944 | 193609. | 0.000 | | | | |
| 16.200 | 0.002376 | 1141504. | -14275. | -0.000230 | 0.000 | 1.890E+11 |
| -76.4944 | 115907. | 0.000 | | | | |
| 16.500 | 0.001585 | 1089619. | -14535. | -0.000209 | 0.000 | 1.891E+11 |
| -67.7970 | 153943. | 0.000 | | | | |
| 16.800 | 0.000870 | 1036855. | -14758. | -0.000189 | 0.000 | 1.892E+11 |
| -56.2818 | 232964. | 0.000 | | | | |
| 17.100 | 0.000225 | 983361. | -14924. | -0.000170 | 0.000 | 1.893E+11 |
| -36.1270 | 577985. | 0.000 | | | | |
| 17.400 | -0.000352 | 929400. | -14914. | -0.000152 | 0.000 | 1.895E+11 |
| 41.8814 | 427872. | 0.000 | | | | |
| 17.700 | -0.000866 | 875981. | -14737. | -0.000134 | 0.000 | 1.896E+11 |
| 56.5454 | 235005. | 0.000 | | | | |
| 18.000 | -0.001320 | 823295. | -14518. | -0.000118 | 0.000 | 1.897E+11 |
| 65.0787 | 177467. | 0.000 | | | | |
| 18.300 | -0.001718 | 771452. | -14273. | -0.000103 | 0.000 | 1.898E+11 |
| 71.0523 | 148900. | 0.000 | | | | |
| 18.600 | -0.002063 | 720531. | -14009. | -8.902E-05 | 0.000 | 1.900E+11 |
| 75.5240 | 131799. | 0.000 | | | | |
| 18.900 | -0.002359 | 670588. | -13731. | -7.584E-05 | 0.000 | 1.901E+11 |
| 78.9760 | 120535. | 0.000 | | | | |
| 19.200 | -0.002609 | 621668. | -13442. | -6.360E-05 | 0.000 | 1.902E+11 |
| 81.6756 | 112702. | 0.000 | | | | |
| 19.500 | -0.002817 | 573807. | -13144. | -5.229E-05 | 0.000 | 1.903E+11 |
| 83.7896 | 107090. | 0.000 | | | | |
| 19.800 | -0.002985 | 527032. | -12839. | -4.188E-05 | 0.000 | 1.904E+11 |
| 85.4307 | 103017. | 0.000 | | | | |
| 20.100 | -0.003118 | 481364. | -12529. | -3.235E-05 | 0.000 | 1.906E+11 |
| 86.6799 | 100071. | 0.000 | | | | |
| 20.400 | -0.003218 | 436820. | -12216. | -2.368E-05 | 0.000 | 1.906E+11 |
| 87.5981 | 97985. | 0.000 | | | | |
| 20.700 | -0.003289 | 393411. | -11899. | -1.584E-05 | 0.000 | 1.907E+11 |
| 88.2326 | 96582. | 0.000 | | | | |
| 21.000 | -0.003332 | 351145. | -11581. | -8.816E-06 | 0.000 | 1.908E+11 |
| 88.6216 | 95737. | 0.000 | | | | |
| 21.300 | -0.003352 | 310028. | -10909. | -2.579E-06 | 0.000 | 1.909E+11 |
| 284.4303 | 305451. | 0.000 | | | | |
| 21.600 | -0.003351 | 272597. | -9863.9873 | 2.913E-06 | 0.000 | 1.910E+11 |
| 296.3888 | 318411. | 0.000 | | | | |
| 21.900 | -0.003331 | 239007. | -8778.5432 | 7.733E-06 | 0.000 | 1.911E+11 |
| 306.6357 | 331371. | 0.000 | | | | |
| 22.200 | -0.003295 | 209391. | -7659.2561 | 1.196E-05 | 0.000 | 1.911E+11 |
| 315.1905 | 344331. | 0.000 | | | | |
| 22.500 | -0.003245 | 183860. | -6512.1741 | 1.566E-05 | 0.000 | 1.911E+11 |
| 322.0773 | 357291. | 0.000 | | | | |
| 22.800 | -0.003183 | 162504. | -5343.2574 | 1.892E-05 | 0.000 | 1.911E+11 |
| 327.3209 | 370251. | 0.000 | | | | |
| 23.100 | -0.003109 | 145389. | -4158.3862 | 2.182E-05 | 0.000 | 1.911E+11 |
| 330.9408 | 383211. | 0.000 | | | | |
| 23.400 | -0.003025 | 132563. | -2963.3903 | 2.444E-05 | 0.000 | 1.911E+11 |
| 332.9458 | 396171. | 0.000 | | | | |
| 23.700 | -0.002933 | 124053. | -2361.9777 | 2.686E-05 | 0.000 | 1.911E+11 |
| 1.1723 | 1438.9410 | 0.000 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 24.000 | -0.002832 | 115557. | -2357.7818 | 2.911E-05 | 0.000 | 1.911E+11 |
| 1.1587 | 1472.9154 | 0.000 | | | | |
| 24.300 | -0.002723 | 107077. | -2353.6373 | 3.121E-05 | 0.000 | 1.911E+11 |
| 1.1437 | 1511.8616 | 0.000 | | | | |
| 24.600 | -0.002607 | 98611. | -2349.5496 | 3.315E-05 | 0.000 | 1.911E+11 |
| 1.1273 | 1556.3710 | 0.000 | | | | |
| 24.900 | -0.002485 | 90160. | -2345.5238 | 3.492E-05 | 0.000 | 1.911E+11 |
| 1.1093 | 1607.1845 | 0.000 | | | | |
| 25.200 | -0.002356 | 81723. | -2341.5655 | 3.654E-05 | 0.000 | 1.911E+11 |
| 1.0898 | 1665.2336 | 0.000 | | | | |
| 25.500 | -0.002222 | 73301. | -2337.6802 | 3.800E-05 | 0.000 | 1.911E+11 |
| 1.0687 | 1731.6984 | 0.000 | | | | |
| 25.800 | -0.002082 | 64892. | -2333.8741 | 3.930E-05 | 0.000 | 1.911E+11 |
| 1.0459 | 1808.0897 | 0.000 | | | | |
| 26.100 | -0.001939 | 56497. | -2330.1534 | 4.045E-05 | 0.000 | 1.911E+11 |
| 1.0212 | 1896.3676 | 0.000 | | | | |
| 26.400 | -0.001791 | 48115. | -2326.5248 | 4.143E-05 | 0.000 | 1.911E+11 |
| 0.9946 | 1999.1193 | 0.000 | | | | |
| 26.700 | -0.001640 | 39746. | -2322.9958 | 4.226E-05 | 0.000 | 1.911E+11 |
| 0.9659 | 2119.8301 | 0.000 | | | | |
| 27.000 | -0.001487 | 31389. | -2319.5746 | 4.293E-05 | 0.000 | 1.911E+11 |
| 0.9348 | 2263.3137 | 0.000 | | | | |
| 27.300 | -0.001331 | 23045. | -2316.2702 | 4.344E-05 | 0.000 | 1.911E+11 |
| 0.9010 | 2436.4234 | 0.000 | | | | |
| 27.600 | -0.001174 | 14712. | -1881.3743 | 4.380E-05 | 0.000 | 1.911E+11 |
| 240.7079 | 738062. | 0.000 | | | | |
| 27.900 | -0.001016 | 9498.8014 | -1261.7757 | 4.403E-05 | 0.000 | 1.911E+11 |
| 103.5136 | 366811. | 0.000 | | | | |
| 28.200 | -0.000857 | 5627.1771 | -912.7000 | 4.417E-05 | 0.000 | 1.911E+11 |
| 90.4173 | 379771. | 0.000 | | | | |
| 28.500 | -0.000698 | 2927.3614 | -612.9040 | 4.425E-05 | 0.000 | 1.911E+11 |
| 76.1360 | 392731. | 0.000 | | | | |
| 28.800 | -0.000539 | 1214.2680 | -366.6244 | 4.429E-05 | 0.000 | 1.911E+11 |
| 60.6860 | 405691. | 0.000 | | | | |
| 29.100 | -0.000379 | 287.6657 | -178.0475 | 4.430E-05 | 0.000 | 1.911E+11 |
| 44.0789 | 418651. | 0.000 | | | | |
| 29.400 | -0.000220 | -67.6738 | -51.3273 | 4.430E-05 | 0.000 | 1.911E+11 |
| 26.3212 | 431611. | 0.000 | | | | |
| 29.700 | -6.005E-05 | -81.8906 | 9.3991 | 4.430E-05 | 0.000 | 1.911E+11 |
| 7.4157 | 444571. | 0.000 | | | | |
| 30.000 | 9.944E-05 | 0.000 | 0.000 | 4.430E-05 | 0.000 | 1.911E+11 |
| -12.6374 | 228765. | 0.000 | | | | |

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

| | | |
|---|---|---|
| Pile-head deflection | = | 0.5914927 inches |
| Computed slope at pile head | = | -0.0046569 radians |
| Maximum bending moment | = | 1616905. inch-lbs |
| Maximum shear force | = | 18500. lbs |
| Depth of maximum bending moment | = | 9.3000000 feet below pile head |
| Depth of maximum shear force | = | 0.3000000 feet below pile head |
| Number of iterations | = | 60 |

L-PILE compressor.lp7o

Number of zero deflection points = 2

---

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 14800.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 30000.0 lbs

| Depth X feet | Deflect. y inches | Bending Moment in-lbs | Shear Force lbs | Slope S radians | Total Stress psi* | Bending Stiffness lb-in^2 | Soil Res. Es*h lb/inch | Soil Spr. Lat. Load lb/inch | p lb/in |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.1630 | -2.452E-06 | 14800. | -0.001238 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 0.300 | 0.1586 | 53414. | 14800. | -0.001237 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 0.600 | 0.1541 | 106827. | 14800. | -0.001236 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 0.900 | 0.1497 | 160241. | 14800. | -0.001233 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 1.200 | 0.1452 | 213654. | 14800. | -0.001230 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 1.500 | 0.1408 | 267066. | 14800. | -0.001225 | 0.000 | 1.907E+11 | 0.000 | 0.000 | 0.000 |
| 1.800 | 0.1364 | 320478. | 14800. | -0.001220 | 0.000 | 1.906E+11 | 0.000 | 0.000 | 0.000 |
| 2.100 | 0.1320 | 373890. | 14800. | -0.001213 | 0.000 | 1.905E+11 | 0.000 | 0.000 | 0.000 |
| 2.400 | 0.1277 | 427300. | 14800. | -0.001206 | 0.000 | 1.905E+11 | 0.000 | 0.000 | 0.000 |
| 2.700 | 0.1233 | 480710. | 14800. | -0.001197 | 0.000 | 1.904E+11 | 0.000 | 0.000 | 0.000 |
| 3.000 | 0.1191 | 534119. | 14800. | -0.001187 | 0.000 | 1.902E+11 | 0.000 | 0.000 | 0.000 |
| 3.300 | 0.1148 | 587527. | 14800. | -0.001177 | 0.000 | 1.901E+11 | 0.000 | 0.000 | 0.000 |
| 3.600 | 0.1106 | 640933. | 14800. | -0.001165 | 0.000 | 1.900E+11 | 0.000 | 0.000 | 0.000 |
| 3.900 | 0.1064 | 694338. | 14800. | -0.001153 | 0.000 | 1.899E+11 | 0.000 | 0.000 | 0.000 |
| 4.200 | 0.1023 | 747742. | 14800. | -0.001139 | 0.000 | 1.898E+11 | 0.000 | 0.000 | 0.000 |
| 4.500 | 0.0982 | 801144. | 14800. | -0.001124 | 0.000 | 1.897E+11 | 0.000 | 0.000 | 0.000 |
| 4.800 | 0.0942 | 854545. | 14800. | -0.001108 | 0.000 | 1.895E+11 | 0.000 | 0.000 | 0.000 |
| 5.100 | 0.0902 | 907944. | 14703. | -0.001092 | 0.000 | 1.894E+11 | -54.1365 | 2160.0000 | 0.000 |
| 5.400 | 0.0863 | 960639. | 14232. | -0.001074 | 0.000 | 1.893E+11 | -207.1880 | 8640.0000 | 0.000 |
| 5.700 | 0.0825 | 1010647. | 13405. | -0.001055 | 0.000 | 1.892E+11 | -252.4109 | 11015. | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6.000 | 0.0787 | 1057382. | 12489. | -0.001036 | 0.000 | 1.891E+11 |
| -256.3853 | 11723. | 0.000 | | | | |
| 6.300 | 0.0750 | 1100792. | 11559. | -0.001015 | 0.000 | 1.890E+11 |
| -260.1474 | 12481. | 0.000 | | | | |
| 6.600 | 0.0714 | 1140828. | 10616. | -0.000994 | 0.000 | 1.889E+11 |
| -263.6933 | 13291. | 0.000 | | | | |
| 6.900 | 0.0679 | 1177445. | 9661.1055 | -0.000972 | 0.000 | 1.888E+11 |
| -267.0186 | 14160. | 0.000 | | | | |
| 7.200 | 0.0644 | 1210598. | 8694.2576 | -0.000949 | 0.000 | 1.887E+11 |
| -270.1191 | 15093. | 0.000 | | | | |
| 7.500 | 0.0611 | 1240248. | 7716.6606 | -0.000925 | 0.000 | 1.887E+11 |
| -272.9904 | 16097. | 0.000 | | | | |
| 7.800 | 0.0578 | 1266358. | 6729.1481 | -0.000901 | 0.000 | 1.886E+11 |
| -275.6277 | 17177. | 0.000 | | | | |
| 8.100 | 0.0546 | 1288893. | 5732.5708 | -0.000877 | 0.000 | 1.885E+11 |
| -278.0263 | 18344. | 0.000 | | | | |
| 8.400 | 0.0515 | 1307822. | 4727.7978 | -0.000852 | 0.000 | 1.885E+11 |
| -280.1809 | 19604. | 0.000 | | | | |
| 8.700 | 0.0484 | 1323117. | 3715.7171 | -0.000827 | 0.000 | 1.885E+11 |
| -282.0861 | 20970. | 0.000 | | | | |
| 9.000 | 0.0455 | 1334754. | 2697.2374 | -0.000802 | 0.000 | 1.884E+11 |
| -283.7359 | 22452. | 0.000 | | | | |
| 9.300 | 0.0427 | 1342711. | 1673.2901 | -0.000776 | 0.000 | 1.884E+11 |
| -285.1237 | 24064. | 0.000 | | | | |
| 9.600 | 0.0399 | 1346969. | 908.6779 | -0.000750 | 0.000 | 1.884E+11 |
| -139.6608 | 12599. | 0.000 | | | | |
| 9.900 | 0.0373 | 1349415. | 652.3648 | -0.000725 | 0.000 | 1.884E+11 |
| -2.7354 | 264.3483 | 0.000 | | | | |
| 10.200 | 0.0347 | 1351823. | 642.6330 | -0.000699 | 0.000 | 1.884E+11 |
| -2.6712 | 277.2125 | 0.000 | | | | |
| 10.500 | 0.0322 | 1354193. | 633.1336 | -0.000673 | 0.000 | 1.884E+11 |
| -2.6062 | 291.2035 | 0.000 | | | | |
| 10.800 | 0.0298 | 1356527. | 623.8695 | -0.000647 | 0.000 | 1.884E+11 |
| -2.5405 | 306.4653 | 0.000 | | | | |
| 11.100 | 0.0276 | 1358825. | 614.8433 | -0.000621 | 0.000 | 1.884E+11 |
| -2.4740 | 323.1661 | 0.000 | | | | |
| 11.400 | 0.0254 | 1361088. | 606.0580 | -0.000595 | 0.000 | 1.884E+11 |
| -2.4067 | 341.5036 | 0.000 | | | | |
| 11.700 | 0.0233 | 1363317. | 146.4598 | -0.000569 | 0.000 | 1.884E+11 |
| -252.9256 | 39121. | 0.000 | | | | |
| 12.000 | 0.0213 | 1362265. | -762.9118 | -0.000543 | 0.000 | 1.884E+11 |
| -252.2809 | 42694. | 0.000 | | | | |
| 12.300 | 0.0194 | 1357941. | -1669.3316 | -0.000517 | 0.000 | 1.884E+11 |
| -251.2857 | 46717. | 0.000 | | | | |
| 12.600 | 0.0175 | 1350358. | -2571.5100 | -0.000491 | 0.000 | 1.884E+11 |
| -249.9245 | 51269. | 0.000 | | | | |
| 12.900 | 0.0158 | 1339532. | -3468.0966 | -0.000466 | 0.000 | 1.884E+11 |
| -248.1792 | 56451. | 0.000 | | | | |
| 13.200 | 0.0142 | 1325488. | -4357.6704 | -0.000440 | 0.000 | 1.884E+11 |
| -246.0285 | 62386. | 0.000 | | | | |
| 13.500 | 0.0127 | 1308252. | -5238.7271 | -0.000415 | 0.000 | 1.885E+11 |
| -243.4474 | 69236. | 0.000 | | | | |
| 13.800 | 0.0112 | 1287859. | -6109.6617 | -0.000390 | 0.000 | 1.885E+11 |
| -240.4052 | 77208. | 0.000 | | | | |
| 14.100 | 0.009849 | 1264347. | -6968.7465 | -0.000366 | 0.000 | 1.886E+11 |
| -236.8642 | 86578. | 0.000 | | | | |
| 14.400 | 0.008576 | 1237763. | -7814.1009 | -0.000342 | 0.000 | 1.887E+11 |
| -232.7771 | 97718. | 0.000 | | | | |
| 14.700 | 0.007387 | 1208159. | -8643.6491 | -0.000319 | 0.000 | 1.887E+11 |
| -228.0830 | 111151. | 0.000 | | | | |
| 15.000 | 0.006282 | 1175597. | -9455.0606 | -0.000296 | 0.000 | 1.888E+11 |
| -222.7011 | 127627. | 0.000 | | | | |
| 15.300 | 0.005257 | 1140147. | -10246. | -0.000274 | 0.000 | 1.889E+11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| -216.5217 | 148274. | 0.000 | | | | |
| 15.600 | 0.004310 | 1101888. | -11012. | -0.000252 | 0.000 | 1.890E+11 |
| -209.3889 | 174876. | 0.000 | | | | |
| 15.900 | 0.003440 | 1060913. | -11722. | -0.000232 | 0.000 | 1.891E+11 |
| -184.9783 | 193609. | 0.000 | | | | |
| 16.200 | 0.002641 | 1017538. | -12198. | -0.000212 | 0.000 | 1.892E+11 |
| -79.2673 | 108040. | 0.000 | | | | |
| 16.500 | 0.001913 | 973134. | -12470. | -0.000193 | 0.000 | 1.893E+11 |
| -72.2023 | 135893. | 0.000 | | | | |
| 16.800 | 0.001251 | 927793. | -12715. | -0.000175 | 0.000 | 1.894E+11 |
| -63.5638 | 182943. | 0.000 | | | | |
| 17.100 | 0.000652 | 881625. | -12922. | -0.000158 | 0.000 | 1.895E+11 |
| -51.5391 | 284395. | 0.000 | | | | |
| 17.400 | 0.000114 | 834788. | -13067. | -0.000142 | 0.000 | 1.896E+11 |
| -29.0375 | 914695. | 0.000 | | | | |
| 17.700 | -0.000367 | 787573. | -13043. | -0.000126 | 0.000 | 1.897E+11 |
| 42.3655 | 415834. | 0.000 | | | | |
| 18.000 | -0.000794 | 740906. | -12868. | -0.000112 | 0.000 | 1.898E+11 |
| 54.8820 | 248829. | 0.000 | | | | |
| 18.300 | -0.001171 | 694948. | -12657. | -9.804E-05 | 0.000 | 1.899E+11 |
| 62.4888 | 192161. | 0.000 | | | | |
| 18.600 | -0.001500 | 649798. | -12422. | -8.530E-05 | 0.000 | 1.900E+11 |
| 67.8826 | 162927. | 0.000 | | | | |
| 18.900 | -0.001785 | 605527. | -12170. | -7.341E-05 | 0.000 | 1.901E+11 |
| 71.9420 | 145106. | 0.000 | | | | |
| 19.200 | -0.002028 | 562187. | -11906. | -6.235E-05 | 0.000 | 1.902E+11 |
| 75.0821 | 133251. | 0.000 | | | | |
| 19.500 | -0.002234 | 519819. | -11631. | -5.212E-05 | 0.000 | 1.903E+11 |
| 77.5383 | 124962. | 0.000 | | | | |
| 19.800 | -0.002404 | 478455. | -11348. | -4.268E-05 | 0.000 | 1.904E+11 |
| 79.4595 | 119006. | 0.000 | | | | |
| 20.100 | -0.002541 | 438120. | -11060. | -3.401E-05 | 0.000 | 1.904E+11 |
| 80.9474 | 114681. | 0.000 | | | | |
| 20.400 | -0.002649 | 398832. | -10766. | -2.610E-05 | 0.000 | 1.905E+11 |
| 82.0756 | 111558. | 0.000 | | | | |
| 20.700 | -0.002729 | 360608. | -10469. | -1.893E-05 | 0.000 | 1.905E+11 |
| 82.8995 | 109359. | 0.000 | | | | |
| 21.000 | -0.002785 | 323458. | -10170. | -1.247E-05 | 0.000 | 1.906E+11 |
| 83.4629 | 107893. | 0.000 | | | | |
| 21.300 | -0.002819 | 287388. | -9589.1307 | -6.698E-06 | 0.000 | 1.907E+11 |
| 239.1629 | 305451. | 0.000 | | | | |
| 21.600 | -0.002833 | 254417. | -8707.5946 | -1.585E-06 | 0.000 | 1.908E+11 |
| 250.5794 | 318411. | 0.000 | | | | |
| 21.900 | -0.002830 | 224694. | -7787.6365 | 2.935E-06 | 0.000 | 1.908E+11 |
| 260.5084 | 331371. | 0.000 | | | | |
| 22.200 | -0.002812 | 198346. | -6834.5993 | 6.925E-06 | 0.000 | 1.908E+11 |
| 268.9567 | 344331. | 0.000 | | | | |
| 22.500 | -0.002780 | 175483. | -5853.7905 | 1.045E-05 | 0.000 | 1.908E+11 |
| 275.9371 | 357291. | 0.000 | | | | |
| 22.800 | -0.002737 | 156196. | -4850.4689 | 1.358E-05 | 0.000 | 1.908E+11 |
| 281.4638 | 370251. | 0.000 | | | | |
| 23.100 | -0.002683 | 140557. | -3829.8486 | 1.638E-05 | 0.000 | 1.908E+11 |
| 285.5475 | 383211. | 0.000 | | | | |
| 23.400 | -0.002619 | 128618. | -2797.1202 | 1.892E-05 | 0.000 | 1.908E+11 |
| 288.1905 | 396171. | 0.000 | | | | |
| 23.700 | -0.002546 | 120413. | -2276.3642 | 2.127E-05 | 0.000 | 1.908E+11 |
| 1.1183 | 1581.0665 | 0.000 | | | | |
| 24.000 | -0.002466 | 112223. | -2272.3598 | 2.346E-05 | 0.000 | 1.908E+11 |
| 1.1064 | 1615.3699 | 0.000 | | | | |
| 24.300 | -0.002377 | 104047. | -2268.4009 | 2.550E-05 | 0.000 | 1.908E+11 |
| 1.0930 | 1655.1232 | 0.000 | | | | |
| 24.600 | -0.002282 | 95885. | -2264.4926 | 2.739E-05 | 0.000 | 1.908E+11 |
| 1.0782 | 1700.9171 | 0.000 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 24.900 | -0.002180 | 87737. | -2260.6404 | 2.912E-05 | 0.000 | 1.908E+11 |
| 1.0619 | 1753.4978 | 0.000 | | | | |
| 25.200 | -0.002072 | 79602. | -2256.8494 | 3.070E-05 | 0.000 | 1.908E+11 |
| 1.0441 | 1813.8072 | 0.000 | | | | |
| 25.500 | -0.001959 | 71481. | -2253.1253 | 3.212E-05 | 0.000 | 1.908E+11 |
| 1.0248 | 1883.0397 | 0.000 | | | | |
| 25.800 | -0.001841 | 63373. | -2249.4739 | 3.339E-05 | 0.000 | 1.908E+11 |
| 1.0038 | 1962.7222 | 0.000 | | | | |
| 26.100 | -0.001719 | 55278. | -2245.9012 | 3.451E-05 | 0.000 | 1.908E+11 |
| 0.9810 | 2054.8288 | 0.000 | | | | |
| 26.400 | -0.001593 | 47195. | -2242.4138 | 3.548E-05 | 0.000 | 1.908E+11 |
| 0.9564 | 2161.9511 | 0.000 | | | | |
| 26.700 | -0.001463 | 39125. | -2239.0185 | 3.629E-05 | 0.000 | 1.908E+11 |
| 0.9298 | 2287.5554 | 0.000 | | | | |
| 27.000 | -0.001331 | 31066. | -2235.7230 | 3.696E-05 | 0.000 | 1.908E+11 |
| 0.9010 | 2436.3850 | 0.000 | | | | |
| 27.300 | -0.001197 | 23019. | -2232.5358 | 3.747E-05 | 0.000 | 1.908E+11 |
| 0.8697 | 2615.1154 | 0.000 | | | | |
| 27.600 | -0.001062 | 14984. | -1811.9936 | 3.783E-05 | 0.000 | 1.908E+11 |
| 232.7649 | 789373. | 0.000 | | | | |
| 27.900 | -0.000925 | 9964.8215 | -1223.3918 | 3.806E-05 | 0.000 | 1.908E+11 |
| 94.2361 | 366811. | 0.000 | | | | |
| 28.200 | -0.000788 | 6167.1405 | -904.2305 | 3.821E-05 | 0.000 | 1.908E+11 |
| 83.0757 | 379771. | 0.000 | | | | |
| 28.500 | -0.000650 | 3446.1082 | -627.1091 | 3.830E-05 | 0.000 | 1.908E+11 |
| 70.8806 | 392731. | 0.000 | | | | |
| 28.800 | -0.000512 | 1643.6817 | -395.7230 | 3.835E-05 | 0.000 | 1.908E+11 |
| 57.6672 | 405691. | 0.000 | | | | |
| 29.100 | -0.000374 | 588.6187 | -213.7173 | 3.837E-05 | 0.000 | 1.908E+11 |
| 43.4471 | 418651. | 0.000 | | | | |
| 29.400 | -0.000235 | 96.6290 | -84.7025 | 3.838E-05 | 0.000 | 1.908E+11 |
| 28.2278 | 431611. | 0.000 | | | | |
| 29.700 | -9.728E-05 | -29.5289 | -12.2693 | 3.838E-05 | 0.000 | 1.908E+11 |
| 12.0129 | 444571. | 0.000 | | | | |
| 30.000 | 4.089E-05 | 0.000 | 0.000 | 3.838E-05 | 0.000 | 1.908E+11 |
| -5.1966 | 228765. | 0.000 | | | | |

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

| | | | |
|---|---|---|---|
| Pile-head deflection | = | 0.1630194 | inches |
| Computed slope at pile head | = | -0.0012379 | radians |
| Maximum bending moment | = | 1363317. | inch-lbs |
| Maximum shear force | = | 14800. | lbs |
| Depth of maximum bending moment | = | 11.7000000 | feet below pile head |
| Depth of maximum shear force | = | 2.4000000 | feet below pile head |
| Number of iterations | = | 19 | |
| Number of zero deflection points | = | 2 | |

L-PILE compressor.lp7o
Summary of Pile Response(s)

---

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

| Load Case No. | Maximum Load Type in Pile No. | Pile-head Condition 1 Shear V(lbs) or y(inches) lbs | Pile-head Condition 2 Pile-head in-lb, rad., or Rotation in-lb/rad. radians | Axial Loading lbs | Pile-head Deflection inches | Maximum Moment in Pile in-lbs |
|---|---|---|---|---|---|---|
| 1 | 1 | V = 18500. | M = 0.000 | 0.0000000 | 0.59149273 | 1616905. |
| | | 18500. | -0.00465691 | | | |
| 2 | 1 | V = 14800. | M = 0.000 | 30000. | 0.16301935 | 1363317. |
| | | 14800. | -0.00123789 | | | |

The analysis ended normally.

Profis Anchor 2.4.7

www.hilti.us

| | | | |
|---|---|---|---|
| Company: | | Page: | 1 |
| Specifier: | | Project: | LITTLE MO - COMPRE |
| Address: | | Sub-Project I Pos. No.: | COMPRESSOR BUILDI |
| Phone I Fax: | | Date: | 7/22/2014 |
| E-Mail: | | | |

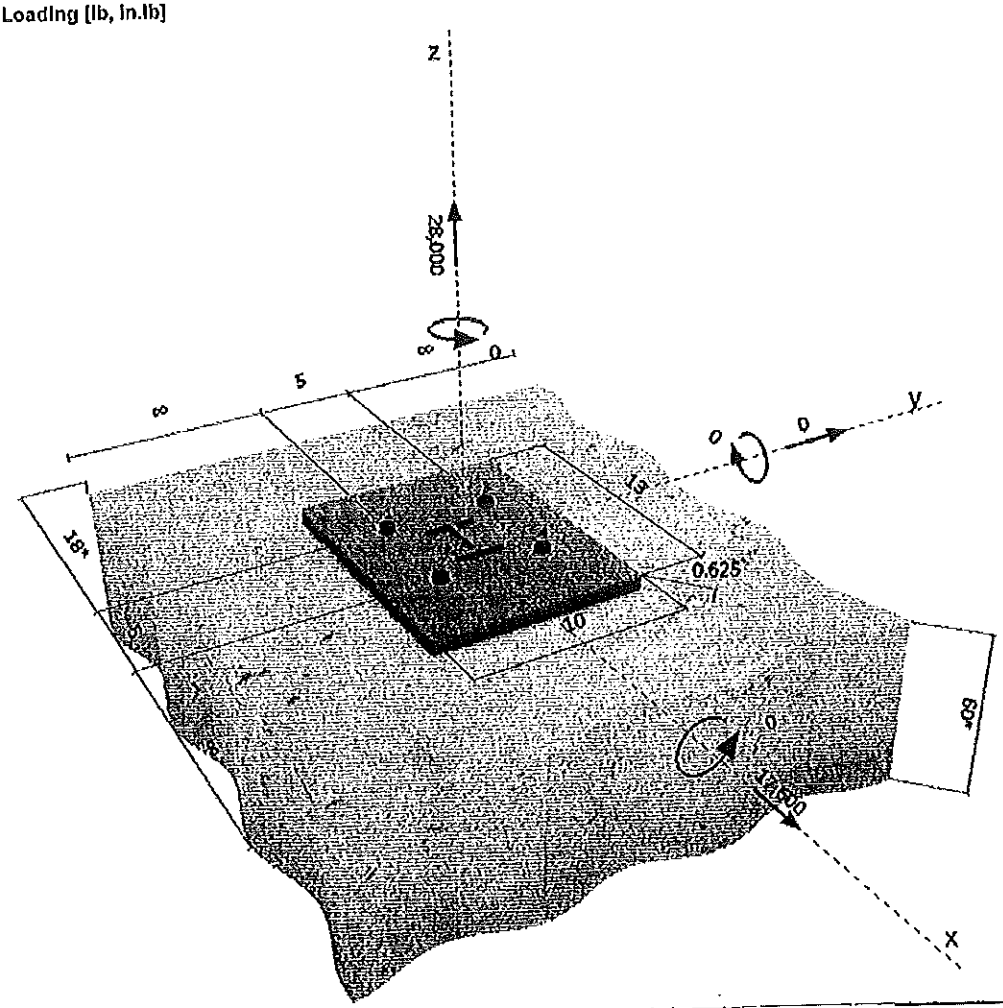
**Specifier's comments:**

## 1 Input data



| | |
|---|---|
| Anchor type and diameter: | Hex Head ASTM F 1554 GR. 36 3/4 |
| Effective embedment depth: | $h_{ef}$ = 12.000 in. |
| Material: | ASTM F 1554 |
| Proof: | design method ACI 318-08 / CIP |
| Stand-off installation: | $e_b$ = 0.000 in. (no stand-off); t = 0.625 in. |
| Anchor plate: | $l_x$ x $l_y$ x t = 13.000 in. x 10.000 in. x 0.625 in.; (Recommended plate thickness: not calculated) |
| Profile: | S shape (AISC); (L x W x T x FT) = 3.000 in. x 2.330 in. x 0.170 in. x 0.260 in. |
| Base material: | uncracked concrete, 4000, $f_c'$ = 4000 psi; h = 60.000 in. |
| Reinforcement: | tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar |
| Seismic loads (cat. C, D, E, or F) | no |

**Geometry [in.] & Loading [lb, in.lb]**



| | | | |
|---|---|---|---|
| Company: | | Page: | 2 |
| Specifier: | | Project: | LITTLE MO - COMPRE |
| Address: | | Sub-Project I Pos. No.: | COMPRESSOR BUILDI |
| Phone I Fax: | | Date: | 7/22/2014 |
| E-Mail: | | | |

## 2 Proof I Utilization (Governing Cases)

| | | Design values [lb] | | Utilization | |
|---|---|---|---|---|---|
| Loading | Proof | Load | Capacity | $\beta_N$ / $\beta_V$ [%] | Status |
| Tension | Steel Strength | 7000 | 14520 | 49 / - | OK |
| Shear | Steel Strength | 4400 | 7555 | - / 59 | OK |

| Loading | $\beta_N$ | $\beta_V$ | $\zeta$ | Utilization $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|---|
| Combined tension and shear loads | 0.482 | 0.582 | 5/3 | 71 | OK |

## 3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

**Fastening meets the design criteria!**

## 4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.


PROFIS Anchor ( c ) 2003-2009 Hilti AG, FL-9494 Schaan Hilti is a registered Trademark of Hilti AG, Schaan

File = C:\Users\cmckee\Desktop\SYNCTO~1\targa\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : ElKON Consultant Group, LLC

# Concrete Beam

Lic. # : KW-06010235

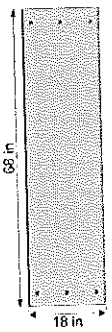
Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## CODE REFERENCES

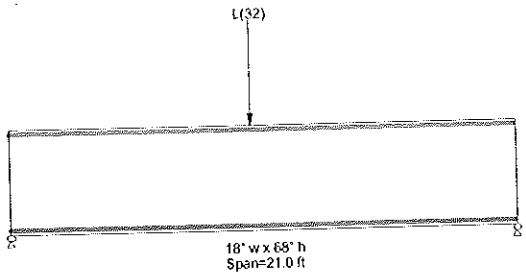
Calculations per ACI 318-11, IBC 2012, ASCE 7-10
Load Combination Set : ASCE 7-05

### Material Properties

| | | | | | |
|---|---|---|---|---|---|
| f'c | = | 4.50 ksi | $\phi$ Phi Values | Flexure : | 0.90 |
| fr = f'c$^{1/2}$ * 7.50 | = | 503.12 psi | | Shear : | 0.750 |
| $\psi$ Density | = | 145.0 pcf | $\beta_1$ | = | 0.8250 |
| $\lambda$ LtWt Factor | = | 1.0 | | | |
| Elastic Modulus | = | 3,122.0 ksi | Fy - Stirrups | | 60.0 ksi |
| | | | E - Stirrups | = | 29,000.0 ksi |
| fy - Main Rebar | = | 60.0 ksi | Stirrup Bar Size # = | | # 4 |
| E - Main Rebar | = | 29,000.0 ksi | | | |
| | | | Number of Resisting Legs Per Stirrup = | | 2 |




Load Combination ASCE 7-05




### Cross Section & Reinforcing Details

Rectangular Section, Width = 18.0 in, Height = 68.0 in
Span #1 Reinforcing....
3-#7 at 3.0 in from Bottom, from 0.0 to 21.0 ft in this span
3-#7 at 3.0 in from Top, from 0.0 to 21.0 ft in this span

### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Point Load : L = 32.0 k @ 10.0 ft

**Design OK**

## DESIGN SUMMARY

| | | | | | |
|---|---|---|---|---|---|
| Maximum Bending Stress Ratio | = | 0.668 : 1 | Maximum Deflection | | |
| Section used for this span | | Typical Section | Max Downward L+Lr+S Deflection | 0.007 in | Ratio = 34907 |
| Mu : Applied | | 349.168 k-ft | Max Upward L+Lr+S Deflection | 0.000 in | Ratio = 0 <360 |
| Mn * Phi : Allowable | | 523.09 k-ft | Max Downward Total Deflection | 0.011 in | Ratio = 23165 |
| Load Combination | | +1.20D+0.50Lr+1.60L+1.60H | Max Upward Total Deflection | 0.000 in | Ratio = 999 <180 |
| Location of maximum on span | | 9.987 ft | | | |
| Span # where maximum occurs | | Span # 1 | | | |

### Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 29.703 | 28.179 |
| Overall MINimum | 7.765 | 7.765 |
| +D | 12.941 | 12.941 |
| +D+L+H | 29.703 | 28.179 |
| +D+Lr+H | 12.941 | 12.941 |
| +D+S+H | 12.941 | 12.941 |
| +D+0.750Lr+0.750L+H | 25.513 | 24.370 |
| +D+0.750L+0.750S+H | 25.513 | 24.370 |
| +D+W+H | 12.941 | 12.941 |
| +D+0.70E+H | 12.941 | 12.941 |
| +D+0.750Lr+0.750L+0.750W+H | 25.513 | 24.370 |
| +D+0.750L+0.750S+0.750W+H | 25.513 | 24.370 |
| +D+0.750Lr+0.750L+0.525E+H | 25.513 | 24.370 |
| +D+0.750L+0.750S+0.525E+H | 25.513 | 24.370 |
| +0.60D+W+H | 7.765 | 7.765 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +0.60D+0.70E+H | 7.765 | 7.765 |
| D Only | 12.941 | 12.941 |
| Lr Only | | |
| L Only | 16.762 | 15.238 |
| S Only | | |
| W Only | | |
| E Only | | |
| H Only | | |
| +D | 12.941 | 12.941 |
| +D+L+H | 29.703 | 28.179 |
| +D+Lr+H | 12.941 | 12.941 |
| +D+S+H | 12.941 | 12.941 |
| +D+0.750Lr+0.750L+H | 25.513 | 24.370 |
| +D+0.750L+0.750S+H | 25.513 | 24.370 |
| +D+W+H | 12.941 | 12.941 |
| +D+0.70E+H | 12.941 | 12.941 |
| +D+0.750Lr+0.750L+0.750W+H | 25.513 | 24.370 |

## Shear Stirrup Requirements

Entire Beam Span Length : Vu < PhiVc/2, Req'd Vs = Not Reqd 11.4.6.1, use stirrups spaced at 0.000 in

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Location (ft) in Span | Bending Stress Results (k-ft) Mu : Max | Phi*Mnx | Stress Ratio |
|---|---|---|---|---|---|
| MAXimum BENDING Envelope | | | | | |
| Span # 1 | 1 | 21.000 | 349.17 | 523.09 | 0.67 |
| +1.40D | | | | | |
| Span # 1 | 1 | 21.000 | 95.12 | 523.09 | 0.18 |
| +1.20D+0.50Lr+1.60L+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 349.17 | 523.09 | 0.67 |
| +1.20D+1.60L+0.50S+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 349.17 | 523.09 | 0.67 |
| +1.20D+1.60Lr+0.50L | | | | | |
| Span # 1 | 1 | 21.000 | 165.03 | 523.09 | 0.32 |
| +1.20D+1.60Lr+0.80W | | | | | |
| Span # 1 | 1 | 21.000 | 81.53 | 523.09 | 0.16 |
| +1.20D+0.50L+1.60S | | | | | |
| Span # 1 | 1 | 21.000 | 165.03 | 523.09 | 0.32 |
| +1.20D+1.60S+0.80W | | | | | |
| Span # 1 | 1 | 21.000 | 81.53 | 523.09 | 0.16 |
| +1.20D+0.50Lr+0.50L+1.60W | | | | | |
| Span # 1 | 1 | 21.000 | 165.03 | 523.09 | 0.32 |
| +1.20D+0.50L+0.50S+1.60W | | | | | |
| Span # 1 | 1 | 21.000 | 165.03 | 523.09 | 0.32 |
| +1.20D+0.50L+0.20S+E | | | | | |
| Span # 1 | 1 | 21.000 | 165.03 | 523.09 | 0.32 |
| +0.90D+1.60W+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 61.15 | 523.09 | 0.12 |
| +0.90D+E+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 61.15 | 523.09 | 0.12 |

## Overall Maximum Deflections - Unfactored Loads

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| L Only | 1 | 0.0072 | 10.290 | | 0.0000 | 0.000 |

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.00 | 65.00 | 42.35 | 42.35 | 0.00 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.05 | 65.00 | 42.28 | 42.28 | 1.97 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.09 | 65.00 | 42.21 | 42.21 | 3.95 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.14 | 65.00 | 42.14 | 42.14 | 5.91 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.19 | 65.00 | 42.07 | 42.07 | 7.88 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.23 | 65.00 | 42.00 | 42.00 | 9.84 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.28 | 65.00 | 41.93 | 41.93 | 11.80 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.33 | 65.00 | 41.87 | 41.87 | 13.75 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.37 | 65.00 | 41.80 | 41.80 | 15.71 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.42 | 65.00 | 41.73 | 41.73 | 17.66 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.47 | 65.00 | 41.66 | 41.66 | 19.60 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.51 | 65.00 | 41.59 | 41.59 | 21.54 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.56 | 65.00 | 41.52 | 41.52 | 23.48 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.61 | 65.00 | 41.45 | 41.45 | 25.42 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.65 | 65.00 | 41.38 | 41.38 | 27.35 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.70 | 65.00 | 41.31 | 41.31 | 29.28 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.75 | 65.00 | 41.24 | 41.24 | 31.21 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.79 | 65.00 | 41.18 | 41.18 | 33.13 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.84 | 65.00 | 41.11 | 41.11 | 35.05 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.89 | 65.00 | 41.04 | 41.04 | 36.97 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.93 | 65.00 | 40.97 | 40.97 | 38.88 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.98 | 65.00 | 40.90 | 40.90 | 40.79 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.03 | 65.00 | 40.83 | 40.83 | 42.70 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.07 | 65.00 | 40.76 | 40.76 | 44.60 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.12 | 65.00 | 40.69 | 40.69 | 46.50 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.17 | 65.00 | 40.62 | 40.62 | 48.40 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.21 | 65.00 | 40.55 | 40.55 | 50.29 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.26 | 65.00 | 40.48 | 40.48 | 52.19 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.31 | 65.00 | 40.42 | 40.42 | 54.07 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.35 | 65.00 | 40.35 | 40.35 | 55.96 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.40 | 65.00 | 40.28 | 40.28 | 57.84 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.45 | 65.00 | 40.21 | 40.21 | 59.72 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.49 | 65.00 | 40.14 | 40.14 | 61.59 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.54 | 65.00 | 40.07 | 40.07 | 63.46 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.59 | 65.00 | 40.00 | 40.00 | 65.33 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.63 | 65.00 | 39.93 | 39.93 | 67.20 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.68 | 65.00 | 39.86 | 39.86 | 69.06 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.73 | 65.00 | 39.79 | 39.79 | 70.92 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.77 | 65.00 | 39.73 | 39.73 | 72.77 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.82 | 65.00 | 39.66 | 39.66 | 74.62 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.87 | 65.00 | 39.59 | 39.59 | 76.47 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.91 | 65.00 | 39.52 | 39.52 | 78.32 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.96 | 65.00 | 39.45 | 39.45 | 80.16 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.01 | 65.00 | 39.38 | 39.38 | 82.00 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.05 | 65.00 | 39.31 | 39.31 | 83.84 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.10 | 65.00 | 39.24 | 39.24 | 85.67 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.15 | 65.00 | 39.17 | 39.17 | 87.50 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.19 | 65.00 | 39.10 | 39.10 | 89.33 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.24 | 65.00 | 39.04 | 39.04 | 91.15 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.29 | 65.00 | 38.97 | 38.97 | 92.97 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.33 | 65.00 | 38.90 | 38.90 | 94.79 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.38 | 65.00 | 38.83 | 38.83 | 96.60 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.43 | 65.00 | 38.76 | 38.76 | 98.41 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.47 | 65.00 | 38.69 | 38.69 | 100.22 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.52 | 65.00 | 38.62 | 38.62 | 102.02 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.57 | 65.00 | 38.55 | 38.55 | 103.82 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.61 | 65.00 | 38.48 | 38.48 | 105.62 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.66 | 65.00 | 38.41 | 38.41 | 107.41 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.71 | 65.00 | 38.35 | 38.35 | 109.21 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.75 | 65.00 | 38.28 | 38.28 | 110.99 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.80 | 65.00 | 38.21 | 38.21 | 112.78 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.85 | 65.00 | 38.14 | 38.14 | 114.56 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.89 | 65.00 | 38.07 | 38.07 | 116.34 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.94 | 65.00 | 38.00 | 38.00 | 118.11 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.99 | 65.00 | 37.93 | 37.93 | 119.88 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.03 | 65.00 | 37.86 | 37.86 | 121.65 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.08 | 65.00 | 37.79 | 37.79 | 123.42 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.13 | 65.00 | 37.72 | 37.72 | 125.18 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.17 | 65.00 | 37.66 | 37.66 | 126.94 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.22 | 65.00 | 37.59 | 37.59 | 128.69 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.27 | 65.00 | 37.52 | 37.52 | 130.45 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.31 | 65.00 | 37.45 | 37.45 | 132.20 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.36 | 65.00 | 37.38 | 37.38 | 133.94 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.41 | 65.00 | 37.31 | 37.31 | 135.69 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.45 | 65.00 | 37.24 | 37.24 | 137.42 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.50 | 65.00 | 37.17 | 37.17 | 139.16 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.55 | 65.00 | 37.10 | 37.10 | 140.89 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.59 | 65.00 | 37.03 | 37.03 | 142.62 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.64 | 65.00 | 36.96 | 36.96 | 144.35 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.69 | 65.00 | 36.90 | 36.90 | 146.07 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.73 | 65.00 | 36.83 | 36.83 | 147.79 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.78 | 65.00 | 36.76 | 36.76 | 149.51 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.83 | 65.00 | 36.69 | 36.69 | 151.22 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.87 | 65.00 | 36.62 | 36.62 | 152.94 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.92 | 65.00 | 36.55 | 36.55 | 154.64 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.97 | 65.00 | 36.48 | 36.48 | 156.35 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.01 | 65.00 | 36.41 | 36.41 | 158.05 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.06 | 65.00 | 36.34 | 36.34 | 159.75 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.11 | 65.00 | 36.27 | 36.27 | 161.44 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.15 | 65.00 | 36.21 | 36.21 | 163.13 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.20 | 65.00 | 36.14 | 36.14 | 164.82 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.25 | 65.00 | 36.07 | 36.07 | 166.50 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.29 | 65.00 | 36.00 | 36.00 | 168.19 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.34 | 65.00 | 35.93 | 35.93 | 169.86 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.39 | 65.00 | 35.86 | 35.86 | 171.54 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.43 | 65.00 | 35.79 | 35.79 | 173.21 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.48 | 65.00 | 35.72 | 35.72 | 174.88 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.53 | 65.00 | 35.65 | 35.65 | 176.54 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.57 | 65.00 | 35.58 | 35.58 | 178.21 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.62 | 65.00 | 35.52 | 35.52 | 179.87 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.67 | 65.00 | 35.45 | 35.45 | 181.52 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.71 | 65.00 | 35.38 | 35.38 | 183.17 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.76 | 65.00 | 35.31 | 35.31 | 184.82 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.81 | 65.00 | 35.24 | 35.24 | 186.47 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.85 | 65.00 | 35.17 | 35.17 | 188.11 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.90 | 65.00 | 35.10 | 35.10 | 189.75 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.95 | 65.00 | 35.03 | 35.03 | 191.39 | 0.99 | 115.19 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.99 | 65.00 | 34.96 | 34.96 | 193.02 | 0.98 | 115.15 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.04 | 65.00 | 34.89 | 34.89 | 194.65 | 0.97 | 115.12 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.09 | 65.00 | 34.83 | 34.83 | 196.28 | 0.96 | 115.09 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.13 | 65.00 | 34.76 | 34.76 | 197.90 | 0.95 | 115.05 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.18 | 65.00 | 34.69 | 34.69 | 199.52 | 0.94 | 115.02 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.23 | 65.00 | 34.62 | 34.62 | 201.14 | 0.93 | 114.99 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.27 | 65.00 | 34.55 | 34.55 | 202.75 | 0.92 | 114.96 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.32 | 65.00 | 34.48 | 34.48 | 204.36 | 0.91 | 114.93 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.37 | 65.00 | 34.41 | 34.41 | 205.97 | 0.90 | 114.90 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.41 | 65.00 | 34.34 | 34.34 | 207.58 | 0.90 | 114.87 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.46 | 65.00 | 34.27 | 34.27 | 209.18 | 0.89 | 114.84 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.51 | 65.00 | 34.20 | 34.20 | 210.78 | 0.88 | 114.81 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.55 | 65.00 | 34.14 | 34.14 | 212.37 | 0.87 | 114.78 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.60 | 65.00 | 34.07 | 34.07 | 213.96 | 0.86 | 114.75 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.65 | 65.00 | 34.00 | 34.00 | 215.55 | 0.85 | 114.73 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.69 | 65.00 | 33.93 | 33.93 | 217.13 | 0.85 | 114.70 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.74 | 65.00 | 33.86 | 33.86 | 218.72 | 0.84 | 114.67 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.79 | 65.00 | 33.79 | 33.79 | 220.29 | 0.83 | 114.65 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.83 | 65.00 | 33.72 | 33.72 | 221.87 | 0.82 | 114.62 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.88 | 65.00 | 33.65 | 33.65 | 223.44 | 0.82 | 114.60 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.93 | 65.00 | 33.58 | 33.58 | 225.01 | 0.81 | 114.57 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.97 | 65.00 | 33.51 | 33.51 | 226.58 | 0.80 | 114.55 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.02 | 65.00 | 33.44 | 33.44 | 228.14 | 0.79 | 114.52 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.07 | 65.00 | 33.38 | 33.38 | 229.70 | 0.79 | 114.50 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.11 | 65.00 | 33.31 | 33.31 | 231.25 | 0.78 | 114.48 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.16 | 65.00 | 33.24 | 33.24 | 232.81 | 0.77 | 114.45 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.21 | 65.00 | 33.17 | 33.17 | 234.36 | 0.77 | 114.43 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.25 | 65.00 | 33.10 | 33.10 | 235.90 | 0.76 | 114.41 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.30 | 65.00 | 33.03 | 33.03 | 237.44 | 0.75 | 114.39 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.35 | 65.00 | 32.96 | 32.96 | 238.98 | 0.75 | 114.36 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.39 | 65.00 | 32.89 | 32.89 | 240.52 | 0.74 | 114.34 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.44 | 65.00 | 32.82 | 32.82 | 242.05 | 0.73 | 114.32 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.49 | 65.00 | 32.75 | 32.75 | 243.58 | 0.73 | 114.30 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.53 | 65.00 | 32.69 | 32.69 | 245.11 | 0.72 | 114.28 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.58 | 65.00 | 32.62 | 32.62 | 246.64 | 0.72 | 114.26 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.63 | 65.00 | 32.55 | 32.55 | 248.16 | 0.71 | 114.24 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.67 | 65.00 | 32.48 | 32.48 | 249.67 | 0.70 | 114.22 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.72 | 65.00 | 32.41 | 32.41 | 251.19 | 0.70 | 114.20 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.77 | 65.00 | 32.34 | 32.34 | 252.70 | 0.69 | 114.18 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.81 | 65.00 | 32.27 | 32.27 | 254.21 | 0.69 | 114.16 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.86 | 65.00 | 32.20 | 32.20 | 255.71 | 0.68 | 114.14 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.91 | 65.00 | 32.13 | 32.13 | 257.21 | 0.68 | 114.13 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.95 | 65.00 | 32.06 | 32.06 | 258.71 | 0.67 | 114.11 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.00 | 65.00 | 32.00 | 32.00 | 260.20 | 0.67 | 114.09 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.05 | 65.00 | 31.93 | 31.93 | 261.70 | 0.66 | 114.07 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.09 | 65.00 | 31.86 | 31.86 | 263.18 | 0.66 | 114.06 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.14 | 65.00 | 31.79 | 31.79 | 264.67 | 0.65 | 114.04 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.19 | 65.00 | 31.72 | 31.72 | 266.15 | 0.65 | 114.02 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.23 | 65.00 | 31.65 | 31.65 | 267.63 | 0.64 | 114.00 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.28 | 65.00 | 31.58 | 31.58 | 269.10 | 0.64 | 113.99 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.33 | 65.00 | 31.51 | 31.51 | 270.58 | 0.63 | 113.97 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.37 | 65.00 | 31.44 | 31.44 | 272.05 | 0.63 | 113.96 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.42 | 65.00 | 31.37 | 31.37 | 273.51 | 0.62 | 113.94 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.47 | 65.00 | 31.31 | 31.31 | 274.97 | 0.62 | 113.92 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.51 | 65.00 | 31.24 | 31.24 | 276.43 | 0.61 | 113.91 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.56 | 65.00 | 31.17 | 31.17 | 277.89 | 0.61 | 113.89 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.61 | 65.00 | 31.10 | 31.10 | 279.34 | 0.60 | 113.88 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.65 | 65.00 | 31.03 | 31.03 | 280.79 | 0.60 | 113.86 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.70 | 65.00 | 30.96 | 30.96 | 282.24 | 0.59 | 113.85 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.75 | 65.00 | 30.89 | 30.89 | 283.68 | 0.59 | 113.83 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.79 | 65.00 | 30.82 | 30.82 | 285.12 | 0.59 | 113.82 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.84 | 65.00 | 30.75 | 30.75 | 286.56 | 0.58 | 113.80 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |

# Concrete Beam

File = C:\Users\cmckee\Desktop\SYNCTO~1\targa\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee: EIKON Consultant Group, LLC

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.89 | 65.00 | 30.68 | 30.68 | 287.99 | 0.58 | 113.79 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.93 | 65.00 | 30.62 | 30.62 | 289.42 | 0.57 | 113.78 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.98 | 65.00 | 30.55 | 30.55 | 290.85 | 0.57 | 113.76 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.03 | 65.00 | 30.48 | 30.48 | 292.27 | 0.56 | 113.75 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.07 | 65.00 | 30.41 | 30.41 | 293.69 | 0.56 | 113.74 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.12 | 65.00 | 30.34 | 30.34 | 295.11 | 0.56 | 113.72 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.17 | 65.00 | 30.27 | 30.27 | 296.53 | 0.55 | 113.71 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.21 | 65.00 | 30.20 | 30.20 | 297.94 | 0.55 | 113.70 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.26 | 65.00 | 30.13 | 30.13 | 299.34 | 0.55 | 113.68 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.31 | 65.00 | 30.06 | 30.06 | 300.75 | 0.54 | 113.67 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.35 | 65.00 | 29.99 | 29.99 | 302.15 | 0.54 | 113.66 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.40 | 65.00 | 29.92 | 29.92 | 303.55 | 0.53 | 113.64 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.45 | 65.00 | 29.86 | 29.86 | 304.94 | 0.53 | 113.63 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.49 | 65.00 | 29.79 | 29.79 | 306.34 | 0.53 | 113.62 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.54 | 65.00 | 29.72 | 29.72 | 307.72 | 0.52 | 113.61 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.59 | 65.00 | 29.65 | 29.65 | 309.11 | 0.52 | 113.60 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.63 | 65.00 | 29.58 | 29.58 | 310.49 | 0.52 | 113.58 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.68 | 65.00 | 29.51 | 29.51 | 311.87 | 0.51 | 113.57 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.73 | 65.00 | 29.44 | 29.44 | 313.25 | 0.51 | 113.56 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.77 | 65.00 | 29.37 | 29.37 | 314.62 | 0.51 | 113.55 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.82 | 65.00 | 29.30 | 29.30 | 315.99 | 0.50 | 113.54 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.87 | 65.00 | 29.23 | 29.23 | 317.35 | 0.50 | 113.53 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.91 | 65.00 | 29.17 | 29.17 | 318.72 | 0.50 | 113.52 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.96 | 65.00 | 29.10 | 29.10 | 320.07 | 0.49 | 113.50 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.01 | 65.00 | 29.03 | 29.03 | 321.43 | 0.49 | 113.49 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.05 | 65.00 | 28.96 | 28.96 | 322.78 | 0.49 | 113.48 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.10 | 65.00 | 28.89 | 28.89 | 324.13 | 0.48 | 113.47 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.15 | 65.00 | 28.82 | 28.82 | 325.48 | 0.48 | 113.46 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.19 | 65.00 | 28.75 | 28.75 | 326.82 | 0.48 | 113.45 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.24 | 65.00 | 28.68 | 28.68 | 328.16 | 0.47 | 113.44 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.29 | 65.00 | 28.61 | 28.61 | 329.50 | 0.47 | 113.43 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.33 | 65.00 | 28.54 | 28.54 | 330.83 | 0.47 | 113.42 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.38 | 65.00 | 28.48 | 28.48 | 332.16 | 0.46 | 113.41 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.43 | 65.00 | 28.41 | 28.41 | 333.49 | 0.46 | 113.40 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.47 | 65.00 | 28.34 | 28.34 | 334.82 | 0.46 | 113.39 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.52 | 65.00 | 28.27 | 28.27 | 336.14 | 0.46 | 113.38 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.57 | 65.00 | 28.20 | 28.20 | 337.45 | 0.45 | 113.37 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.61 | 65.00 | 28.13 | 28.13 | 338.77 | 0.45 | 113.36 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.66 | 65.00 | 28.06 | 28.06 | 340.08 | 0.45 | 113.35 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.71 | 65.00 | 27.99 | 27.99 | 341.39 | 0.44 | 113.34 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.75 | 65.00 | 27.92 | 27.92 | 342.69 | 0.44 | 113.33 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.80 | 65.00 | 27.85 | 27.85 | 343.99 | 0.44 | 113.32 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.85 | 65.00 | 27.79 | 27.79 | 345.29 | 0.44 | 113.31 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.89 | 65.00 | 27.72 | 27.72 | 346.59 | 0.43 | 113.30 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.94 | 65.00 | 27.65 | 27.65 | 347.88 | 0.43 | 113.30 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.99 | 65.00 | 27.58 | 27.58 | 349.17 | 0.43 | 113.29 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.03 | 65.00 | -23.69 | 23.69 | 348.75 | 0.37 | 113.08 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.08 | 65.00 | -23.76 | 23.76 | 347.64 | 0.37 | 113.09 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.13 | 65.00 | -23.83 | 23.83 | 346.53 | 0.37 | 113.10 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.17 | 65.00 | -23.90 | 23.90 | 345.42 | 0.37 | 113.11 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.22 | 65.00 | -23.97 | 23.97 | 344.30 | 0.38 | 113.12 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.27 | 65.00 | -24.04 | 24.04 | 343.18 | 0.38 | 113.12 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.31 | 65.00 | -24.10 | 24.10 | 342.06 | 0.38 | 113.13 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.36 | 65.00 | -24.17 | 24.17 | 340.93 | 0.38 | 113.14 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.41 | 65.00 | -24.24 | 24.24 | 339.80 | 0.39 | 113.15 | Vu < PhiVc/2 | Not Reqd 1 | 113.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.45 | 65.00 | -24.31 | 24.31 | 338.67 | 0.39 | 113.15 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.50 | 65.00 | -24.38 | 24.38 | 337.53 | 0.39 | 113.16 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.55 | 65.00 | -24.45 | 24.45 | 336.39 | 0.39 | 113.17 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.59 | 65.00 | -24.52 | 24.52 | 335.25 | 0.40 | 113.18 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.64 | 65.00 | -24.59 | 24.59 | 334.10 | 0.40 | 113.19 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.69 | 65.00 | -24.66 | 24.66 | 332.95 | 0.40 | 113.20 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.73 | 65.00 | -24.73 | 24.73 | 331.80 | 0.40 | 113.20 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.78 | 65.00 | -24.80 | 24.80 | 330.65 | 0.41 | 113.21 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.83 | 65.00 | -24.86 | 24.86 | 329.49 | 0.41 | 113.22 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.87 | 65.00 | -24.93 | 24.93 | 328.32 | 0.41 | 113.23 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.92 | 65.00 | -25.00 | 25.00 | 327.16 | 0.41 | 113.24 | Vu < PhiVc/2 | Not Reqd 1 | 113.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.97 | 65.00 | -25.07 | 25.07 | 325.99 | 0.42 | 113.25 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.01 | 65.00 | -25.14 | 25.14 | 324.82 | 0.42 | 113.26 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.06 | 65.00 | -25.21 | 25.21 | 323.64 | 0.42 | 113.27 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.11 | 65.00 | -25.28 | 25.28 | 322.47 | 0.42 | 113.28 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.15 | 65.00 | -25.35 | 25.35 | 321.29 | 0.43 | 113.28 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.20 | 65.00 | -25.42 | 25.42 | 320.10 | 0.43 | 113.29 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.25 | 65.00 | -25.49 | 25.49 | 318.91 | 0.43 | 113.30 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.29 | 65.00 | -25.55 | 25.55 | 317.72 | 0.44 | 113.31 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.34 | 65.00 | -25.62 | 25.62 | 316.53 | 0.44 | 113.32 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.39 | 65.00 | -25.69 | 25.69 | 315.33 | 0.44 | 113.33 | Vu < PhiVc/2 | Not Reqd 1 | 113.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.43 | 65.00 | -25.76 | 25.76 | 314.13 | 0.44 | 113.34 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.48 | 65.00 | -25.83 | 25.83 | 312.93 | 0.45 | 113.35 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.53 | 65.00 | -25.90 | 25.90 | 311.72 | 0.45 | 113.36 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.57 | 65.00 | -25.97 | 25.97 | 310.51 | 0.45 | 113.37 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.62 | 65.00 | -26.04 | 26.04 | 309.30 | 0.46 | 113.38 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.67 | 65.00 | -26.11 | 26.11 | 308.08 | 0.46 | 113.39 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.71 | 65.00 | -26.18 | 26.18 | 306.86 | 0.46 | 113.40 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.76 | 65.00 | -26.24 | 26.24 | 305.64 | 0.47 | 113.41 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.81 | 65.00 | -26.31 | 26.31 | 304.41 | 0.47 | 113.42 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.85 | 65.00 | -26.38 | 26.38 | 303.18 | 0.47 | 113.43 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.90 | 65.00 | -26.45 | 26.45 | 301.95 | 0.47 | 113.44 | Vu < PhiVc/2 | Not Reqd 1 | 113.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.95 | 65.00 | -26.52 | 26.52 | 300.71 | 0.48 | 113.45 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.99 | 65.00 | -26.59 | 26.59 | 299.47 | 0.48 | 113.47 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.04 | 65.00 | -26.66 | 26.66 | 298.23 | 0.48 | 113.48 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.09 | 65.00 | -26.73 | 26.73 | 296.98 | 0.49 | 113.49 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.13 | 65.00 | -26.80 | 26.80 | 295.74 | 0.49 | 113.50 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.18 | 65.00 | -26.87 | 26.87 | 294.48 | 0.49 | 113.51 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.23 | 65.00 | -26.93 | 26.93 | 293.23 | 0.50 | 113.52 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.27 | 65.00 | -27.00 | 27.00 | 291.97 | 0.50 | 113.53 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.32 | 65.00 | -27.07 | 27.07 | 290.71 | 0.50 | 113.55 | Vu < PhiVc/2 | Not Reqd 1 | 113.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.37 | 65.00 | -27.14 | 27.14 | 289.44 | 0.51 | 113.56 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.41 | 65.00 | -27.21 | 27.21 | 288.17 | 0.51 | 113.57 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.46 | 65.00 | -27.28 | 27.28 | 286.90 | 0.52 | 113.58 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.51 | 65.00 | -27.35 | 27.35 | 285.63 | 0.52 | 113.59 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.55 | 65.00 | -27.42 | 27.42 | 284.35 | 0.52 | 113.61 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.60 | 65.00 | -27.49 | 27.49 | 283.07 | 0.53 | 113.62 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.65 | 65.00 | -27.56 | 27.56 | 281.78 | 0.53 | 113.63 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.69 | 65.00 | -27.62 | 27.62 | 280.50 | 0.53 | 113.64 | Vu < PhiVc/2 | Not Reqd 1 | 113.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.74 | 65.00 | -27.69 | 27.69 | 279.21 | 0.54 | 113.66 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.79 | 65.00 | -27.76 | 27.76 | 277.91 | 0.54 | 113.67 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.83 | 65.00 | -27.83 | 27.83 | 276.61 | 0.55 | 113.68 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.88 | 65.00 | -27.90 | 27.90 | 275.31 | 0.55 | 113.70 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |

File = C:\Users\cmckee\Desktop\SYNCTO~1\targa\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : ElKON Consultant Group, LLC

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.93 | 65.00 | -27.97 | 27.97 | 274.01 | 0.55 | 113.71 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.97 | 65.00 | -28.04 | 28.04 | 272.70 | 0.56 | 113.72 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.02 | 65.00 | -28.11 | 28.11 | 271.39 | 0.56 | 113.74 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.07 | 65.00 | -28.18 | 28.18 | 270.08 | 0.57 | 113.75 | Vu < PhiVc/2 | Not Reqd 1 | 113.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.11 | 65.00 | -28.25 | 28.25 | 268.76 | 0.57 | 113.76 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.16 | 65.00 | -28.32 | 28.32 | 267.44 | 0.57 | 113.78 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.21 | 65.00 | -28.38 | 28.38 | 266.12 | 0.58 | 113.79 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.25 | 65.00 | -28.45 | 28.45 | 264.80 | 0.58 | 113.81 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.30 | 65.00 | -28.52 | 28.52 | 263.47 | 0.59 | 113.82 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.35 | 65.00 | -28.59 | 28.59 | 262.13 | 0.59 | 113.84 | Vu < PhiVc/2 | Not Reqd 1 | 113.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.39 | 65.00 | -28.66 | 28.66 | 260.80 | 0.60 | 113.85 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.44 | 65.00 | -28.73 | 28.73 | 259.46 | 0.60 | 113.87 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.49 | 65.00 | -28.80 | 28.80 | 258.12 | 0.60 | 113.88 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.53 | 65.00 | -28.87 | 28.87 | 256.77 | 0.61 | 113.90 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.58 | 65.00 | -28.94 | 28.94 | 255.42 | 0.61 | 113.91 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.63 | 65.00 | -29.01 | 29.01 | 254.07 | 0.62 | 113.93 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.67 | 65.00 | -29.07 | 29.07 | 252.71 | 0.62 | 113.95 | Vu < PhiVc/2 | Not Reqd 1 | 113.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.72 | 65.00 | -29.14 | 29.14 | 251.36 | 0.63 | 113.96 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.77 | 65.00 | -29.21 | 29.21 | 249.99 | 0.63 | 113.98 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.81 | 65.00 | -29.28 | 29.28 | 248.63 | 0.64 | 114.00 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.86 | 65.00 | -29.35 | 29.35 | 247.26 | 0.64 | 114.01 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.91 | 65.00 | -29.42 | 29.42 | 245.89 | 0.65 | 114.03 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.95 | 65.00 | -29.49 | 29.49 | 244.52 | 0.65 | 114.05 | Vu < PhiVc/2 | Not Reqd 1 | 114.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.00 | 65.00 | -29.56 | 29.56 | 243.14 | 0.66 | 114.06 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.05 | 65.00 | -29.63 | 29.63 | 241.76 | 0.66 | 114.08 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.09 | 65.00 | -29.70 | 29.70 | 240.37 | 0.67 | 114.10 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.14 | 65.00 | -29.76 | 29.76 | 238.99 | 0.67 | 114.12 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.19 | 65.00 | -29.83 | 29.83 | 237.59 | 0.68 | 114.14 | Vu < PhiVc/2 | Not Reqd 1 | 114.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.23 | 65.00 | -29.90 | 29.90 | 236.20 | 0.69 | 114.16 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.28 | 65.00 | -29.97 | 29.97 | 234.80 | 0.69 | 114.18 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.33 | 65.00 | -30.04 | 30.04 | 233.40 | 0.70 | 114.20 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.37 | 65.00 | -30.11 | 30.11 | 232.00 | 0.70 | 114.22 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.42 | 65.00 | -30.18 | 30.18 | 230.59 | 0.71 | 114.24 | Vu < PhiVc/2 | Not Reqd 1 | 114.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.47 | 65.00 | -30.25 | 30.25 | 229.18 | 0.71 | 114.26 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.51 | 65.00 | -30.32 | 30.32 | 227.77 | 0.72 | 114.28 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.56 | 65.00 | -30.39 | 30.39 | 226.35 | 0.73 | 114.30 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.61 | 65.00 | -30.45 | 30.45 | 224.93 | 0.73 | 114.32 | Vu < PhiVc/2 | Not Reqd 1 | 114.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.65 | 65.00 | -30.52 | 30.52 | 223.51 | 0.74 | 114.34 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.70 | 65.00 | -30.59 | 30.59 | 222.09 | 0.75 | 114.36 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.75 | 65.00 | -30.66 | 30.66 | 220.66 | 0.75 | 114.38 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.79 | 65.00 | -30.73 | 30.73 | 219.22 | 0.76 | 114.41 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.84 | 65.00 | -30.80 | 30.80 | 217.79 | 0.77 | 114.43 | Vu < PhiVc/2 | Not Reqd 1 | 114.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.89 | 65.00 | -30.87 | 30.87 | 216.35 | 0.77 | 114.45 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.93 | 65.00 | -30.94 | 30.94 | 214.91 | 0.78 | 114.47 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.98 | 65.00 | -31.01 | 31.01 | 213.46 | 0.79 | 114.50 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.03 | 65.00 | -31.08 | 31.08 | 212.01 | 0.79 | 114.52 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.07 | 65.00 | -31.14 | 31.14 | 210.56 | 0.80 | 114.55 | Vu < PhiVc/2 | Not Reqd 1 | 114.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.12 | 65.00 | -31.21 | 31.21 | 209.11 | 0.81 | 114.57 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.17 | 65.00 | -31.28 | 31.28 | 207.65 | 0.82 | 114.60 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.21 | 65.00 | -31.35 | 31.35 | 206.19 | 0.82 | 114.62 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.26 | 65.00 | -31.42 | 31.42 | 204.72 | 0.83 | 114.65 | Vu < PhiVc/2 | Not Reqd 1 | 114.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.31 | 65.00 | -31.49 | 31.49 | 203.25 | 0.84 | 114.67 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.35 | 65.00 | -31.56 | 31.56 | 201.78 | 0.85 | 114.70 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.40 | 65.00 | -31.63 | 31.63 | 200.31 | 0.86 | 114.73 | Vu < PhiVc/2 | Not Reqd 1 | 114.7 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.45 | 65.00 | -31.70 | 31.70 | 198.83 | 0.86 | 114.76 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.49 | 65.00 | -31.77 | 31.77 | 197.35 | 0.87 | 114.79 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.54 | 65.00 | -31.84 | 31.84 | 195.87 | 0.88 | 114.81 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.59 | 65.00 | -31.90 | 31.90 | 194.38 | 0.89 | 114.84 | Vu < PhiVc/2 | Not Reqd 1 | 114.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.63 | 65.00 | -31.97 | 31.97 | 192.89 | 0.90 | 114.87 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.68 | 65.00 | -32.04 | 32.04 | 191.39 | 0.91 | 114.90 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.73 | 65.00 | -32.11 | 32.11 | 189.90 | 0.92 | 114.93 | Vu < PhiVc/2 | Not Reqd 1 | 114.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.77 | 65.00 | -32.18 | 32.18 | 188.40 | 0.93 | 114.97 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.82 | 65.00 | -32.25 | 32.25 | 186.89 | 0.93 | 115.00 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.87 | 65.00 | -32.32 | 32.32 | 185.39 | 0.94 | 115.03 | Vu < PhiVc/2 | Not Reqd 1 | 115.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.91 | 65.00 | -32.39 | 32.39 | 183.88 | 0.95 | 115.06 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.96 | 65.00 | -32.46 | 32.46 | 182.36 | 0.96 | 115.10 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.01 | 65.00 | -32.53 | 32.53 | 180.85 | 0.97 | 115.13 | Vu < PhiVc/2 | Not Reqd 1 | 115.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.05 | 65.00 | -32.59 | 32.59 | 179.33 | 0.98 | 115.17 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.10 | 65.00 | -32.66 | 32.66 | 177.81 | 1.00 | 115.20 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.15 | 65.00 | -32.73 | 32.73 | 176.28 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.19 | 65.00 | -32.80 | 32.80 | 174.75 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.24 | 65.00 | -32.87 | 32.87 | 173.22 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.29 | 65.00 | -32.94 | 32.94 | 171.68 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.33 | 65.00 | -33.01 | 33.01 | 170.14 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.38 | 65.00 | -33.08 | 33.08 | 168.60 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.43 | 65.00 | -33.15 | 33.15 | 167.06 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.47 | 65.00 | -33.22 | 33.22 | 165.51 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.52 | 65.00 | -33.28 | 33.28 | 163.96 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.57 | 65.00 | -33.35 | 33.35 | 162.40 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.61 | 65.00 | -33.42 | 33.42 | 160.84 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.66 | 65.00 | -33.49 | 33.49 | 159.28 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.71 | 65.00 | -33.56 | 33.56 | 157.72 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.75 | 65.00 | -33.63 | 33.63 | 156.15 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.80 | 65.00 | -33.70 | 33.70 | 154.58 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.85 | 65.00 | -33.77 | 33.77 | 153.00 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.89 | 65.00 | -33.84 | 33.84 | 151.43 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.94 | 65.00 | -33.91 | 33.91 | 149.85 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.99 | 65.00 | -33.97 | 33.97 | 148.26 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.03 | 65.00 | -34.04 | 34.04 | 146.68 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.08 | 65.00 | -34.11 | 34.11 | 145.09 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.13 | 65.00 | -34.18 | 34.18 | 143.49 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.17 | 65.00 | -34.25 | 34.25 | 141.90 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.22 | 65.00 | -34.32 | 34.32 | 140.30 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.27 | 65.00 | -34.39 | 34.39 | 138.69 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.31 | 65.00 | -34.46 | 34.46 | 137.09 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.36 | 65.00 | -34.53 | 34.53 | 135.48 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.41 | 65.00 | -34.60 | 34.60 | 133.86 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.45 | 65.00 | -34.66 | 34.66 | 132.25 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.50 | 65.00 | -34.73 | 34.73 | 130.63 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.55 | 65.00 | -34.80 | 34.80 | 129.01 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.59 | 65.00 | -34.87 | 34.87 | 127.38 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.64 | 65.00 | -34.94 | 34.94 | 125.75 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.69 | 65.00 | -35.01 | 35.01 | 124.12 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.73 | 65.00 | -35.08 | 35.08 | 122.48 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.78 | 65.00 | -35.15 | 35.15 | 120.84 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.83 | 65.00 | -35.22 | 35.22 | 119.20 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.87 | 65.00 | -35.29 | 35.29 | 117.56 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.92 | 65.00 | -35.36 | 35.36 | 115.91 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.97 | 65.00 | -35.42 | 35.42 | 114.26 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.01 | 65.00 | -35.49 | 35.49 | 112.60 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.06 | 65.00 | -35.56 | 35.56 | 110.94 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.11 | 65.00 | -35.63 | 35.63 | 109.28 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.15 | 65.00 | -35.70 | 35.70 | 107.62 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.20 | 65.00 | -35.77 | 35.77 | 105.95 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.25 | 65.00 | -35.84 | 35.84 | 104.28 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.29 | 65.00 | -35.91 | 35.91 | 102.61 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.34 | 65.00 | -35.98 | 35.98 | 100.93 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.39 | 65.00 | -36.05 | 36.05 | 99.25 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.43 | 65.00 | -36.11 | 36.11 | 97.57 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.48 | 65.00 | -36.18 | 36.18 | 95.88 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.53 | 65.00 | -36.25 | 36.25 | 94.19 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.57 | 65.00 | -36.32 | 36.32 | 92.49 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.62 | 65.00 | -36.39 | 36.39 | 90.80 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.67 | 65.00 | -36.46 | 36.46 | 89.10 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.71 | 65.00 | -36.53 | 36.53 | 87.40 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.76 | 65.00 | -36.60 | 36.60 | 85.69 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.81 | 65.00 | -36.67 | 36.67 | 83.98 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.85 | 65.00 | -36.74 | 36.74 | 82.27 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.90 | 65.00 | -36.80 | 36.80 | 80.55 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.95 | 65.00 | -36.87 | 36.87 | 78.83 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.99 | 65.00 | -36.94 | 36.94 | 77.11 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.04 | 65.00 | -37.01 | 37.01 | 75.38 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.09 | 65.00 | -37.08 | 37.08 | 73.65 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.13 | 65.00 | -37.15 | 37.15 | 71.92 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.18 | 65.00 | -37.22 | 37.22 | 70.19 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.23 | 65.00 | -37.29 | 37.29 | 68.45 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.27 | 65.00 | -37.36 | 37.36 | 66.71 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.32 | 65.00 | -37.43 | 37.43 | 64.96 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.37 | 65.00 | -37.49 | 37.49 | 63.21 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.41 | 65.00 | -37.56 | 37.56 | 61.46 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.46 | 65.00 | -37.63 | 37.63 | 59.71 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.51 | 65.00 | -37.70 | 37.70 | 57.95 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.55 | 65.00 | -37.77 | 37.77 | 56.19 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.60 | 65.00 | -37.84 | 37.84 | 54.43 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.65 | 65.00 | -37.91 | 37.91 | 52.66 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.69 | 65.00 | -37.98 | 37.98 | 50.89 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.74 | 65.00 | -38.05 | 38.05 | 49.11 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.79 | 65.00 | -38.12 | 38.12 | 47.34 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.83 | 65.00 | -38.18 | 38.18 | 45.56 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.88 | 65.00 | -38.25 | 38.25 | 43.77 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.93 | 65.00 | -38.32 | 38.32 | 41.99 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.97 | 65.00 | -38.39 | 38.39 | 40.20 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.02 | 65.00 | -38.46 | 38.46 | 38.40 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.07 | 65.00 | -38.53 | 38.53 | 36.61 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.11 | 65.00 | -38.60 | 38.60 | 34.81 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.16 | 65.00 | -38.67 | 38.67 | 33.00 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.21 | 65.00 | -38.74 | 38.74 | 31.20 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.25 | 65.00 | -38.81 | 38.81 | 29.39 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.30 | 65.00 | -38.88 | 38.88 | 27.57 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.35 | 65.00 | -38.94 | 38.94 | 25.76 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.39 | 65.00 | -39.01 | 39.01 | 23.94 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.44 | 65.00 | -39.08 | 39.08 | 22.12 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd | 115.2 | 0.0 | 0.0 |

## Concrete Beam

File = C:\Users\cmckee\Desktop\SYNCTO~1\targa\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235 Licensee : EIKON Consultant Group, LLC

Description : TYPICAL GRADE BEAM WITH WHEEL LOADS (18 INCH)

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.49 | 65.00 | -39.15 | 39.15 | 20.29 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.53 | 65.00 | -39.22 | 39.22 | 18.46 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.58 | 65.00 | -39.29 | 39.29 | 16.63 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.63 | 65.00 | -39.36 | 39.36 | 14.80 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.67 | 65.00 | -39.43 | 39.43 | 12.96 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.72 | 65.00 | -39.50 | 39.50 | 11.12 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.77 | 65.00 | -39.57 | 39.57 | 9.27 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.81 | 65.00 | -39.63 | 39.63 | 7.42 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.86 | 65.00 | -39.70 | 39.70 | 5.57 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.91 | 65.00 | -39.77 | 39.77 | 3.72 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.95 | 65.00 | -39.84 | 39.84 | 1.86 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 21.00 | 65.00 | -39.91 | 39.91 | 0.00 | 1.00 | 115.22 | Vu < PhiVc/2 | Not Reqd 1 | 115.2 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

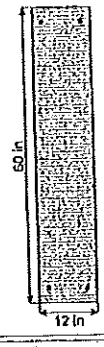
## CODE REFERENCES

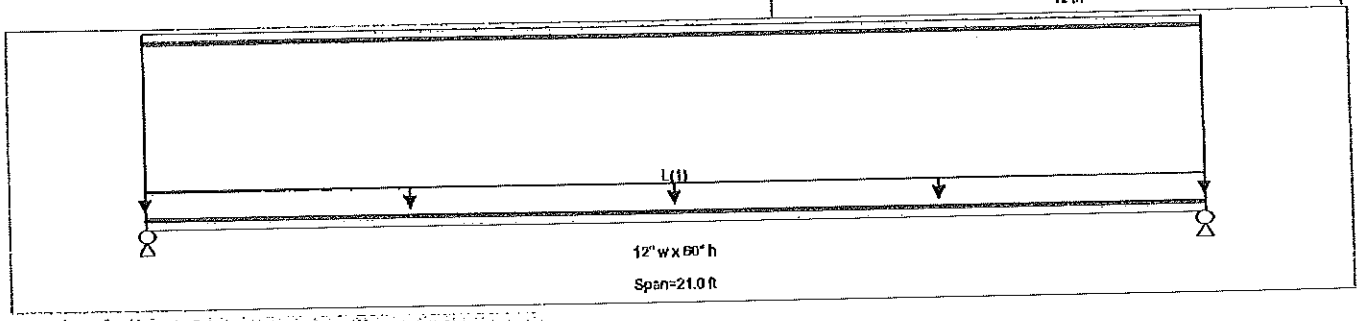
Calculations per ACI 318-11, IBC 2012, ASCE 7-10
Load Combination Set : ASCE 7-05

## Material Properties

| | | | | |
|---|---|---|---|---|
| f'c | = 4.50 ksi | ϕ Phi Values | Flexure : | 0.90 |
| fr = f'c^1/2 * 7.50 | = 503.12 psi | | Shear : | 0.750 |
| ψ Density | = 145.0 pcf | $\beta_1$ | = | 0.8250 |
| λ LtWt Factor | = 1.0 | | | |
| Elastic Modulus | = 3,122.0 ksi | Fy - Stirrups | | 60.0 ksi |
| | | E - Stirrups | = | 29,000.0 ksi |
| fy - Main Rebar | = 60.0 ksi | Stirrup Bar Size # | = | # 4 |
| E - Main Rebar | = 29,000.0 ksi | Number of Resisting Legs Per Stirrup | = | 2 |

Load Combination ASCE 7-05




## Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 60.0 in
Span #1 Reinforcing....
2-#7 at 3.0 in from Bottom, from 0.0 to 21.0 ft in this span
2-#7 at 3.0 in from Top, from 0.0 to 21.0 ft in this span

## Applied Loads

Service loads entered. Load Factors will be applied for calculations.

**Beam self weight calculated and added to loads**
**Load for Span Number 1**
Uniform Load : L = 1.0 k/ft, Tributary Width = 1.0 ft

## DESIGN SUMMARY

**Design OK**

| | | | | | |
|---|---|---|---|---|---|
| Maximum Bending Stress Ratio | = 0.446 : 1 | Maximum Deflection | | | |
| Section used for this span | Typical Section | Max Downward L+Lr+S Deflection | 0.006 in | Ratio = | 38872 |
| Mu : Applied | 136.159 k-ft | Max Upward L+Lr+S Deflection | 0.000 in | Ratio = | 0 <360 |
| Mn * Phi : Allowable | 305.524 k-ft | Max Downward Total Deflection | 0.011 in | Ratio = | 22534 |
| Load Combination | +1.20D+0.50Lr+1.60L+1.60H | Max Upward Total Deflection | 0.000 in | Ratio = | 999 |
| Location of maximum on span | 10.500 ft | | | | |
| Span # where maximum occurs | Span # 1 | | | | |

## Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 18.112 | 18.112 |
| Overall MINimum | 4.567 | 4.567 |
| +D | 7.612 | 7.612 |
| +D+L+H | 18.112 | 18.112 |
| +D+Lr+H | 7.612 | 7.612 |
| +D+S+H | 7.612 | 7.612 |
| +D+0.750Lr+0.750L+H | 15.487 | 15.487 |
| +D+0.750L+0.750S+H | 15.487 | 15.487 |
| +D+W+H | 7.612 | 7.612 |
| +D+0.70E+H | 7.612 | 7.612 |
| +D+0.750Lr+0.750L+0.750W+H | 15.487 | 15.487 |
| +D+0.750L+0.750S+0.750W+H | 15.487 | 15.487 |
| +D+0.750Lr+0.750L+0.525E+H | 15.487 | 15.487 |
| +D+0.750L+0.750S+0.525E+H | 15.487 | 15.487 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Consultant Group, LLC
Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +0.60D+W+H | 4.567 | 4.567 |
| +0.60D+0.70E+H | 4.567 | 4.567 |
| D Only | 7.612 | 7.612 |
| Lr Only | | |
| L Only | 10.500 | 10.500 |
| S Only | | |
| W Only | | |
| E Only | | |
| H Only | | |
| +D | 7.612 | 7.612 |
| +D+L+H | 18.112 | 18.112 |
| +D+Lr+H | 7.612 | 7.612 |
| +D+S+H | 7.612 | 7.612 |
| +D+0.750Lr+0.750L+H | 15.487 | 15.487 |
| +D+0.750L+0.750S+H | 15.487 | 15.487 |
| +D+W+H | 7.612 | 7.612 |
| +D+0.70E+H | 7.612 | 7.612 |
| +D+0.750Lr+0.750L+0.750W+H | 15.487 | 15.487 |

### Shear Stirrup Requirements

Entire Beam Span Length : Vu < PhiVc/2, Req'd Vs = Not Reqd 11.4.6.1, use stirrups spaced at 0.000 in

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Location (ft) in Span | Bending Stress Results (k-ft) Mu : Max | Phi*Mnx | Stress Ratio |
|---|---|---|---|---|---|
| MAXimum BENDING Envelope | | | | | |
| Span # 1 | 1 | 21.000 | 136.16 | 305.52 | 0.45 |
| +1.40D | | | | | |
| Span # 1 | 1 | 21.000 | 55.95 | 305.52 | 0.18 |
| +1.20D+0.50Lr+1.60L+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 136.16 | 305.52 | 0.45 |
| +1.20D+1.60L+0.50S+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 136.16 | 305.52 | 0.45 |
| +1.20D+1.60Lr+0.50L | | | | | |
| Span # 1 | 1 | 21.000 | 75.52 | 305.52 | 0.25 |
| +1.20D+1.60Lr+0.80W | | | | | |
| Span # 1 | 1 | 21.000 | 47.96 | 305.52 | 0.16 |
| +1.20D+0.50L+1.60S | | | | | |
| Span # 1 | 1 | 21.000 | 75.52 | 305.52 | 0.25 |
| +1.20D+1.60S+0.80W | | | | | |
| Span # 1 | 1 | 21.000 | 47.96 | 305.52 | 0.16 |
| +1.20D+0.50Lr+0.50L+1.60W | | | | | |
| Span # 1 | 1 | 21.000 | 75.52 | 305.52 | 0.25 |
| +1.20D+0.50L+0.50S+1.60W | | | | | |
| Span # 1 | 1 | 21.000 | 75.52 | 305.52 | 0.25 |
| +1.20D+0.50L+0.20S+E | | | | | |
| Span # 1 | 1 | 21.000 | 75.52 | 305.52 | 0.25 |
| +0.90D+1.60W+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 35.97 | 305.52 | 0.12 |
| +0.90D+E+1.60H | | | | | |
| Span # 1 | 1 | 21.000 | 35.97 | 305.52 | 0.12 |

### Overall Maximum Deflections - Unfactored Loads

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| L Only | 1 | 0.0065 | 10.290 | | 0.0000 | 0.000 |

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.00 | 57.00 | 25.93 | 25.93 | 0.00 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.05 | 57.00 | 25.82 | 25.82 | 1.21 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.09 | 57.00 | 25.70 | 25.70 | 2.41 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.14 | 57.00 | 25.59 | 25.59 | 3.61 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.19 | 57.00 | 25.47 | 25.47 | 4.80 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.23 | 57.00 | 25.36 | 25.36 | 5.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |

## Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.28 | 57.00 | 25.24 | 25.24 | 7.16 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.33 | 57.00 | 25.13 | 25.13 | 8.34 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.37 | 57.00 | 25.01 | 25.01 | 9.51 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.42 | 57.00 | 24.90 | 24.90 | 10.67 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.47 | 57.00 | 24.78 | 24.78 | 11.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.51 | 57.00 | 24.67 | 24.67 | 12.99 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.56 | 57.00 | 24.55 | 24.55 | 14.14 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.61 | 57.00 | 24.44 | 24.44 | 15.28 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.65 | 57.00 | 24.32 | 24.32 | 16.42 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.70 | 57.00 | 24.21 | 24.21 | 17.55 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.75 | 57.00 | 24.09 | 24.09 | 18.68 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.79 | 57.00 | 23.98 | 23.98 | 19.80 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.84 | 57.00 | 23.86 | 23.86 | 20.91 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.89 | 57.00 | 23.74 | 23.74 | 22.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.93 | 57.00 | 23.63 | 23.63 | 23.13 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.98 | 57.00 | 23.51 | 23.51 | 24.23 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.03 | 57.00 | 23.40 | 23.40 | 25.32 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.07 | 57.00 | 23.28 | 23.28 | 26.41 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.12 | 57.00 | 23.17 | 23.17 | 27.50 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.17 | 57.00 | 23.05 | 23.05 | 28.58 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.21 | 57.00 | 22.94 | 22.94 | 29.65 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.26 | 57.00 | 22.82 | 22.82 | 30.72 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.31 | 57.00 | 22.71 | 22.71 | 31.78 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.35 | 57.00 | 22.59 | 22.59 | 32.84 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.40 | 57.00 | 22.48 | 22.48 | 33.89 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.45 | 57.00 | 22.36 | 22.36 | 34.93 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.49 | 57.00 | 22.25 | 22.25 | 35.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.54 | 57.00 | 22.13 | 22.13 | 37.01 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.59 | 57.00 | 22.02 | 22.02 | 38.04 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.63 | 57.00 | 21.90 | 21.90 | 39.07 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.68 | 57.00 | 21.79 | 21.79 | 40.09 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.73 | 57.00 | 21.67 | 21.67 | 41.10 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.77 | 57.00 | 21.55 | 21.55 | 42.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.82 | 57.00 | 21.44 | 21.44 | 43.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.87 | 57.00 | 21.32 | 21.32 | 44.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.91 | 57.00 | 21.21 | 21.21 | 45.10 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.96 | 57.00 | 21.09 | 21.09 | 46.09 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.01 | 57.00 | 20.98 | 20.98 | 47.07 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.05 | 57.00 | 20.86 | 20.86 | 48.05 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.10 | 57.00 | 20.75 | 20.75 | 49.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.15 | 57.00 | 20.63 | 20.63 | 49.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.19 | 57.00 | 20.52 | 20.52 | 50.94 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.24 | 57.00 | 20.40 | 20.40 | 51.90 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.29 | 57.00 | 20.29 | 20.29 | 52.85 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.33 | 57.00 | 20.17 | 20.17 | 53.79 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.38 | 57.00 | 20.06 | 20.06 | 54.73 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.43 | 57.00 | 19.94 | 19.94 | 55.66 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.47 | 57.00 | 19.83 | 19.83 | 56.59 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.52 | 57.00 | 19.71 | 19.71 | 57.51 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.57 | 57.00 | 19.60 | 19.60 | 58.43 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.61 | 57.00 | 19.48 | 19.48 | 59.34 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.66 | 57.00 | 19.36 | 19.36 | 60.25 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.71 | 57.00 | 19.25 | 19.25 | 61.15 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.75 | 57.00 | 19.13 | 19.13 | 62.05 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |

File = E:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Consultant Group, LLC

## Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.80 | 57.00 | 19.02 | 19.02 | 62.94 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.85 | 57.00 | 18.90 | 18.90 | 63.82 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.89 | 57.00 | 18.79 | 18.79 | 64.70 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.94 | 57.00 | 18.67 | 18.67 | 65.57 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.99 | 57.00 | 18.56 | 18.56 | 66.44 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.03 | 57.00 | 18.44 | 18.44 | 67.31 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.08 | 57.00 | 18.33 | 18.33 | 68.16 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.13 | 57.00 | 18.21 | 18.21 | 69.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.17 | 57.00 | 18.10 | 18.10 | 69.86 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.22 | 57.00 | 17.98 | 17.98 | 70.71 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.27 | 57.00 | 17.87 | 17.87 | 71.54 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.31 | 57.00 | 17.75 | 17.75 | 72.37 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.36 | 57.00 | 17.64 | 17.64 | 73.20 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.41 | 57.00 | 17.52 | 17.52 | 74.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.45 | 57.00 | 17.41 | 17.41 | 74.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.50 | 57.00 | 17.29 | 17.29 | 75.64 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.55 | 57.00 | 17.17 | 17.17 | 76.45 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.59 | 57.00 | 17.06 | 17.06 | 77.25 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.64 | 57.00 | 16.94 | 16.94 | 78.04 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.69 | 57.00 | 16.83 | 16.83 | 78.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.73 | 57.00 | 16.71 | 16.71 | 79.61 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.78 | 57.00 | 16.60 | 16.60 | 80.39 | 0.98 | 67.59 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.83 | 57.00 | 16.48 | 16.48 | 81.16 | 0.96 | 67.56 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.87 | 57.00 | 16.37 | 16.37 | 81.93 | 0.95 | 67.52 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.92 | 57.00 | 16.25 | 16.25 | 82.69 | 0.93 | 67.49 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.97 | 57.00 | 16.14 | 16.14 | 83.44 | 0.92 | 67.45 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.01 | 57.00 | 16.02 | 16.02 | 84.19 | 0.90 | 67.42 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.06 | 57.00 | 15.91 | 15.91 | 84.94 | 0.89 | 67.39 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.11 | 57.00 | 15.79 | 15.79 | 85.68 | 0.88 | 67.35 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.15 | 57.00 | 15.68 | 15.68 | 86.41 | 0.86 | 67.32 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.20 | 57.00 | 15.56 | 15.56 | 87.14 | 0.85 | 67.29 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.25 | 57.00 | 15.45 | 15.45 | 87.87 | 0.83 | 67.26 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.29 | 57.00 | 15.33 | 15.33 | 88.58 | 0.82 | 67.23 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.34 | 57.00 | 15.22 | 15.22 | 89.30 | 0.81 | 67.21 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.39 | 57.00 | 15.10 | 15.10 | 90.00 | 0.80 | 67.18 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.43 | 57.00 | 14.98 | 14.98 | 90.71 | 0.78 | 67.15 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.48 | 57.00 | 14.87 | 14.87 | 91.40 | 0.77 | 67.12 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.53 | 57.00 | 14.75 | 14.75 | 92.09 | 0.76 | 67.10 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.57 | 57.00 | 14.64 | 14.64 | 92.78 | 0.75 | 67.07 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.62 | 57.00 | 14.52 | 14.52 | 93.46 | 0.74 | 67.05 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.67 | 57.00 | 14.41 | 14.41 | 94.13 | 0.73 | 67.02 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.71 | 57.00 | 14.29 | 14.29 | 94.80 | 0.72 | 67.00 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.76 | 57.00 | 14.18 | 14.18 | 95.47 | 0.71 | 66.97 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.81 | 57.00 | 14.06 | 14.06 | 96.13 | 0.69 | 66.95 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.85 | 57.00 | 13.95 | 13.95 | 96.78 | 0.68 | 66.93 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.90 | 57.00 | 13.83 | 13.83 | 97.43 | 0.67 | 66.90 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.95 | 57.00 | 13.72 | 13.72 | 98.07 | 0.66 | 66.88 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.99 | 57.00 | 13.60 | 13.60 | 98.71 | 0.65 | 66.86 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.04 | 57.00 | 13.49 | 13.49 | 99.34 | 0.64 | 66.84 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.09 | 57.00 | 13.37 | 13.37 | 99.97 | 0.64 | 66.81 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.13 | 57.00 | 13.26 | 13.26 | 100.59 | 0.63 | 66.79 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.18 | 57.00 | 13.14 | 13.14 | 101.21 | 0.62 | 66.77 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.23 | 57.00 | 13.03 | 13.03 | 101.82 | 0.61 | 66.75 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.27 | 57.00 | 12.91 | 12.91 | 102.42 | 0.60 | 66.73 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |

## Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.32 | 57.00 | 12.79 | 12.79 | 103.02 | 0.59 | 66.71 | Vu < PhiVc/2 | Not Reqd ! | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.37 | 57.00 | 12.68 | 12.68 | 103.62 | 0.58 | 66.69 | Vu < PhiVc/2 | Not Reqd ! | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.41 | 57.00 | 12.56 | 12.56 | 104.20 | 0.57 | 66.67 | Vu < PhiVc/2 | Not Reqd ! | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.46 | 57.00 | 12.45 | 12.45 | 104.79 | 0.56 | 66.65 | Vu < PhiVc/2 | Not Reqd ! | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.51 | 57.00 | 12.33 | 12.33 | 105.37 | 0.56 | 66.64 | Vu < PhiVc/2 | Not Reqd ! | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.55 | 57.00 | 12.22 | 12.22 | 105.94 | 0.55 | 66.62 | Vu < PhiVc/2 | Not Reqd ! | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.60 | 57.00 | 12.10 | 12.10 | 106.51 | 0.54 | 66.60 | Vu < PhiVc/2 | Not Reqd ! | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.65 | 57.00 | 11.99 | 11.99 | 107.07 | 0.53 | 66.58 | Vu < PhiVc/2 | Not Reqd ! | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.69 | 57.00 | 11.87 | 11.87 | 107.63 | 0.52 | 66.56 | Vu < PhiVc/2 | Not Reqd ! | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.74 | 57.00 | 11.76 | 11.76 | 108.18 | 0.52 | 66.55 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.70 | 57.00 | 11.64 | 11.64 | 108.72 | 0.51 | 66.53 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.83 | 57.00 | 11.53 | 11.53 | 109.26 | 0.50 | 66.51 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.88 | 57.00 | 11.41 | 11.41 | 109.80 | 0.49 | 66.50 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.93 | 57.00 | 11.30 | 11.30 | 110.33 | 0.49 | 66.48 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.97 | 57.00 | 11.18 | 11.18 | 110.85 | 0.48 | 66.46 | Vu < PhiVc/2 | Not Reqd ! | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.02 | 57.00 | 11.07 | 11.07 | 111.37 | 0.47 | 66.45 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.07 | 57.00 | 10.95 | 10.95 | 111.89 | 0.46 | 66.43 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.11 | 57.00 | 10.84 | 10.84 | 112.39 | 0.46 | 66.42 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.16 | 57.00 | 10.72 | 10.72 | 112.90 | 0.45 | 66.40 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.21 | 57.00 | 10.60 | 10.60 | 113.39 | 0.44 | 66.38 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.25 | 57.00 | 10.49 | 10.49 | 113.89 | 0.44 | 66.37 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.30 | 57.00 | 10.37 | 10.37 | 114.37 | 0.43 | 66.35 | Vu < PhiVc/2 | Not Reqd ! | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.35 | 57.00 | 10.26 | 10.26 | 114.85 | 0.42 | 66.34 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.39 | 57.00 | 10.14 | 10.14 | 115.33 | 0.42 | 66.32 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.44 | 57.00 | 10.03 | 10.03 | 115.80 | 0.41 | 66.31 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.49 | 57.00 | 9.91 | 9.91 | 116.27 | 0.40 | 66.30 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.53 | 57.00 | 9.80 | 9.80 | 116.73 | 0.40 | 66.28 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.58 | 57.00 | 9.68 | 9.68 | 117.18 | 0.39 | 66.27 | Vu < PhiVc/2 | Not Reqd ! | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.63 | 57.00 | 9.57 | 9.57 | 117.63 | 0.39 | 66.25 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.67 | 57.00 | 9.45 | 9.45 | 118.07 | 0.38 | 66.24 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.72 | 57.00 | 9.34 | 9.34 | 118.51 | 0.37 | 66.23 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.77 | 57.00 | 9.22 | 9.22 | 118.95 | 0.37 | 66.21 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.81 | 57.00 | 9.11 | 9.11 | 119.37 | 0.36 | 66.20 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.86 | 57.00 | 8.99 | 8.99 | 119.80 | 0.36 | 66.19 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.91 | 57.00 | 8.88 | 8.88 | 120.21 | 0.35 | 66.17 | Vu < PhiVc/2 | Not Reqd ! | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.95 | 57.00 | 8.76 | 8.76 | 120.62 | 0.34 | 66.16 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.00 | 57.00 | 8.64 | 8.64 | 121.03 | 0.34 | 66.15 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.05 | 57.00 | 8.53 | 8.53 | 121.43 | 0.33 | 66.14 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.09 | 57.00 | 8.41 | 8.41 | 121.83 | 0.33 | 66.12 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.14 | 57.00 | 8.30 | 8.30 | 122.22 | 0.32 | 66.11 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.19 | 57.00 | 8.18 | 8.18 | 122.60 | 0.32 | 66.10 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.23 | 57.00 | 8.07 | 8.07 | 122.98 | 0.31 | 66.09 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.28 | 57.00 | 7.95 | 7.95 | 123.35 | 0.31 | 66.07 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.33 | 57.00 | 7.84 | 7.84 | 123.72 | 0.30 | 66.06 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.37 | 57.00 | 7.72 | 7.72 | 124.09 | 0.30 | 66.05 | Vu < PhiVc/2 | Not Reqd ! | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.42 | 57.00 | 7.61 | 7.61 | 124.44 | 0.29 | 66.04 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.47 | 57.00 | 7.49 | 7.49 | 124.80 | 0.29 | 66.03 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.51 | 57.00 | 7.38 | 7.38 | 125.14 | 0.28 | 66.01 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.56 | 57.00 | 7.26 | 7.26 | 125.48 | 0.27 | 66.00 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.61 | 57.00 | 7.15 | 7.15 | 125.82 | 0.27 | 65.99 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.65 | 57.00 | 7.03 | 7.03 | 126.15 | 0.26 | 65.98 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.70 | 57.00 | 6.92 | 6.92 | 126.48 | 0.26 | 65.97 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.75 | 57.00 | 6.80 | 6.80 | 126.80 | 0.25 | 65.96 | Vu < PhiVc/2 | Not Reqd ! | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.79 | 57.00 | 6.69 | 6.69 | 127.11 | 0.25 | 65.95 | Vu < PhiVc/2 | Not Reqd ! | 65.9 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.84 | 57.00 | 6.57 | 6.57 | 127.42 | 0.24 | 65.94 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.89 | 57.00 | 6.45 | 6.45 | 127.72 | 0.24 | 65.92 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.93 | 57.00 | 6.34 | 6.34 | 128.02 | 0.24 | 65.91 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.98 | 57.00 | 6.22 | 6.22 | 128.32 | 0.23 | 65.90 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.03 | 57.00 | 6.11 | 6.11 | 128.60 | 0.23 | 65.89 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.07 | 57.00 | 5.99 | 5.99 | 128.89 | 0.22 | 65.88 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.12 | 57.00 | 5.88 | 5.88 | 129.16 | 0.22 | 65.87 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.17 | 57.00 | 5.76 | 5.76 | 129.43 | 0.21 | 65.86 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.21 | 57.00 | 5.65 | 5.65 | 129.70 | 0.21 | 65.85 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.26 | 57.00 | 5.53 | 5.53 | 129.96 | 0.20 | 65.84 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.31 | 57.00 | 5.42 | 5.42 | 130.22 | 0.20 | 65.83 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.35 | 57.00 | 5.30 | 5.30 | 130.47 | 0.19 | 65.82 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.40 | 57.00 | 5.19 | 5.19 | 130.71 | 0.19 | 65.81 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.45 | 57.00 | 5.07 | 5.07 | 130.95 | 0.18 | 65.80 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.49 | 57.00 | 4.96 | 4.96 | 131.19 | 0.18 | 65.79 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.54 | 57.00 | 4.84 | 4.84 | 131.41 | 0.17 | 65.78 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.59 | 57.00 | 4.73 | 4.73 | 131.64 | 0.17 | 65.77 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.63 | 57.00 | 4.61 | 4.61 | 131.86 | 0.17 | 65.76 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.68 | 57.00 | 4.50 | 4.50 | 132.07 | 0.16 | 65.75 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.73 | 57.00 | 4.38 | 4.38 | 132.28 | 0.16 | 65.74 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.77 | 57.00 | 4.26 | 4.26 | 132.48 | 0.15 | 65.73 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.82 | 57.00 | 4.15 | 4.15 | 132.67 | 0.15 | 65.72 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.87 | 57.00 | 4.03 | 4.03 | 132.86 | 0.14 | 65.71 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.91 | 57.00 | 3.92 | 3.92 | 133.05 | 0.14 | 65.70 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.96 | 57.00 | 3.80 | 3.80 | 133.23 | 0.14 | 65.69 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.01 | 57.00 | 3.69 | 3.69 | 133.40 | 0.13 | 65.68 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.05 | 57.00 | 3.57 | 3.57 | 133.57 | 0.13 | 65.67 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.10 | 57.00 | 3.46 | 3.46 | 133.74 | 0.12 | 65.66 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.15 | 57.00 | 3.34 | 3.34 | 133.90 | 0.12 | 65.65 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.19 | 57.00 | 3.23 | 3.23 | 134.05 | 0.11 | 65.64 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.24 | 57.00 | 3.11 | 3.11 | 134.20 | 0.11 | 65.63 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.29 | 57.00 | 3.00 | 3.00 | 134.34 | 0.11 | 65.62 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.33 | 57.00 | 2.88 | 2.88 | 134.48 | 0.10 | 65.61 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.38 | 57.00 | 2.77 | 2.77 | 134.61 | 0.10 | 65.60 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.43 | 57.00 | 2.65 | 2.65 | 134.74 | 0.09 | 65.60 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.47 | 57.00 | 2.54 | 2.54 | 134.86 | 0.09 | 65.59 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.52 | 57.00 | 2.42 | 2.42 | 134.97 | 0.09 | 65.58 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.57 | 57.00 | 2.31 | 2.31 | 135.08 | 0.08 | 65.57 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.61 | 57.00 | 2.19 | 2.19 | 135.19 | 0.08 | 65.56 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.66 | 57.00 | 2.07 | 2.07 | 135.29 | 0.07 | 65.55 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.71 | 57.00 | 1.96 | 1.96 | 135.38 | 0.07 | 65.54 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.75 | 57.00 | 1.84 | 1.84 | 135.47 | 0.06 | 65.53 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.80 | 57.00 | 1.73 | 1.73 | 135.55 | 0.06 | 65.52 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.85 | 57.00 | 1.61 | 1.61 | 135.63 | 0.06 | 65.51 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.89 | 57.00 | 1.50 | 1.50 | 135.70 | 0.05 | 65.50 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.94 | 57.00 | 1.38 | 1.38 | 135.77 | 0.05 | 65.49 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.99 | 57.00 | 1.27 | 1.27 | 135.83 | 0.04 | 65.48 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.03 | 57.00 | 1.15 | 1.15 | 135.89 | 0.04 | 65.48 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.08 | 57.00 | 1.04 | 1.04 | 135.94 | 0.04 | 65.47 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.13 | 57.00 | 0.92 | 0.92 | 135.99 | 0.03 | 65.46 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.17 | 57.00 | 0.81 | 0.81 | 136.03 | 0.03 | 65.45 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.22 | 57.00 | 0.69 | 0.69 | 136.06 | 0.02 | 65.44 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.27 | 57.00 | 0.58 | 0.58 | 136.09 | 0.02 | 65.43 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.31 | 57.00 | 0.46 | 0.46 | 136.12 | 0.02 | 65.42 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |

l

# Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : ELKON Consultant Group, LLC

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.36 | 57.00 | 0.35 | 0.35 | 136.13 | 0.01 | 65.41 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.41 | 57.00 | 0.23 | 0.23 | 136.15 | 0.01 | 65.40 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.45 | 57.00 | 0.12 | 0.12 | 136.16 | 0.00 | 65.39 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.50 | 57.00 | -0.00 | 0.00 | 136.16 | 0.00 | 65.38 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.55 | 57.00 | -0.12 | 0.12 | 136.16 | 0.00 | 65.39 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.59 | 57.00 | -0.23 | 0.23 | 136.15 | 0.01 | 65.40 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.64 | 57.00 | -0.35 | 0.35 | 136.13 | 0.01 | 65.41 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.69 | 57.00 | -0.46 | 0.46 | 136.12 | 0.02 | 65.42 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.73 | 57.00 | -0.58 | 0.58 | 136.09 | 0.02 | 65.43 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.78 | 57.00 | -0.69 | 0.69 | 136.06 | 0.02 | 65.44 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.83 | 57.00 | -0.81 | 0.81 | 136.03 | 0.03 | 65.45 | Vu < PhiVc/2 | Not Reqd 1 | 65.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.87 | 57.00 | -0.92 | 0.92 | 135.99 | 0.03 | 65.46 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.92 | 57.00 | -1.04 | 1.04 | 135.94 | 0.04 | 65.47 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 10.97 | 57.00 | -1.15 | 1.15 | 135.89 | 0.04 | 65.48 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.01 | 57.00 | -1.27 | 1.27 | 135.83 | 0.04 | 65.48 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.06 | 57.00 | -1.38 | 1.38 | 135.77 | 0.05 | 65.49 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.11 | 57.00 | -1.50 | 1.50 | 135.70 | 0.05 | 65.50 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.15 | 57.00 | -1.61 | 1.61 | 135.63 | 0.06 | 65.51 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.20 | 57.00 | -1.73 | 1.73 | 135.55 | 0.06 | 65.52 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.25 | 57.00 | -1.84 | 1.84 | 135.47 | 0.06 | 65.53 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.29 | 57.00 | -1.96 | 1.96 | 135.38 | 0.07 | 65.54 | Vu < PhiVc/2 | Not Reqd 1 | 65.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.34 | 57.00 | -2.07 | 2.07 | 135.29 | 0.07 | 65.55 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.39 | 57.00 | -2.19 | 2.19 | 135.19 | 0.08 | 65.56 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.43 | 57.00 | -2.31 | 2.31 | 135.08 | 0.08 | 65.57 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.48 | 57.00 | -2.42 | 2.42 | 134.97 | 0.09 | 65.58 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.53 | 57.00 | -2.54 | 2.54 | 134.86 | 0.09 | 65.59 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.57 | 57.00 | -2.65 | 2.65 | 134.74 | 0.09 | 65.60 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.62 | 57.00 | -2.77 | 2.77 | 134.61 | 0.10 | 65.60 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.67 | 57.00 | -2.88 | 2.88 | 134.48 | 0.10 | 65.61 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.71 | 57.00 | -3.00 | 3.00 | 134.34 | 0.11 | 65.62 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.76 | 57.00 | -3.11 | 3.11 | 134.20 | 0.11 | 65.63 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.81 | 57.00 | -3.23 | 3.23 | 134.05 | 0.11 | 65.64 | Vu < PhiVc/2 | Not Reqd 1 | 65.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.85 | 57.00 | -3.34 | 3.34 | 133.90 | 0.12 | 65.65 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.90 | 57.00 | -3.46 | 3.46 | 133.74 | 0.12 | 65.66 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.95 | 57.00 | -3.57 | 3.57 | 133.57 | 0.13 | 65.67 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 11.99 | 57.00 | -3.69 | 3.69 | 133.40 | 0.13 | 65.68 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.04 | 57.00 | -3.80 | 3.80 | 133.23 | 0.14 | 65.69 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.09 | 57.00 | -3.92 | 3.92 | 133.05 | 0.14 | 65.70 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.13 | 57.00 | -4.03 | 4.03 | 132.86 | 0.14 | 65.71 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.18 | 57.00 | -4.15 | 4.15 | 132.67 | 0.15 | 65.72 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.23 | 57.00 | -4.26 | 4.26 | 132.48 | 0.15 | 65.73 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.27 | 57.00 | -4.38 | 4.38 | 132.28 | 0.16 | 65.74 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.32 | 57.00 | -4.50 | 4.50 | 132.07 | 0.16 | 65.75 | Vu < PhiVc/2 | Not Reqd 1 | 65.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.37 | 57.00 | -4.61 | 4.61 | 131.86 | 0.17 | 65.76 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.41 | 57.00 | -4.73 | 4.73 | 131.64 | 0.17 | 65.77 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.46 | 57.00 | -4.84 | 4.84 | 131.41 | 0.17 | 65.78 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.51 | 57.00 | -4.96 | 4.96 | 131.19 | 0.18 | 65.79 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.55 | 57.00 | -5.07 | 5.07 | 130.95 | 0.18 | 65.80 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.60 | 57.00 | -5.19 | 5.19 | 130.71 | 0.19 | 65.81 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.65 | 57.00 | -5.30 | 5.30 | 130.47 | 0.19 | 65.82 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.69 | 57.00 | -5.42 | 5.42 | 130.22 | 0.20 | 65.83 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.74 | 57.00 | -5.53 | 5.53 | 129.96 | 0.20 | 65.84 | Vu < PhiVc/2 | Not Reqd 1 | 65.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.79 | 57.00 | -5.65 | 5.65 | 129.70 | 0.21 | 65.85 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.83 | 57.00 | -5.76 | 5.76 | 129.43 | 0.21 | 65.86 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |

File = I:\14030T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Consultant Group, LLC

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.88 | 57.00 | -5.88 | 5.88 | 129.16 | 0.22 | 65.87 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.93 | 57.00 | -5.99 | 5.99 | 128.89 | 0.22 | 65.88 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 12.97 | 57.00 | -6.11 | 6.11 | 128.60 | 0.23 | 65.89 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.02 | 57.00 | -6.22 | 6.22 | 128.32 | 0.23 | 65.90 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.07 | 57.00 | -6.34 | 6.34 | 128.02 | 0.24 | 65.91 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.11 | 57.00 | -6.45 | 6.45 | 127.72 | 0.24 | 65.92 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.16 | 57.00 | -6.57 | 6.57 | 127.42 | 0.24 | 65.94 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.21 | 57.00 | -6.69 | 6.69 | 127.11 | 0.25 | 65.95 | Vu < PhiVc/2 | Not Reqd 1 | 65.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.25 | 57.00 | -6.80 | 6.80 | 126.80 | 0.25 | 65.96 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.30 | 57.00 | -6.92 | 6.92 | 126.48 | 0.26 | 65.97 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.35 | 57.00 | -7.03 | 7.03 | 126.15 | 0.26 | 65.98 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.39 | 57.00 | -7.15 | 7.15 | 125.82 | 0.27 | 65.99 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.44 | 57.00 | -7.26 | 7.26 | 125.48 | 0.27 | 66.00 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.49 | 57.00 | -7.38 | 7.38 | 125.14 | 0.28 | 66.01 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.53 | 57.00 | -7.49 | 7.49 | 124.80 | 0.29 | 66.03 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.58 | 57.00 | -7.61 | 7.61 | 124.44 | 0.29 | 66.04 | Vu < PhiVc/2 | Not Reqd 1 | 66.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.63 | 57.00 | -7.72 | 7.72 | 124.09 | 0.30 | 66.05 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.67 | 57.00 | -7.84 | 7.84 | 123.72 | 0.30 | 66.06 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.72 | 57.00 | -7.95 | 7.95 | 123.35 | 0.31 | 66.07 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.77 | 57.00 | -8.07 | 8.07 | 122.98 | 0.31 | 66.09 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.81 | 57.00 | -8.18 | 8.18 | 122.60 | 0.32 | 66.10 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.86 | 57.00 | -8.30 | 8.30 | 122.22 | 0.32 | 66.11 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.91 | 57.00 | -8.41 | 8.41 | 121.83 | 0.33 | 66.12 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 13.95 | 57.00 | -8.53 | 8.53 | 121.43 | 0.33 | 66.14 | Vu < PhiVc/2 | Not Reqd 1 | 66.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.00 | 57.00 | -8.64 | 8.64 | 121.03 | 0.34 | 66.15 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.05 | 57.00 | -8.76 | 8.76 | 120.62 | 0.34 | 66.16 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.09 | 57.00 | -8.88 | 8.88 | 120.21 | 0.35 | 66.17 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.14 | 57.00 | -8.99 | 8.99 | 119.80 | 0.36 | 66.19 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.19 | 57.00 | -9.11 | 9.11 | 119.37 | 0.36 | 66.20 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.23 | 57.00 | -9.22 | 9.22 | 118.95 | 0.37 | 66.21 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.28 | 57.00 | -9.34 | 9.34 | 118.51 | 0.37 | 66.23 | Vu < PhiVc/2 | Not Reqd 1 | 66.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.33 | 57.00 | -9.45 | 9.45 | 118.07 | 0.38 | 66.24 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.37 | 57.00 | -9.57 | 9.57 | 117.63 | 0.39 | 66.25 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.42 | 57.00 | -9.68 | 9.68 | 117.18 | 0.39 | 66.27 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.47 | 57.00 | -9.80 | 9.80 | 116.73 | 0.40 | 66.28 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.51 | 57.00 | -9.91 | 9.91 | 116.27 | 0.40 | 66.30 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.56 | 57.00 | -10.03 | 10.03 | 115.80 | 0.41 | 66.31 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.61 | 57.00 | -10.14 | 10.14 | 115.33 | 0.42 | 66.32 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.65 | 57.00 | -10.26 | 10.26 | 114.85 | 0.42 | 66.34 | Vu < PhiVc/2 | Not Reqd 1 | 66.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.70 | 57.00 | -10.37 | 10.37 | 114.37 | 0.43 | 66.35 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.75 | 57.00 | -10.49 | 10.49 | 113.89 | 0.44 | 66.37 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.79 | 57.00 | -10.60 | 10.60 | 113.39 | 0.44 | 66.38 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.84 | 57.00 | -10.72 | 10.72 | 112.90 | 0.45 | 66.40 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.89 | 57.00 | -10.84 | 10.84 | 112.39 | 0.46 | 66.42 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.93 | 57.00 | -10.95 | 10.95 | 111.89 | 0.46 | 66.43 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 14.98 | 57.00 | -11.07 | 11.07 | 111.37 | 0.47 | 66.45 | Vu < PhiVc/2 | Not Reqd 1 | 66.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.03 | 57.00 | -11.18 | 11.18 | 110.85 | 0.48 | 66.46 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.07 | 57.00 | -11.30 | 11.30 | 110.33 | 0.49 | 66.48 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.12 | 57.00 | -11.41 | 11.41 | 109.80 | 0.49 | 66.50 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.17 | 57.00 | -11.53 | 11.53 | 109.26 | 0.50 | 66.51 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.21 | 57.00 | -11.64 | 11.64 | 108.72 | 0.51 | 66.53 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.26 | 57.00 | -11.76 | 11.76 | 108.18 | 0.52 | 66.55 | Vu < PhiVc/2 | Not Reqd 1 | 66.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.31 | 57.00 | -11.87 | 11.87 | 107.63 | 0.52 | 66.56 | Vu < PhiVc/2 | Not Reqd 1 | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.35 | 57.00 | -11.99 | 11.99 | 107.07 | 0.53 | 66.58 | Vu < PhiVc/2 | Not Reqd 1 | 66.6 | 0.0 | 0.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.40 | 57.00 | -12.10 | 12.10 | 106.51 | 0.54 | 66.60 | Vu < PhiVc/2 | Not Reqd 1 | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.45 | 57.00 | -12.22 | 12.22 | 105.94 | 0.55 | 66.62 | Vu < PhiVc/2 | Not Reqd 1 | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.49 | 57.00 | -12.33 | 12.33 | 105.37 | 0.56 | 66.64 | Vu < PhiVc/2 | Not Reqd 1 | 66.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.54 | 57.00 | -12.45 | 12.45 | 104.79 | 0.56 | 66.65 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.59 | 57.00 | -12.56 | 12.56 | 104.20 | 0.57 | 66.67 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.63 | 57.00 | -12.68 | 12.68 | 103.62 | 0.58 | 66.69 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.68 | 57.00 | -12.79 | 12.79 | 103.02 | 0.59 | 66.71 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.73 | 57.00 | -12.91 | 12.91 | 102.42 | 0.60 | 66.73 | Vu < PhiVc/2 | Not Reqd 1 | 66.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.77 | 57.00 | -13.03 | 13.03 | 101.82 | 0.61 | 66.75 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.82 | 57.00 | -13.14 | 13.14 | 101.21 | 0.62 | 66.77 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.87 | 57.00 | -13.26 | 13.26 | 100.59 | 0.63 | 66.79 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.91 | 57.00 | -13.37 | 13.37 | 99.97 | 0.64 | 66.81 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 15.96 | 57.00 | -13.49 | 13.49 | 99.34 | 0.64 | 66.84 | Vu < PhiVc/2 | Not Reqd 1 | 66.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.01 | 57.00 | -13.60 | 13.60 | 98.71 | 0.65 | 66.86 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.05 | 57.00 | -13.72 | 13.72 | 98.07 | 0.66 | 66.88 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.10 | 57.00 | -13.83 | 13.83 | 97.43 | 0.67 | 66.90 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.15 | 57.00 | -13.95 | 13.95 | 96.78 | 0.68 | 66.93 | Vu < PhiVc/2 | Not Reqd 1 | 66.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.19 | 57.00 | -14.06 | 14.06 | 96.13 | 0.69 | 66.95 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.24 | 57.00 | -14.18 | 14.18 | 95.47 | 0.71 | 66.97 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.29 | 57.00 | -14.29 | 14.29 | 94.80 | 0.72 | 67.00 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.33 | 57.00 | -14.41 | 14.41 | 94.13 | 0.73 | 67.02 | Vu < PhiVc/2 | Not Reqd 1 | 67.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.38 | 57.00 | -14.52 | 14.52 | 93.46 | 0.74 | 67.05 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.43 | 57.00 | -14.64 | 14.64 | 92.78 | 0.75 | 67.07 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.47 | 57.00 | -14.75 | 14.75 | 92.09 | 0.76 | 67.10 | Vu < PhiVc/2 | Not Reqd 1 | 67.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.52 | 57.00 | -14.87 | 14.87 | 91.40 | 0.77 | 67.12 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.57 | 57.00 | -14.98 | 14.98 | 90.71 | 0.78 | 67.15 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.61 | 57.00 | -15.10 | 15.10 | 90.00 | 0.80 | 67.18 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.66 | 57.00 | -15.22 | 15.22 | 89.30 | 0.81 | 67.21 | Vu < PhiVc/2 | Not Reqd 1 | 67.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.71 | 57.00 | -15.33 | 15.33 | 88.58 | 0.82 | 67.23 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.75 | 57.00 | -15.45 | 15.45 | 87.87 | 0.83 | 67.26 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.80 | 57.00 | -15.56 | 15.56 | 87.14 | 0.85 | 67.29 | Vu < PhiVc/2 | Not Reqd 1 | 67.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.85 | 57.00 | -15.68 | 15.68 | 86.41 | 0.86 | 67.32 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.89 | 57.00 | -15.79 | 15.79 | 85.68 | 0.88 | 67.35 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.94 | 57.00 | -15.91 | 15.91 | 84.94 | 0.89 | 67.39 | Vu < PhiVc/2 | Not Reqd 1 | 67.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 16.99 | 57.00 | -16.02 | 16.02 | 84.19 | 0.90 | 67.42 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.03 | 57.00 | -16.14 | 16.14 | 83.44 | 0.92 | 67.45 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.08 | 57.00 | -16.25 | 16.25 | 82.69 | 0.93 | 67.49 | Vu < PhiVc/2 | Not Reqd 1 | 67.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.13 | 57.00 | -16.37 | 16.37 | 81.93 | 0.95 | 67.52 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.17 | 57.00 | -16.48 | 16.48 | 81.16 | 0.96 | 67.56 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.22 | 57.00 | -16.60 | 16.60 | 80.39 | 0.98 | 67.59 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.27 | 57.00 | -16.71 | 16.71 | 79.61 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.31 | 57.00 | -16.83 | 16.83 | 78.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.36 | 57.00 | -16.94 | 16.94 | 78.04 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.41 | 57.00 | -17.06 | 17.06 | 77.25 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.45 | 57.00 | -17.17 | 17.17 | 76.45 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.50 | 57.00 | -17.29 | 17.29 | 75.64 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.55 | 57.00 | -17.41 | 17.41 | 74.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.59 | 57.00 | -17.52 | 17.52 | 74.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.64 | 57.00 | -17.64 | 17.64 | 73.20 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.69 | 57.00 | -17.75 | 17.75 | 72.37 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.73 | 57.00 | -17.87 | 17.87 | 71.54 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.78 | 57.00 | -17.98 | 17.98 | 70.71 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.83 | 57.00 | -18.10 | 18.10 | 69.86 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.87 | 57.00 | -18.21 | 18.21 | 69.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : ElKON Consultant Group, LLC

## Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.92 | 57.00 | -18.33 | 18.33 | 68.16 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 17.97 | 57.00 | -18.44 | 18.44 | 67.31 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.01 | 57.00 | -18.56 | 18.56 | 66.44 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.06 | 57.00 | -18.67 | 18.67 | 65.57 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.11 | 57.00 | -18.79 | 18.79 | 64.70 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.15 | 57.00 | -18.90 | 18.90 | 63.82 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.20 | 57.00 | -19.02 | 19.02 | 62.94 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.25 | 57.00 | -19.13 | 19.13 | 62.05 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.29 | 57.00 | -19.25 | 19.25 | 61.15 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.34 | 57.00 | -19.36 | 19.36 | 60.25 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.39 | 57.00 | -19.48 | 19.48 | 59.34 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.43 | 57.00 | -19.60 | 19.60 | 58.43 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.48 | 57.00 | -19.71 | 19.71 | 57.51 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.53 | 57.00 | -19.83 | 19.83 | 56.59 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.57 | 57.00 | -19.94 | 19.94 | 55.66 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.62 | 57.00 | -20.06 | 20.06 | 54.73 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.67 | 57.00 | -20.17 | 20.17 | 53.79 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.71 | 57.00 | -20.29 | 20.29 | 52.85 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.76 | 57.00 | -20.40 | 20.40 | 51.90 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.81 | 57.00 | -20.52 | 20.52 | 50.94 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.85 | 57.00 | -20.63 | 20.63 | 49.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.90 | 57.00 | -20.75 | 20.75 | 49.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.95 | 57.00 | -20.86 | 20.86 | 48.05 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 18.99 | 57.00 | -20.98 | 20.98 | 47.07 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.04 | 57.00 | -21.09 | 21.09 | 46.09 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.09 | 57.00 | -21.21 | 21.21 | 45.10 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.13 | 57.00 | -21.32 | 21.32 | 44.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.18 | 57.00 | -21.44 | 21.44 | 43.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.23 | 57.00 | -21.55 | 21.55 | 42.11 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.27 | 57.00 | -21.67 | 21.67 | 41.10 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.32 | 57.00 | -21.79 | 21.79 | 40.09 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.37 | 57.00 | -21.90 | 21.90 | 39.07 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.41 | 57.00 | -22.02 | 22.02 | 38.04 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.46 | 57.00 | -22.13 | 22.13 | 37.01 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.51 | 57.00 | -22.25 | 22.25 | 35.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.55 | 57.00 | -22.36 | 22.36 | 34.93 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.60 | 57.00 | -22.48 | 22.48 | 33.89 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.65 | 57.00 | -22.59 | 22.59 | 32.84 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.69 | 57.00 | -22.71 | 22.71 | 31.78 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.74 | 57.00 | -22.82 | 22.82 | 30.72 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.79 | 57.00 | -22.94 | 22.94 | 29.65 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.83 | 57.00 | -23.05 | 23.05 | 28.58 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.88 | 57.00 | -23.17 | 23.17 | 27.50 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.93 | 57.00 | -23.28 | 23.28 | 26.41 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 19.97 | 57.00 | -23.40 | 23.40 | 25.32 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.02 | 57.00 | -23.51 | 23.51 | 24.23 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.07 | 57.00 | -23.63 | 23.63 | 23.13 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.11 | 57.00 | -23.74 | 23.74 | 22.02 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.16 | 57.00 | -23.86 | 23.86 | 20.91 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.21 | 57.00 | -23.98 | 23.98 | 19.80 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.25 | 57.00 | -24.09 | 24.09 | 18.68 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.30 | 57.00 | -24.21 | 24.21 | 17.55 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.35 | 57.00 | -24.32 | 24.32 | 16.42 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.39 | 57.00 | -24.44 | 24.44 | 15.28 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Consultant Group, LLC

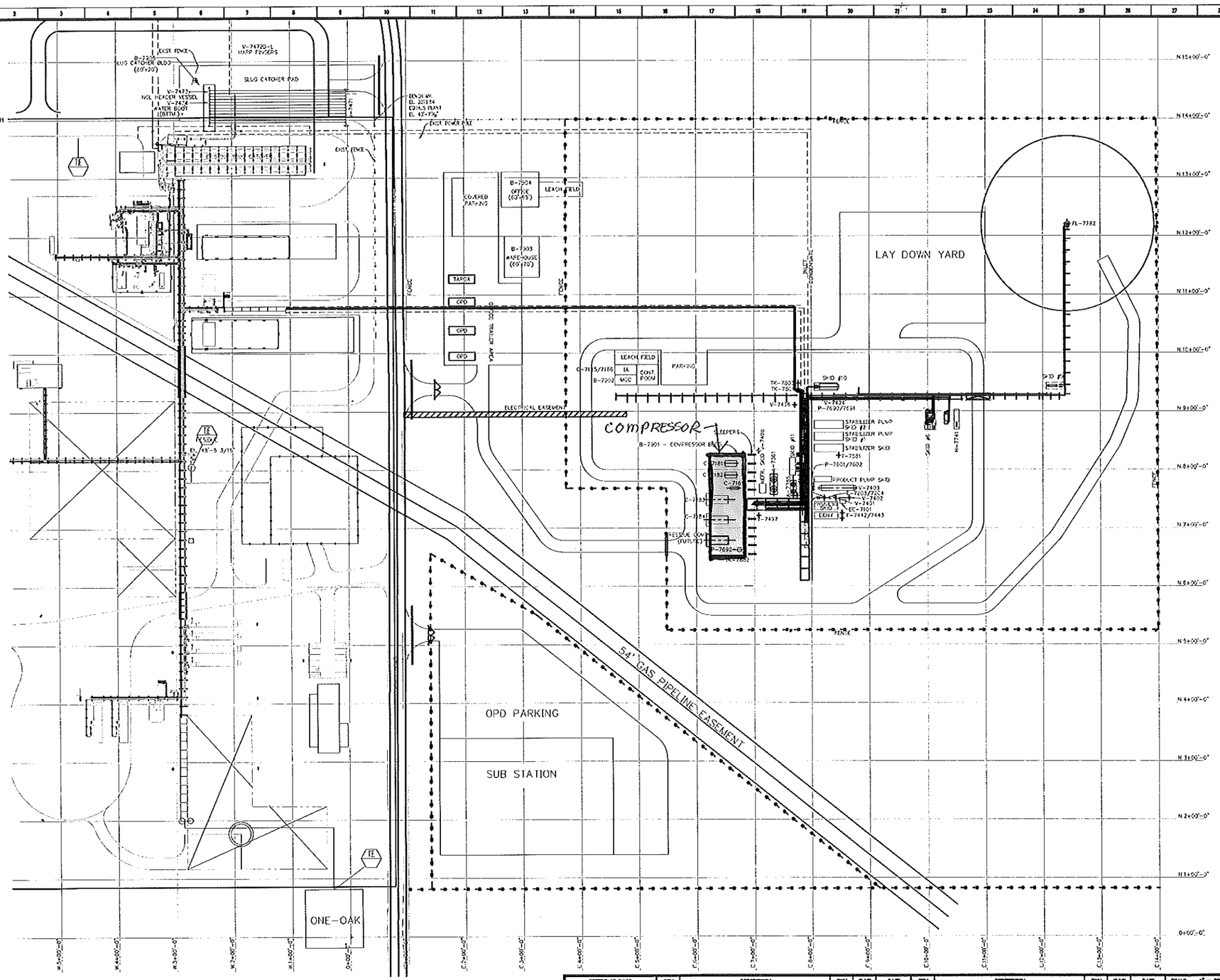
## Concrete Beam

Lic. # : KW-06010235

Description : TYPICAL GRADE BEAM

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.44 | 57.00 | -24.55 | 24.55 | 14.14 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.49 | 57.00 | -24.67 | 24.67 | 12.99 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.53 | 57.00 | -24.78 | 24.78 | 11.83 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.58 | 57.00 | -24.90 | 24.90 | 10.67 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.63 | 57.00 | -25.01 | 25.01 | 9.51 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.67 | 57.00 | -25.13 | 25.13 | 8.34 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.72 | 57.00 | -25.24 | 25.24 | 7.16 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.77 | 57.00 | -25.36 | 25.36 | 5.98 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.81 | 57.00 | -25.47 | 25.47 | 4.80 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.86 | 57.00 | -25.59 | 25.59 | 3.61 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.91 | 57.00 | -25.70 | 25.70 | 2.41 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 20.95 | 57.00 | -25.82 | 25.82 | 1.21 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 21.00 | 57.00 | -25.93 | 25.93 | 0.00 | 1.00 | 67.63 | Vu < PhiVc/2 | Not Reqd 1 | 67.6 | 0.0 | 0.0 |




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7445 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TRIM REBOILER |

**PRODUCT PUMP SKID #3**

P-7605/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7451 | REFRIGERANT SUCTION SCRUBBER |
| V-7452 | REFRIGERANT ECONOMIZER |
| V-7453 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7697 | HEAT MEDIUM FILTER |
| P-7636/7637 | HEAT MEDIUM PUMPS |
| V-7492 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7693/7694/7695 | CONDENSATE PIPELINE PUMPS |
| V-7475 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7281 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| E-7282 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7283 | STABILIZER REBOILER |
| F-7681/7682 | STABILIZER FEED FILTERS |
| F-7683/7684 | STABILIZER FEED COALESCERS |
| F-7485 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7492 | FLARE KNOCK OUT DRUM |
| P-7682/7683 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7494 | CLOSED DRAIN TANK |
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7456 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7284 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7201 | COMPRESSOR BUILDING |
| B-7202 | CONTROL ROOM/MCC/I.A. BUILDING |
| B-7203 | WAREHOUSE BUILDING |
| B-7204 | OFFICE BUILDING |
| B-7205 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7383/7384 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7385 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7181 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7251/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | STAB REBOILER - REBOILER |
| E-7208 | SEAL GAS HEATER |
| F-7462/7463 | MOL SIEVE DEHYDRATORS |
| F-7464 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7781 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7639 | METHANOL INJECTION PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEHYDRATOR |
| T-7581 | STABILIZER |
| TK-7801 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | SKID OIL TANK |
| V-7431 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7491 | HEADER VESSEL |
| V-7472/0-L | HASP ENGINES |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7435 | INSTRUMENT AIR RECEIVER |
| V-7437 | STARTING AIR VOLUME TANK |
| V-7438 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| B | ISSUED FOR APPROVAL | RBJ | | |
| A | ISSUED FOR BID - OPD JOB #4025 | RBJ | - | - |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

SCALE: 1" = 80'

DATE: 3/7/14

DWN BY: RBJ

CHKD BY:

FINAL OK:

ENGR: MP

APPR:

APPR:

PLANT NAME: LITTLE MISSOURI #3

TARGA

DRAWING NUMBER: LM-3000

CAD FILE NAME: LM-3000

REVISION: B

# PLOT PLAN
## LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: -

PLANT NORTH

N

EXIST FENCE

V-7472D-L HARP FENDERS

B-7955 SLUG CATCHER BLDG (60'x20')

SLUG CATCHER PAD

V-7475 NGL HEADER VESSEL V-7474 WATER BOOT (18'HTS)

EXIST SLUG CATCHER

BENCH MK. EL. 3211.54 EQUALS PLANT EL. 42'-7¾"

EXIST PIPE RACK

EXIST EDGE

TE

B-7904 OFFICE (60'x65')

LEACH FIELD

COVERED PARKING

B-7903 WAREHOUSE (60'x70')

TARCK

OPD

OPD

OPD

UTILITY TRENCH

UTILITY TRENCH

UTILITY TRENCH

LEACH FIELD

TK

MCC

CONT. ROOM

C-7155/7185

B-7902

PARKING

ELECTRICAL EASEMENT

TK-7503

TK-7504

V-7456

SKID #10

P-7651

P-7650/7651

STABILIZER PUMP SKID #7

STABILIZER PUMP SKID #7

STABILIZER SKID #8

T-7581

P-7601/7602

PRODUCT PUMP SKID #3

V-7403

P-7653/7654

V-7452

V-7451

EC-7101

F-7446/7445

EXCHANGER SKID #4

EXCHANGER SKID #4

SKID #11

SKID #6

H-7741

SKID #5

COMPRESSOR

SLEEPERS

B-7901 - COMPRESSOR BLDG

C-7181

C-7182

C-7183

C-7184

C-7186

T-7457

T-7458

T-7501

V-7408

V-7401

V-7402

V-7403

V-7452

V-7451

EC-7101

F-7446/7445

PRESSURE CONT (PUR GAS)

TK-7502

FL-7782

LAY DOWN YARD

FENCE

54" GAS PIPELINE EASEMENT

OPD PARKING

SUB STATION

TE

ONE-OAK

N.15+00'-0"

N.14+00'-0"

N.13+00'-0"

N.12+00'-0"

N.11+00'-0"

N.10+00'-0"

N.9+00'-0"

N.8+00'-0"

N.7+00'-0"

N.6+00'-0"

N.5+00'-0"

N.4+00'-0"

N.3+00'-0"

N.2+00'-0"

N.1+00'-0"

0+00'-0"

W.5+00'-0"

W.4+00'-0"

W.3+00'-0"

W.2+00'-0"

W.1+00'-0"

0+00'-0"

C.2+00'-0"

C.3+00'-0"

C.4+00'-0"

C.5+00'-0"

C.6+00'-0"

C.7+00'-0"

C.8+00'-0"

C.9+00'-0"

C.10+00'-0"

C.11+00'-0"

C.12+00'-0"

C.13+00'-0"

C.14+00'-0"

## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7446/7445 | DRY GAS FILTERS |
| V-7446 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | D-ILLER |
| E-7207 | TRIM REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7461 | REFRIGERANT SUCTION SCRUBBER |
| V-7462 | REFRIGERANT ECONOMIZER |
| V-7463 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7687 | HEAT MEDIUM FILTER |
| P-7686/7687 | HEAT MEDIUM PUMPS |
| V-7432 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7653/7654/7655 | CONDENSATE PIPELINE PUMPS |
| V-7479 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7281 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| E-7282 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7283 | STABILIZER REBOILER |
| F-7481/7482 | STABILIZER FEED FILTERS |
| F-7483/7484 | STABILIZER FEED COALESCERS |
| F-7485 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7483 | FLARE KNOCK OUT DRUM |
| P-7685/7659 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7454 | CLOSED DRAIN TANK |
| P-7693/7651 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7456 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7284 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7951 | COMPRESSOR BUILDING |
| B-7952 | CONTROL ROOM/OFFICE BUILDING |
| B-7953 | WAREHOUSE BUILDING |
| B-7954 | OFFICE BUILDING |
| B-7955 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7353/7354 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7355 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7181 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| E-7208 | SEAL GAS HEATER |
| F-7442/7443 | MOL SIEVE DEHYDRATORS |
| F-7468 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7781 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7639 | METHANOL INJECTION PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7581 | STABILIZER |
| TK-7851 | WATER TANK |
| TK-7852 | COMPRESSOR BUILDING SUMP |
| TK-7853 | SLOP OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7471 | HEADER VESSEL |
| V-7472D-L | HARP FENDERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7455 | INSTRUMENT AIR RECEIVER |
| V-7457 | STARTING AIR VOLUME TANK |
| V-7458 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| B | ISSUED FOR APPROVAL | RBJ | | |
| A | ISSUED FOR BID - OPD JOB #4025 | RBJ | | |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

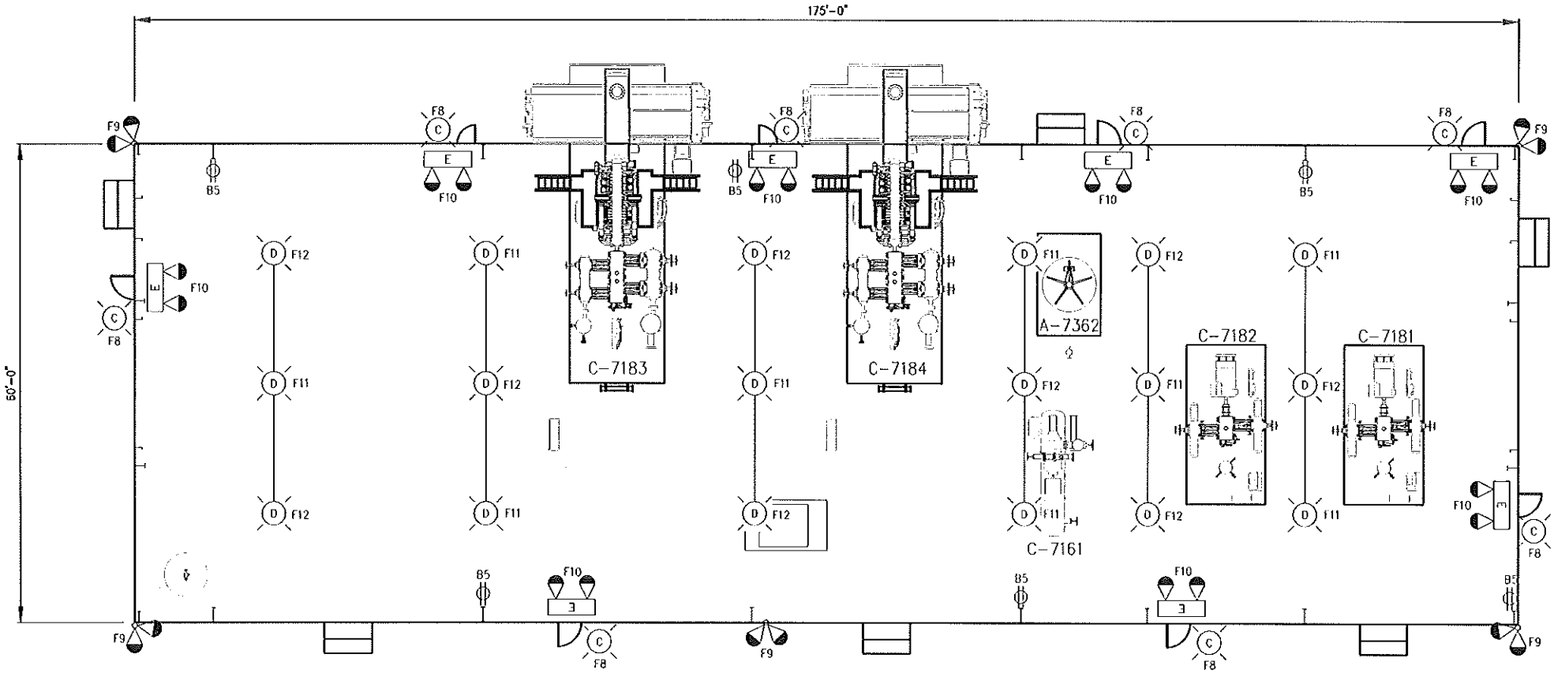
| | |
|---|---|
| SCALE: | 1" = 80' |
| DRN BY: | RBJ |
| DATE: | 3/7/14 |
| CHKD BY: | |
| FINAL CK: | |
| ENGR: | MP |
| APPR: | |
| APPR: | |
| PLANT NAME | LITTLE MISSOURI #3 |

TARGA

| | |
|---|---|
| DRAWING NUMBER | LM-3000 |
| CAD FILE NAME | LM-3000 |
| REVISION | B |

# PLOT PLAN
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: -




COMPRESSOR BUILDING

NOTES:
1. SEE DWG. LM-EL-70009 FOR BILL OF MATERIALS.

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| LM-EL-72048 | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | A | ISSUED FOR BID – CPD JOB #14025 | RK | JMD | 7-16-14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGNS | PROJECT NUMBER: 14025

SCALE: 3/8" = 1'-0" | DATE
DWN BY: RK | 8-5-14
CHKD BY: LS | 8-5-14
FINAL CK:
ENGR:
APPRV:
APPRV:
PLANT NAME: LITTLE MISSOURI #3 GAS PLANT
MCKENZIE COUNTY, NORTH DAKOTA

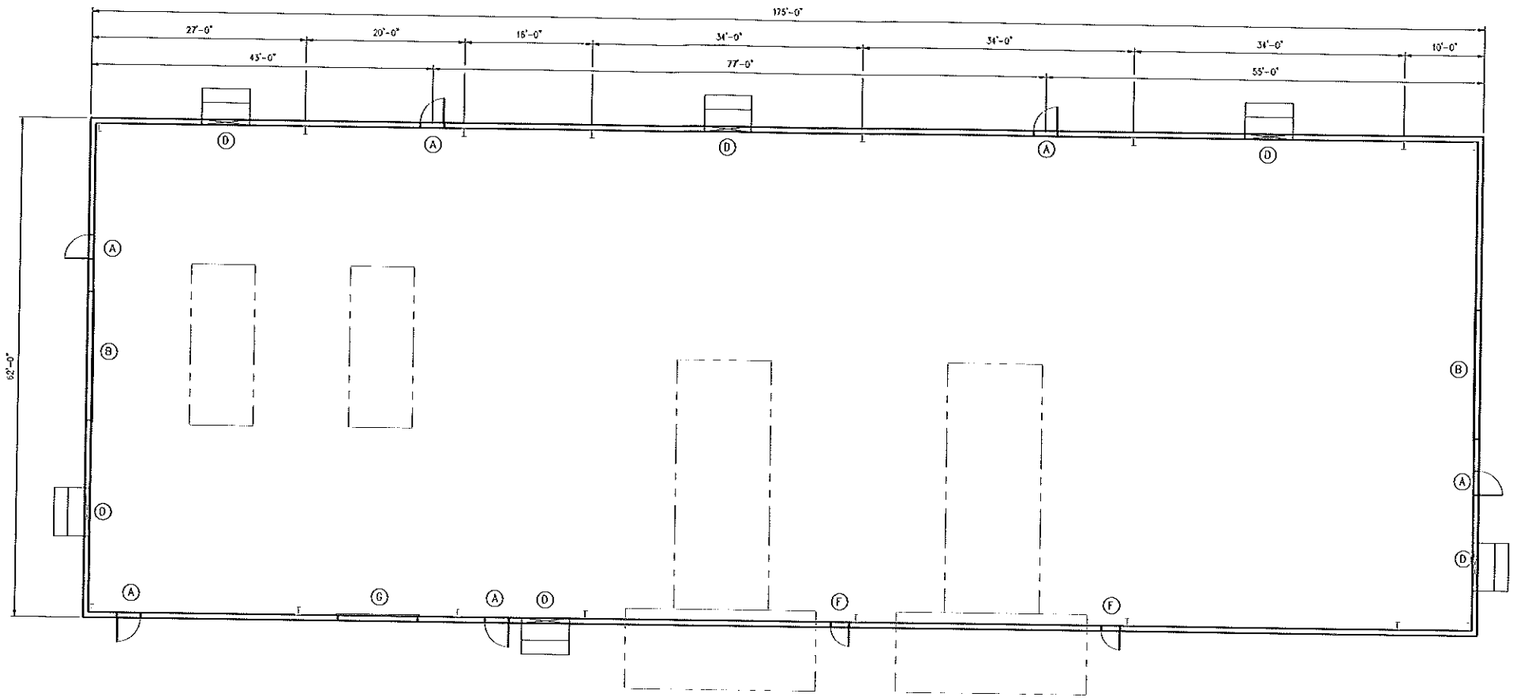
TARGA

DRAWING NUMBER: LM-EL-73115
CAD FILE NAME: LM-EL-73115
REVISION: A

LIGHTING PLAN
COMPRESSOR BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE:

H:\14025\CPD Drawings\Electrical\LM-EL-73115.dwg ~ 7-22-14 08:18 ~ RK




## NOTES:

1. DESIGN LOADS: PER IBC 2012,
   WIND = 120 MPH, EXPOSURE C, RISK CAT. III
   SDS=0.0 S1=.7% S=2.6%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. ROOF FRAME TYPE BUILDING (PANNED EAVE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CAPLESBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CAPLESBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CAPLESBAD CANYON.
7. 6" INSULATION IN THE WALLS AND ROOF.
8. FDN. BY OPD.
9. 8'-0" HIGH WALL LINER PANEL.
10. ELECTRICAL BY OPD.
11. CONTINUOUS RIDGE VENT W/ BIRD SCREEN.
12. 5'-0" WALL LIGHT BAND TRANSLUCENT PANEL AROUND THE PERIMETER OF THE BUILDING
13. (1)- 5 TON ELECTRIC TYPE BRIDGE CRANE (MIN. HOOK HEIGHT = 21'-0")
    (3 PH, 460V). (EXPLOSION PROOF – CLASS 1, DIV. 2) (SPARK PERSISTANT)
    CRANE TO HAVE A FULL-LENGTH, GRATED PLATFORM WITH HANDRAILS OR LIFE LINE
    ATTACHED TO ITS TOP. A VERTICAL CAGED LADDER SHALL BE PROVIDED FOR ACCESS
    TO THE CRANE. CRANE TO BE ABLE TO TRAVEL FULL LENGTH OF BUILDING IN AN
    UNOBSTRUCTED MANNER. THE CRANE'S DESIGN AND INSTALLATION SHALL COMPLY WITH
    ALL OF THE MOST RECENT OSHA STANDARDS.
    **(USE OBI#4 CRANE)**
14. ROOF PANELS TO BE REMOVABLE FOR COMPRESSOR ACCESS
15. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT
    PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.
16. PROVIDE FLASHING AROUND COMPRESSOR COOLER & PIPING PENETRATIONS.

## LEGEND

(A)- 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.

(B)- 16'-0"W x 18'-0"H ROLL-UP DOOR

(C)- EXTERIOR LIGHTING AT EA. EXT. DOOR ~ (BY OPD)

(D)- EXHAUST FANS SHALL BE 1 – SPEED DIRECT DRIVE TEFC-MP 460V 1150 RPM, TEFC, SUITABLE FOR CL. 1, DIV. 2, GROUP D. MOTOR NAME PLATE SHALL INCLUDE ELECTRICAL CLASSIFICATION. FAN AIR FLOW TO MATCH SAME FLOW DIRECTION AS TEFC MOTOR FAN AIR. FANS SHALL BE DESIGNED SO THAT 5 OF THE 6 FANS WILL PROVIDE THE NECESSARY AIR CHANGE OUTS (EVERY 10 MINS.) THE 6TH FAN WILL BE THE SAME SIZE AND ACT AS A SPARE IN CASE ONE FAN IS INOPERABLE FANS SHALL BE EQUIPPED WITH DIFFUSERS. NO MANUAL SWITCH ON THE FANS.

(E)- INTAKE TO BE THROUGH CONTINUOUS RIDGE VENT W/ BIRD SCREEN & 12" THROAT – FIXED OPEN

(F)- 2'-4" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.

(G)- 10'-0"W x 10'-0"H ROLL-UP DOOR

## FLOOR PLAN
(COMPRESSOR BUILDING)
SCALE: 1/8"=1'-0"

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|
| 4 | REVISED LEGEND | JMH | TT | 7/18/14 |
| 3 | MOVED DOOR | JMH | TT | 7/14/14 |
| 2 | REVISED AS SHOWN | JMH | TT | 7/9/14 |
| 1 | REVISED AS SHOWN | JMH | JND | 6/26/14 |
| 0 | ISSUE FOR CONSTRUCTION | JMH | JND | 4/29/14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

| SCALE: NOTED | DATE |
|---|---|
| DWN BY: TT | 3/27/14 |
| CHKD BY: JND | 4/3/14 |
| FINAL OK: JND | 3/27/14 |
| ENGR.: JND | 3/27/14 |
| APPRV. | |
| APPRV. ~ | ~ |

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

DRAWING NUMBER: 14025-A-905
CAD FILE NAME: 14025-A-905
REVISION: 4

# COMPRESSOR BUILDING
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: ~

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Compressor Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 10,850 SF
2. Height of Building: +/- 38'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group F-1
5. Table 503: Allowable height: 40'/1 story. Allowable area: 8500 sf.
6. 506.2: Frontage increase: [299/474 – 0.25] 30/30 = .38
7. Allowable area: 11,730 sf. OK
8. Table 1004.1.2: Occupant load: equipment: 1/300 sf. 10,850 sf @ 1/300: 36 occs.
9. Table 1015.1: One exit required, less than 49 occupants. 8 exits provided. OK
10. Doors/Windows: Refer to Legend, Targa Drawing number 905 for door/window information.
11. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
12. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
13. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

14. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
15. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
16. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

John Biggs

Date 8-5-2014 Lic. No. 2163

Lightowler Johnson Associates
architects engineers
Incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Compressor Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 10,850 SF
2. Height of Building: +/- 38'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group F-1
5. Table 503: Allowable height: 40'/1 story. Allowable area: 8500 sf.
6. 506.2: Frontage increase: [299/474 – 0.25] 30/30 = .38
7. Allowable area: 11,730 sf. OK
8. Table 1004.1.2: Occupant load: equipment: 1/300 sf. 10,850 sf @ 1/300: 36 occs.
9. Table 1015.1: One exit required, less than 49 occupants. 8 exits provided. OK
10. Doors/Windows: Refer to Legend, Targa Drawing number 905 for door/window information.
11. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
12. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
13. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

14. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
15. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
16. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

John Biggs

Date 8-5-2014 Lic. No. 2163

EIKON

August 1, 2014

Jerry W. Divin, P.E., M.ASCE
Manager Civil/Structural Department
Optimized Process Designs, LLC
25610 Clay Road
Katy, TX 77493
Jerry.Divin@opdepc.com

RE: Building Foundation, Little Missouri #3, Compressor Building
Watford City, North Dakota

Dear Mr. Divin,

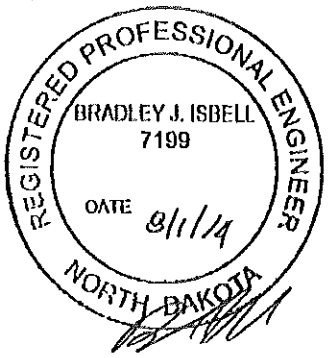
This letter is to state the foundation for the Compressor Building, shown in Drawings S1.0, S1.1, S2.1, and S2.2 dated July 28, 2014 provided to you by EIKON, has been designed based on the metal building foundation reactions provided to EIKON by Red-Dot Buildings on July 22, 2014, for the above referenced building. The building foundation complies with the 2012 International Building Code, Building Risk Category III.

If you have any questions, please feel free to contact us.

Sincerely,

R. Craig McKee

Brad Isbell, P.E.



RED DOT BUILDINGS

Better building systems.
*You have our word on it*

# Letter of Certification

Date: June 27, 2014
Customer: C & H Buildings
Project: Compressor Building
Project Address: Watford City, McKenzie County, North Dakota 58854

Red Dot Job Number: 14186-03

| Building | Type | Width | Length | Eave Height | Roof Slope |
|---|---|---|---|---|---|
| A | DS | 60'-0" | 175'-0" | 32'-4" | 3:12 |

This is to certify that the above described building/buildings has/have been designed for the following loads and deflections:

**Design Notes:**

| | | | |
|---|---|---|---|
| Building Code | 2012 International Building Code | | |
| Dead Load | 2.0 psf – Weight of roof material such as panel, insulation and purlins | | |
| Collateral Load | 3.0 psf | | |
| Live Load | 20 psf – Reducible per applicable building code | | |
| Wind Speed | 120 mph – Ultimate | | |
| Exposure | C | Risk Category | II - Normal |
| Enclosure | Enclosed | | |
| Ground Snow | 30 psf | Importance Factor | 1.10 |
| Seismic | | | |
| Site Class | D | | |
| Design Category | A | Importance Factor | 1.25 |
| $S_S$ | 0.0730 | $S_{DS}$ | 0.0779 |
| $S_1$ | 0.0260 | $S_{D1}$ | 0.0416 |
| $C_S$ | 0.0100 | | |
| Transverse SFRS | OSMF R=3 | | |
| Longitudinal SFRS | OSCBF/OSMF R=3 | | |
| Analysis Procedure | Equivalent Lateral Force | | |

Bridge Crane: (1) 1 Ton Top Running Bridge Crane in Center Module

| Building | Drift – Lateral and Longitudinal | Vertical Frame | | Purlin Deflection | | Girt Deflection | Panel Deflection |
|---|---|---|---|---|---|---|---|
| | | Live Load | Total Load | Live Load | Total Load | | |
| A | H/100 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |

Loads are applied in accordance with the 2006 MBMA Low Rise Systems Manual and/or the 2012 Edition of the International Building Code. Design is in accordance with the applicable sections of the 2005 AISC and 2007 NAUS specifications.

It is the responsibility of the buyer to protect all openings from wind-borne debris during high wind load conditions. All wall framing by others and overhead doors are required to be wind load rated to wind speed and exposure specified above, to ensure "enclosed building" conditions are maintained

This certification is limited to the design of the metal building components and specifically excludes an analysis of the foundation and parts that may be supplied by anyone other than Red Dot Buildings located in Athens, TX. This certification is for design only, no inspection or supervision is implied.

JOHN D. STARK REGISTERED PROFESSIONAL PE 2567 ENGINEER NORTH DAKOTA

**State of North Dakota**
**Registered Professional Engineer**
**Red Dot Corporation**

RED DOT
BUILDINGS

P.O. Box 1240

Athens, Texas 75751

(800) 657 – 2234

# PEMB Calculations

# Job No. 14186-03

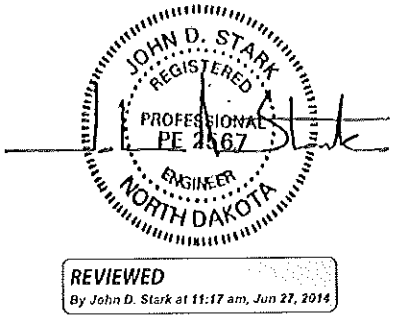
# C & H Buildings

# Compressor Building

# Watford City

# McKenzie County

# North Dakota




REVIEWED
By John D. Stark at 11:17 am, Jun 27, 2014

PEMB DESIGN CALCULATIONS

FOR

C & H Buildings

62'x 175'x 32'-4"

14186-03R1

BUILDING LAYOUT

Width (ft)= 62.0

Length (ft)= 175.0

Eave Height (ft)= 32.3/ 32.3

Roof Slope (rise/12 )= 3.00/ 3.00

BUILDING LOADS

Roof Dead Load (psf )= 2.0

Wall Dead Load

Left Endwall (psf )= 2.0

Right Endwall (psf )= 2.0

Front Sidewall(psf )= 2.0

Back Sidewall(psf )= 2.0

Roof Live Load (psf )= 20.0

Frame Live Load (psf )= 12.0

Collateral Load (psf )= 2.0

Snow Load (psf )= 23.1

Wind Speed (mph )= 120.0

Wind Code = IBC 12

Closed/Open = C

Exposure = C

Internal Wind Coeff = -0.18, +0.18

Risk Category = II - Normal

Importance - Seismic = 1.25

Seismic Design Category= A

==========

14186-03 Design Loads For Building Components: 6/27/14 10:02am

==========

FRONT SIDEWALL:

---

BASIC LOADS:

-----Edge_Strip_Ratio-----

| Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 31.9 | 0.40 | 1.00 | 6.20 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long | |
|---|---|---|---|
| 35.7 | -39.3 | | .. Girt/Header |
| 43.3 | -46.9 | | .. Panel |
| 34.8 | -38.1 | | .. Jamb |
| 55.0 | -36.7 | | .. Parapet |

BACK SIDEWALL:

---

BASIC LOADS:

-----Edge_Strip_Ratio-----

| Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 36.7 | 0.70 | 1.00 | 6.20 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long |
|---|---|---|

35.7 -39.3 .. Girt/Header

43.3 -46.9 .. Panel

34.8 -38.1 .. Jamb

55.0 -36.7 .. Parapet

LEFT ENDWALL:

---

BASIC LOADS:

| | | | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
| 2.0 | 2.0 | 18.4 | 23.1 | 0.0 | 36.7 | 0.70 | 1.00 | 6.20 | 1.12 | 1.23 | 1.07 |

BASIC LOADS AT EAVE:

| Seis | ---Torsion--- |
|---|---|
| Load | Wind Seismic |
| 0.00 | 0.00 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 34.9 | -38.5 | .. Column |
| 35.7 | -39.3 | .. Girt/Header |
| 34.8 | -38.1 | .. Jamb |
| 43.3 | -46.9 | .. Panel |
| 55.0 | -36.7 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf Id | Wind_1 Left | Right | Wind_2 Left | Right | Wind_2 Left | Right | Long Wind | Surface Friction |
| 1 | 0.47 | -0.68 | 0.83 | -0.32 | 0.47 | -0.68 | -0.63 | 0.00 |
| 2 | -1.14 | -0.75 | -0.78 | -0.39 | -1.14 | -0.75 | -0.87 | 0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | -0.75 | -1.14 | -0.39 | -0.78 | -0.75 | -1.14 | -0.87 | 0.00 |
| 4 | -0.68 | 0.47 | -0.32 | 0.83 | -0.68 | 0.47 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | Wind_2 | Long_Wind | | Column_Wind | | Long | Tran | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 31 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 12 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 13 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 | |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 | |
| | 22 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 | |
| | 23 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 | |
| | 24 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 | |
| | 25 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 | |
| | 26 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 | |
| | 27 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 29 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

RAFTER DESIGN LOADS:

| Load | | | --Add_Snow- | | | | Wind_1 | | Wind_2 | | Long | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis Id | Coef |
| 52 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.20 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.20 | 0.00 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 3 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 4 | 1.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| | 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| | 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| | 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| | 21 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 22 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 23 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 29 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 37 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.90 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.90 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 51 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 52 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

AUXILIARY LOADS:

| No. Aux Id | Aux Name | No. Load | Add_Load Id | Add_Load Coeff |
|---|---|---|---|---|
| 6 1 | E1UNB_SL_L | 3 | 1 | 0.30 |
| | | 2 | | 1.00 |
| | | 3 | | 0.73 |
| 2 | E1UNB_SL_R | 3 | 2 | 0.30 |

| | | | | |
|---|---|---|---|---|
| | | 1 | 1.00 | |
| | | 4 | 0.73 | |
| 3 | LWIND1_L | 1 | 5 | 1.00 |
| 4 | LWIND1_R | 1 | 6 | 1.00 |
| 5 | LWIND2_L | 1 | 5 | 1.00 |
| 6 | LWIND2_R | 1 | 6 | 1.00 |

ADDITIONAL LOADS:

| No. | Add Loc | Basic Load | | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|---|---|
| Add | Id | Id | Load | Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 10 | 1 | 3 | U_SNOW | D | -0.30 | -0.30 | -0.25 | 0.00 | 31.95 | |
| | 2 | 2 | U_SNOW | D | -0.30 | -0.30 | 0.25 | 0.00 | 31.95 | |
| | 3 | 2 | U_SNOW | D | -0.30 | -0.30 | 0.25 | 21.84 | 31.95 | |
| | 4 | 3 | U_SNOW | D | -0.30 | -0.30 | -0.25 | 0.00 | 10.12 | |
| | 5 | 2 | U_WIND | D | 0.19 | 0.19 | 0.00 | 0.00 | 12.40 | |
| | 6 | 3 | U_WIND | D | 0.19 | 0.19 | 0.00 | 19.55 | 31.95 | |
| | 7 | 2 | WINDL1 | D | -0.18 | -0.18 | 0.00 | 31.00 | 31.95 | |
| | 8 | 2 | WINDL2 | D | -0.18 | -0.18 | 0.00 | 31.00 | 31.95 | |
| | 9 | 3 | WINDR1 | D | -0.18 | -0.18 | 0.00 | 0.00 | 0.95 | |
| | 10 | 3 | WINDR2 | D | -0.18 | -0.18 | 0.00 | 0.00 | 0.95 | |

RIGHT ENDWALL:

---

BASIC LOADS:

| | | | | | | ----Edge_Strip_Ratio---- | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Load_Ratio Deflect | Zone Factor | Width | Girt | Col/ Panel Jamb |
| 2.0 | 2.0 | 20.0 | 23.1 | 0.0 | 36.7 | 0.70 | 1.00 | 6.20 | 1.12 | 1.23 1.07 |

BASIC LOADS AT EAVE:

| Seis | ---Torsion--- | |
|---|---|---|
| Load | Wind | Seismic |
| 0.00 | 0.00 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 34.9 | -38.5 | .. Column |
| 35.7 | -39.3 | .. Girt/Header |
| 34.8 | -38.1 | .. Jamb |
| 43.3 | -46.9 | .. Panel |
| 55.0 | -36.7 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf | Wind_1 | | Wind_2 | | Wind_2 | | Long | Surface |
| Id | Left | Right | Left | Right | Left | Right | Wind | Friction |
| 1 | 0.53 | -0.72 | 0.89 | -0.36 | 0.53 | -0.72 | -0.63 | 0.00 |
| 2 | -1.23 | -0.79 | -0.87 | -0.43 | -1.23 | -0.79 | -0.87 | 0.00 |
| 3 | -0.79 | -1.23 | -0.43 | -0.87 | -0.79 | -1.23 | -0.87 | 0.00 |
| 4 | -0.72 | 0.53 | -0.36 | 0.89 | -0.72 | 0.53 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | | Wind_2 | | Long_Wind | Column_Wind | | | Long | Tran | Aux_Load |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 31 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |
| | 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 13 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 28 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 29 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

RAFTER DESIGN LOADS:

| Load | | | --Add_Snow- | | | | Wind_1 | Wind_2 | Long | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis | Id | Coef |
| 52 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 3 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 4 | 1.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 37 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 51 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 52 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

AUXILIARY LOADS:

| No. Aux Aux | | No. | Add_Load |
|---|---|---|---|
| Aux Id | Name | Load Id | Coeff |
| 6 1 | E2UNB_SL_L | 3 1 | 0.30 |
| | | 2 | 1.00 |
| | | 3 | 0.73 |
| 2 | E2UNB_SL_R | 3 2 | 0.30 |
| | | 1 | 1.00 |
| | | 4 | 0.73 |
| 3 | LWIND1_L | 1 5 | 1.00 |
| 4 | LWIND1_R | 1 6 | 1.00 |
| 5 | LWIND2_L | 1 5 | 1.00 |
| 6 | LWIND2_R | 1 6 | 1.00 |

ADDITIONAL LOADS:

| No. Add Loc | Basic Load | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|
| Add Id Id | Load Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 10 1 3 | U_SNOW D | -0.11 | -0.11 | -0.25 | 0.00 | 31.95 | |
| 2 2 | U_SNOW D | -0.11 | -0.11 | 0.25 | 0.00 | 31.95 | |
| 3 2 | U_SNOW D | -0.11 | -0.11 | 0.25 | 21.84 | 31.95 | |
| 4 3 | U_SNOW D | -0.11 | -0.11 | -0.25 | 0.00 | 10.12 | |
| 5 2 | U_WIND D | 0.07 | 0.07 | 0.00 | 0.00 | 12.40 | |
| 6 3 | U_WIND D | 0.07 | 0.07 | 0.00 | 19.55 | 31.95 | |
| 7 2 | WINDL1 D | 0.00 | 0.00 | 0.00 | 31.00 | 31.95 | |
| 8 2 | WINDL2 D | 0.00 | 0.00 | 0.00 | 31.00 | 31.95 | |

9 3 WINDR1 D 0.00 0.00 0.00 0.00 0.95

10 3 WINDR2 D 0.00 0.00 0.00 0.00 0.95

ROOFDES:

---

BASIC LOADS:

| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Surface Factor | Seis Friction | % Factor | Snow |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.0 | 2.0 | 20.0 | 23.1 | 0.0 | 36.7 | 0.70 | 1.00 | 0.00 | 1.000 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Suct_Roof | |
|---|---|---|---|
| 17.6 | -35.9 | | .. Purlins |
| 0.0 | -80.6 | | .. Gable Extensions |
| 24.9 | -39.6 | | .. Panels |
| 21.3 | -4.0 | -25.3 | .. Long Bracing, Building |
| 29.0 | -9.2 | | .. Long Bracing, Wall Edge Zone |
| 55.0 | -36.7 | 29.3 | .. Long Bracing, Facia/Parapet |

EDGE & CORNER ZONE WIND:

| Wind Id | Surf Id | No. Zone | Zone Id | --Purlin--- Width | Length | ---Panel--- Press | Suct | Press | Suct |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 9 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | | 3 | 0.00 | 6.20 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 4 | 6.20 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 5 | 0.00 | 6.20 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 6 | 6.20 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 7 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 8 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 9 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 10 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 |
| 3 | 9 | 1 | | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 0.00 | 6.20 | 1.00 | 1.41 | 1.00 | 1.73 | | | | | |
| | | 4 | 6.20 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | | |
| | | 5 | 0.00 | 6.20 | 1.00 | 1.41 | 1.00 | 1.73 | | | | | |
| | | 6 | 6.20 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | | |
| | | 7 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 | | | | | |
| | | 8 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 | | | | | |
| | | 9 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 | | | | | |
| | | 10 | 6.20 | 6.20 | 1.00 | 2.22 | 1.00 | 2.57 | | | | | |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | |

EDGE & CORNER ZONE WIND: LONGITUDINAL

| Wind Id | Surf Id | No. Zone | Zone Id | Width | Length | Purlin Suct |
|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 |

PURLIN DESIGN LOADS:

| Surf | --Load- | | | | | --Add_Snow- | | | Wind | Wind | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Id | No. | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Press | Suct | Id | Coef |
| 2 | 20 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 14 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 15 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 16 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 17 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 18 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | 19 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | 20 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 3 | 20 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 14 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 15 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 16 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 17 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 18 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | 19 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | 20 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |

BRACING DESIGN LOADS:

| --Load- | | | | --Add_Snow- | | | Wind | Wind | Seis | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Press | Suct | Load Id | Coef |
| 11 | 1 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 4 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 5 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 6 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux Name | No. Load | Add_Load Id | Coef |
|---|---|---|---|---|
| 9 1 | PAT_SL_1 | 1 | 1 | 0.50 |
| 2 | PAT_SL_2 | 1 | 7 | 0.50 |
| 3 | PAT_SL_3 | 2 | 1 | 0.50 |
| | | 2 | 0.50 | |
| 4 | PAT_SL_4 | 2 | 2 | 0.50 |
| | | 3 | 0.50 | |
| 5 | PAT_SL_5 | 2 | 3 | 0.50 |
| | | 4 | 0.50 | |
| 6 | PAT_SL_6 | 2 | 4 | 0.50 |
| | | 5 | 0.50 | |
| 7 | PAT_SL_7 | 2 | 5 | 0.50 |
| | | 6 | 0.50 | |
| 8 | PAT_SL_8 | 2 | 6 | 0.50 |
| | | 7 | 0.50 | |
| 9 | UNB_SL | 4 | 8 | 1.00 |
| | | 9 | 0.73 | |
| | | 10 | 1.00 | |
| | | 11 | 0.73 | |

ADDITIONAL LOADS:

| No. Add Surf | Basic Load | Fy | Dx | .. Conc |
|---|---|---|---|---|

| Add | Id | Id | Load | Type | W1 | W2 | Dx1 | Dx2 | .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 11 | 1 | 0 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 27.0 | |
| | 2 | 0 | U_SNOW | D | -23.1 | -23.1 | 27.0 | 47.0 | |
| | 3 | 0 | U_SNOW | D | -23.1 | -23.1 | 47.0 | 63.0 | |
| | 4 | 0 | U_SNOW | D | -23.1 | -23.1 | 63.0 | 97.0 | |
| | 5 | 0 | U_SNOW | D | -23.1 | -23.1 | 97.0 | 131.0 | |
| | 6 | 0 | U_SNOW | D | -23.1 | -23.1 | 131.0 | 165.0 | |
| | 7 | 0 | U_SNOW | D | -23.1 | -23.1 | 165.0 | 175.0 | |
| | 8 | 2 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 32.0 | |
| | 9 | 2 | U_SNOW | D | -23.1 | -23.1 | 21.8 | 32.0 | |
| | 10 | 3 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 32.0 | |
| | 11 | 3 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 10.1 | |

RIGID FRAME #1:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 2.0 | 12.0 | 23.1 | 0.0 | 36.7 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |
| 3 | -0.80 | -1.25 | -0.44 | -0.89 | -0.87 | -0.51 | 0.00 |
| 4 | -0.73 | 0.54 | -0.37 | 0.90 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 134 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 29 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 30 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 31 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 32 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 8 | 1.00 |

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 5 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 6 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 7 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 8 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 7 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 8 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 7 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 8 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

100 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

101 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

102 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

125 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

126 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

127 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

128 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

129 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

130 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

131 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

132 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

133 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

134 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Add_Load Coeff |
|---|---|---|---|---|---|
| 14 | 1 | F1CRANEA1 | 4 | 1 | -14.85 |
| | | | 2 | | 1.00 |
| | | | 3 | | -5.46 |
| | | | 4 | | 1.00 |
| | 2 | F1CRANEA2 | 4 | 1 | -14.85 |
| | | | 2 | | -1.00 |
| | | | 3 | | -5.46 |
| | | | 4 | | -1.00 |
| | 3 | F1CRANEA3 | 4 | 1 | -5.46 |
| | | | 2 | | 1.00 |
| | | | 3 | | -14.85 |
| | | | 4 | | 1.00 |
| | 4 | F1CRANEA4 | 4 | 1 | -5.46 |
| | | | 2 | | -1.00 |
| | | | 3 | | -14.85 |
| | | | 4 | | -1.00 |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 | 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 | 1.00 |
| | 9 | F1PAT_LL_1 | 3 | 11 | 1.00 |
| | | | 12 | | 1.00 |
| | | | 13 | | 1.00 |
| | 10 | F1PAT_LL_2 | 3 | 12 | 1.00 |
| | | | 13 | | 1.00 |
| | | | 14 | | 1.00 |
| | 11 | F1PAT_LL_3 | 2 | 11 | 1.00 |
| | | | 14 | | 1.00 |
| | 12 | F1PAT_LL_4 | 2 | 12 | 1.00 |
| | | | 13 | | 1.00 |

13 F1UNB_SL_L 3 15 0.30

16 1.00

17 0.73

14 F1UNB_SL_R 3 16 0.30

15 1.00

18 0.73

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 18 1 | 1 | ------ | C | 0.00 | 1.00 | 0.00 | 3.50 | 20.90 | |
| 2 | 1 | ------ | C | 1.00 | 0.00 | 0.00 | 3.50 | 22.40 | |
| 3 | 4 | ------ | C | 0.00 | 1.00 | 0.00 | -3.50 | -11.44 | |
| 4 | 4 | ------ | C | 1.00 | 0.00 | 0.00 | -3.50 | -9.94 | |
| 5 | 2 | U_WIND | D | 0.19 | 0.19 | 0.000 | 0.00 | 12.40 | |
| 6 | 3 | U_WIND | D | 0.19 | 0.19 | 0.000 | 19.55 | 31.95 | |
| 7 | 2 | WINDL1 | D | -0.22 | -0.22 | 0.000 | 31.00 | 31.95 | |
| 8 | 2 | WINDL2 | D | -0.22 | -0.22 | 0.000 | 31.00 | 31.95 | |
| 9 | 3 | WINDR1 | D | -0.22 | -0.22 | 0.000 | 0.00 | 0.95 | |
| 10 | 3 | WINDR2 | D | -0.22 | -0.22 | 0.000 | 0.00 | 0.95 | |
| 11 | 2 | U_LIVE | D | -0.16 | -0.16 | 0.250 | 0.00 | 21.30 | |
| 12 | 2 | U_LIVE | D | -0.16 | -0.16 | 0.250 | 21.30 | 31.95 | |
| 13 | 3 | U_LIVE | D | -0.16 | -0.16 | -0.250 | 0.00 | 10.65 | |
| 14 | 3 | U_LIVE | D | -0.16 | -0.16 | -0.250 | 10.65 | 31.95 | |
| 15 | 3 | U_SNOW | D | -0.30 | -0.30 | -0.250 | 0.00 | 31.95 | |
| 16 | 2 | U_SNOW | D | -0.30 | -0.30 | 0.250 | 0.00 | 31.95 | |
| 17 | 2 | U_SNOW | D | -0.30 | -0.30 | 0.250 | 21.84 | 31.95 | |
| 18 | 3 | U_SNOW | D | -0.30 | -0.30 | -0.250 | 0.00 | 10.12 | |

RIGID FRAME #2:

---

BASIC LOADS:

| | | | | | | Basic Defl Temperature | |
|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | Change |

2.0 2.0 12.0 23.1 0.0 36.7 0.70 0

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |
| 3 | -0.61 | -0.87 | -0.25 | -0.51 | -0.87 | -0.51 | 0.00 |
| 4 | -0.55 | 0.30 | -0.19 | 0.66 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- No. | Id | Dead | Coll | ---Live--- Roof | Floor | --Add_Snow- Snow | Drift | Slide | Rain | --Wind_1- Lt | Rt | --Wind_2- Lt | Rt | Long_Wind Lt | Rt | --Seismic- Long | Tran | Temp | Aux_Load Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 126 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 29 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 30 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 31 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 32 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 33 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 34 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 35 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 36 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 37 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 38 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 39 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 42 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 43 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 44 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 45 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 46 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 47 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 48 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 49 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 50 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

100 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

101 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

102 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 119 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| 120 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| 121 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| 122 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| 123 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 124 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 125 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |
| 126 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Coeff |
|---|---|---|---|---|---|
| 10 | 1 | F2CRANEA1 | 4 | 1 | -16.28 |
| | | | 2 | | 1.04 |
| | | | 3 | | -6.57 |
| | | | 4 | | 1.04 |
| | 2 | F2CRANEA2 | 4 | 1 | -16.28 |
| | | | 2 | | -1.04 |
| | | | 3 | | -6.57 |
| | | | 4 | | -1.04 |
| | 3 | F2CRANEA3 | 4 | 1 | -6.57 |
| | | | 2 | | 1.04 |
| | | | 3 | | -16.28 |
| | | | 4 | | 1.04 |
| | 4 | F2CRANEA4 | 4 | 1 | -6.57 |
| | | | 2 | | -1.04 |
| | | | 3 | | -16.28 |
| | | | 4 | | -1.04 |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 | 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 | 1.00 |
| | 9 | F2UNB_SL_L | 3 | 11 | 0.30 |
| | | | 12 | | 1.00 |

| | | | | |
|---|---|---|---|---|
| | | 13 | 0.73 | |
| 10 | F2UNB_SL_R | 3 | 12 | 0.30 |
| | | 11 | 1.00 | |
| | | 14 | 0.73 | |

ADDITIONAL LOADS:

| No. | Add Surf Id | Basic Load Id | Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 1 | 1 | ------ | C | 0.00 | 1.00 | 0.00 | 3.50 | 20.90 | |
| 2 | 1 | ------ | | C | 1.00 | 0.00 | 0.00 | 3.50 | 22.40 | |
| 3 | 4 | ------ | | C | 0.00 | 1.00 | 0.00 | -3.50 | -11.44 | |
| 4 | 4 | ------ | | C | 1.00 | 0.00 | 0.00 | -3.50 | -9.94 | |
| 5 | 2 | U_WIND | | D | 0.35 | 0.35 | 0.000 | 0.00 | 12.40 | |
| 6 | 3 | U_WIND | | D | 0.35 | 0.35 | 0.000 | 19.55 | 31.95 | |
| 7 | 2 | WINDL1 | | D | -0.23 | -0.23 | 0.000 | 31.00 | 31.95 | |
| 8 | 2 | WINDL2 | | D | -0.23 | -0.23 | 0.000 | 31.00 | 31.95 | |
| 9 | 3 | WINDR1 | | D | -0.23 | -0.23 | 0.000 | 0.00 | 0.95 | |
| 10 | 3 | WINDR2 | | D | -0.23 | -0.23 | 0.000 | 0.00 | 0.95 | |
| 11 | 3 | U_SNOW | | D | -0.54 | -0.54 | -0.250 | 0.00 | 31.95 | |
| 12 | 2 | U_SNOW | | D | -0.54 | -0.54 | 0.250 | 0.00 | 31.95 | |
| 13 | 2 | U_SNOW | | D | -0.54 | -0.54 | 0.250 | 21.84 | 31.95 | |
| 14 | 3 | U_SNOW | | D | -0.54 | -0.54 | -0.250 | 0.00 | 10.12 | |

RIGID FRAME #3:

---

BASIC LOADS:

| | | | | | | Basic Defl Ratio | Temperature Change |
|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | | |
| 2.0 | 2.0 | 12.0 | 23.1 | 0.0 | 36.7 | 0.70 | 0 |

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |
| 3 | -0.61 | -0.87 | -0.25 | -0.51 | -0.87 | -0.51 | 0.00 |
| 4 | -0.55 | 0.30 | -0.19 | 0.66 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- No. | Id | ---Live--- Dead | Coll | --Add_Snow- Roof | Floor | Snow | Drift | Slide | Rain | --Wind_1- Lt | Rt | --Wind_2- Lt | Rt | Long_Wind Lt | Rt | --Seismic- Long | Tran | Aux_Load Temp | Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 126 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |

23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 5 1.00

28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 6 1.00

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

100 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

101 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

102 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

125 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

126 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Add_Load Coeff |
|---|---|---|---|---|---|
| 10 | 1 | F3CRANEA1 | 4 | 1 | -16.05 |
| | | | | 2 | 1.04 |
| | | | | 3 | -6.33 |
| | | | | 4 | 1.04 |
| | 2 | F3CRANEA2 | 4 | 1 | -16.05 |
| | | | | 2 | -1.04 |
| | | | | 3 | -6.33 |
| | | | | 4 | -1.04 |
| | 3 | F3CRANEA3 | 4 | 1 | -6.33 |
| | | | | 2 | 1.04 |
| | | | | 3 | -16.05 |
| | | | | 4 | 1.04 |
| | 4 | F3CRANEA4 | 4 | 1 | -6.33 |
| | | | | 2 | -1.04 |
| | | | | 3 | -16.05 |
| | | | | 4 | -1.04 |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 | 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 | 1.00 |
| | 9 | F3UNB_SL_L | 3 | 11 | 0.30 |
| | | | | 12 | 1.00 |
| | | | | 13 | 0.73 |
| | 10 | F3UNB_SL_R | 3 | 12 | 0.30 |
| | | | | 11 | 1.00 |
| | | | | 14 | 0.73 |

ADDITIONAL LOADS:

| No. | Add Surf Id | Basic Load Id | Type | Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 1 | 1 | ------ | C | 0.00 | 1.00 | 0.00 | 3.50 | 20.90 | |
| | 2 | 1 | ------ | C | 1.00 | 0.00 | 0.00 | 3.50 | 22.40 | |
| | 3 | 4 | ------ | C | 0.00 | 1.00 | 0.00 | -3.50 | -11.44 | |
| | 4 | 4 | ------ | C | 1.00 | 0.00 | 0.00 | -3.50 | -9.94 | |
| | 5 | 2 | U_WIND | D | 0.30 | 0.30 | 0.000 | 0.00 | 12.40 | |
| | 6 | 3 | U_WIND | D | 0.30 | 0.30 | 0.000 | 19.55 | 31.95 | |
| | 7 | 2 | WINDL1 | D | -0.20 | -0.20 | 0.000 | 31.00 | 31.95 | |
| | 8 | 2 | WINDL2 | D | -0.20 | -0.20 | 0.000 | 31.00 | 31.95 | |
| | 9 | 3 | WINDR1 | D | -0.20 | -0.20 | 0.000 | 0.00 | 0.95 | |
| | 10 | 3 | WINDR2 | D | -0.20 | -0.20 | 0.000 | 0.00 | 0.95 | |
| | 11 | 3 | U_SNOW | D | -0.47 | -0.47 | -0.250 | 0.00 | 31.95 | |
| | 12 | 2 | U_SNOW | D | -0.47 | -0.47 | 0.250 | 0.00 | 31.95 | |
| | 13 | 2 | U_SNOW | D | -0.47 | -0.47 | 0.250 | 21.84 | 31.95 | |
| | 14 | 3 | U_SNOW | D | -0.47 | -0.47 | -0.250 | 0.00 | 10.12 | |

RIGID FRAME #4:

---

BASIC LOADS:

| Dead | Coll | Live | Snow | Rain | Wind | Basic Defl Ratio | Temperature Change |
|---|---|---|---|---|---|---|---|
| 2.0 | 2.0 | 12.0 | 23.1 | 0.0 | 36.7 | 0.70 | 0 |

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |

3 -0.61 -0.87 -0.25 -0.51 -0.87 -0.51 0.00

4 -0.55 0.30 -0.19 0.66 -0.63 -0.27 0.00

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 126 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| | 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

100 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

101 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

102 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

125 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

126 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

AUXILIARY LOADS:

| No. Aux Aux | | No. | Add_Load |
|---|---|---|---|
| Aux | Id Name | Load | Id Coeff |

| | | | | | |
|---|---|---|---|---|---|
| 10 | 1 | F4CRANEA1 | 4 | 1 | -17.04 |
| | | | 2 | | 1.04 |
| | | | 3 | | -7.32 |
| | | | 4 | | 1.04 |
| | 2 | F4CRANEA2 | 4 | 1 | -17.04 |
| | | | 2 | | -1.04 |
| | | | 3 | | -7.32 |
| | | | 4 | | -1.04 |
| | 3 | F4CRANEA3 | 4 | 1 | -7.32 |
| | | | 2 | | 1.04 |
| | | | 3 | | -17.04 |
| | | | 4 | | 1.04 |
| | 4 | F4CRANEA4 | 4 | 1 | -7.32 |
| | | | 2 | | -1.04 |
| | | | 3 | | -17.04 |
| | | | 4 | | -1.04 |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 | 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 | 1.00 |
| | 9 | F4UNB_SL_L | 3 | 11 | 0.30 |
| | | | 12 | | 1.00 |
| | | | 13 | | 0.73 |
| | 10 | F4UNB_SL_R | 3 | 12 | 0.30 |
| | | | 11 | | 1.00 |
| | | | 14 | | 0.73 |

ADDITIONAL LOADS:

| No. | Add Surf | Basic | Load | Fx | Fy | Mom | Dx | Dy | .. | Conc |
|---|---|---|---|---|---|---|---|---|---|---|
| Add | Id Id | Type | Type | W1 | W2 | Co | Dl1 | Dl2 | .. | Dist |
| 14 | 1 1 | ------ | C | 0.00 | 1.00 | 0.00 | 3.50 | 20.90 | | |
| | 2 1 | ------ | C | 1.00 | 0.00 | 0.00 | 3.50 | 22.40 | | |
| | 3 4 | ------ | C | 0.00 | 1.00 | 0.00 | -3.50 | -11.44 | | |
| | 4 4 | ------ | C | 1.00 | 0.00 | 0.00 | -3.50 | -9.94 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 2 | U_WIND | D | 0.47 | 0.47 | 0.000 | 0.00 | 12.40 | |
| 6 | 3 | U_WIND | D | 0.47 | 0.47 | 0.000 | 19.55 | 31.95 | |
| 7 | 2 | WINDL1 | D | -0.32 | -0.32 | 0.000 | 31.00 | 31.95 | |
| 8 | 2 | WINDL2 | D | -0.32 | -0.32 | 0.000 | 31.00 | 31.95 | |
| 9 | 3 | WINDR1 | D | -0.32 | -0.32 | 0.000 | 0.00 | 0.95 | |
| 10 | 3 | WINDR2 | D | -0.32 | -0.32 | 0.000 | 0.00 | 0.95 | |
| 11 | 3 | U_SNOW | D | -0.74 | -0.74 | -0.250 | 0.00 | 31.95 | |
| 12 | 2 | U_SNOW | D | -0.74 | -0.74 | 0.250 | 0.00 | 31.95 | |
| 13 | 2 | U_SNOW | D | -0.74 | -0.74 | 0.250 | 21.84 | 31.95 | |
| 14 | 3 | U_SNOW | D | -0.74 | -0.74 | -0.250 | 0.00 | 10.12 | |

RIGID FRAME #5:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 2.0 | 17.8 | 23.1 | 0.0 | 36.7 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |
| 3 | -0.80 | -1.25 | -0.44 | -0.89 | -0.87 | -0.51 | 0.00 |
| 4 | -0.73 | 0.54 | -0.37 | 0.90 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |

134 1 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
2 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
3 1.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
4 1.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
5 1.00 1.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
6 1.00 1.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
7 1.00 1.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
8 1.00 1.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
9 1.00 1.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
10 1.00 1.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
11 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
12 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
13 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00
15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 5 1.00
16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 6 1.00
17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00
18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00
19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00
20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00
21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00
22 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00
23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00
27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 5 1.00
28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 6 1.00
29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00
30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00
31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00
32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00
33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00
34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 69 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 70 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 71 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 72 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 73 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 74 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 75 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 76 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 77 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 78 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 79 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 80 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 81 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 82 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 83 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 84 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 85 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 86 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 87 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 88 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 89 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 90 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 91 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 92 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 93 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 94 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 95 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 96 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 97 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 98 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 99 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 100 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| 101 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| 102 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

125 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

126 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

127 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

128 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

129 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

130 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

131 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

132 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

133 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

134 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

AUXILIARY LOADS:

| No. Aux | Aux | Aux | No. | Add_Load |
|---|---|---|---|---|
| Aux | Id | Name | Load | Id Coeff |
| 14 | 1 | F5CRANEA1 | 4 | 1 -10.34 |
| | | | 2 | 0.72 |
| | | | 3 | -3.58 |
| | | | 4 | 0.72 |
| | 2 | F5CRANEA2 | 4 | 1 -10.34 |
| | | | 2 | -0.72 |
| | | | 3 | -3.58 |
| | | | 4 | -0.72 |
| | 3 | F5CRANEA3 | 4 | 1 -3.58 |
| | | | 2 | 0.72 |
| | | | 3 | -10.34 |
| | | | 4 | 0.72 |
| | 4 | F5CRANEA4 | 4 | 1 -3.58 |
| | | | 2 | -0.72 |
| | | | 3 | -10.34 |
| | | | 4 | -0.72 |
| | 5 | LWIND1_L2E | 1 | 5 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 1.00 |
| | 9 | F5PAT_LL_1 | 3 | 11 1.00 |
| | | | 12 | 1.00 |
| | | | 13 | 1.00 |
| | 10 | F5PAT_LL_2 | 3 | 12 1.00 |
| | | | 13 | 1.00 |
| | | | 14 | 1.00 |
| | 11 | F5PAT_LL_3 | 2 | 11 1.00 |
| | | | 14 | 1.00 |
| | 12 | F5PAT_LL_4 | 2 | 12 1.00 |
| | | | 13 | 1.00 |
| | 13 | F5UNB_SL_L | 3 | 15 0.30 |
| | | | 16 | 1.00 |

| | | | | |
|---|---|---|---|---|
| | | 17 | 0.73 | |
| 14 | F5UNB_SL_R | 3 | 16 | 0.30 |
| | | 15 | 1.00 | |
| | | 18 | 0.73 | |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Id | Load Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 1 | 1 | ------ | C | | 0.00 | 1.00 | 0.00 | 3.50 | 20.90 | |
| 2 | 1 | ------ | C | | 1.00 | 0.00 | 0.00 | 3.50 | 22.40 | |
| 3 | 4 | ------ | C | | 0.00 | 1.00 | 0.00 | -3.50 | -11.44 | |
| 4 | 4 | ------ | C | | 1.00 | 0.00 | 0.00 | -3.50 | -9.94 | |
| 5 | 2 | U_WIND | D | | 0.07 | 0.07 | 0.000 | 0.00 | 12.40 | |
| 6 | 3 | U_WIND | D | | 0.07 | 0.07 | 0.000 | 19.55 | 31.95 | |
| 7 | 2 | WINDL1 | D | | -0.09 | -0.09 | 0.000 | 31.00 | 31.95 | |
| 8 | 2 | WINDL2 | D | | -0.09 | -0.09 | 0.000 | 31.00 | 31.95 | |
| 9 | 3 | WINDR1 | D | | -0.09 | -0.09 | 0.000 | 0.00 | 0.95 | |
| 10 | 3 | WINDR2 | D | | -0.09 | -0.09 | 0.000 | 0.00 | 0.95 | |
| 11 | 2 | U_LIVE | D | | -0.09 | -0.09 | 0.250 | 0.00 | 21.30 | |
| 12 | 2 | U_LIVE | D | | -0.09 | -0.09 | 0.250 | 21.30 | 31.95 | |
| 13 | 3 | U_LIVE | D | | -0.09 | -0.09 | -0.250 | 0.00 | 10.65 | |
| 14 | 3 | U_LIVE | D | | -0.09 | -0.09 | -0.250 | 10.65 | 31.95 | |
| 15 | 3 | U_SNOW | D | | -0.11 | -0.11 | -0.250 | 0.00 | 31.95 | |
| 16 | 2 | U_SNOW | D | | -0.11 | -0.11 | 0.250 | 0.00 | 31.95 | |
| 17 | 2 | U_SNOW | D | | -0.11 | -0.11 | 0.250 | 21.84 | 31.95 | |
| 18 | 3 | U_SNOW | D | | -0.11 | -0.11 | -0.250 | 0.00 | 10.12 | |

| Frame Line | Col Line | Max_Pos_Val Id | Horz | Vert | Max_Neg_Val Id | Horz | Vert | Anc._Bolt No. | Diam | Base_Plate Width | Len | Thick |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 29 | 14.3 | -11.8 | 30 | -12.9 | -8.1 | 4 | 0.750 | 8.00 | 16.00 | 0.500 |
| | | 31 | 0.0 | 11.5 | 29 | 14.3 | -11.8 | | | | | |
| 1 | B | 27 | 14.3 | -11.8 | 30 | -12.9 | -8.1 | 4 | 0.750 | 8.00 | 16.00 | 0.500 |
| | | 32 | 0.0 | 11.5 | 27 | 14.3 | -11.8 | | | | | |
| 8 | B | 29 | 14.3 | -4.4 | 30 | -12.9 | -2.5 | 4 | 0.750 | 8.00 | 16.00 | 0.375 |
| | | 33 | 0.0 | 5.3 | 29 | 14.3 | -4.4 | | | | | |
| 8 | C | 27 | 14.3 | -4.4 | 30 | -12.9 | -2.5 | 4 | 0.750 | 8.00 | 16.00 | 0.375 |
| | | 34 | 0.0 | 5.3 | 27 | 14.3 | -4.4 | | | | | |
| 1 | D | 1 | 9.8 | 6.6 | 2 | -11.6 | -11.8 | 8 | 0.750 | 12.00 | 21.00 | 0.375 |
| | | 3 | 5.2 | 22.2 | 4 | -9.2 | -15.4 | | | | | |
| 1 | A | 5 | 11.6 | -11.8 | 6 | -9.8 | 6.6 | 8 | 0.750 | 12.00 | 21.00 | 0.375 |
| | | 7 | -5.2 | 22.2 | 8 | 9.2 | -15.4 | | | | | |
| 2* | D | 9 | 10.8 | 9.3 | 2 | -17.3 | -16.1 | 8 | 0.750 | 10.00 | 23.00 | 0.500 |
| | | 10 | 5.0 | 32.5 | 11 | 4.3 | -38.5 | | | | | |
| 2* | A | 5 | 17.3 | -16.1 | 12 | -10.8 | 9.3 | 8 | 0.750 | 10.00 | 23.00 | 0.500 |
| | | 13 | -5.0 | 32.5 | 8 | 14.4 | -26.4 | | | | | |
| 3* | D | 9 | 9.4 | 8.3 | 2 | -15.0 | -13.9 | 8 | 0.750 | 10.00 | 23.00 | 0.500 |
| | | 14 | 4.5 | 30.5 | 11 | 3.9 | -35.0 | | | | | |
| 3* | A | 5 | 15.0 | -13.9 | 12 | -9.4 | 8.3 | 8 | 0.750 | 10.00 | 23.00 | 0.500 |
| | | 15 | -4.5 | 30.5 | 16 | -3.9 | -37.3 | | | | | |
| 5* | D | 17 | 14.6 | 12.3 | 2 | -23.5 | -22.2 | 8 | 0.875 | 10.00 | 24.00 | 0.625 |
| | | 18 | 6.1 | 38.6 | 11 | 6.0 | -42.6 | | | | | |

```
5*   A     5 23.5 -22.2 19 -14.6 12.3   8 0.875  10.00 24.00 0.625
          20 -6.1 38.6 16 -6.0 -50.2
8    D     1  3.8  3.6  2 -4.4  -3.9   6 0.750  12.00 17.00 0.375
          21  2.5 14.6  4 -3.5  -5.2
8    A     5  4.4 -3.9  6 -3.8   3.6   6 0.750  12.00 17.00 0.375
          22 -2.5 14.6  8  3.5  -5.2
1    C     8  0.0 -19.5  8  0.0 -19.5   4 0.750   8.00 16.00 0.500
          23  0.0 11.1
1    B     4  0.0 -19.5  4  0.0 -19.5   4 0.750   8.00 16.00 0.500
          24  0.0 11.1
8    C     8  0.0  -7.0  8  0.0  -7.0   4 0.750   8.00 16.00 0.375
          25  0.0  5.5
8    B     4  0.0  -7.0  4  0.0  -7.0   4 0.750   8.00 16.00 0.375
          26  0.0  5.5
----- ------ -- ----- ----- -- ----- -----  --- -----  ----- ----- -----
```

---

2* Frame Lines:2 4

3* Frame Lines:3 7

5* Frame Lines:5 6

LOAD COMBINATIONS:

---

| Id | Combination |
|---|---|
| 1 | Dead+Wind_Right1 |
| 2 | 0.6Dead+Wind_Left2 |
| 3 | Dead+Wind_Right2/2+F1CRANEA2 |
| 4 | 0.6Dead+Wind_Left1 |
| 5 | 0.6Dead+Wind_Right2 |
| 6 | Dead+Wind_Left1 |
| 7 | Dead+Wind_Left2/2+F1CRANEA3 |
| 8 | 0.6Dead+Wind_Right1 |

9 Dead+Collateral+0.75Snow+0.75Wind_Right1+0.75Slide_Snow

10 Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA2

11 0.6Dead+Wind_Long1+LWIND1_L2E

12 Dead+Collateral+0.75Snow+0.75Wind_Left1+0.75Slide_Snow

13 Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA3

14 Dead+Collateral+0.56Snow+F3CRANEA2

15 Dead+Collateral+0.56Snow+F3CRANEA3

16 0.6Dead+Wind_Long1+LWIND1_R2E

17 Dead+Collateral+0.75Snow+0.75Wind_Right1

18 Dead+Collateral+0.56Snow+0.56Slide_Snow+F4CRANEA2

19 Dead+Collateral+0.75Snow+0.75Wind_Left1

20 Dead+Collateral+0.56Snow+0.56Slide_Snow+F4CRANEA3

21 Dead+Wind_Right2/2+F5CRANEA2

22 Dead+Wind_Left2/2+F5CRANEA3

23 Dead+Collateral+F1UNB_SL_L

24 Dead+Collateral+F1UNB_SL_R

25 Dead+Collateral+0.56Snow+0.56Slide_Snow+F5CRANEA1

26 Dead+Collateral+0.56Snow+0.56Slide_Snow+F5CRANEA4

27 0.6Dead+Wind_Right2+Wind_Suction

28 0.6Dead+Wind_Pressure+Wind_Long2

29 0.6Dead+Wind_Left2+Wind_Suction

30 0.6Dead+Wind_Pressure+Wind_Long1

31 Dead+Collateral+E1UNB_SL_L

32 Dead+Collateral+E1UNB_SL_R

33 Dead+Collateral+E2UNB_SL_L

34 Dead+Collateral+E2UNB_SL_R

==========

14186-03 Bracing Reactions Report: 6/27/14 10:02am

==========

BUILDING BRACING REACTIONS:

---

------Reactions(k )-------

---Wall-- Col ----Wind---- --Seismic--- Panel_Shear(lb/ft)

Loc Line Line Horz Vert Horz Vert Wind Seismic

---- ---- -------- ----- ----- ----- ----- ------ -------

L_EW 1 Rigid Frame At Endwall

F_SW A 6 ,7 16.91 15.17 0.40 0.36

R_EW 8 Rigid Frame At Endwall

B_SW D 6 ,5 8.45 7.58 0.20 0.18

3 ,2 8.45 12.89 0.20 0.31

---- ---- -------- ----- ----- ----- ----- ------ -------

==========

14186-03 Additional Reactions Report: 6/27/14 10:02am

==========

Rigid Frame Column Reactions

---

Frame Col ----Dead--- Collateral ----Live--- ----Snow--- Wind_Left1

Line Line Horz Vert Horz Vert Horz Vert Horz Vert Horz Vert

----- ------ ----- ----- ----- ----- ----- ----- ----- ----- ----- -----

1 D 0.0 2.4 0.0 0.3 0.1 1.7 0.2 3.3 -9.2 -16.8

1 A 0.0 2.4 0.0 0.3 -0.1 1.7 -0.2 3.3 -9.8 4.2

1 C 0.0 2.2 0.0 0.6 0.0 3.4 0.0 6.6 0.0 1.6

1 B 0.0 2.2 0.0 0.6 0.0 3.4 0.0 6.6 0.0 -20.9

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1 | D | 9.8 | 4.2 | -11.6 | -13.2 | 7.4 | 7.8 | 4.1 | -7.6 | 1.7 | -4.1 |
| 1 | A | 9.2 | -16.8 | -7.4 | 7.8 | 11.6 | -13.2 | -4.1 | -7.6 | -1.7 | -4.1 |
| 1 | C | 0.0 | -20.9 | 0.0 | 3.7 | 0.0 | -18.8 | 0.0 | -6.0 | 0.0 | -3.9 |
| 1 | B | 0.0 | 1.6 | 0.0 | -18.8 | 0.0 | 3.7 | 0.0 | -6.0 | 0.0 | -3.9 |

| Frame | Col | -Seis_Left- | | -Seis_Right | | -F1CRANEA1 | | -F1CRANEA2 | | -F1CRANEA3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1 | D | -0.1 | -0.2 | 0.1 | 0.2 | -0.5 | 12.9 | 1.5 | 15.9 | -0.5 | 4.5 |
| 1 | A | -0.1 | 0.2 | 0.1 | -0.2 | -1.5 | 7.6 | 0.5 | 4.5 | -1.5 | 15.9 |
| 1 | C | 0.0 | 0.3 | 0.0 | -0.3 | 0.0 | 2.8 | 0.0 | -1.5 | 0.0 | 1.4 |
| 1 | B | 0.0 | -0.3 | 0.0 | 0.3 | 0.0 | -2.9 | 0.0 | 1.4 | 0.0 | -1.5 |

| Frame | Col | -F1CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | | LWIND2_R2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1 | D | 1.5 | 7.6 | 0.2 | -1.2 | -0.3 | -0.8 | 0.2 | -1.2 | -0.3 | -0.8 |
| 1 | A | 0.5 | 12.9 | 0.3 | -0.8 | -0.2 | -1.2 | 0.3 | -0.8 | -0.2 | -1.2 |
| 1 | C | 0.0 | -2.9 | 0.0 | -1.5 | 0.0 | 1.2 | 0.0 | -1.5 | 0.0 | 1.2 |
| 1 | B | 0.0 | 2.8 | 0.0 | 1.2 | 0.0 | -1.5 | 0.0 | 1.2 | 0.0 | -1.5 |

| Frame | Col | F1PAT_LL_1 | | F1PAT_LL_2 | | F1PAT_LL_3 | | F1PAT_LL_4 | | F1UNB_SL_L | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1 | D | 0.0 | 1.5 | 0.0 | -0.1 | 0.1 | 2.0 | 0.0 | -0.3 | 0.1 | 3.0 |
| 1 | A | 0.0 | -0.1 | 0.0 | 1.5 | -0.1 | 2.0 | 0.0 | -0.3 | -0.1 | 0.9 |
| 1 | C | 0.0 | 3.8 | 0.0 | 1.6 | 0.0 | 1.4 | 0.0 | 2.0 | 0.0 | 8.3 |
| 1 | B | 0.0 | 1.6 | 0.0 | 3.8 | 0.0 | 1.4 | 0.0 | 2.0 | 0.0 | 2.9 |

| Frame | Col | F1UNB_SL_R |
|---|---|---|

| Line | Line | Horz | Vert |
|---|---|---|---|
| 1 | D | 0.1 | 0.9 |
| 1 | A | -0.1 | 3.0 |
| 1 | C | 0.0 | 2.9 |
| 1 | B | 0.0 | 8.3 |

---

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | 0.6 | 4.1 | 0.4 | 1.6 | 2.3 | 9.3 | 4.4 | 17.9 | -14.8 | -28.8 |
| 2* | A | -0.6 | 4.1 | -0.4 | 1.6 | -2.3 | 9.3 | -4.4 | 17.9 | -8.6 | -13.0 |

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | 8.6 | -13.0 | -17.7 | -18.6 | 5.7 | -2.8 | 3.6 | -37.6 | 0.6 | -27.4 |
| 2* | A | 14.8 | -28.8 | -5.7 | -2.8 | 17.7 | -18.6 | -3.6 | -24.7 | -0.6 | -14.5 |

| Frame | Col | -Seis_Left- | | -Seis_Right | | -Seis_Long- | | -F2CRANEA1 | | -F2CRANEA2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | -0.1 | -0.1 | 0.1 | 0.1 | 0.0 | -0.3 | -0.6 | 15.2 | 1.5 | 16.8 |
| 2* | A | -0.1 | 0.1 | 0.1 | -0.1 | 0.0 | 0.0 | -1.5 | 7.6 | 0.6 | 6.0 |

| Frame | Col | -F2CRANEA3 | | -F2CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | -0.6 | 6.0 | 1.5 | 7.6 | 0.4 | -3.3 | -0.7 | -0.9 | 0.4 | -3.3 |
| 2* | A | -1.5 | 16.8 | 0.6 | 15.2 | 0.7 | -0.9 | -0.4 | -3.3 | 0.7 | -0.9 |

| Frame | Col | LWIND2_R2E | | F2UNB_SL_L | | F2UNB_SL_R | |
|---|---|---|---|---|---|---|---|

| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |
|---|---|---|---|---|---|---|---|
| 2* | D | -0.7 | -0.9 | 3.6 | 17.3 | 3.6 | 10.2 |
| 2* | A | -0.4 | -3.3 | -3.6 | 10.2 | -3.6 | 17.3 |

---

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | D | 0.5 | 3.8 | 0.3 | 1.4 | 1.9 | 8.1 | 3.7 | 15.6 | -12.7 | -25.0 |
| 3* | A | -0.5 | 3.8 | -0.3 | 1.4 | -1.9 | 8.1 | -3.7 | 15.6 | -7.7 | -11.4 |

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | D | 7.7 | -11.4 | -15.3 | -16.1 | 5.0 | -2.5 | 3.3 | -34.4 | 0.6 | -25.5 |
| 3* | A | 12.7 | -25.0 | -5.0 | -2.5 | 15.3 | -16.1 | -3.3 | -36.7 | -0.6 | -27.8 |

| Frame | Col | -Seis_Left- | | -Seis_Right | | -Seis_Long- | | -F3CRANEA1 | | -F3CRANEA2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | D | -0.1 | -0.1 | 0.1 | 0.1 | 0.0 | -0.3 | -0.6 | 15.0 | 1.5 | 16.6 |
| 3* | A | -0.1 | 0.1 | 0.1 | -0.1 | 0.0 | -0.4 | -1.5 | 7.4 | 0.6 | 5.8 |

| Frame | Col | -F3CRANEA3 | | -F3CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | D | -0.6 | 5.8 | 1.5 | 7.4 | 0.3 | -2.9 | -0.6 | -0.8 | 0.3 | -2.9 |
| 3* | A | -1.5 | 16.6 | 0.6 | 15.0 | 0.6 | -0.8 | -0.3 | -2.9 | 0.6 | -0.8 |

| Frame | Col | LWIND2_R2E | | F3UNB_SL_L | | F3UNB_SL_R | |
|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3* | D | -0.6 | -0.8 | 3.0 | 15.0 | 3.0 | 8.8 |
| 3* | A | -0.3 | -2.9 | -3.0 | 8.8 | -3.0 | 15.0 |

---

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5* | D | 0.8 | 5.1 | 0.5 | 2.2 | 3.0 | 12.6 | 5.9 | 24.3 | -19.9 | -39.2 |
| 5* | A | -0.8 | 5.1 | -0.5 | 2.2 | -3.0 | 12.6 | -5.9 | 24.3 | -11.9 | -17.7 |

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5* | D | 11.9 | -17.7 | -24.0 | -25.3 | 7.8 | -3.8 | 5.0 | -41.2 | 0.9 | -27.3 |
| 5* | A | 19.9 | -39.2 | -7.8 | -3.8 | 24.0 | -25.3 | -5.0 | -48.8 | -0.9 | -34.9 |

| Frame | Col | -Seis_Left- | | -Seis_Right | | -Seis_Long- | | -F4CRANEA1 | | -F4CRANEA2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5* | D | -0.2 | -0.2 | 0.2 | 0.2 | 0.0 | -0.2 | -0.6 | 16.0 | 1.5 | 17.6 |
| 5* | A | -0.2 | 0.2 | 0.2 | -0.2 | 0.0 | -0.4 | -1.5 | 8.4 | 0.6 | 6.8 |

| Frame | Col | -F4CRANEA3 | | -F4CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5* | D | -0.6 | 6.8 | 1.5 | 8.4 | 0.5 | -4.5 | -0.9 | -1.2 | 0.5 | -4.5 |
| 5* | A | -1.5 | 17.6 | 0.6 | 16.0 | 0.9 | -1.2 | -0.5 | -4.5 | 0.9 | -1.2 |

| Frame | Col | LWIND2_R2E | | F4UNB_SL_L | | F4UNB_SL_R | |
|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |
| 5* | D | -0.9 | -1.2 | 4.9 | 23.5 | 4.9 | 13.8 |
| 5* | A | -0.5 | -4.5 | -4.9 | 13.8 | -4.9 | 23.5 |

---

| Frame Col | | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 8 | D | 0.0 | 2.0 | 0.0 | 0.1 | 0.1 | 1.0 | 0.1 | 1.3 | -3.5 | -6.4 |
| 8 | A | 0.0 | 2.0 | 0.0 | 0.1 | -0.1 | 1.0 | -0.1 | 1.3 | -3.7 | 1.6 |
| 8 | C | 0.0 | 1.8 | 0.0 | 0.2 | 0.0 | 1.9 | 0.0 | 2.5 | 0.0 | 0.8 |
| 8 | B | 0.0 | 1.8 | 0.0 | 0.2 | 0.0 | 1.9 | 0.0 | 2.5 | 0.0 | -8.1 |

| Frame Col | | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 8 | D | 3.7 | 1.6 | -4.5 | -5.1 | 2.8 | 2.9 | 1.6 | -2.8 | 0.7 | -1.5 |
| 8 | A | 3.5 | -6.4 | -2.8 | 2.9 | 4.5 | -5.1 | -1.6 | -2.8 | -0.7 | -1.5 |
| 8 | C | 0.0 | -8.1 | 0.0 | 1.6 | 0.0 | -7.3 | 0.0 | -2.3 | 0.0 | -1.5 |
| 8 | B | 0.0 | 0.8 | 0.0 | -7.3 | 0.0 | 1.6 | 0.0 | -2.3 | 0.0 | -1.5 |

| Frame Col | | -Seis_Left- | | -Seis_Right | | -F5CRANEA1 | | -F5CRANEA2 | | -F5CRANEA3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 8 | D | -0.1 | -0.1 | 0.1 | 0.1 | -0.3 | 8.9 | 1.1 | 11.1 | -0.3 | 3.0 |
| 8 | A | -0.1 | 0.1 | 0.1 | -0.1 | -1.1 | 5.2 | 0.3 | 3.0 | -1.1 | 11.1 |
| 8 | C | 0.0 | 0.2 | 0.0 | -0.2 | 0.0 | 2.1 | 0.0 | -1.1 | 0.0 | 0.9 |
| 8 | B | 0.0 | -0.2 | 0.0 | 0.2 | 0.0 | -2.3 | 0.0 | 0.9 | 0.0 | -1.1 |

| Frame Col | | -F5CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | | LWIND2_R2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 8 | D | 1.1 | 5.2 | 0.1 | -0.5 | -0.1 | -0.3 | 0.1 | -0.5 | -0.1 | -0.3 |
| 8 | A | 0.3 | 8.9 | 0.1 | -0.3 | -0.1 | -0.5 | 0.1 | -0.3 | -0.1 | -0.5 |
| 8 | C | 0.0 | -2.3 | 0.0 | -0.6 | 0.0 | 0.5 | 0.0 | -0.6 | 0.0 | 0.5 |
| 8 | B | 0.0 | 2.1 | 0.0 | 0.5 | 0.0 | -0.6 | 0.0 | 0.5 | 0.0 | -0.6 |

| Frame Line | Col Line | F5PAT_LL_1 Horz | F5PAT_LL_1 Vert | F5PAT_LL_2 Horz | F5PAT_LL_2 Vert | F5PAT_LL_3 Horz | F5PAT_LL_3 Vert | F5PAT_LL_4 Horz | F5PAT_LL_4 Vert | F5UNB_SL_L Horz | F5UNB_SL_L Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | D | 0.0 | 0.8 | 0.0 | 0.0 | 0.1 | 1.1 | 0.0 | -0.2 | 0.0 | 1.1 |
| 8 | A | 0.0 | 0.0 | 0.0 | 0.8 | -0.1 | 1.1 | 0.0 | -0.2 | 0.0 | 0.4 |
| 8 | C | 0.0 | 2.2 | 0.0 | 0.9 | 0.0 | 0.8 | 0.0 | 1.1 | 0.0 | 3.2 |
| 8 | B | 0.0 | 0.9 | 0.0 | 2.2 | 0.0 | 0.8 | 0.0 | 1.1 | 0.0 | 1.1 |

| Frame Line | Col Line | F5UNB_SL_R Horz | F5UNB_SL_R Vert |
|---|---|---|---|
| 8 | D | 0.0 | 0.4 |
| 8 | A | 0.0 | 1.1 |
| 8 | C | 0.0 | 1.1 |
| 8 | B | 0.0 | 3.2 |

---

2* Frame Lines:2 4

3* Frame Lines:3 7

5* Frame Lines:5 6

Endwall Column Reactions

---

| Frame Line | Col Line | Dead Vert | Collat Vert | Live Vert | Snow Vert | Wind Left1 Vert | Wind Right1 Vert | Wind Left2 Vert | Wind Right2 Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 1.9 | 0.6 | 5.6 | 7.1 | -13.1 | -8.9 | -13.1 | -8.9 |
| 1 | B | 1.9 | 0.6 | 5.6 | 7.1 | -8.9 | -13.1 | -8.9 | -13.1 |

| Frame Line | Col Line | Wind Press Horz | Wind Suct Horz | Wind Long1 Vert | Wind Long2 Vert | Seismic Left Vert | Seismic Right Vert | -E1UNB_SL_L- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | -12.9 | 14.3 | -9.4 | -5.5 | | | 0.0 | 8.7 |
| 1 | B | -12.9 | 14.3 | -9.4 | -5.5 | | | 0.0 | 3.0 |

| Frame Line | Col Line | -E1UNB_SL_R- Horz | Vert | --LWIND1_L-- Horz | Vert | --LWIND1_R-- Horz | Vert | --LWIND2_L-- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 0.0 | 3.0 | 0.0 | -1.0 | 0.0 | 0.2 | 0.0 | -1.0 |
| 1 | B | 0.0 | 8.7 | 0.0 | 0.2 | 0.0 | -1.0 | 0.0 | 0.2 |

| Frame Line | Col Line | --LWIND2_R-- Horz | Vert |
|---|---|---|---|
| 1 | C | 0.0 | 0.2 |
| 1 | B | 0.0 | -1.0 |

---

| Frame Line | Col Line | Dead Vert | Collat Vert | Live Vert | Snow Vert | Wind Left1 Vert | Wind Right1 Vert | Wind Left2 Vert | Wind Right2 Vert |
|---|---|---|---|---|---|---|---|---|---|
| 8 | B | 1.5 | 0.2 | 2.3 | 2.7 | -5.4 | -3.6 | -5.4 | -3.6 |
| 8 | C | 1.5 | 0.2 | 2.3 | 2.7 | -3.6 | -5.4 | -3.6 | -5.4 |

| Frame Line | Col Line | Wind Press Horz | Wind Suct Horz | Wind Long1 Vert | Wind Long2 Vert | Seismic Left Vert | Seismic Right Vert | -E2UNB_SL_L- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 8 | B | -12.9 | 14.3 | -3.6 | -2.1 | | | 0.0 | 3.3 |
| 8 | C | -12.9 | 14.3 | -3.6 | -2.1 | | | 0.0 | 1.1 |

| Frame Line | Col Line | -E2UNB_SL_R- Horz | Vert | --LWIND1_L-- Horz | Vert | --LWIND1_R-- Horz | Vert | --LWIND2_L-- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 8 | B | 0.0 | 1.1 | 0.0 | -0.4 | 0.0 | 0.1 | 0.0 | -0.4 |
| 8 | C | 0.0 | 3.3 | 0.0 | 0.1 | 0.0 | -0.4 | 0.0 | 0.1 |

| Frame Line | Col Line | --LWIND2_R-- Horz | Vert |
|---|---|---|---|
| 8 | B | 0.0 | 0.1 |
| 8 | C | 0.0 | -0.4 |

---

==========

14186-03 Seismic Design Report: 6/27/14 10:02am

==========

Building Data

---

Code =IBC 12

Length = 175.00

Width = 62.00

Left Eave Height = 32.33

Right Eave Height = 32.33

Seismic Formula

---

Base Shear, V = 0.01*W

Shear Force, E = V

(Rigid frame, endwall frame, wind bent, wind column & base reactions)

Shear Force, Em = Omega*V

(Wall diagonal bracing, splice at rigid frame & wind bent knee)

Note: Applied load is seismic force multiplied by load combination

Zone/Design Category= A

Seismic Dead Load, W

---

Snow Factor = 0.000

Roof Dead+Collateral= 4.00 (psf )

Frame Dead = 2.00 (psf )

Roof Total = 6.00 (psf ) , Weight= 65.10 (k )

L_EW Dead = 2.00 (psf ) , Weight= 2.24 (k )

F_SW Dead = 2.00 (psf ) , Weight= 5.66 (k )

R_EW Dead = 2.00 (psf ) , Weight= 2.24 (k )

B_SW Dead = 2.00 (psf ) , Weight= 5.66 (k )

Crane Dead Weight= 12.10 (k )

Runway Weight Weight= 26.52 (k )

---

Total = 119.52 (k )

Seismic Forces

---

Roof Bracing

Cs = 0.0100

W = 69.59 (k )

Force, V = 0.70 (k )

Force, E = 0.70 (k )

Sidewall Bracing

Front Omega= 3.00

Cs = 0.0100

W = 40.45 (k )

Force, V = 0.40 (k )

Force, Em = 1.21 (k )

Force, E = 0.40 (k )

Back Omega= 3.00

Cs = 0.0100

W = 40.45 (k )

Force, V = 0.40 (k )

Force, Em = 1.21 (k )

Force, E = 0.40 (k )

Rigid Frames

Cs = 0.0100

Frame 1 W = 20.00 (k )

Force, V = 0.20 (k )

Force, E = 0.20 (k )

Frame 2 W = 26.00 (k )

Force, V = 0.26 (k )

Force, E = 0.26 (k )

Frame 3 W = 24.00 (k )

Force, V = 0.24 (k )

Force, E = 0.24 (k )

Frame 4 W = 32.00 (k )

Force, V = 0.32 (k )

Force, E = 0.32 (k )

Frame 5 W = 12.00 (k )

Force, V = 0.12 (k )

Force, E = 0.12 (k )

End Plates

Frame Omega= 3.00

Total Base Shear

Longitudinal

Force, V = 0.81 (k )

Transverse

Force, V = 1.96 (k )

**Design to Drafting Package**

Job No. 14186-03
Customer: C & H Buildings
Designed By: JDS on 05/29/14

**Building Description**

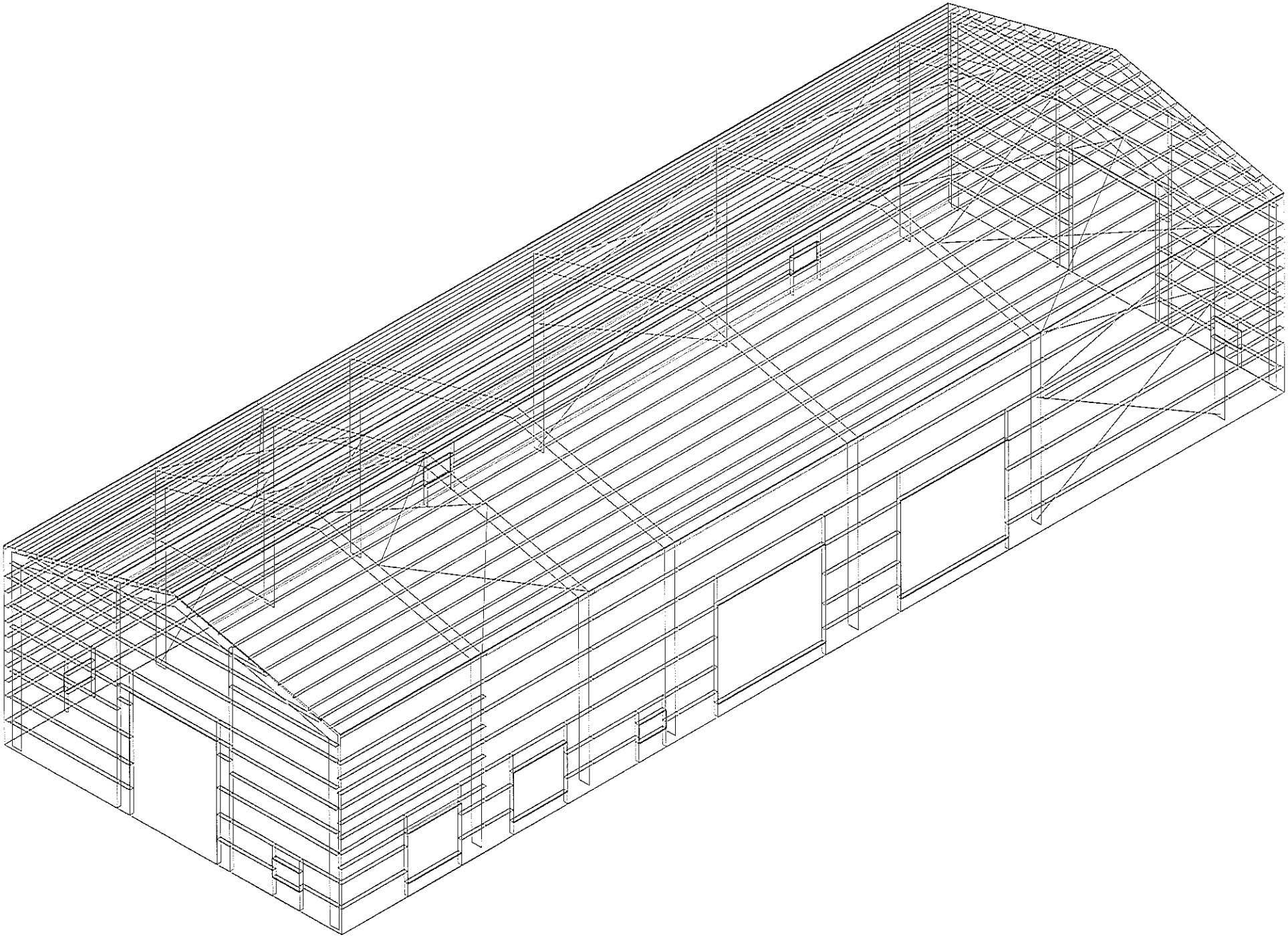
62' - 0" x 175' - 0" x 32' - 4" Gable Framed

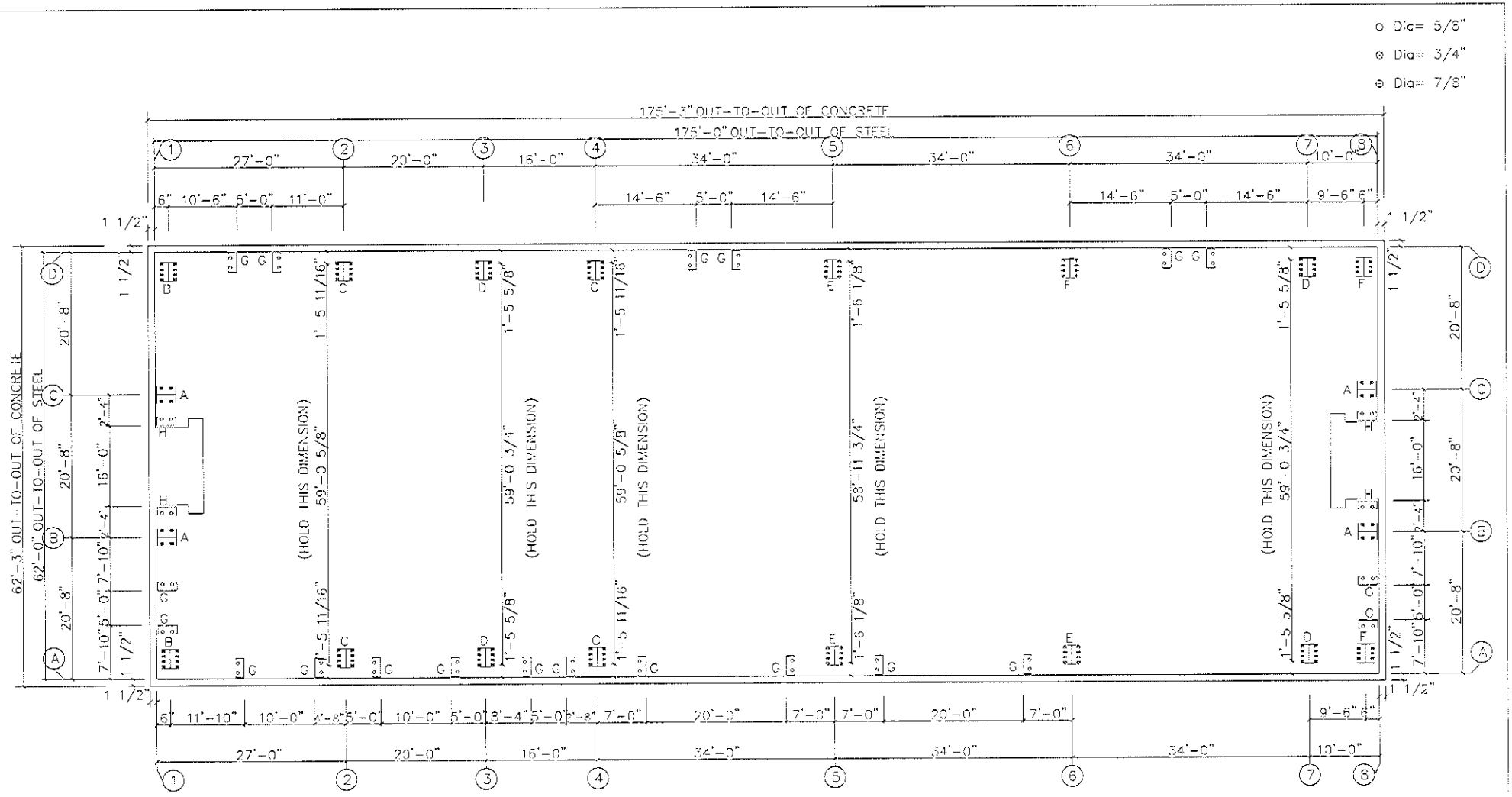
**Design Notes for Drafting**

1) Please clean up any MBS overstrikes on drawings
2) Follow Notations on the Following Pages
3) MBS Start Marks
   14186-03: 0

**Table of Contents**


| | Page | File |
|---|---|---|
| Design to Drafting Cover Sheet | 1 | Design to Drafting Cover Sheet 052914.xls |
| 3D Model | 2 | 14186-03 / 3DBuild.dwg |
| Anchor Bolt Plan | 3 | 14186-03 / AnDwg-1.dwg |
| Anchor Bolt Details | 4 | 14186-03 / AnDwg-2.dwg |
| Reactions | 5 | 14186-03 / AnDwg-3.dwg |
| Roof Framing and Sheeting | 6 | 14186-03 / RoofDwg.dwg |
| LEW Framing and Sheeting | 7 | 14186-03 / EwDwg-L.dwg |
| Rigid Frame Cross Section | 8 | 14186-03 / RfDwg-1.dwg |
| Rigid Frame Cross Section | 9 | 14186-03 / RfDwg-2.dwg |
| Rigid Frame Cross Section | 10 | 14186-03 / RfDwg-3.dwg |
| Rigid Frame Cross Section | 11 | 14186-03 / RfDwg-4.dwg |
| Rigid Frame Cross Section | 12 | 14186-03 / RfDwg-5.dwg |
| Crane Plan | 13 | 14186-03 / CraneDwg.dwg |
| REW Framing and Sheeting | 14 | 14186-03 / EwDwg-R.dwg |
| BSW Framing and Sheeting | 15 | 14186-03 / SwDwg-B.dwg |
| FSW Framing and Sheeting | 16 | 14186-03 / SwDwg-F.dwg |
| Wall Liner | 17 | 14186-03 / WallLnr.dwg |

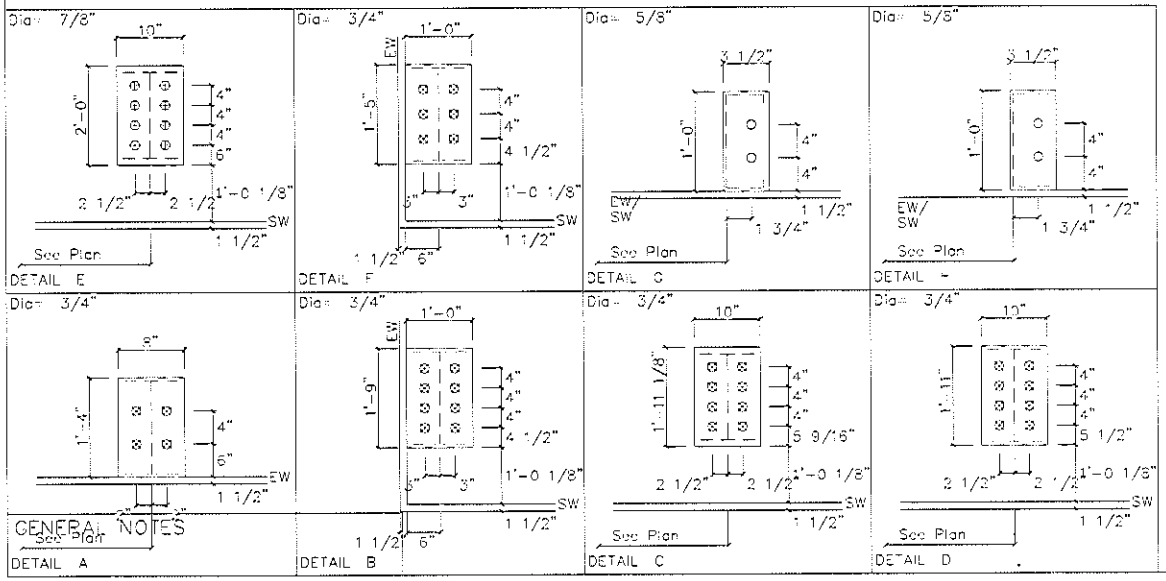





ANCHOR BOLT PLAN

NOTE: All Base Plates @ 100'-0" (U.N.)

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62 | ANCHOR BOLT PLAN | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 3/25/14 | SHEET OF |




GENERAL NOTES

| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 52 | ANCHOR BOLT DETAILS | | |
| ID | 14186-03 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

Replace with "Risk Category = II - Normal"

## NOTES FOR REACTIONS

Building reactions are based on the following building data:

| | | |
|---|---|---|
| Width (ft) | = | 62.0 |
| Length (ft) | = | 175.0 |
| Eave Height (ft) | = | 32.0 / 32.3 |
| Roof Slope (rise/12 ) | = | 3.0 / 3.0 |
| Dead Load (psf ) | = | 2.0 |
| Collateral Load (psf ) | = | 2.0 |
| Roof Live Load(psf ) | = | 20.0 |
| Frame Live Load(psf ) | = | 12.0 |
| Snow Load (psf ) | = | 23.1 |
| Wind Speed (mph ) | = | 120.0 |
| Wind Code | = | IBC '12 |
| Exposure | = | C |
| Closed/Open | = | C |
| Wind Importance Seismic | = | 1.25 |
| Seismic Zone | = | A |

| ID | Description |
|---|---|
| 1 | 0.6Dead+Wind_Left1 |
| 2 | 0.6Dead+Wind_Right1 |
| 3 | 0.6Dead+Wind_Left2 |
| 4 | 0.6Dead+Wind_Right2 |
| 5 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 6 | 0.6Dead+Wind_Long1+LWIND1_R2E |
| 7 | Dead+Wind_Left1 |
| 8 | Dead+Wind_Right1 |
| 9 | Dead+Collateral+0.75Snow+0.75Wind_Left1 |
| 10 | Dead+Collateral+0.75Snow+0.75Wind_Left1+0.75Slide_Snow |
| 11 | Dead+Collateral+0.75Snow+0.75Wind_Right1 |
| 12 | Dead+Collateral+0.75Snow+0.75Wind_Right1+0.75Slide_Snow |
| 13 | Dead+Wind_Right2/2+F1CRANEA2 |
| 14 | Dead+Wind_Left2/2+F1CRANEA3 |
| 15 | Dead+Collateral+F1UNB_SL_L |
| 16 | Dead+Collateral+F1UNB_SL_R |
| 17 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA2 |
| 18 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA3 |
| 19 | Dead+Collateral+0.56Snow+F3CRANEA2 |
| 20 | Dead+Collateral+0.56Snow+F3CRANEA3 |
| 21 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F4CRANEA2 |
| 22 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F4CRANEA3 |
| 23 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F5CRANEA1 |
| 24 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F5CRANEA4 |
| 25 | Dead+Wind_Right2/2+F5CRANEA2 |
| 26 | Dead+Wind_Left2/2+F5CRANEA3 |
| 27 | 0.6Dead+Wind_Left2+Wind_Suction |
| 28 | 0.6Dead+Wind_Pressure+Wind_Long1 |
| 29 | Dead+Collateral+E1UNB_SL_L |
| 30 | 0.6Dead+Wind_Right2+Wind_Suction |
| 31 | Dead+Collateral+E1UNB_SL_R |
| 32 | Dead+Collateral+E2UNB_SL_L |
| 33 | Dead+Collateral+E2UNB_SL_R |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3* | D | 12 | 9.4 | 8.3 | 3 | -15.0 | -13.9 | 8 | 0.750 | 10.00 | 23.00 | 0.500 | 0.0 |
| | | 19 | 4.5 | 38.5 | 5 | 3.5 | -35.0 | | | | | | |
| 3* | A | 4 | 15.0 | -13.0 | 10 | -9.4 | 8.3 | 8 | 0.750 | 10.00 | 23.00 | 0.500 | 0.0 |
| | | 20 | -4.5 | 38.5 | 6 | -3.9 | -37.3 | | | | | | |

3* Frame lines: 3 7

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5* | D | 11 | 14.6 | 12.3 | 3 | -23.5 | -22.2 | 8 | 0.875 | 10.00 | 24.00 | 0.625 | 0.0 |
| | | 21 | 6.1 | 38.6 | 5 | 0.0 | -42.0 | | | | | | |
| 5* | A | 4 | 23.5 | -22.2 | 9 | -14.6 | 12.3 | 8 | 0.875 | 10.00 | 24.00 | 0.625 | 0.0 |
| | | 22 | -6.1 | 39.6 | 6 | -6.0 | -38.2 | | | | | | |

5* Frame lines: 5 6

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | 8 | 3.8 | 3.6 | 3 | -4.4 | -3.6 | 6 | 0.750 | 12.00 | 17.00 | 0.375 | 0.0 |
| | | 25 | 2.5 | 14.6 | 1 | -3.5 | -5.2 | | | | | | |
| | A | 4 | 4.4 | -3.0 | 7 | -3.8 | 3.6 | 6 | 0.750 | 12.00 | 17.00 | 0.375 | 0.0 |
| | | 26 | -2.5 | 14.6 | 2 | 3.5 | -5.2 | | | | | | |
| 8 | C | 2 | 0.0 | -7.0 | 2 | 0.0 | -7.0 | 4 | 0.750 | 8.000 | 16.00 | 0.375 | 0.0 |
| | | 23 | 0.0 | 5.5 | | | | | | | | | |
| | B | 1 | 0.0 | -7.0 | 1 | 0.0 | -7.0 | 4 | 0.750 | 8.000 | 16.00 | 0.375 | 0.0 |
| | | 24 | 0.0 | 5.5 | | | | | | | | | |

## ENDWALL COLUMN REACTIONS(k )

| | |
|---|---|
| MAXIMUM VERTICAL Dead+Collateral+Snow | = 9.6 |
| MAXIMUM VERTICAL Dead+Wind | = -11.3 |
| MAXIMUM HORIZONTAL Dead+Wind | = 14.3 |

## BUILDING BRACING REACTIONS

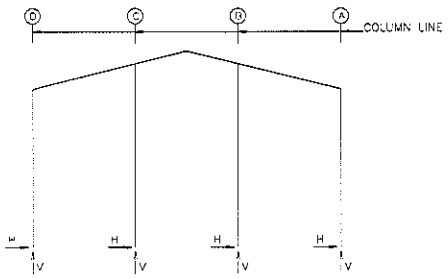
| Wall Loc | Col Line | | ± Reactions (k ) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|---|
| B_EW | 1 | Rigid Frame At Endwall | | | | | | |
| B_SW | A | | 6.7 | 16.0 | 15.2 | 0.4 | 0.4 | |
| B_EW | 8 | Rigid Frame At Endwall | | | | | | |
| B_SW | B | | 8.6 | 8.5 | 7.6 | 0.2 | 0.2 | |
| | | | 3.5 | 8.5 | 12.9 | 0.2 | 0.3 | |

## ANCHOR BOLT SUMMARY

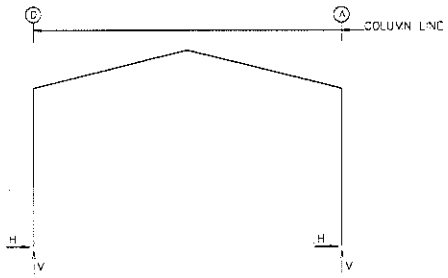
| Qty | Locatn | Dia (in) | Type | Total Len (in) | Bend Len (in) | Proj (in) |
|---|---|---|---|---|---|---|
| 0 48 | Jamb | 5/8" | A307 | 12.0 | 2.00 | 2.00 |
| 88 16 | Endwall | 3/4" | A307 | 15.0 | 2.50 | 2.00 |
| 88 92 | Frame | 3/4" | A307 | 15.0 | 2.50 | 2.00 |
| 0 32 | Frame | 7/8" | A307 | 18.0 | 3.50 | 2.00 |

Remove

FRAME LINES: 1 8




FRAME LINES: 2 3 4 5 6 7




## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | D | 8 | 0.8 | 6.6 | 3 | -11.0 | -11.8 | 8 | 0.750 | 12.00 | 21.00 | 0.375 | 0.0 |
| | | 13 | 5.2 | 22.2 | 1 | -9.2 | -15.4 | | | | | | |
| 1 | A | 4 | 11.6 | -11.8 | 7 | -9.6 | 6.6 | 8 | 0.750 | 12.00 | 21.00 | 0.375 | 0.0 |
| | | 14 | -5.2 | 22.2 | 2 | 9.2 | -15.4 | | | | | | |
| 1 | C | 2 | 0.0 | -19.5 | 2 | 0.0 | -19.5 | 4 | 0.750 | 8.000 | 16.00 | 0.500 | 0.0 |
| | | 15 | 0.0 | 11.1 | | | | | | | | | |
| 1 | B | 1 | 0.0 | -19.5 | 1 | 0.0 | -19.5 | 4 | 0.750 | 8.000 | 16.00 | 0.500 | 0.0 |
| | | 16 | 0.0 | 11.1 | | | | | | | | | |

## RIGID FRAME: MAXIMUV REACTIONS, ANCHOR BOLTS, & BASE PLATES

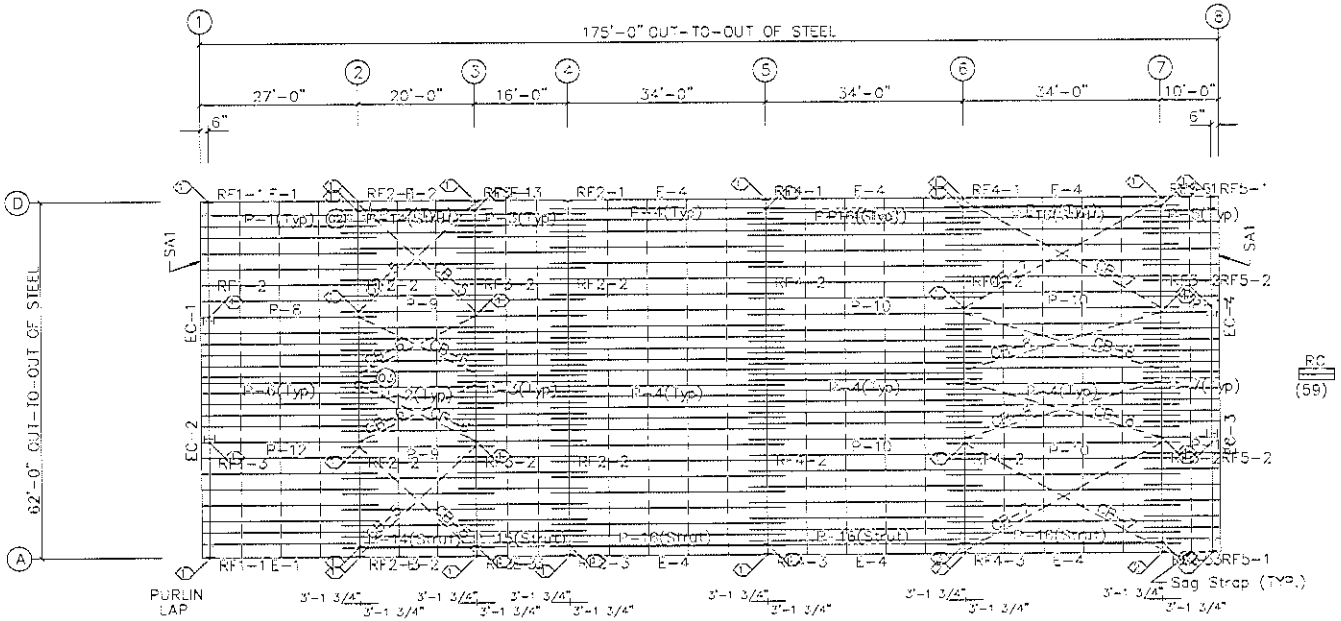
| Frm Line | Col Line | Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | D | 12 | 10.8 | 0.3 | 3 | -17.3 | -16.1 | 8 | 0.750 | 10.00 | 23.13 | 0.500 | 0.0 |
| | | 17 | 5.0 | 32.5 | 5 | 4.3 | -36.5 | | | | | | |
| 2* | A | 4 | 17.3 | -19.1 | 10 | -10.8 | 0.3 | 8 | 0.750 | 10.00 | 23.13 | 0.500 | 0.0 |
| | | 18 | -5.0 | 32.5 | 2 | 14.4 | -26.4 | | | | | | |

2* Frame lines: 2 4

| | | | |
|---|---|---|---|
| RED DOT CORPORATION | | | |
| PROJECT | 62 | ANCHOR BOLT REACTIONS | |
| ID | 14186-03R1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 6/27/14 | SHEET OF |

Note: All Eave Struts to have 5/8" A325 B & N's

Note: All Rod Bracing to have 3/8" Backer Plates




ROOF FRAMING PLAN

MEMBER TABLE
ROOF PLAN

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 12 | P-1 | 10X25Z14 | 30'-1 1/2" |
| 24 | P-2 | 10X25Z14 | 26'-3 1/2" |
| 26 | P-3 | 10X25Z14 | 22'-3 1/2" |
| 74 | P-4 | 10X25Z14 | 40'-3 1/2" |
| 12 | P-5 | 10X25Z14 | 13'-1 1/2" |
| 12 | P-6 | 10X25Z14 | 30'-1 1/2" |
| 12 | P-7 | 10X25Z14 | 13'-1 1/2" |
| 1 | P-8 | 10X25Z12 | 30'-1 1/2" |
| 2 | P-9 | 10X25Z12 | 26'-3 1/2" |
| 4 | P-10 | 10X25Z12 | 40'-3 1/2" |
| 1 | P-11 | 10X25Z12 | 13'-1 1/2" |
| 1 | P-12 | 10X25Z12 | 30'-1 1/2" |
| 1 | P-13 | 10X25Z12 | 13'-1 1/2" |
| 2 | P-14 | 10X25Z14 | 20'-7 1/2" |
| 1 | P-15 | 10X25Z14 | 16'-7 1/2" |
| 5 | P-16 | 10X25Z14 | 34'-7 1/2" |
| 2 | E-1 | 10 7/16" 14GA | 26'-11 1/2" |
| 2 | E-2 | 10 7/16" 14GA | 29'-11 1/2" |
| 2 | E-3 | 10 7/16" 14GA | 38'-11 1/2" |
| 6 | E-4 | 10 7/16" 14GA | 35'-11 1/2" |
| 2 | E-5 | 10 7/16" 14GA | 11 1/2" |
| 4 | CB-5 | RD0750 | 27'-6" |
| 4 | CB-6 | RD0500 | 22'-6" |
| 4 | CB-7 | RD0750 | 38'-1" |
| 4 | CB-8 | RD0500 | 35'-7" |

SPECIAL BOLTS
ROOF PLAN

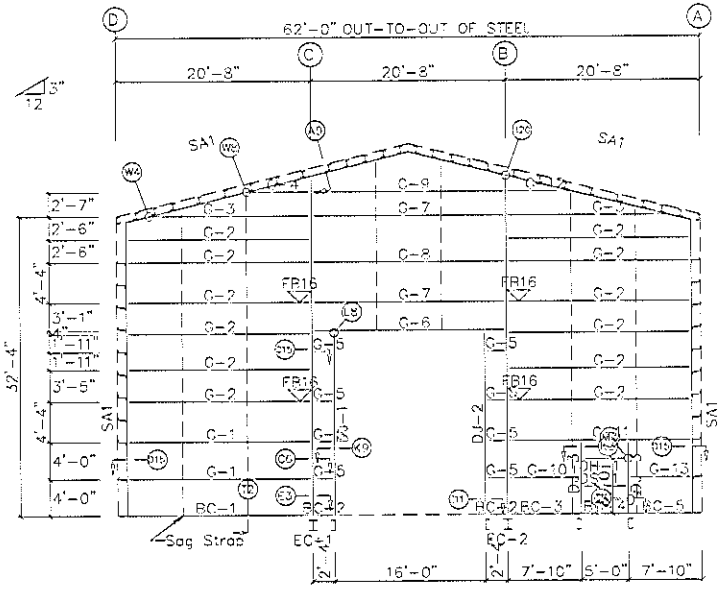
| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 1 | 2 | A325 | 1/2" | 1 1/4" | 2 |
| 2 | 2 | A325 | 1/2" | 1 1/2" | 2 |
| 3 | 4 | A307 | 1/2" | 1" | 1 |

ROOF
SHEETING

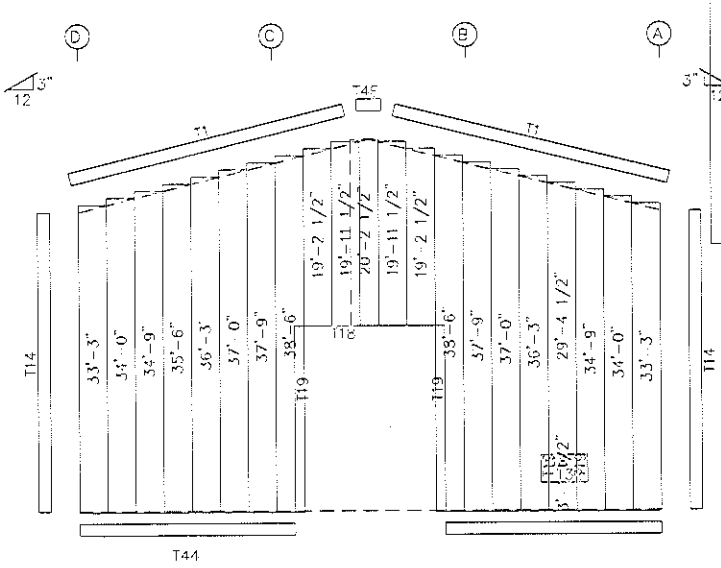
PANELS: 26 Ga. PBR
Kynar

RED DOT CORPORATION

| | | | |
|---|---|---|---|
| PROJECT | 62 | ROOF FRAMING | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |




LEFT ENDWALL FRAMING: FRAME LINE 1




LEFT ENDWALL SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. PBR – Kynar

BOLT TABLE
FRAME LINE 1

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Columns/Raf | 4 | A325 | 5/8 | 1 1/2 |

MEMBER TABLE
FRAME LINE 1

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 1 | EC-1 | W16X6X35 | 34'-11 1/16" |
| 1 | EC-2 | W16X6X35 | 34'-11 1/16" |
| 1 | DJ-1 | C12x20.7 | 19'-11" |
| 1 | DJ-2 | C12x20.7 | 19'-11" |
| 2 | DJ-3 | 12X35C14 | 5'-0" |
| 1 | DH-1 | 12X35C14 | 5'-0" |
| 1 | DS-1 | 12X35C14 | 5'-0" |
| 2 | G-1 | 12X35Z12 | 17'-7 1/4" |
| 12 | G-2 | 12X35Z14 | 17'-7 1/4" |
| 2 | G-3 | 12X35Z14 | 9'-9 9/16" |
| 1 | G-4 | 12X35Z14 | 5'-7" |
| 8 | G-5 | 12X35Z14 | 1'-9 9/16" |
| 1 | G-6 | 12X35C12 | 20'-1 1/2" |
| 2 | G-7 | 12X35Z14 | 20'-1 1/2" |
| 1 | G-8 | 12X35Z12 | 20'-1 1/2" |
| 1 | G-9 | 12X35Z14 | 20'-1 11/16" |
| 1 | G-10 | 12X35Z14 | 7'-3" |
| 1 | G-11 | 12X35Z12 | 17'-7 1/4" |
| 1 | G-12 | 12X35Z14 | 6'-6 1/4" |
| 1 | G-13 | 12X35Z14 | 4'-8 3/4" |
| 1 | BC-1 | 12X35C14 | 18'-11 1/2" |
| 2 | BC-2 | 12X35C14 | 1'-8" |
| 1 | BC-3 | 12X35C14 | 7'-2" |
| 1 | BC-4 | 12X35C14 | 4'-11" |
| 1 | BC-5 | 12X35C14 | 6'-1 1/2" |

TRIM TABLE
FRAME LINE 1

| QTY | MARK | LENGTH |
|---|---|---|
| | T32 | 64.000 |
| | T18 | 64.000 |
| | T19 | 38.000 |
| | T18 | 196.000 |
| | T19 | 241.000 |
| | T45 | 18.000 |
| | T1 | 201.000 |
| | T14 | 196.000 |
| | T44 | 133.000 |

FLANGE BRACE TABLE
FRAME LINE 1

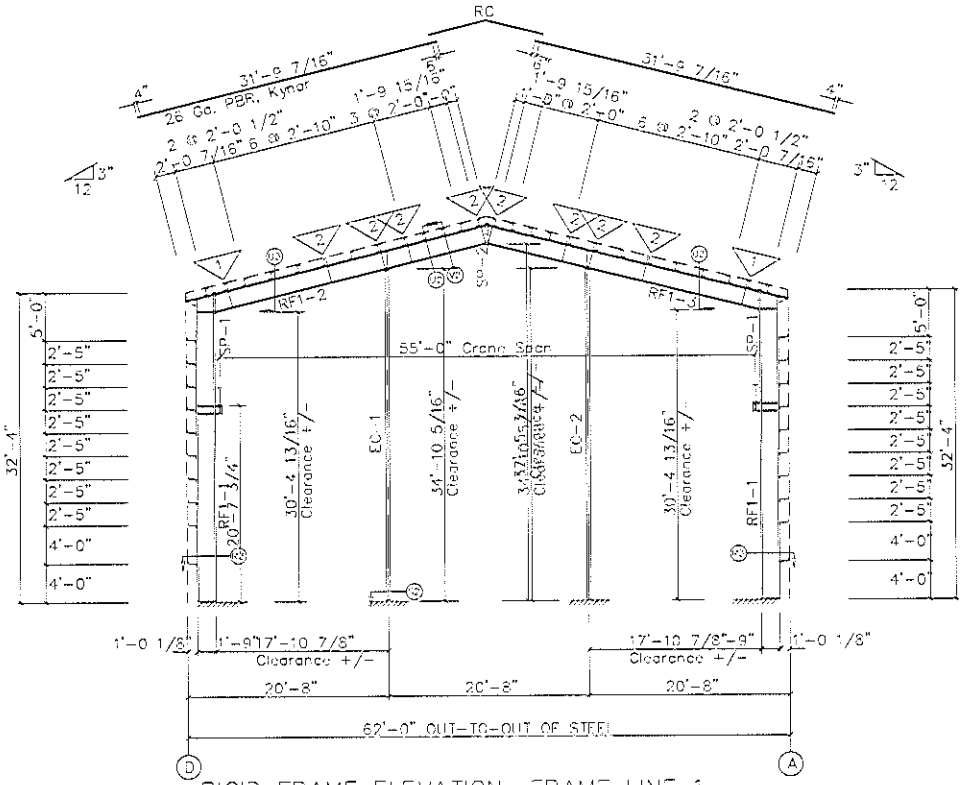
| QTY | MARK | LENGTH |
|---|---|---|
| 1 | FB16 | 1'-4 |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62 | ENDWALL FRAMING | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | | | CAP PLATE BOLTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length | | Mark | Qty | Type | Dia | Length |
| SP-1 | 4 | 4 | 2 | A325 | 7/8" | 2 3/4" | 1'-0" | 3/4" | 2'-4 1/2" | | EC-1 | 4 | A325 | 5/8" | 1 1/2" |
| SP-2 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 2'-4" | | EC-2 | 4 | A325 | 5/8" | 1 1/2" |

| FLANGE BRACE TABLE FRAME LINE 1 | | | | |
|---|---|---|---|---|
| ▽ID | SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB41 | L3x3x3/1 | 2'-4" |
| 2 | 1 | FB40 | L2x2x1/8 | 2'-4" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF1-1 | 20.0/20.0 | 0.250 | 120.0 | 12 x 1/2" x 234.0 | 12 x 1/2" x 234.0 |
| | 20.0/20.0 | 0.250 | 120.0 | 12 x 1/2" x 145.8 | 12 x 1/2" x 126.6 |
| | 20.0/20.0 | 0.250 | 120.0 | 6 x 3/8" x 33.5 | |
| | 20.0/20.0 | 0.250 | 25.0 | | |
| RF1-2 | 20.0/20.0 | 0.188 | 120.0 | 6 x 3/8" x 53.7 | 6 x 5/16" x 56.8 |
| | 20.0/20.0 | 0.188 | 112.8 | 6 x 1/4" x 240.0 | 6 x 1/4" x 240.0 |
| | 20.0/20.0 | 0.135 | 108.1 | 6 x 1/4" x 54.1 | 6 x 1/4" x 49.0 |
| | 20.0/20.0 | 0.135 | 12.0 | | |
| RF1-3 | 20.0/20.0 | 0.135 | 12.0 | 6 x 1/4" x 54.1 | 6 x 1/4" x 49.0 |
| | 20.0/20.0 | 0.135 | 108.1 | 6 x 1/4" x 240.0 | 6 x 1/4" x 240.0 |
| | 20.0/20.0 | 0.188 | 112.8 | 6 x 3/8" x 53.7 | 6 x 5/16" x 56.8 |
| | 20.0/20.0 | 0.188 | 120.0 | | |
| EC-1 | W16X6X35 | | | | |
| EC-2 | W16X6X35 | | | | |




RIGID FRAME ELEVATION: FRAME LINE 1

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62 | RIGID FRAME CROSS SECTION | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

SPLICE PLATE & BOLT TABLE

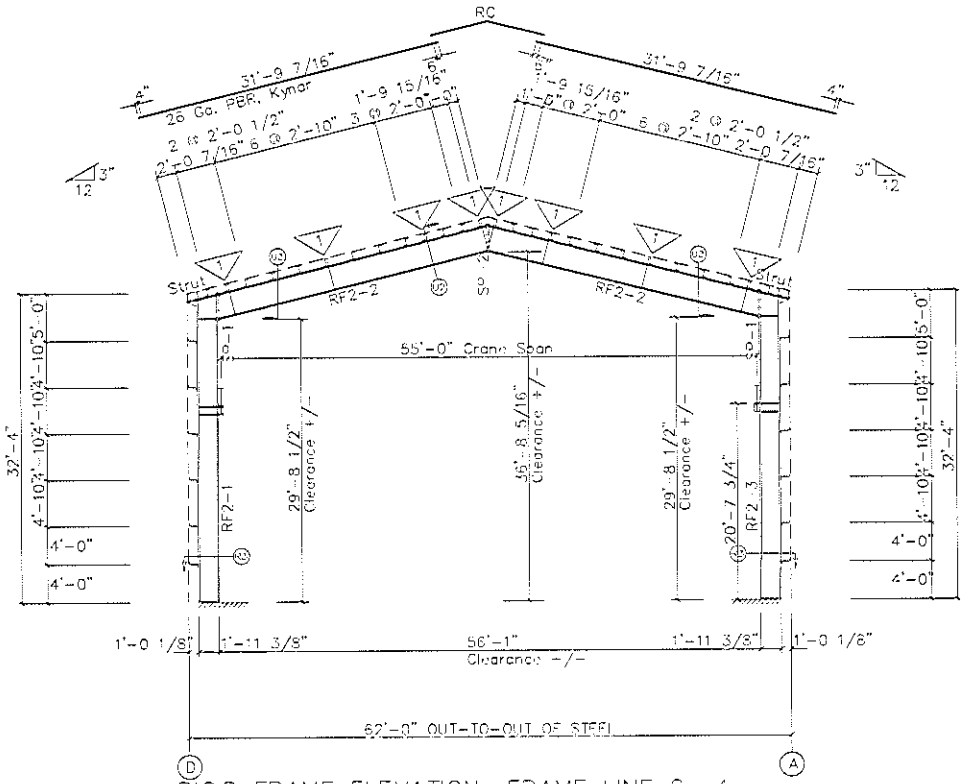
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
|---|---|---|---|---|---|---|---|---|---|
| SP-1 | 4 | 4 | 4 | A325 | 1" | 3 1/4" | 10" | 1" | 3'-2" |
| SP-2 | 4 | 4 | 4 | A325 | 9/8" | 2" | 6" | 1/2" | 3'-1" |

FLANGE BRACE TABLE
FRAME LINE 2 4

| ▽ID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
|---|---|---|---|---|
| : | 2 | FB47 | L2x2x1/8 | 2'-4" |

MEMBER TABLE

| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
|---|---|---|---|---|---|
| RF2-1 | 22.3/22.3 | 0.188 | 120.0 | 10 x 3/8" x 234.0 | 10 x 3/8" x 114.0 |
| | 22.3/22.3 | 0.188 | 120.0 | 10 x 1/2" x 145.6 | 10 x 1/2" x 120.0 |
| | 22.3/22.3 | 0.250 | 111.9 | 6 x 1/2" x 35.8 | 10 x 5/8" x 117.9 |
| | 22.3/22.3 | 0.313 | 33.4 | | |
| RF2-2 | 28.5/28.5 | 0.250 | 112.0 | 6 x 1/2" x 110.6 | 6 x 3/8" x 118.0 |
| | 28.5/28.5 | 0.188 | 120.0 | 6 x 1/4" x 234.0 | 6 x 1/4" x 226.8 |
| | 28.5/28.5 | 0.188 | 120.0 | | |
| RF2-3 | 22.3/22.3 | 0.313 | 33.4 | 6 x 1/2" x 35.8 | 10 x 5/8" x 117.9 |
| | 22.3/22.3 | 0.250 | 111.9 | 10 x 1/2" x 145.6 | 10 x 1/2" x 120.0 |
| | 22.3/22.3 | 0.188 | 120.0 | 10 x 3/8" x 234.0 | 10 x 3/8" x 114.0 |
| | 22.3/22.3 | 0.188 | 120.0 | | |



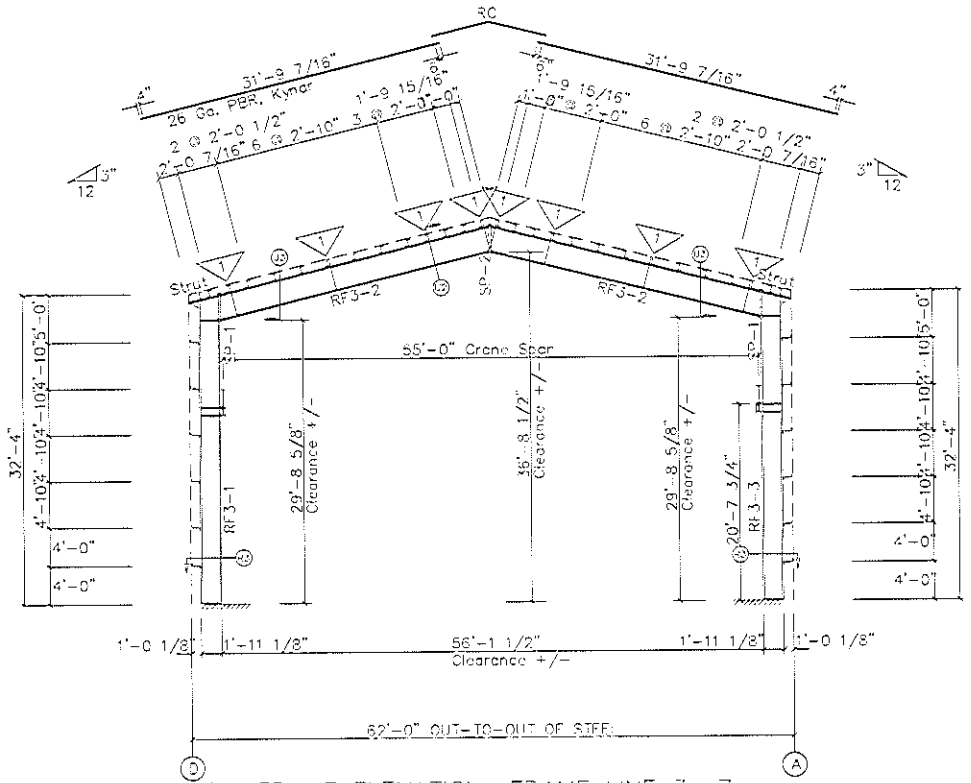

RIGID FRAME ELEVATION: FRAME LINE 2 4

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62 | RIGID FRAME CROSS SECTION | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
| SP-1 | 4 | 4 | 4 | A325 | 1" | 2 3/4" | 10" | 3/4" | 3'-2" |
| SP-2 | 4 | 4 | 4 | A325 | 5/8" | 2" | 6" | 1/2" | 3'-1" |

| FLANGE BRACE TABLE<br>FRAME LINE 3 7 | | | | |
|---|---|---|---|---|
| ▽ID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 2 | FB47 | L2x2x1/8 | 2'-4" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF3-1 | 22.3/22.5 | 0.188 | 120.0 | 10 x 3/8" x 240.0 | 10 x 3/8" x 1'4.0 |
| | 22.5/22.8 | 0.250 | 120.0 | 10 x 3/8" x 139.8 | 10 x 1/2" x 237.9 |
| | 22.8/23.1 | 0.250 | 111.9 | 5 x 5/16" x 35.7 | |
| | 23.1/23.3 | 0.313 | 33.5 | | |
| RF3-2 | 28.5/28.5 | 0.250 | 112.7 | 6 x 5/16" x 111.5 | 6 x 5/16" x 118.7 |
| | 28.5/28.5 | 0.188 | 120.0 | 6 x 1/4" x 234.0 | 6 x 1/4" x 226.8 |
| | 28.5/28.5 | 0.188 | 120.0 | | |
| RF3-3 | 23.3/23.6 | 0.313 | 33.5 | 6 x 5/16" x 35.7 | 10 x 1/2" x 237.9 |
| | 23.6/23.8 | 0.250 | 111.9 | 10 x 3/8" x 139.8 | 10 x 3/8" x 1'4.0 |
| | 23.8/23.8 | 0.250 | 120.0 | 10 x 3/8" x 240.0 | |
| | 23.8/23.8 | 0.188 | 120.0 | | |




RIGID FRAME ELEVATION: FRAME LINE 3 7

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62 | RIGID FRAME CROSS SECTION | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/23/14 | SHEET OF |

SPLICE PLATE & BOLT TABLE

| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
|---|---|---|---|---|---|---|---|---|---|
| SP-1 | 4 | 4 | 4 | A325 | 1 1/8 | 3 1/2" | 10" | 1" | 3'-2 1/2" |
| SP-2 | 4 | 4 | 4 | A325 | 3/4" | 2" | 8" | 1/2" | 3'-1" |

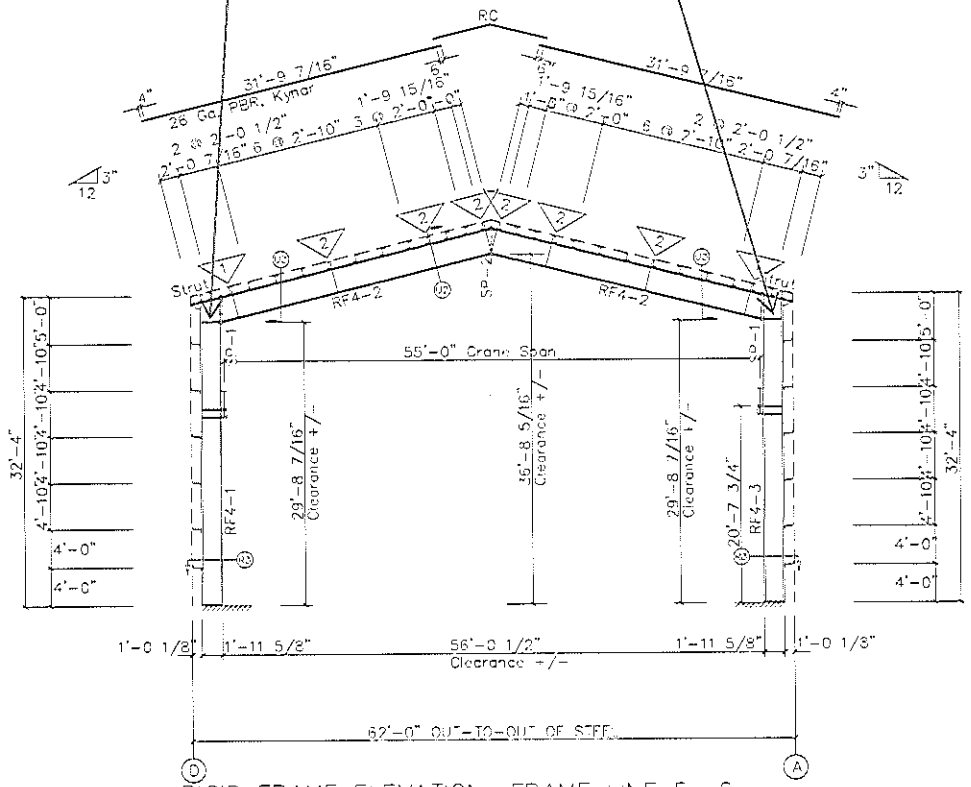
FLANGE BRACE TABLE
FRAME LINE 5 6

| ▽ID | SIDES | MARK | PART | CL FRM TO FB BOLT |
|---|---|---|---|---|
| 1 | 2 | FB47 | L3x3x3/16 | 2'-4" |
| 2 | 2 | FB47 | L2x2x1/8 | 2'-4" |

MEMBER TABLE

| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
|---|---|---|---|---|---|
| RF4-1 | 22.3/22.5 | 0.188 | 120.0 | 10 x 3/8" x 114.0 | 10 x 1/2" x 114.0 |
| | 22.3/22.5 | 0.250 | 120.0 | 10 x 1/2" x 120.0 | 10 x 5/8" x 120.0 |
| | 22.3/22.5 | 0.250 | 111.6 | 10 x 5/8" x 145.5 | 10 x 3/4" x 117.6 |
| | 22.5/22.5 | 0.500 | 33.6 | 6 x 1/2" x 36.0 | |
| RF4-2 | 28.5/28.5 | 0.250 | 120.0 | 8 x 1/2" x 110.7 | 8 x 1/2" x 117.9 |
| | 28.5/28.5 | 0.250 | 111.9 | 8 x 1/4" x 105.0 | 8 x 1/2" x 226.8 |
| | 28.5/28.5 | 0.188 | 120.0 | 8 x 5/16" x 126.0 | |
| RF4-3 | 22.3/22.5 | 0.500 | 33.6 | 6 x 1/2" x 36.0 | 10 x 3/4" x 117.6 |
| | 22.3/22.5 | 0.250 | 111.6 | 10 x 5/8" x 145.5 | 10 x 5/8" x 120.0 |
| | 22.3/22.5 | 0.250 | 120.0 | 10 x 1/2" x 120.0 | 10 x 1/2" x 114.0 |
| | 22.3/22.5 | 0.188 | 120.0 | 10 x 3/8" x 114.0 | |

Note: Bearing Stiffeners to have 1/2" Fillet Weld BS Full Depth



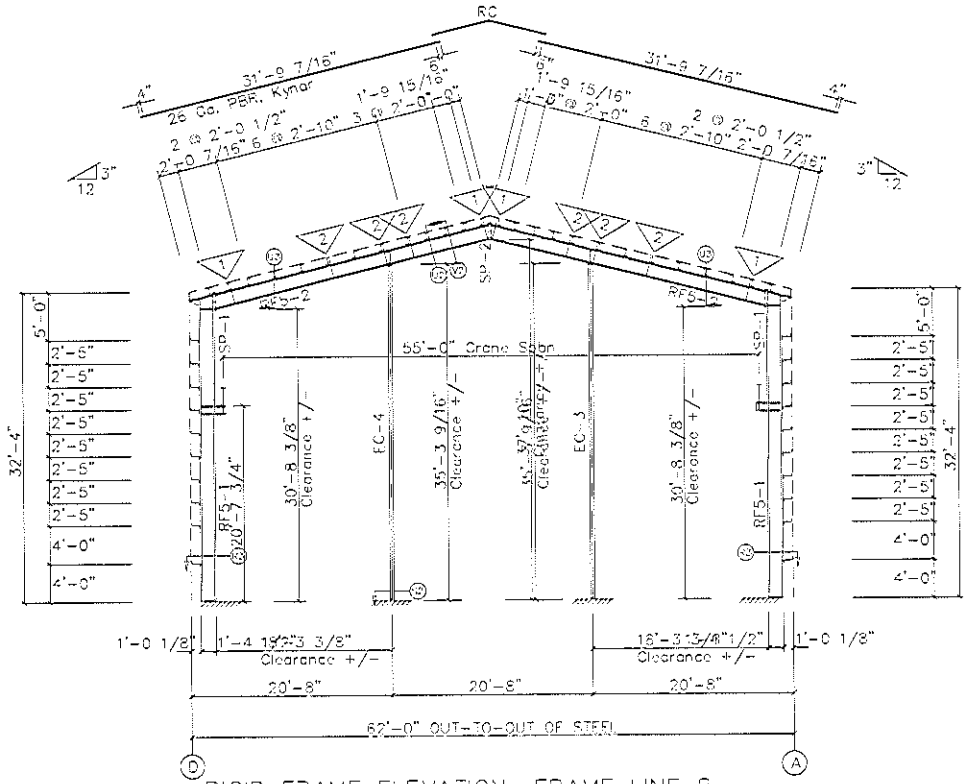

RIGID FRAME ELEVATION: FRAME LINE 5 6

| RED DOT CORPORATION | | |
|---|---|---|
| PROJECT | 62 | RIGID FRAME CROSS SECTION |
| ID | 14186-03 | DESIGN: DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | | | CAP PLATE BOLTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Qty Bot | Qty Int | Type | Dia | Length | Width | Thick | Length | | Mark | Qty | Type | Dia | Length |
| SP-1 | 4 | 4 | 2 | A325 | 3/4" | 2" | 1'-0" | 1/2" | 1'-11 1/2" | | EC-4 | 4 | A325 | 5/8" | 1 1/2" |
| SP-2 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-11 1/2" | | EC-3 | 4 | A325 | 5/8" | 1 1/2" |

| FLANGE BRACE TABLE FRAME LINE 8 | | | | |
|---|---|---|---|---|
| ▽ID | SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB40 | L2x2x1/8 | 2'-4" |
| 2 | 1 | FB35 | L2x2x1/8 | 3'-4" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF5-1 | 15.5/15.5 | 0.250 | 120.0 | 12 x 1/2" x 234.0 | 12 x 1/2" x 234.0 |
| | 15.5/15.5 | 0.250 | 120.0 | 12 x 1/2" x 146.0 | 12 x 1/2" x 130.5 |
| | 15.5/15.5 | 0.250 | 130.0 | 5 x 1/4" x 28.9 | |
| | 15.5/15.5 | 0.250 | 24.0 | | |
| RF5-2 | 15.5/15.5 | 0.135 | 120.0 | 5 x 1/4" x 230.1 | 5 x 1/4" x 178.0 |
| | 15.2/15.0 | 0.135 | 58.0 | 5 x 1/4" x 122.9 | 5 x 1/4" x 118.8 |
| | 15.0/15.0 | 0.135 | 118.9 | | 5 x 1/4" x 56.1 |
| | 15.0/15.5 | 0.135 | 60.1 | | |
| EC-4 | W16X6X35 | | | | |
| EC-3 | W16X6X35 | | | | |




RIGID FRAME ELEVATION: FRAME LINE 8

| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 82 | RIGID FRAME CROSS SECTION | | |
| ID | 14186-03 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

Note: Crane Brackets @ Frame Lines 4 & 7 to be located at the bottom of the RB-5's. Use 1/8" Punched Shim Plate on half of the Bracket at these Lines to accommodate the depth difference between the RB-5 and RB- 4 & 6

| MEMBER TABLE | | |
|---|---|---|
| Mark | Part | Length |
| RB-1 | 21W44C10 | 26'-6 5/8" |
| RB-2 | 21W44C10 | 26'-8 5/8" |
| RB-3 | 21W44C10 | 19'-11 3/4" |
| RB-4 | 21W44C10 | 15'-11 3/4" |
| RB-5 | 21W50C10 | 33'-11 3/4" |
| RB-6 | 21W44C10 | 9'-8 5/8" |
| RB-7 | 21W44C10 | 6'-8 5/8" |

| ANGLE TABLE | |
|---|---|
| ◇(1) | Mark |
| 1 | CA-1 |
| 2 | CA-2 |
| 3 | CA-3 |
| 4 | CA-4 |
| 5 | CA-5 |
| 6 | CA-6 |
| 7 | CA-7 |
| 8 | CA-8 |
| 9 | CA-9 |
| 10 | CA-10 |
| 11 | CA-11 |
| 12 | CA-12 |
| 13 | CA-13 |
| 14 | CA-14 |
| 15 | CA-15 |

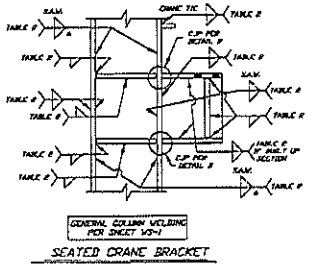
175'-0" OUT-TO-OUT OF STEEL

27'-0" | 20'-0" | 16'-0" | 34'-0" | 34'-0" | 34'-0" | 10'-0"

62'-0" OUT-TO-OUT OF STEEL

3'-6" | 20'-8" | 20'-8" | 55'-0" | 20'-8" | 3'-6"

Note: All Crane Brackets to be W21x44. Connect Crane Beams to Brackets with (4) 3/4" A325 B & N's

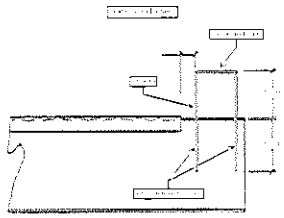



SEATED CRANE BRACKET

TABLE 2
GENERAL FILLET WELDS
VPS #6

| | ONE SIDE | BOTH SIDES |
|---|---|---|
| THINNER PLATE THICKNESS | FILLET SIZE | FILLET SIZE |
| UNDER 1/4 | 3/16 | 3/16 |
| 1/4 | 1/4 | 3/16 |
| 5/16 | 5/16 | 1/4 |
| OVER 5/16 | 5/16 | 5/16 |

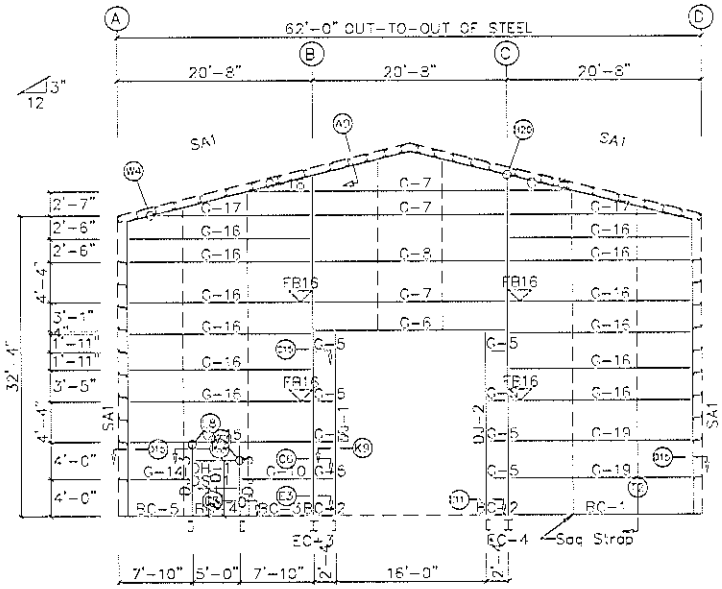
Crane System 1
Elevation: 22'-4 3/4



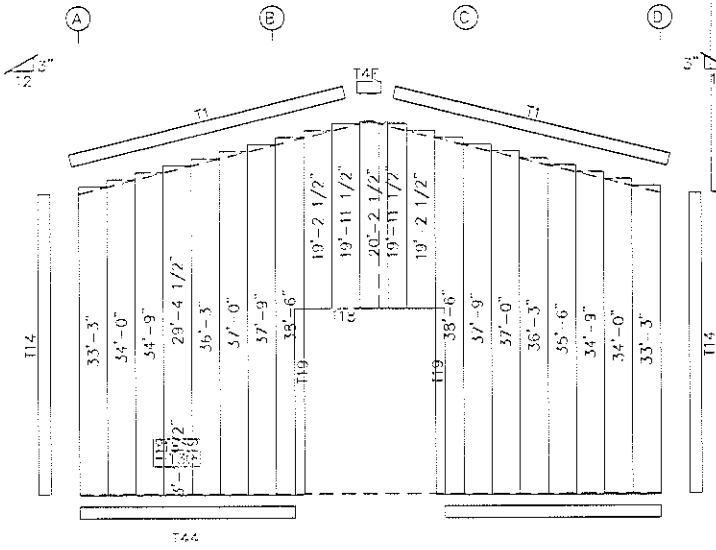
FRAME LINE DIMENSIONS

CRANE PLAN

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 52 | CRANE PLAN | |
| ID | 14180-02 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |




RIGHT ENDWALL FRAMING: FRAME LINE 8




RIGHT ENDWALL SHEETING & TRIM: FRAME LINE 8

PANELS: 26 Ga. PBR - Kynar

BOLT TABLE
FRAME LINE 8

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Columns/Rafters | 4 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE 8

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 1 | EC-3 | W16X6X35 | 35'-4 5/16" |
| 1 | EC-4 | W16X6X35 | 35'-4 5/16" |
| 1 | DJ-1 | C12x20.7 | 19'-11" |
| 1 | DJ-2 | C12x20.7 | 19'-11" |
| 2 | DJ-3 | 12X35C14 | 5'-0" |
| 1 | DH-1 | 12X35C14 | 5'-0" |
| 1 | DS-1 | 12X35C14 | 5'-0" |
| 8 | G-5 | 12X35Z14 | 1'-9 9/16" |
| 1 | G-6 | 12X35C12 | 20'-1 1/2" |
| 3 | G-7 | 12X35Z14 | 20'-1 1/2" |
| 1 | G-8 | 12X35Z12 | 20'-1 1/2" |
| 1 | G-10 | 12X35Z14 | 7'-3" |
| 1 | G-14 | 12X35Z14 | 5'-1 1/4" |
| 1 | G-15 | 12X35Z12 | 17'-11 3/4" |
| 12 | G-16 | 12X35Z14 | 17'-11 3/4" |
| 2 | G-17 | 12X35Z14 | 11'-5 9/16" |
| 2 | G-18 | 12X35Z14 | 1'-2 3/4" |
| 2 | G-19 | 12X35Z12 | 17'-11 3/4" |
| 1 | BC-1 | 12X35C14 | 19'-11 1/2" |
| 2 | BC-2 | 12X35C14 | 1'-8" |
| 1 | BC-3 | 12X35C14 | 7'-2" |
| 1 | BC-4 | 12X35C14 | 4'-1" |
| 1 | BC-5 | 12X35C14 | 6'-1 1/2" |

TRIM TABLE
FRAME LINE 8

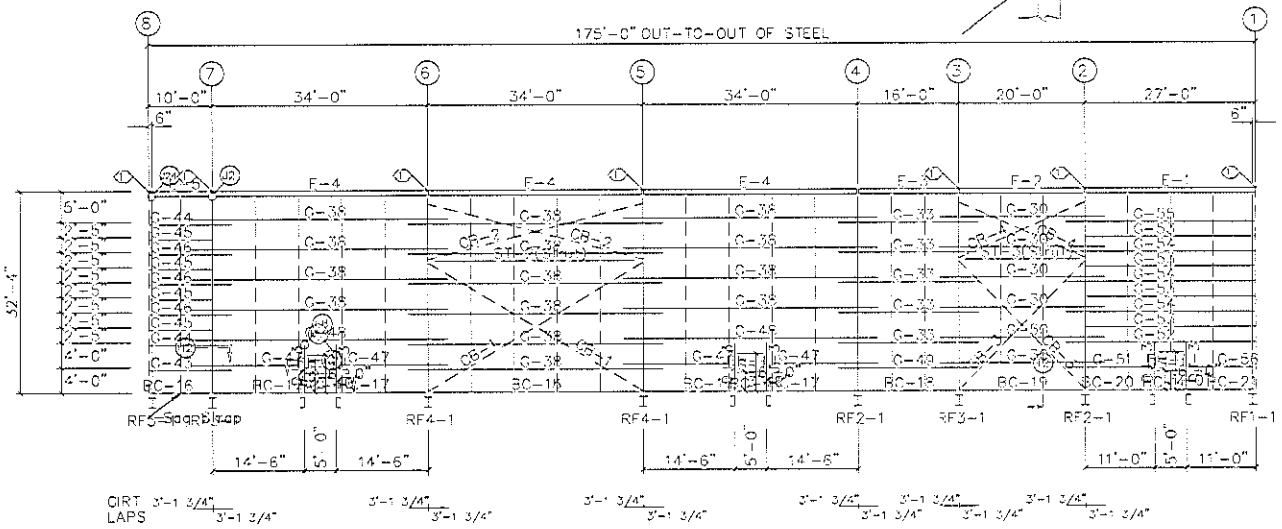
| QID | MARK | LENGTH |
|---|---|---|
| | T18 | 196.000 |
| | T19 | 241.000 |
| | T32 | 64.000 |
| | T18 | 64.000 |
| | T19 | 38.000 |
| | T4E | 18.000 |
| | T1 | 201.000 |
| | T14 | 196.000 |
| | T44 | 139.000 |

FLANGE BRACE TABLE
FRAME LINE 8

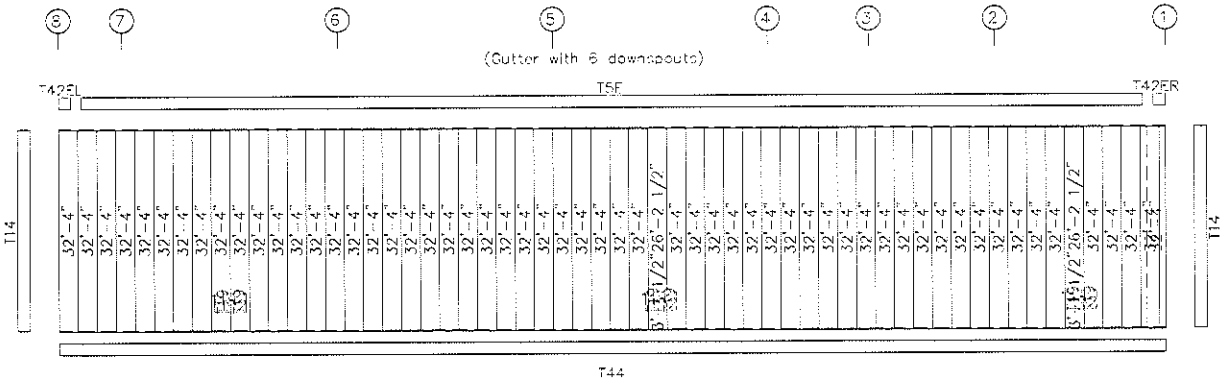
| VID | MARK | LENGTH |
|---|---|---|
| 1 | FB16 | 1'-4" |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | S2 | ENDWALL FRAMING | |
| ID | 14136-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

Note: All Rod Bracing to have 3/8" Backer Plates




BACK SIDEWALL FRAMING: FRAME LINE D




BACK SIDEWALL SHEETING & TRIM: FRAME LINE D

PANELS: 26 Ga. PBR - Kynar

Note on Approval Drawings: All Field Located Walk Doors are not to conflict with Sidewall Rod Bracing

BOLT TABLE
FRAME LINE D

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Strut | 4 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE D

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 6 | DJ-3 | 12X35C14 | 8'-0" |
| 3 | DH-1 | 12X35C14 | 5'-0" |
| 3 | DS-1 | 12X35C14 | 5'-0" |
| 1 | E-1 | 10 7/16" 14GA | 26'-11 1/2" |
| 1 | E-2 | 10 7/16" 14GA | 34'-11 1/2" |
| 1 | E-3 | 10 7/16" 14GA | 35'-11 1/2" |
| 3 | E-4 | 10 7/16" 14GA | 28'-11 1/2" |
| 1 | E-5 | 10 7/16" 14GA | 11'-11 1/2" |
| 5 | G-30 | 12X35Z14 | 26'-3 1/2" |
| 5 | G-35 | 12X35Z12 | 22'-3 1/2" |
| 14 | G-36 | 12X35Z12 | 40'-3 1/2" |
| 1 | G-43 | 12X35Z14 | 13'-1 1/2" |
| 2 | G-44 | 12X35Z12 | 13'-1 1/2" |
| 4 | G-45 | 12X35Z14 | 10'-3 1/2" |
| 3 | G-46 | 12X35Z12 | 13'-1 1/2" |
| 4 | G-47 | 12X35Z14 | 17'-4" |
| 2 | G-48 | 12X35Z12 | 40'-3 1/2" |
| 1 | G-49 | 12X35Z14 | 22'-3 1/2" |
| 1 | G-50 | 12X35Z12 | 26'-3 1/2" |
| 1 | G-51 | 12X35Z14 | 13'-10" |
| 1 | G-52 | 12X35Z12 | 30'-1 1/2" |
| 4 | G-53 | 12X35Z14 | 27'-3 1/2" |
| 3 | G-54 | 12X35Z14 | 30'-1 1/2" |
| 1 | G-55 | 12X35Z14 | 30'-1 1/2" |
| 1 | G-56 | 12X35Z14 | 10'-8" |
| 1 | ST-2 | P6X11 | 33'-11 3/4" |
| 1 | ST-3 | P5X15 | 19'-11 3/4" |
| 3 | BC-4 | 12X35C14 | 4'-11" |
| 1 | BC-14 | 12X35C14 | 30'-0" |
| 1 | BC-15 | 12X35C14 | 3'-11 1/2" |
| 1 | BC-16 | 12X35C14 | 9'-11 1/4" |
| 4 | BC-17 | 12X35C14 | 14'-1 3/4" |
| 1 | BC-18 | 12X35C14 | 15'-11 1/2" |
| 1 | BC-19 | 12X35C14 | 19'-11 1/2" |
| 1 | BC-20 | 12X35C14 | 10'-7 3/4" |
| 1 | BC-21 | 12X35C14 | 10'-7 1/2" |
| 2 | CB-1 | RD0875 | 39'-7" |
| 2 | CB-2 | RD0875 | 35'-7" |
| 2 | CB-3 | RD1000 | 28'-4" |
| 2 | CB-4 | RD0875 | 22'-5" |

SPECIAL BOLTS

| QTY | ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|---|
| | 1 | 2 | A325 | 1/2" | 1 1/4" | 2 |

TRIM TABLE
FRAME LINE D

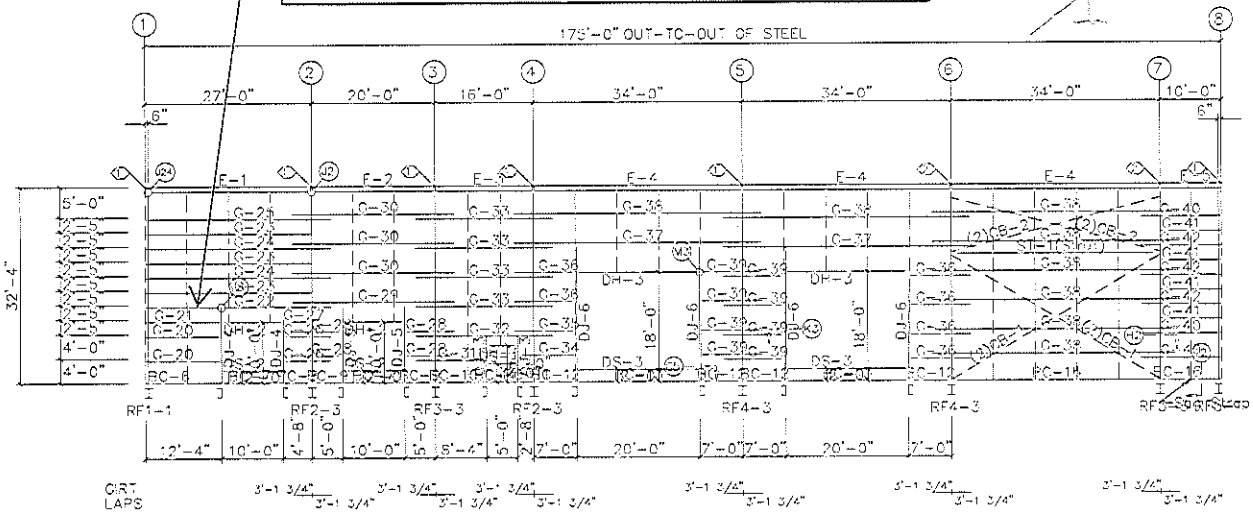
| QTY | MARK | LENGTH |
|---|---|---|
| | T32 | 64.000 |
| | T18 | 64.000 |
| | T19 | 38.000 |
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T5E | 236.000 |
| | T14 | 196.000 |
| | T44 | 236.000 |

RED DOT CORPORATION

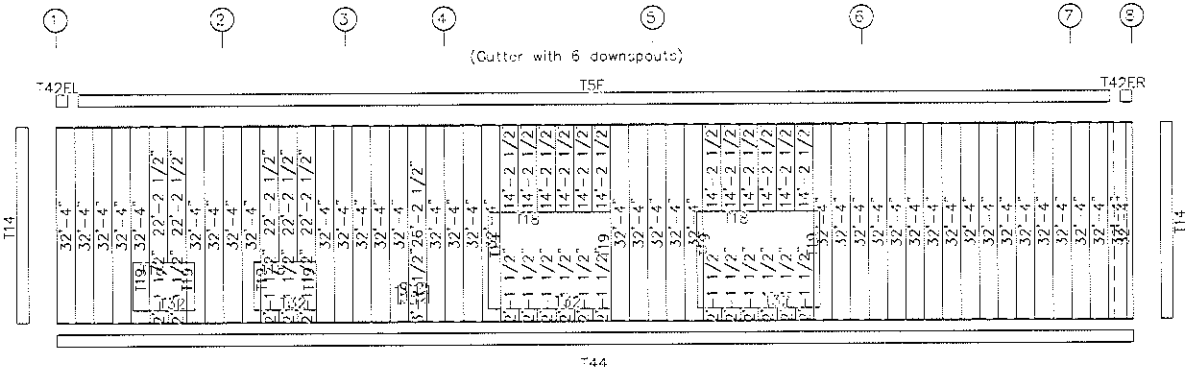
| | | | | |
|---|---|---|---|---|
| PROJECT | 62 | SIDEWALL FRAMING | | |
| ID | 14186-03 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

G - 22 to be Nested with 12x35Z14

Note: All Rod Bracing to have 3/8" Backer Plates




FRONT SIDEWALL FRAMING: FRAME LINE A




FRONT SIDEWALL SHEETING & TRIM: FRAME LINE A

PANELS: 26 Ga. PBR – Kynar

Note on Approval Drawings: All Field Located Walk Doors are not to conflict with Sidewall Rod Bracing

BOLT TABLE
FRAME LINE A

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Strut | 4 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE A

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 2 | DJ-3 | 12X35C14 | 8'-0" |
| 2 | DJ-4 | 12X35C14 | 12'-10" |
| 2 | DJ-5 | 12X35C14 | 12'-10" |
| 4 | DJ-6 | 12X35C14 | 22'-6" |
| 1 | DH-1 | 12X35C14 | 5'-0" |
| 2 | DH-2 | 12X35C14 | 10'-0" |
| 2 | DH-3 | 12X35C14 | 20'-0" |
| 1 | DS-1 | 12X35C14 | 5'-0" |
| 2 | DS-2 | 12X35C14 | 10'-0" |
| 2 | DS-3 | 12X35C14 | 20'-0" |
| 1 | E-1 | 10 7/16" 14GA | 33'-11 1/2" |
| 1 | E-2 | 10 7/16" 14GA | 33'-11 1/2" |
| 1 | E-3 | 10 7/16" 14GA | 33'-11 1/2" |
| 3 | E-4 | 10 7/16" 14GA | 33'-11 1/2" |
| 1 | E-5 | 10 7/16" 14GA | 33'-11 1/2" |
| 2 | G-20 | 12X35Z14 | 12'-0" |
| 1 | G-21 | 12X35Z14 | 12'-0" |
| 1 | G-22 | 12X35Z12 | 30'-1 1/2" |
| 3 | G-23 | 12X35Z14 | 27'-3 1/2" |
| 2 | G-24 | 12X35Z14 | 30'-1 1/2" |
| 1 | G-25 | 12X35Z14 | 30'-1 1/2" |
| 2 | G-26 | 12X35Z14 | 7'-6" |
| 1 | G-27 | 12X35Z14 | 4'-8" |
| 4 | G-28 | 12X35Z14 | 7'-10" |
| 1 | G-29 | 12X35Z12 | 26'-3 1/2" |
| 3 | G-30 | 12X35Z14 | 26'-3 1/2" |
| 1 | G-31 | 12X35Z14 | 11'-2" |
| 1 | G-32 | 12X35Z12 | 22'-3 1/2" |
| 4 | G-33 | 12X35Z12 | 22'-3 1/2" |
| 1 | G-34 | 12X35Z14 | 9'-0 1/2" |
| 1 | G-35 | 12X35Z12 | 9'-10" |
| 6 | G-36 | 12X35Z12 | 9'-10" |
| 2 | G-37 | 12X35Z12 | 40'-3 1/2" |
| 8 | G-38 | 12X35Z12 | 40'-3 1/2" |
| 8 | G-39 | 12X35Z14 | 9'-10" |
| 3 | G-40 | 12X35Z12 | 13'-1 1/2" |
| 4 | G-41 | 12X35Z14 | 10'-3 1/2" |
| 3 | G-42 | 12X35Z12 | 13'-1 1/2" |
| 1 | ST-1 | P6X13 | 33'-11 3/4" |
| 1 | BC-4 | 12X35C14 | 4'-11" |
| 1 | BC-6 | 12X35C14 | 11'-11 1/2" |
| 2 | BC-7 | 12X35C14 | 9'-11" |
| 1 | BC-8 | 12X35C14 | 4'-3 3/4" |
| 2 | BC-9 | 12X35C14 | 4'-7 3/4" |
| 1 | BC-10 | 12X35C14 | 7'-11 3/4" |
| 1 | BC-11 | 12X35C14 | 2'-3 3/4" |
| 4 | BC-12 | 12X35C14 | 6'-7 3/4" |
| 2 | BC-13 | 12X35C14 | 19'-11" |
| 1 | BC-14 | 12X35C14 | 30'-0" |
| 1 | BC-15 | 12X35C14 | 3'-11 1/2" |
| 1 | BC-16 | 12X35C14 | 9'-11 1/4" |
| 4 | CB-1 | RD0875 | 39'-7" |
| 4 | CB-2 | RD0875 | 35'-7" |

SPECIAL BOLTS

| O ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 1 | 2 | A325 | 1/2" | 1 1/4" | 2 |
| 2 | 2 | A325 | 1/2" | 1 1/2" | 2 |

| | |
|---|---|
| PROJECT | 62 |
| ID | 14186-03 |
| PROJECT ADDRESS | |

RED DOT CORPORATION

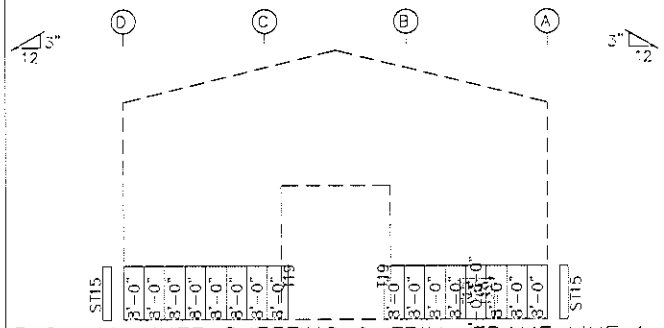
SIDEWALL FRAMING

SECTION: DR244.000 CHECK:

DATE: 3/28/14 194.000 SHEET OF

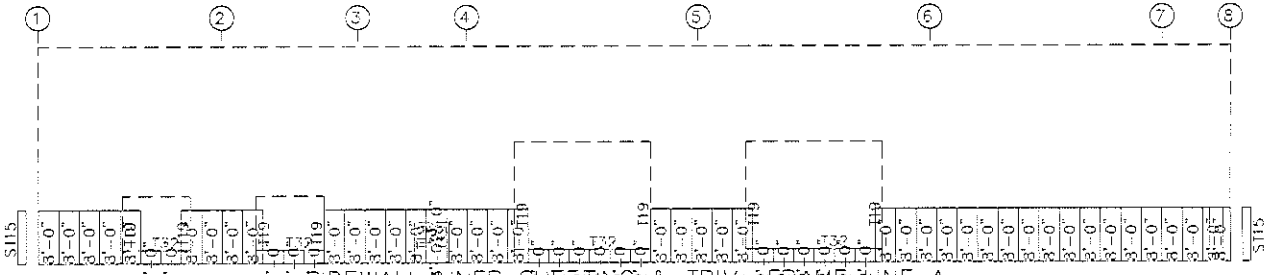
TRIM TABLE
FRAME LINE A

| QUAN | MARK | LENGTH |
|---|---|---|
| | T32 | 64.000 |
| | T18 | 64.000 |
| | T19 | 38.000 |
| | T32 | 124.000 |
| | T18 | 124.000 |
| | T19 | 98.000 |
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T5F | 230.000 |
| | T14 | 195.000 |
| | T44 | 235.000 |



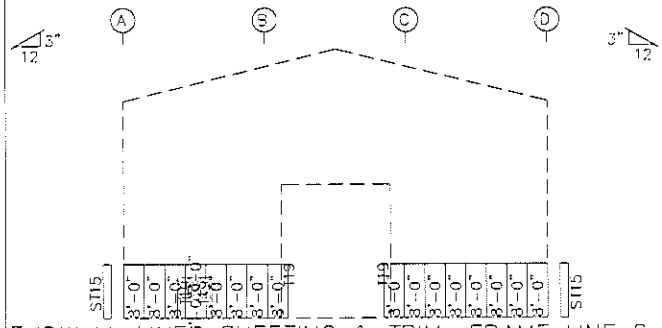

ENDWALL LINER SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. REV U – Kynar



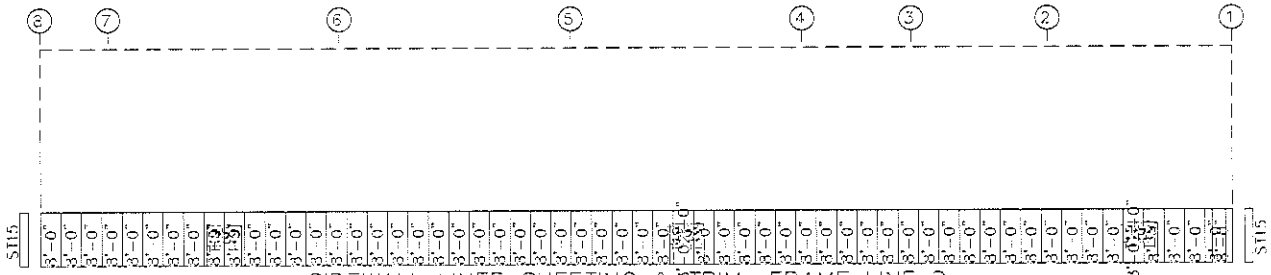

SIDEWALL LINER SHEETING & TRIM: FRAME LINE A

PANELS: 26 Ga. REV U – Kynar




ENDWALL LINER SHEETING & TRIM: FRAME LINE 8

PANELS: 26 Ga. REV U – Kynar




SIDEWALL LINER SHEETING & TRIM: FRAME LINE D

PANELS: 26 Ga. REV U – Kynar

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 62'x 175'x 32'-4" | WALL LINER PANEL | |
| ID | 14186-03 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

RED DOT BUILDINGS

Better building systems.
*You have our word on it*

# Letter of Certification

| | |
|---|---|
| Date: | June 27, 2014 |
| Customer: | C & H Buildings |
| Project: | (B) Maintenance Building |
| Project Address: | Watford City, McKenzie County, North Dakota 58854 |
| Red Dot Job Number: | 14186-02 |

| Building | Type | Width | Length | Eave Height | Roof Slope |
|---|---|---|---|---|---|
| A | DS | 70'-0" | 60'-0" | 24'-6" | 3:12 |

This is to certify that the above described building/buildings has/have been designed for the following loads and deflections:

**Design Notes:**

| | | | |
|---|---|---|---|
| Building Code | 2012 International Building Code | | |
| Dead Load | 2.0 psf – Weight of roof material such as panel, insulation and purlins | | |
| Collateral Load | 3.0 psf | | |
| Live Load | 20 psf – Reducible per applicable building code | | |
| Wind Speed | 120 mph – Ultimate | | |
| Exposure | C | Risk Category | II - Normal |
| Enclosure | Enclosed | | |
| Ground Snow | 30 psf | Importance Factor | 1.10 |
| Seismic | | | |
| Site Class | D | | |
| Design Category | A | Importance Factor | 1.25 |
| $S_S$ | 0.0730 | $S_{DS}$ | 0.0779 |
| $S_1$ | 0.0260 | $S_{D1}$ | 0.0416 |
| $C_S$ | 0.0100 | | |
| Transverse SFRS | OSMF R=3 | | |
| Longitudinal SFRS | OSCBF/OSMF R=3 | | |
| Analysis Procedure | Equivalent Lateral Force | | |

Bridge Crane: (1) 1 Ton Top Running Bridge Crane in Center Module

| Building | Drift – Lateral and Longitudinal | Vertical Frame | | Purlin Deflection | | Girt Deflection | Panel Deflection |
|---|---|---|---|---|---|---|---|
| | | Live Load | Total Load | Live Load | Total Load | | |
| A | H/100 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |

Loads are applied in accordance with the 2006 MBMA Low Rise Systems Manual and/or the 2012 Edition of the International Building Code. Design is in accordance with the applicable sections of the 2005 AISC and 2007 NAUS specifications.

It is the responsibility of the buyer to protect all openings from wind-borne debris during high wind load conditions. All wall framing by others and overhead doors are required to be wind load rated to wind speed and exposure specified above, to ensure "enclosed building" conditions are maintained

This certification is limited to the design of the metal building components and specifically excludes an analysis of the foundation and parts that may be supplied by anyone other than Red Dot Buildings located in Athens, TX. This certification is for design only, no inspection or supervision is implied.

JOHN D. STARK REGISTERED PROFESSIONAL PE 2567 ENGINEER NORTH DAKOTA

**State of North Dakota**
**Registered Professional Engineer**
**Red Dot Corporation**

RED DOT BUILDINGS

P.O. Box 1240

Athens, Texas 75751

(800) 657 – 2234

# PEMB Calculations

# Job No. 14186-02

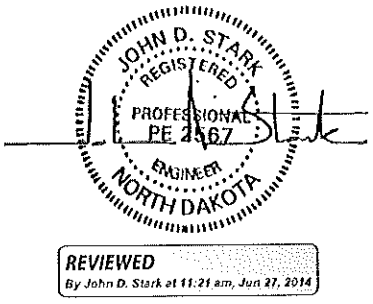
# C & H Buildings

# Maintenance Building

# Watford City

# McKenzie County

# North Dakota



PEMB DESIGN CALCULATIONS

FOR

C & H Buildings

70'x 60'x 21'- 3"

14186-02R1A

BUILDING LAYOUT

Width (ft)= 70.0

Length (ft)= 60.0

Eave Height (ft)= 21.3/ 21.3

Roof Slope (rise/12 )= 3.00/ 3.00

BUILDING LOADS

Roof Dead Load (psf )= 2.0

Wall Dead Load

Left Endwall (psf )= 2.0

Right Endwall (psf )= 2.0

Front Sidewall(psf )= 2.0

Back Sidewall(psf )= 2.0

Roof Live Load (psf )= 20.0

Frame Live Load (psf )= 12.0

Collateral Load (psf )= 2.0

Snow Load (psf )= 23.1

Wind Speed (mph )= 120.0

Wind Code = IBC 12

Closed/Open = C

Exposure = C

Internal Wind Coeff = -0.18, +0.18

Risk Category = II - Normal

Importance - Seismic = 1.25

Seismic Design Category= A

==========

14186-02R1 Design Loads For Building Components: 6/26/14 4:20pm

==========

FRONT SIDEWALL:

---

BASIC LOADS:

| Basic Wind | -----Edge_Strip_Ratio----- Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 29.6 | 0.40 | 1.00 | 6.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long | |
|---|---|---|---|
| 33.1 | -36.5 | | .. Girt/Header |
| 40.2 | -43.6 | | .. Panel |
| 32.4 | -35.4 | | .. Jamb |
| 51.1 | -34.1 | | .. Parapet |

BACK SIDEWALL:

---

BASIC LOADS:

| Basic Wind | -----Edge_Strip_Ratio----- Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 34.1 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long | |
|---|---|---|---|
| 33.1 | -36.5 | | .. Girt/Header |
| 40.2 | -43.6 | | .. Panel |
| 32.4 | -35.4 | | .. Jamb |
| 51.1 | -34.1 | | .. Parapet |

LEFT ENDWALL:

---

BASIC LOADS:

| | | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Zone Factor | Width | Girt | Col/ Panel Jamb |
| 2.0 | 2.0 | 20.0 | 23.1 | 0.0 | 34.1 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 1.07 |

BASIC LOADS AT EAVE:

| Seis Load | ---Torsion--- Wind | Seismic |
|---|---|---|
| 0.00 | 0.00 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 32.4 | -35.8 | .. Column |
| 33.1 | -36.5 | .. Girt/Header |
| 32.4 | -35.4 | .. Jamb |
| 40.2 | -43.6 | .. Panel |
| 51.1 | -34.1 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf | Wind_1 | | Wind_2 | | Wind_2 | | Long | Surface |
| Id | Left | Right | Left | Right | Left | Right | Wind | Friction |
| 1 | 0.50 | -0.70 | 0.86 | -0.34 | 0.50 | -0.70 | -0.63 | 0.00 |
| 2 | -1.19 | -0.77 | -0.83 | -0.41 | -1.19 | -0.77 | -0.87 | 0.00 |
| 3 | -0.77 | -1.19 | -0.41 | -0.83 | -0.77 | -1.19 | -0.87 | 0.00 |
| 4 | -0.70 | 0.50 | -0.34 | 0.86 | -0.70 | 0.50 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | | Wind_2 | | Long_Wind | | Column_Wind | | Long Tran | | Aux_Load |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 29 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| 2 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| 3 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| 4 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| 5 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | |
| 6 | | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 7 | | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 8 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 9 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 10 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 11 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |
| 12 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 | |

13 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0 0.00

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0 0.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00 0 0.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0 0.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

22 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

23 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

24 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

25 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

26 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

27 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

28 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

29 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

RAFTER DESIGN LOADS:

| Load | | --Add_Snow- | | | | Wind_1 | Wind_2 | Long | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis | Id | Coef |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 2 | 1.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| | 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| | 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| | 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| | 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 31 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 32 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 37 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux | | No. | Add_Load | |
|---|---|---|---|---|---|
| Aux | Id | Name | Load | Id | Coeff |
| 4 | 1 | LWIND1_L | 1 | 1 | 1.00 |
| | 2 | LWIND1_R | 1 | 2 | 1.00 |
| | 3 | LWIND2_L | 1 | 1 | 1.00 |
| | 4 | LWIND2_R | 1 | 2 | 1.00 |

ADDITIONAL LOADS:

| No. Add | Loc | Basic Load | | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|---|---|
| Add | Id | Id | Load | Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 6 | 1 | 2 | U_WIND | D | 0.13 | 0.13 | 0.00 | 0.00 | 12.00 | |
| | 2 | 3 | U_WIND | D | 0.13 | 0.13 | 0.00 | 24.08 | 36.08 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 2 | WINDL1 | D | -0.14 | -0.14 | 0.00 | 35.00 | 36.08 | |
| 4 | 2 | WINDL2 | D | -0.14 | -0.14 | 0.00 | 35.00 | 36.08 | |
| 5 | 3 | WINDR1 | D | -0.14 | -0.14 | 0.00 | 0.00 | 1.08 | |
| 6 | 3 | WINDR2 | D | -0.14 | -0.14 | 0.00 | 0.00 | 1.08 | |

RIGHT ENDWALL:

---

BASIC LOADS:

| | | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Col/ Panel Jamb |
| 2.0 | 2.0 | 20.0 | 23.1 | 0.0 | 34.1 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 1.07 |

BASIC LOADS AT EAVE:

| Seis Load | ---Torsion--- Wind | Seismic |
|---|---|---|
| 0.00 | 0.00 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 32.4 | -35.8 | .. Column |
| 33.1 | -36.5 | .. Girt/Header |
| 32.4 | -35.4 | .. Jamb |
| 40.2 | -43.6 | .. Panel |
| 51.1 | -34.1 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf Id | Wind_1 Left | Right | Wind_2 Left | Right | Wind_2 Left | Right | Long Wind | Surface Friction |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.50 | -0.70 | 0.86 | -0.34 | 0.50 | -0.70 | -0.63 | 0.00 |
| 2 | -1.19 | -0.77 | -0.83 | -0.41 | -1.19 | -0.77 | -0.87 | 0.00 |
| 3 | -0.77 | -1.19 | -0.41 | -0.83 | -0.77 | -1.19 | -0.87 | 0.00 |
| 4 | -0.70 | 0.50 | -0.34 | 0.86 | -0.70 | 0.50 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | Wind_2 | Long_Wind | | Column_Wind | | Long Tran | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 29 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| 2 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| 3 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| 4 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| 5 | | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| 6 | | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 7 | | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 8 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 9 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 10 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 11 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 12 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 13 | | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 |
| 14 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 |
| 0.00 | | | | | | | | | | | | | | | | | | | | |

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0 0.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00 0 0.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0 0.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

22 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

23 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

24 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

25 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

26 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

27 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

28 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

29 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

RAFTER DESIGN LOADS:

| Load | | --Add_Snow- | | | | Wind_1 | Wind_2 | Long | Aux_Load | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis Id | Coef |
| 50 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1 | 1.00 |
| 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 2 | 1.00 |
| 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux | Aux | No. | Add_Load |
|---|---|---|---|---|
| Aux | Id | Name | Load | Id | Coeff |
| 4 | 1 | LWIND1_L | 1 | 1 | 1.00 |
| | 2 | LWIND1_R | 1 | 2 | 1.00 |
| | 3 | LWIND2_L | 1 | 1 | 1.00 |
| | 4 | LWIND2_R | 1 | 2 | 1.00 |

ADDITIONAL LOADS:

| No. Add | Loc | Basic Load | | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|---|---|
| Add | Id | Id | Load | Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 6 | 1 | 2 | U_WIND | D | 0.13 | 0.13 | 0.00 | 0.00 | 12.00 | |
| | 2 | 3 | U_WIND | D | 0.13 | 0.13 | 0.00 | 24.08 | 36.08 | |
| | 3 | 2 | WINDL1 | D | -0.07 | -0.07 | 0.00 | 35.00 | 36.08 | |
| | 4 | 2 | WINDL2 | D | -0.07 | -0.07 | 0.00 | 35.00 | 36.08 | |
| | 5 | 3 | WINDR1 | D | -0.07 | -0.07 | 0.00 | 0.00 | 1.08 | |
| | 6 | 3 | WINDR2 | D | -0.07 | -0.07 | 0.00 | 0.00 | 1.08 | |

ROOFDES:

---

BASIC LOADS:

| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Surface Factor | Seis Friction | % Factor | Snow |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.0 | 2.0 | 20.0 | 23.1 | 0.0 | 34.1 | 0.70 | 1.00 | 0.00 | 1.000 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Suct_Roof | |
|---|---|---|---|
| 16.3 | -33.4 | | .. Purlins |
| 0.0 | -74.9 | | .. Gable Extensions |
| 23.2 | -36.8 | | .. Panels |
| 19.8 | -3.7 | -23.5 | .. Long Bracing, Building |
| 26.9 | -8.5 | | .. Long Bracing, Wall Edge Zone |
| 51.1 | -34.1 | 27.2 | .. Long Bracing, Facia/Parapet |

EDGE & CORNER ZONE WIND:

| Wind Id | Surf Id | No. Zone | Zone | --Purlin--- Id | Width | Length | ---Panel--- Press | Suct | Press | Suct |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 9 | 1 | | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | | | 3 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | | 4 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | | 5 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | | 6 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | | 7 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | | 8 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | | 9 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | | 10 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| 3 | 9 | 1 | | | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 4 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 5 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 6 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 7 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 8 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 9 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 10 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |

EDGE & CORNER ZONE WIND: LONGITUDINAL

| Wind Id | Surf Id | No. Zone | Zone Id | Purlin Width | Purlin Length | Suct |
|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 |

PURLIN DESIGN LOADS:

| Surf Id | --Load- No. | Id | Dead | Coll | Live | --Add_Snow- Snow | Drift | Slide | Wind Rain | Wind Press | Suct | Aux_Load Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 16 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 14 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | 15 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | 16 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 3 | 16 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| | | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| | | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| | | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0 | 0.00 |
| | | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | | 14 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | | 15 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | | 16 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |

BRACING DESIGN LOADS:

| --Load- | | | | | --Add_Snow- | | | Wind | Wind | Seis | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Press | Suct | Load | Id | Coef |
| 11 | 1 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux | No. | Add_Load | |
|---|---|---|---|---|
| Aux Id | Name | Load | Id | Coef |
| 5 1 | PAT_SL_1 | 1 | 1 | 0.50 |
| 2 | PAT_SL_2 | 1 | 3 | 0.50 |
| 3 | PAT_SL_3 | 2 | 1 | 0.50 |
| | | 2 | | 0.50 |
| 4 | PAT_SL_4 | 2 | 2 | 0.50 |
| | | 3 | | 0.50 |
| 5 | UNB_SL | 4 | 4 | 1.00 |
| | | 5 | | 0.79 |
| | | 6 | | 1.00 |
| | | 7 | | 0.79 |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Load | Load Type | Fy W1 | W2 | Dx Dx1 | Dx2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|
| 7 1 | 0 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 20.0 | |
| 2 | 0 | U_SNOW | D | -23.1 | -23.1 | 20.0 | 40.0 | |
| 3 | 0 | U_SNOW | D | -23.1 | -23.1 | 40.0 | 60.0 | |
| 4 | 2 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 36.1 | |
| 5 | 2 | U_SNOW | D | -23.1 | -23.1 | 25.2 | 36.1 | |
| 6 | 3 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 36.1 | |
| 7 | 3 | U_SNOW | D | -23.1 | -23.1 | 0.0 | 10.9 | |

RIGID FRAME #1:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 2.0 | 12.0 | 23.1 | 0.0 | 34.0 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |
| 3 | -0.80 | -1.25 | -0.44 | -0.89 | -0.87 | -0.51 | 0.00 |
| 4 | -0.73 | 0.54 | -0.37 | 0.90 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 134 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 |

10 1.00 1.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

11 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

12 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

13 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 5 1.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 6 1.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00

22 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 5 1.00

28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 6 1.00

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 5 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 6 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 7 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 8 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 7 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 8 1.00

35 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75

40 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75

41 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75

42 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75
43 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75
44 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75
45 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75
46 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 8 0.75
47 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
48 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
49 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
50 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
51 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
52 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
53 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
54 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
55 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00
56 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00
57 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00
58 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00
59 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75
60 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75
61 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75
62 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75
63 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75
64 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75
65 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75
66 1.00 1.00 0.00 0.75 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75
67 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 5 0.75
68 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 6 0.75
69 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 5 0.75
70 1.00 1.00 0.00 0.75 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 6 0.75
71 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 7 0.75
72 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 8 0.75
73 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 7 0.75

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 75 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 76 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 77 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 78 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 79 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 80 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 81 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 82 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 83 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 84 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 85 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 86 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 87 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 88 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 89 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 90 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 91 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 92 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 93 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 94 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 95 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 96 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0.00 | 0 | 0.00 |
| 97 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 98 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 99 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 100 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| 101 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| 102 | 1.00 | 1.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| 103 | 1.00 | 1.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 104 | 1.00 | 1.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| 105 | 1.00 | 1.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

125 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

126 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 14 1.00

127 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

128 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

129 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

130 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

131 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

132 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 11 1.00

133 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

134 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 12 1.00

AUXILIARY LOADS:

No. Aux Aux No. Add_Load

| Aux | Id | Name | Load | Id | Coeff |
|---|---|---|---|---|---|
| 14 | 1 | F1CRANEA1 | 4 | 1 | -3.68 |
| | | | 2 | 0.21 | |
| | | | 3 | -1.57 | |
| | | | 4 | 0.21 | |
| | 2 | F1CRANEA2 | 4 | 1 | -3.68 |
| | | | 2 | -0.21 | |
| | | | 3 | -1.57 | |
| | | | 4 | -0.21 | |
| | 3 | F1CRANEA3 | 4 | 1 | -1.57 |
| | | | 2 | 0.21 | |
| | | | 3 | -3.68 | |
| | | | 4 | 0.21 | |
| | 4 | F1CRANEA4 | 4 | 1 | -1.57 |
| | | | 2 | -0.21 | |
| | | | 3 | -3.68 | |
| | | | 4 | -0.21 | |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |
| | 7 | LWIND2_L2E | 1 | 5 | 1.00 |
| | 8 | LWIND2_R2E | 1 | 6 | 1.00 |
| | 9 | F1PAT_LL_1 | 3 | 27 | 1.00 |
| | | | 28 | 1.00 | |
| | | | 29 | 1.00 | |
| | 10 | F1PAT_LL_2 | 3 | 28 | 1.00 |
| | | | 29 | 1.00 | |
| | | | 30 | 1.00 | |
| | 11 | F1PAT_LL_3 | 2 | 27 | 1.00 |
| | | | 30 | 1.00 | |
| | 12 | F1PAT_LL_4 | 2 | 28 | 1.00 |
| | | | 29 | 1.00 | |
| | 13 | F1UNB_SL_L | 3 | 31 | 0.30 |

| | | | | |
|---|---|---|---|---|
| | | 32 | 1.00 | |
| | | 33 | 0.79 | |
| 14 | F1UNB_SL_R | 3 | 32 | 0.30 |
| | | 31 | 1.00 | |
| | | 34 | 0.79 | |

ADDITIONAL LOADS:

| No. Add Surf | Basic Load | Fx | Fy | Mom | Dx | Dy | .. Conc |
|---|---|---|---|---|---|---|---|
| Add Id Id | Type Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 34 1 1 | ------ I | 0.00 | 1.00 | 0.00 | 1.00 | 18.75 | |
| 2 1 | ------ I | 1.00 | 0.00 | 0.00 | 1.00 | 20.25 | |
| 3 2 | ------ I | 0.00 | 1.00 | 0.00 | -1.00 | 18.75 | |
| 4 2 | ------ I | 1.00 | 0.00 | 0.00 | -1.00 | 20.25 | |
| 5 2 | U_WIND D | 0.13 | 0.13 | 0.000 | 0.00 | 12.00 | |
| 6 3 | U_WIND D | 0.13 | 0.13 | 0.000 | 24.08 | 36.08 | |
| 7 2 | WINDL1 D | -0.16 | -0.16 | 0.000 | 35.00 | 36.08 | |
| 8 2 | WINDL2 D | -0.16 | -0.16 | 0.000 | 35.00 | 36.08 | |
| 9 3 | WINDR1 D | -0.16 | -0.16 | 0.000 | 0.00 | 1.08 | |
| 10 3 | WINDR2 D | -0.16 | -0.16 | 0.000 | 0.00 | 1.08 | |
| 11 3 | DEAD CF | 0.00 | -6.48 | 0.00 | 0.00 | 10.73 | |
| 12 3 | COLLAT CF | 0.00 | -0.19 | 0.00 | 0.00 | 10.73 | |
| 13 3 | FLOOR CF | 0.00 | -9.50 | 0.00 | 0.00 | 10.73 | |
| 14 4 | DEAD CF | 0.00 | -7.01 | 0.00 | 0.00 | 10.73 | |
| 15 4 | COLLAT CF | 0.00 | -0.21 | 0.00 | 0.00 | 10.73 | |
| 16 4 | FLOOR CF | 0.00 | -10.32 | 0.00 | 0.00 | 10.73 | |
| 17 3 | DEAD CR | 0.00 | -0.69 | 0.00 | 0.00 | 10.94 | |
| 18 3 | COLLAT CR | 0.00 | -0.02 | 0.00 | 0.00 | 10.94 | |
| 19 3 | FLOOR CR | 0.00 | -0.86 | 0.00 | 0.00 | 10.94 | |
| 20 3 | SEIS CR | 0.28 | 0.00 | 0.00 | 0.00 | 10.94 | |
| 21 4 | DEAD CL | 0.00 | -0.69 | 0.00 | 0.00 | 10.94 | |
| 22 4 | COLLAT CL | 0.00 | -0.02 | 0.00 | 0.00 | 10.94 | |
| 23 4 | FLOOR CL | 0.00 | -0.86 | 0.00 | 0.00 | 10.94 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24 | 4 | SEIS | CL | 0.24 | 0.00 | 0.00 | 0.00 | 10.94 | |
| 25 | 3 | LSEIS | CF | 0.00 | 0.31 | 0.00 | 0.00 | 10.73 | |
| 26 | 4 | LSEIS | CF | 0.00 | 0.31 | 0.00 | 0.00 | 10.73 | |
| 27 | 2 | U_LIVE | D | -0.12 | -0.12 | 0.250 | 0.00 | 15.46 | |
| 28 | 2 | U_LIVE | D | -0.12 | -0.12 | 0.250 | 15.46 | 36.08 | |
| 29 | 3 | U_LIVE | D | -0.12 | -0.12 | -0.250 | 0.00 | 15.46 | |
| 30 | 3 | U_LIVE | D | -0.12 | -0.12 | -0.250 | 15.46 | 36.08 | |
| 31 | 3 | U_SNOW | D | -0.22 | -0.22 | -0.250 | 0.00 | 36.08 | |
| 32 | 2 | U_SNOW | D | -0.22 | -0.22 | 0.250 | 0.00 | 36.08 | |
| 33 | 2 | U_SNOW | D | -0.22 | -0.22 | 0.250 | 25.21 | 36.08 | |
| 34 | 3 | U_SNOW | D | -0.22 | -0.22 | -0.250 | 0.00 | 10.86 | |

RIGID FRAME #2:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 2.0 | 12.0 | 23.1 | 0.0 | 34.0 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |
| 3 | -0.61 | -0.87 | -0.25 | -0.51 | -0.87 | -0.51 | 0.00 |
| 4 | -0.55 | 0.30 | -0.19 | 0.66 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 134 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 5 | | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 6 | | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 5 | | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 6 | | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 7 | | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 8 | | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 7 | | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 8 | | 1.00 |
| | 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | | 0.00 |
| | 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 5 | | 1.00 |
| | 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 6 | | 1.00 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 30 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 31 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 32 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 33 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 34 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 35 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 36 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 37 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 38 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 39 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 42 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 43 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 44 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 45 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 46 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 47 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 48 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 49 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 50 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 51 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 52 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 53 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 54 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 55 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 56 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 57 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 58 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 59 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 60 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 62 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 63 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 64 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 65 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 66 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 67 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 68 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 69 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 70 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 71 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 72 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 73 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 74 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 75 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 76 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 77 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 78 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 79 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 80 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 81 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 7 | 0.75 |
| 82 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0.00 | 0.00 | 0.00 | 8 | 0.75 |
| 83 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 84 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 85 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 86 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 87 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 88 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 89 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 90 | 0.60 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 91 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0 | 0.00 |
| 92 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0.00 | 0 | 0.00 |

93 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

100 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

101 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

102 1.00 1.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

103 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

104 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

105 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

106 1.00 1.00 0.00 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

107 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

108 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

109 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

110 1.00 1.00 0.00 0.00 0.56 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

111 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

112 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

113 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

114 1.00 1.00 0.00 0.00 0.56 0.00 0.56 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

115 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

116 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 1 1.00

117 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2 1.00

118 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 2 1.00

119 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

120 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 3 1.00

121 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 1.00

122 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00 0.00 4 1.00

123 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

124 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 13 1.00

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 125 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14 | 1.00 |
| 126 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14 | 1.00 |
| 127 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 128 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 129 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |
| 130 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |
| 131 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11 | 1.00 |
| 132 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11 | 1.00 |
| 133 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12 | 1.00 |
| 134 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12 | 1.00 |

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Add_Load Coeff |
|---|---|---|---|---|---|
| 14 | 1 | F2CRANEA1 | 4 | 1 | -4.10 |
| | | | 2 | | 0.21 |
| | | | 3 | | -1.98 |
| | | | 4 | | 0.21 |
| | 2 | F2CRANEA2 | 4 | 1 | -4.10 |
| | | | 2 | | -0.21 |
| | | | 3 | | -1.98 |
| | | | 4 | | -0.21 |
| | 3 | F2CRANEA3 | 4 | 1 | -1.98 |
| | | | 2 | | 0.21 |
| | | | 3 | | -4.10 |
| | | | 4 | | 0.21 |
| | 4 | F2CRANEA4 | 4 | 1 | -1.98 |
| | | | 2 | | -0.21 |
| | | | 3 | | -4.10 |
| | | | 4 | | -0.21 |
| | 5 | LWIND1_L2E | 1 | 5 | 1.00 |
| | 6 | LWIND1_R2E | 1 | 6 | 1.00 |

| | | | |
|---|---|---|---|
| 7 | LWIND2_L2E | 1 | 5 1.00 |
| 8 | LWIND2_R2E | 1 | 6 1.00 |
| 9 | F2PAT_LL_1 | 3 | 25 1.00 |
| | | | 26 1.00 |
| | | | 27 1.00 |
| 10 | F2PAT_LL_2 | 3 | 26 1.00 |
| | | | 27 1.00 |
| | | | 28 1.00 |
| 11 | F2PAT_LL_3 | 2 | 25 1.00 |
| | | | 28 1.00 |
| 12 | F2PAT_LL_4 | 2 | 26 1.00 |
| | | | 27 1.00 |
| 13 | F2UNB_SL_L | 3 | 29 0.30 |
| | | | 30 1.00 |
| | | | 31 0.79 |
| 14 | F2UNB_SL_R | 3 | 30 0.30 |
| | | | 29 1.00 |
| | | | 32 0.79 |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 1 | 1 | ------ | I | 0.00 | 1.00 | 0.00 | 1.00 | 18.75 |
| 2 | 1 | 1 | ------ | I | 1.00 | 0.00 | 0.00 | 1.00 | 20.25 |
| 3 | 2 | 1 | ------ | I | 0.00 | 1.00 | 0.00 | -1.00 | 18.75 |
| 4 | 2 | 1 | ------ | I | 1.00 | 0.00 | 0.00 | -1.00 | 20.25 |
| 5 | 2 | 2 | U_WIND | D | 0.26 | 0.26 | 0.000 | 0.00 | 12.00 |
| 6 | 3 | 2 | U_WIND | D | 0.26 | 0.26 | 0.000 | 24.08 | 36.08 |
| 7 | 2 | 2 | WINDL1 | D | -0.17 | -0.17 | 0.000 | 35.00 | 36.08 |
| 8 | 2 | 2 | WINDL2 | D | -0.17 | -0.17 | 0.000 | 35.00 | 36.08 |
| 9 | 3 | 2 | WINDR1 | D | -0.17 | -0.17 | 0.000 | 0.00 | 1.08 |
| 10 | 3 | 2 | WINDR2 | D | -0.17 | -0.17 | 0.000 | 0.00 | 1.08 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 3 | DEAD | CN | 0.00 | -6.64 | 0.00 | 0.00 | 10.73 |
| 12 | 3 | COLLAT | CN | 0.00 | -0.19 | 0.00 | 0.00 | 10.73 |
| 13 | 3 | FLOOR | CN | 0.00 | -9.74 | 0.00 | 0.00 | 10.73 |
| 14 | 3 | DEAD | CF | 0.00 | -6.64 | 0.00 | 0.00 | 10.73 |
| 15 | 3 | COLLAT | CF | 0.00 | -0.19 | 0.00 | 0.00 | 10.73 |
| 16 | 3 | FLOOR | CF | 0.00 | -9.74 | 0.00 | 0.00 | 10.73 |
| 17 | 4 | DEAD | CN | 0.00 | -7.19 | 0.00 | 0.00 | 10.73 |
| 18 | 4 | COLLAT | CN | 0.00 | -0.21 | 0.00 | 0.00 | 10.73 |
| 19 | 4 | FLOOR | CN | 0.00 | -10.59 | 0.00 | 0.00 | 10.73 |
| 20 | 4 | DEAD | CF | 0.00 | -7.19 | 0.00 | 0.00 | 10.73 |
| 21 | 4 | COLLAT | CF | 0.00 | -0.21 | 0.00 | 0.00 | 10.73 |
| 22 | 4 | FLOOR | CF | 0.00 | -10.59 | 0.00 | 0.00 | 10.73 |
| 23 | 3 | LSEIS | CN | 0.00 | 0.31 | 0.00 | 0.00 | 10.73 |
| 24 | 4 | LSEIS | CN | 0.00 | 0.31 | 0.00 | 0.00 | 10.73 |
| 25 | 2 | U_LIVE | D | -0.22 | -0.22 | 0.250 | 0.00 | 15.46 |
| 26 | 2 | U_LIVE | D | -0.22 | -0.22 | 0.250 | 15.46 | 36.08 |
| 27 | 3 | U_LIVE | D | -0.22 | -0.22 | -0.250 | 0.00 | 15.46 |
| 28 | 3 | U_LIVE | D | -0.22 | -0.22 | -0.250 | 15.46 | 36.08 |
| 29 | 3 | U_SNOW | D | -0.43 | -0.43 | -0.250 | 0.00 | 36.08 |
| 30 | 2 | U_SNOW | D | -0.43 | -0.43 | 0.250 | 0.00 | 36.08 |
| 31 | 2 | U_SNOW | D | -0.43 | -0.43 | 0.250 | 25.21 | 36.08 |
| 32 | 3 | U_SNOW | D | -0.43 | -0.43 | -0.250 | 0.00 | 10.86 |

FLOOR:

---

BASIC LOADS

| Floor | Part | -Collateral- | | | | Deflect_Limit | |
|---|---|---|---|---|---|---|---|
| Id | Dead | Dead | Below | Above | Live | Live | Total |
| 1 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0. | 2. |

DESIGN LOADS:

No. Load

Load Id Dead Coll Live Seis

==========

14186-02R1 Reactions, Anchor Bolts, & Base Plates: 6/26/14 4:20pm

==========

| Frame Line | Col Line | Foundation_Loads(k) Max_Pos_Val Id | Horz | Vert | Max_Neg_Val Id | Horz | Vert | Anc._Bolt No. | Diam | Base_Plate Width | Len | Thick |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 17 | 10.3 | 0.2 | 18 | -9.3 | 0.2 | 4 | 0.625 | 8.00 | 14.00 | 0.375 |
| | | 19 | 7.7 | 0.4 | | | | | | | | |
| 1 | B | 17 | 11.9 | 0.3 | 18 | -10.8 | 0.3 | 4 | 0.750 | 8.00 | 14.00 | 0.375 |
| | | 19 | 8.9 | 0.5 | | | | | | | | |
| 4 | B | 17 | 11.9 | 0.3 | 18 | -10.8 | 0.3 | 4 | 0.750 | 8.00 | 14.00 | 0.375 |
| | | 19 | 8.9 | 0.5 | | | | | | | | |
| 4 | C | 17 | 10.3 | 0.2 | 18 | -9.3 | 0.2 | 4 | 0.625 | 8.00 | 14.00 | 0.375 |
| | | 19 | 7.7 | 0.4 | | | | | | | | |
| 1* | D | 1 | 3.8 | 1.5 | 2 | -4.6 | -2.6 | 4 | 0.750 | 8.00 | 13.00 | 0.375 |
| | | 3 | 2.7 | 2.8 | 4 | -3.5 | -3.9 | | | | | |
| 1* | A | 3 | 2.5 | 3.7 | 4 | -1.8 | 5.7 | 4 | 0.750 | 8.00 | 12.00 | 0.375 |
| | | 5 | -0.4 | 20.0 | 1 | 1.5 | -1.3 | | | | | |
| 2* | D | 1 | 5.9 | 2.7 | 2 | -7.1 | -4.3 | 4 | 0.750 | 10.00 | 13.00 | 0.375 |
| | | 3 | 3.8 | 5.3 | 6 | 3.7 | -12.5 | | | | | |
| 2* | A | 3 | 6.8 | 10.8 | 4 | -5.7 | 8.9 | 4 | 0.750 | 10.00 | 13.00 | 0.375 |
| | | 5 | -2.5 | 36.4 | 7 | -3.6 | -6.0 | | | | | |
| 1* | C | 8 | 0.2 | 10.2 | 1 | 0.0 | -10.0 | 4 | 0.750 | 8.00 | 10.00 | 0.375 |
| | | 9 | 0.0 | 11.3 | | | | | | | | |
| 1* | B | 10 | 2.9 | -0.2 | 11 | -2.8 | -3.2 | 4 | 0.750 | 8.00 | 10.00 | 0.375 |
| | | 12 | 0.0 | 20.6 | 4 | -2.8 | -6.8 | | | | | |

2* C 13 0.2 15.4 1 0.0 -15.4 4 0.750 8.00 11.00 0.375

14 0.0 20.2

2* B 4 0.0 -7.1 15 -0.2 11.1 4 0.750 8.00 11.00 0.375

16 0.0 37.4 4 0.0 -7.1

---

---

1* Frame Lines:1 4

2* Frame Lines:2 3

LOAD COMBINATIONS:

---

| Id | Combination |
|---|---|
| 1 | 0.6Dead+Wind_Right1 |
| 2 | Dead+Wind_Left2 |
| 3 | Dead+Wind_Right2 |
| 4 | 0.6Dead+Wind_Left1 |
| 5 | Dead+Collateral+0.75Snow+0.75Wind_Left2+0.75Slide_Snow+0.75Floor_Live |
| 6 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 7 | 0.6Dead+Wind_Long1+LWIND1_R2E |
| 8 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F1CRANEA2 |
| 9 | Dead+Collateral+F1UNB_SL_L |
| 10 | 0.6Dead+Wind_Right2 |
| 11 | Dead+Wind_Left1 |
| 12 | Dead+Collateral+0.75Live+0.52Seismic_Right+0.75Floor_Live |
| 13 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA2 |
| 14 | Dead+Collateral+F2UNB_SL_L |
| 15 | Dead+Wind_Left1/2+F2CRANEA3 |
| 16 | Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Slide_Snow+0.75Floor_Live |
| 17 | 0.6Dead+Wind_Right2+Wind_Suction |

18 0.6Dead+Wind_Pressure+Wind_Long2

19 Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Wind_Suction+0.75Slide_Snow

==========

14186-02R1 Bracing Reactions Report: 6/26/14 4:20pm

==========

BUILDING BRACING REACTIONS:

---

------Reactions(k )-------

---Wall-- Col ----Wind---- --Seismic--- Panel_Shear(lb/ft)

Loc Line Line Horz Vert Horz Vert Wind Seismic

---- ---- ------- ----- ----- ----- ----- ------ -------

L_EW 1 Rigid Frame At Endwall

F_SW A 2 ,3 12.22 11.97 0.16 0.15

R_EW 4 Rigid Frame At Endwall

B_SW D 3 ,2 12.10 11.85 0.16 0.15

---- ---- ------- ----- ----- ----- ----- ------ -------

FLOOR BRACING REACTIONS:

---

Reactions(k )

---Location--- ---Seismic--

Orient Offset Start End Horz Vert

------ ------ ------ ------ ----- -----

| | | | | | |
|---|---|---|---|---|---|
| Long | B | 1 | 2 | 0.55 | 0.31 |
| Long | A | 1 | 2 | 0.55 | 0.31 |

==========

14186-02R1 Additional Reactions Report: 6/26/14 4:20pm

==========

Rigid Frame Column Reactions

---

| Frame Line | Col Line | ----Dead--- Horz | Vert | Collateral Horz | Vert | ----Live--- Horz | Vert | Floor_Live Horz | Vert | ----Snow--- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | D | -0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.2 | -0.1 | -0.3 | 0.0 | 0.4 |
| 1* | A | 0.1 | 8.3 | 0.0 | 0.4 | 0.0 | 0.7 | 0.2 | 11.3 | 0.0 | 1.4 |
| 1* | C | 0.0 | 2.1 | 0.0 | 0.7 | 0.0 | 3.8 | 0.0 | 0.3 | 0.0 | 7.3 |
| 1* | B | -0.1 | 9.0 | 0.0 | 0.9 | 0.0 | 3.9 | -0.1 | 10.2 | 0.0 | 7.4 |

| Frame Line | Col Line | Wind_Left1 Horz | Vert | Wind_Right1 Horz | Vert | Wind_Left2 Horz | Vert | Wind_Right2 Horz | Vert | Wind_Long1 Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | D | -3.5 | -4.1 | 3.9 | 1.3 | -4.5 | -2.8 | 2.8 | 2.5 | 1.8 | -2.4 |
| 1* | A | -1.8 | 0.7 | 1.5 | -6.3 | -1.0 | 2.3 | 2.3 | -4.7 | -1.5 | -3.5 |
| 1* | C | 0.0 | -9.3 | 0.0 | -11.3 | 0.0 | -6.3 | 0.0 | -8.3 | 0.0 | -7.6 |
| 1* | B | -2.8 | -12.2 | 2.7 | -8.6 | -2.6 | -9.3 | 2.9 | -5.6 | -0.3 | -7.7 |

| Frame Line | Col Line | Wind_Long2 Horz | Vert | -Seis_Left- Horz | Vert | -Seis_Right Horz | Vert | -Seis_Long- Horz | Vert | -F1CRANEA1 Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | D | 0.8 | -1.2 | -0.2 | -0.4 | 0.2 | 0.4 | 0.0 | 0.0 | -0.2 | -0.4 |
| 1* | A | -0.6 | -1.8 | -0.1 | 0.2 | 0.1 | -0.2 | 0.0 | -0.3 | -0.1 | 0.4 |
| 1* | C | 0.0 | -4.7 | 0.0 | 0.4 | 0.0 | -0.4 | 0.0 | 0.0 | 0.1 | 4.2 |
| 1* | B | -0.1 | -4.8 | -0.3 | -0.3 | 0.3 | 0.3 | 0.0 | -0.3 | -0.3 | 1.1 |

| Frame | Col | -F1CRANEA2 | | -F1CRANEA3 | | -F1CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1* | D | 0.1 | 0.3 | -0.1 | -0.3 | 0.2 | 0.4 | 0.2 | -0.7 | -0.2 | -0.5 |
| 1* | A | 0.0 | -0.2 | -0.1 | 0.2 | -0.1 | -0.4 | 0.0 | -0.4 | 0.0 | -0.9 |
| 1* | C | 0.2 | 3.4 | 0.0 | 1.9 | 0.1 | 1.1 | 0.0 | -0.9 | 0.0 | 0.6 |
| 1* | B | 0.1 | 1.8 | -0.2 | 3.4 | 0.2 | 4.1 | 0.2 | 0.5 | -0.2 | -0.8 |

| Frame | Col | LWIND2_L2E | | LWIND2_R2E | | F1PAT_LL_1 | | F1PAT_LL_2 | | F1PAT_LL_3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1* | D | 0.2 | -0.7 | -0.2 | -0.5 | 0.0 | 0.1 | 0.0 | -0.7 | 0.1 | 1.1 |
| 1* | A | 0.0 | -0.4 | 0.0 | -0.9 | 0.0 | -0.5 | 0.0 | 0.7 | 0.0 | 1.3 |
| 1* | C | 0.0 | -0.9 | 0.0 | 0.6 | 0.0 | 4.0 | 0.0 | 2.8 | 0.0 | 0.7 |
| 1* | B | 0.2 | 0.5 | -0.2 | -0.8 | 0.0 | 2.6 | 0.0 | 4.0 | 0.0 | 1.2 |

| Frame | Col | F1PAT_LL_4 | | F1UNB_SL_L | | F1UNB_SL_R | |
|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |
| 1* | D | -0.1 | -0.9 | 0.0 | 0.0 | 0.0 | -0.4 |
| 1* | A | 0.0 | -0.5 | 0.0 | -0.2 | 0.0 | 1.4 |
| 1* | C | 0.0 | 3.1 | 0.0 | 8.5 | 0.0 | 3.6 |
| 1* | B | 0.0 | 2.6 | 0.0 | 4.4 | 0.0 | 8.2 |

---

| Frame | Col | ----Dead--- | Collateral | ----Live--- | Floor_Live | ----Snow--- |
|---|---|---|---|---|---|---|

| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | D | -0.2 | 0.4 | 0.0 | 0.1 | 0.1 | 0.5 | -0.3 | -0.6 | 0.1 | 1.0 |
| 2* | A | 0.2 | 15.5 | 0.0 | 0.7 | -0.1 | 1.4 | 0.3 | 21.4 | -0.1 | 2.7 |
| 2* | C | 0.0 | 2.7 | 0.0 | 1.2 | 0.0 | 7.2 | 0.0 | 0.7 | 0.0 | 13.8 |
| 2* | B | 0.0 | 15.4 | 0.0 | 1.7 | 0.0 | 7.5 | 0.0 | 19.2 | 0.0 | 14.4 |

| Frame Col | | Wind_Left1 | | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | -4.9 | -7.1 | 6.0 | 2.5 | -6.9 | -4.7 | 4.0 | 5.0 | 3.5 | -11.5 |
| 2* | A | -5.8 | -0.4 | 4.6 | -7.9 | -3.8 | 2.8 | 6.7 | -4.7 | -3.5 | -13.5 |
| 2* | C | 0.0 | -10.8 | 0.0 | -17.0 | 0.0 | -5.2 | 0.0 | -11.4 | 0.0 | -14.5 |
| 2* | B | 0.0 | -16.3 | 0.0 | -12.3 | 0.0 | -10.6 | 0.0 | -6.6 | 0.0 | -14.9 |

| Frame Col | | Wind_Long2 | | -Seis_Left- | | -Seis_Right | | -Seis_Long- | | -F2CRANEA1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | 1.5 | -9.0 | -0.1 | -0.1 | 0.1 | 0.1 | 0.0 | -0.1 | -0.2 | -0.4 |
| 2* | A | -1.5 | -10.3 | -0.1 | 0.1 | 0.1 | -0.1 | 0.0 | -0.5 | -0.2 | 0.4 |
| 2* | C | 0.0 | -8.9 | 0.0 | 0.2 | 0.0 | -0.2 | 0.0 | 0.0 | 0.2 | 4.6 |
| 2* | B | 0.0 | -9.2 | 0.0 | -0.1 | 0.0 | 0.1 | 0.0 | -0.3 | -0.1 | 1.6 |

| Frame Col | | -F2CRANEA2 | | -F2CRANEA3 | | -F2CRANEA4 | | LWIND1_L2E | | LWIND1_R2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | 0.1 | 0.3 | -0.1 | -0.3 | 0.2 | 0.5 | 0.3 | -1.3 | -0.5 | -1.1 |
| 2* | A | 0.1 | -0.2 | -0.1 | 0.2 | 0.2 | -0.3 | 0.4 | -0.7 | -0.2 | -1.8 |
| 2* | C | 0.2 | 3.7 | 0.1 | 2.3 | 0.1 | 1.4 | 0.0 | -1.9 | 0.0 | 1.3 |
| 2* | B | 0.0 | 2.2 | -0.2 | 3.8 | -0.1 | 4.5 | 0.0 | 0.9 | 0.0 | -1.3 |

| Frame Col | LWIND2_L2E | LWIND2_R2E | F2PAT_LL_1 | F2PAT_LL_2 | F2PAT_LL_3 |
|---|---|---|---|---|---|

| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | D | 0.3 | -1.3 | -0.5 | -1.1 | -0.1 | 0.1 | 0.0 | -1.3 | 0.2 | 2.2 |
| 2* | A | 0.4 | -0.7 | -0.2 | -1.8 | 0.1 | -1.0 | 0.0 | 1.3 | -0.2 | 2.5 |
| 2* | C | 0.0 | -1.9 | 0.0 | 1.3 | 0.0 | 7.7 | 0.0 | 5.4 | 0.0 | 1.3 |
| 2* | B | 0.0 | 0.9 | 0.0 | -1.3 | 0.0 | 5.0 | 0.0 | 7.7 | 0.0 | 2.3 |

| Frame Col | | F2PAT_LL_4 | | F2UNB_SL_L | | F2UNB_SL_R | |
|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |
| 2* | D | -0.1 | -1.7 | -0.1 | 0.0 | 0.1 | -0.6 |
| 2* | A | 0.1 | -1.1 | 0.1 | -0.4 | -0.1 | 2.6 |
| 2* | C | 0.0 | 5.9 | 0.0 | 16.3 | 0.0 | 6.8 |
| 2* | B | 0.0 | 5.2 | 0.0 | 8.7 | 0.0 | 15.8 |

---

1* Frame Lines:1 4

2* Frame Lines:2 3

## Endwall Column Reactions

| Frame Col | | Dead | Wind Press | Wind Suct |
|---|---|---|---|---|
| Line | Line | Vert | Horz | Horz |
| 1 | C | 0.4 | -9.3 | 10.3 |
| 1 | B | 0.5 | -10.8 | 11.9 |

---

| Frame Line | Col Line | Dead Vert | Wind Press Horz | Wind Suct Horz |
|---|---|---|---|---|
| 4 | B | 0.5 | -10.8 | 11.9 |
| 4 | C | 0.4 | -9.3 | 10.3 |

---

==========

14186-02R1 Seismic Design Report: 6/26/14 4:20pm

==========

Building Data

---

Code =IBC 12

Length = 60.00

Width = 70.00

Left Eave Height = 21.25

Right Eave Height = 21.25

Seismic Formula

---

Base Shear, V = 0.01*W

Shear Force, E = V

(Rigid frame, endwall frame, wind bent, wind column & base reactions)

Shear Force, Em = Omega*V

(Wall diagonal bracing, splice at rigid frame & wind bent knee)

Note: Applied load is seismic force multiplied by load combination

Zone/Design Category= A

Seismic Dead Load, W

---

Snow Factor = 0.000

Roof Dead+Collateral= 4.00 (psf )

Frame Dead = 2.00 (psf )

Roof Total = 6.00 (psf ) , Weight= 25.20 (k )

L_EW Dead = 2.00 (psf ) , Weight= 1.79 (k )

F_SW Dead = 2.00 (psf ) , Weight= 1.27 (k )

R_EW Dead = 2.00 (psf ) , Weight= 1.79 (k )

B_SW Dead = 2.00 (psf ) , Weight= 1.27 (k )

Crane Dead Weight= 3.40 (k )

Runway Weight Weight= 4.77 (k )

---

Total = 39.50 (k )

Seismic Forces

---

Roof Bracing

Cs = 0.0100

W = 28.79 (k )

Force, V = 0.29 (k )

Force, E = 0.29 (k )

Sidewall Bracing

Front Omega= 3.00

Cs = 0.0100

W = 15.67 (k )

Force, V = 0.16 (k )

Force, Em = 0.47 (k )

Force, E = 0.16 (k )

Back Omega= 3.00

Cs = 0.0100

W = 15.67 (k )

Force, V = 0.16 (k )

Force, Em = 0.47 (k )

Force, E = 0.16 (k )

Rigid Frames

Cs = 0.0100

Frame 1 W = 62.00 (k )

Force, V = 0.62 (k )

Force, E = 0.62 (k )

Frame 2 W = 14.00 (k )

Force, V = 0.14 (k )

Force, E = 0.14 (k )

End Plates

Frame Omega= 3.00

Total Base Shear

Longitudinal

Force, V = 0.31 (k )

Transverse

Force, V = 1.52 (k )

**Design to Drafting Package**

Job No. 14186-02
Customer: C & H Buildings
Designed By: JDS on 05/28/14

**Building Description**

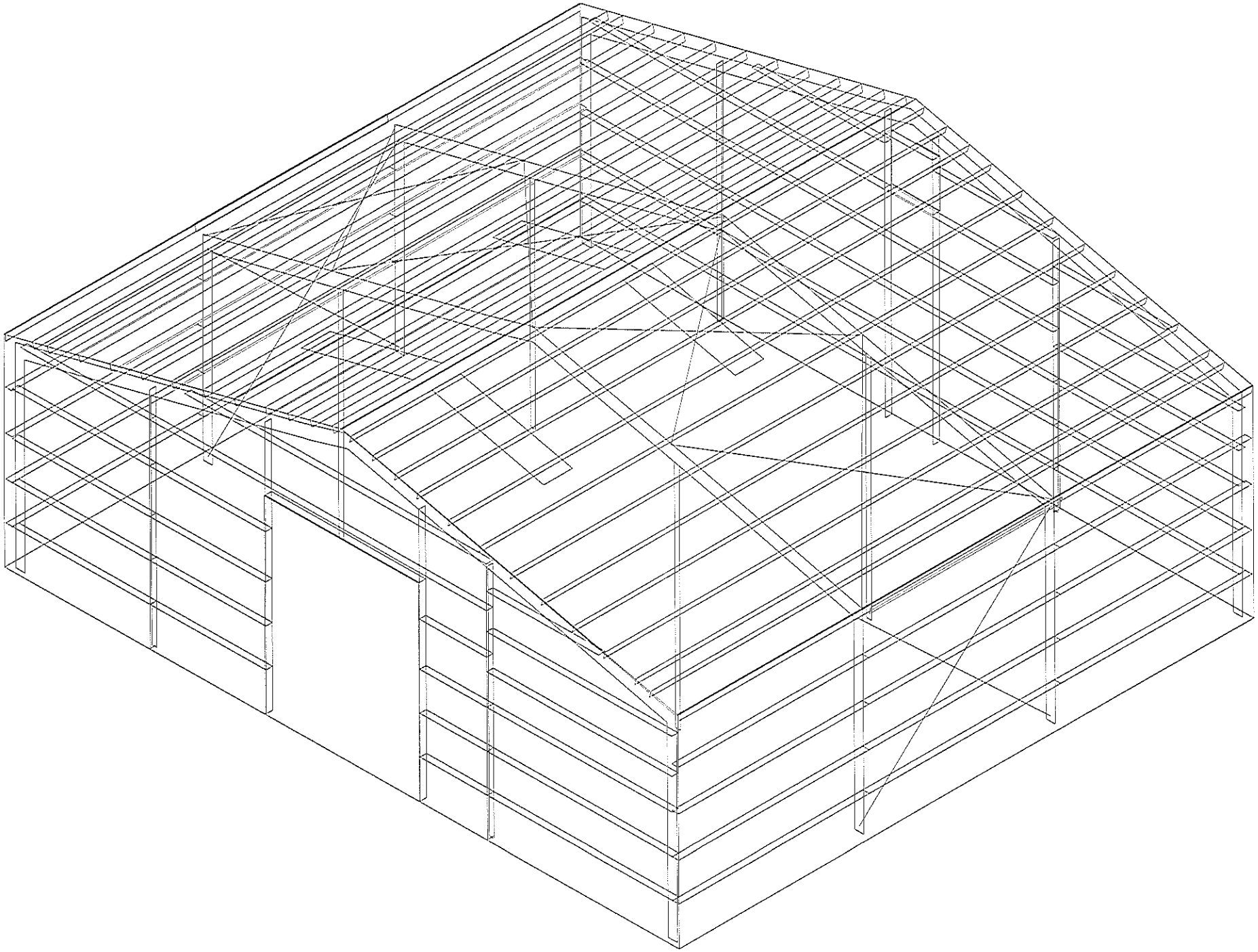
70' - 0" x 60' - 0" x 21' - 3" Gable Framed

**Design Notes for Drafting**

1) Please clean up any MBS overstrikes on drawings
2) Follow Notations on the Following Pages
3) MBS Start Marks
   14186-02R1: 0

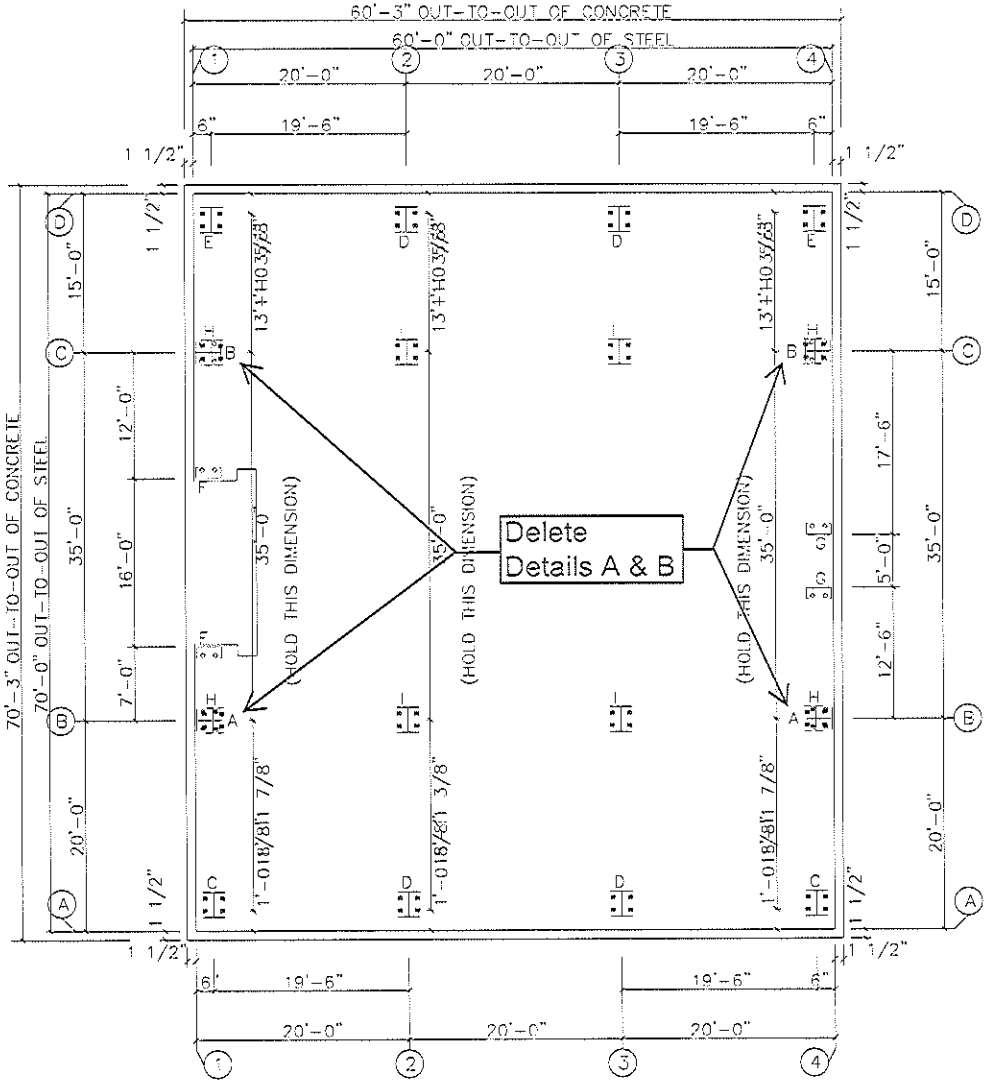
**Table of Contents**


| | Page | File |
|---|---|---|
| Design to Drafting Cover Sheet | 1 | Design to Drafting Cover Sheet 052814.xls |
| 3D Model | 2 | 14186-02R1 / 3DBuild.dwg |
| Anchor Bolt Plan | 3 | 14186-02R1 / AnDwg-1.dwg |
| Anchor Bolt Details | 4 | 14186-02R1 / AnDwg-2.dwg |
| Reactions | 5 | 14186-02R1 / AnDwg-3.dwg |
| Roof Framing and Sheeting | 6 | 14186-02R1 / RoofDwg.dwg |
| LEW Framing and Sheeting | 7 | 14186-02R1 / EwDwg-L.dwg |
| Rigid Frame Cross Section | 8 | 14186-02R1 / RfDwg-1.dwg |
| Rigid Frame Cross Section | 9 | 14186-02R1 / RfDwg-2.dwg |
| Crane Plan | 10 | 14186-02R1 / CraneDwg.dwg |
| REW Framing and Sheeting | 11 | 14186-02R1 / EwDwg-R.dwg |
| BSW Framing and Sheeting | 12 | 14186-02R1 / SwDwg-B.dwg |
| FSW Framing and Sheeting | 13 | 14186-02R1 / SwDwg-F.dwg |
| Wall Liner | 14 | 14186-02R1 / WallLnr.dwg |
| Mezzanine Key Plan | 15 | 14186-02R1 / FlrDwg1.dwg |
| Mezzanine Framing | 16 | 14186-02R1 / FlrDwg2.dwg |



o Dia= 5/8"

⊗ Dia= 3/4"

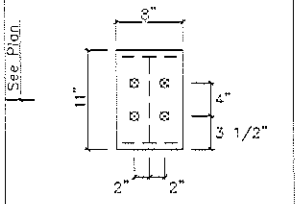



ANCHOR BOLT PLAN

NOTE: All Base Plates @ 100'-0" (U.N.)

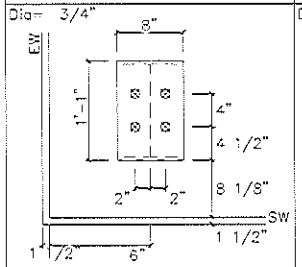
| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | ANCHOR BOLT PLAN | |
| ID | 14186-02R1 | DESIGN: DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 SHEET | OF |

Dia= 3/4"



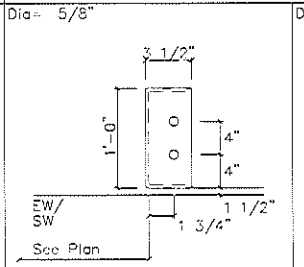

DETAIL I

Dia= 3/4"



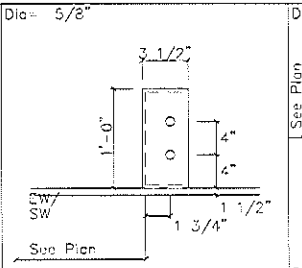

DETAIL E

Dia= 5/8"



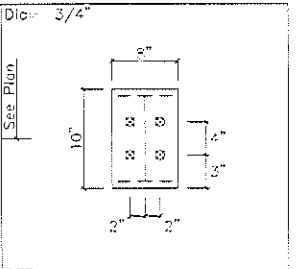

DETAIL F

Dia= 5/8"



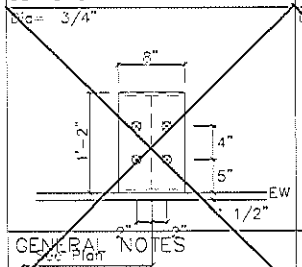

DETAIL C

Dia= 3/4"



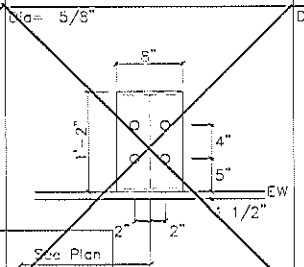

DETAIL H

Dia= 3/4"



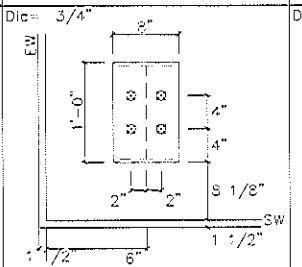

DETAIL A

Dia= 5/8"



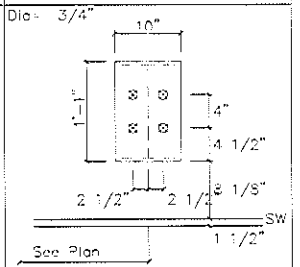

DETAIL B

Dia= 3/4"




DETAIL C

Dia= 3/4"




DETAIL D

GENERAL NOTES

| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 70 | ANCHOR BOLT DETAILS | | |
| ID | 14136-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

Replace with "Risk Category = II - Normal"

## NOTES FOR REACTIONS

Building reactions are based on the following building data:

| | | |
|---|---|---|
| Width (ft) | = | 70.0 |
| Length (ft) | = | 60.0 |
| Eave Height (ft) | = | 21.3/ 21.3 |
| Roof Slope (rise/12 ) | = | 3.0/ 3.0 |
| Dead Load (psf ) | = | 2.0 |
| Collateral Load (psf ) | = | 3.0 |
| Roof Live Load(psf ) | = | 20.0 |
| Frame Live Load(psf ) | = | 13.0 |
| Snow Load (psf ) | = | 23.1 |
| Wind Speed (mph ) | = | 120.0 |
| Wind Code | = | IBC 12 |
| Exposure | = | C |
| Closed/Open | = | C |
| Importance W | = | 1.00 |
| Importance Seismic | = | 1.25 |
| Seismic Zone | = | A |

| ID | Description |
|---|---|
| 1 | 0.6Dead+Wind_Left1 |
| 2 | 0.6Dead+Wind_Right1 |
| 3 | 0.6Dead+Wind_Right2 |
| 4 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 5 | 0.6Dead+Wind_Long1+LWIND1_R2E |
| 6 | Dead+Wind_Left1 |
| 7 | Dead+Wind_Left2 |
| 8 | Dead+Wind_Right2 |
| 9 | Dead+Collateral+0.75Snow+0.75Wind_Left2+0.75Slide_Snow+0.75Floor_Live |
| 10 | Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Slide_Snow+0.75Floor_Live |
| 11 | Dead+Collateral+0.75Live+0.52Seismic_Left+0.75Floor_Live |
| 12 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F1CRANEA2* |
| 13 | Dead+Collateral+F1UNB_SL_L |
| 14 | Dead+Collateral+0.56Snow+0.56Slide_Snow+F2CRANEA2* |
| 15 | Dead+Wind_Left1/2+F2CRANEA3 |
| 16 | Dead+Collateral+F2UNB_SL_L |
| 17 | 0.6Dead+Wind_Right2+Wind_Suction |
| 18 | 0.6Dead+Wind_Pressure+Wind_Long2 |
| 19 | Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Wind_Suction+0.75Slide_Snow |

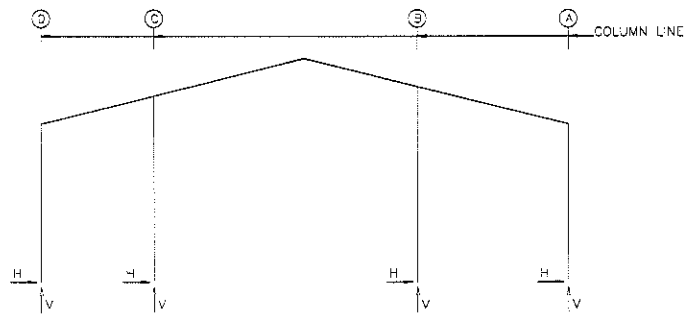
## BUILDING BRACING REACTIONS

| Wall Loc | Wall Line | Col Line | ± Reactions (k) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|---|
| L_EW | 1 | Rigid Frame At Endwall | | | | | | |
| F_SW | A | 2.3 | 12.2 | 12.0 | 0.2 | 0.2 | | |
| R_EW | 4 | Rigid Frame At Endwall | | | | | | |
| B_SW | D | 3.2 | 12.1 | 11.9 | 0.2 | 0.2 | | |

## FLOOR BRACING REACTIONS

| Orient | Offset | Location Start | Location End | Reactions(k) Seismic Horz | Seismic Vert |
|---|---|---|---|---|---|
| Long | B | 1 | 2 | 0.6 | 0.3 |
| Long | A | 1 | 2 | 0.6 | 0.3 |

FRAME LINES: 1 2 3 4




## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 8 | 2.5 | 3.7 | 1 | -1.8 | 5.7 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 9 | -0.4 | 20.0 | 2 | 1.5 | -1.3 | | | | | | |
| 1* | C | 12 | 0.2 | 10.2 | 2 | 0.0 | -10.0 | 4 | 0.750 | 8.000 | 10.00 | 0.375 | 0.0 |
| | | 13 | 0.0 | 11.3 | | | | | | | | | |
| 1* | B | 3 | 2.0 | -0.2 | 6 | -2.6 | -3.2 | 4 | 0.750 | 8.000 | 10.00 | 0.375 | 0.0 |
| | | 11 | 0.0 | 20.6 | 1 | -2.6 | -6.6 | | | | | | |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | D | 2 | 5.9 | 2.7 | 7 | -7.1 | -4.3 | 4 | 0.750 | 10.00 | 13.00 | 0.375 | 0.0 |
| | | 8 | 3.8 | 5.3 | 4 | 3.7 | -12.5 | | | | | | |
| 2* | A | 8 | 9.8 | 10.8 | 1 | -5.7 | 3.9 | 4 | 0.750 | 10.00 | 13.00 | 0.375 | 0.0 |
| | | 9 | -2.5 | 36.4 | 5 | -3.6 | -6.0 | | | | | | |
| 2* | C | 14 | 0.2 | 15.4 | 2 | 0.0 | -15.4 | 4 | 0.750 | 8.000 | 11.00 | 0.375 | 0.0 |
| | | 16 | 0.0 | 20.2 | | | | | | | | | |
| 2* | B | 1 | 0.0 | -7.1 | 15 | -0.2 | 11.1 | 4 | 0.750 | 8.000 | 11.00 | 0.375 | 0.0 |
| | | 10 | 0.0 | 37.4 | 1 | 0.0 | -7.1 | | | | | | |

2* Frame lines: 2 3

## ANCHOR BOLT SUMMARY

| Qty | Locate | Dia (in) | Type | Total Len (in) | Bend Len (in) | Proj (in) |
|---|---|---|---|---|---|---|
| 8 | Jamb | 5/8" | A307 | 12.0 | 2.00 | 2.00 |
| 8 | Endwall | 5/8" | A307 | 12.0 | 2.00 | 2.00 |
| 8 | Endwall | 3/4" | A307 | 15.0 | 2.50 | 2.00 |
| 64 | Frame | 3/4" | A307 | 15.0 | 2.50 | 2.00 |

Remove

## ENDWALL COLUMN REACTIONS(k)

| | | |
|---|---|---|
| MAXIMUM VERTICAL Dead+Collateral+Live | = | 0.5 |
| MAXIMUM VERTICAL Dead+Wind | = | 0.9 |
| MAXIMUM HORIZONTAL Dead+Wind | = | 11.9 |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | ANCHOR BOLT REACTIONS | |
| ID | 14186-02R1A | DESIGN: DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 6/26/14 | SHEET OF |

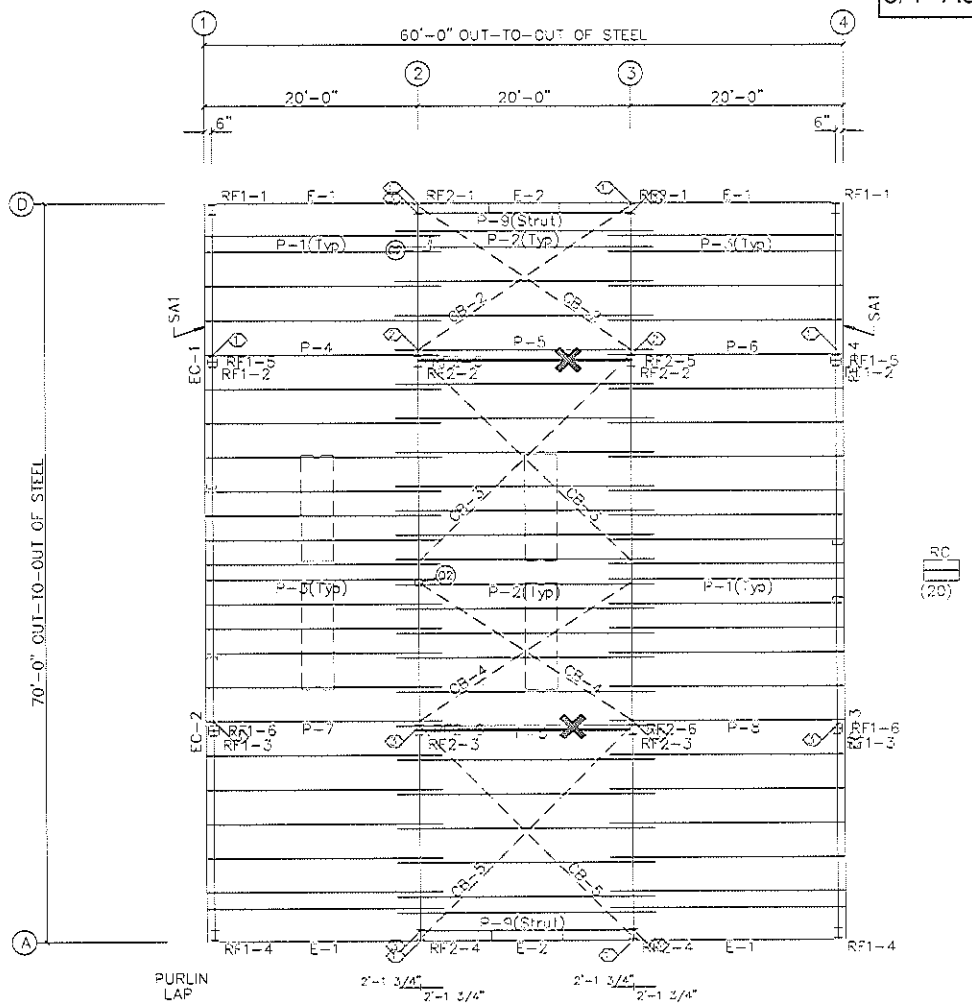
Note: All Eave Struts to be connected to main frames with 3/4" A325 B & N's

MEMBER TABLE
ROOF PLAN

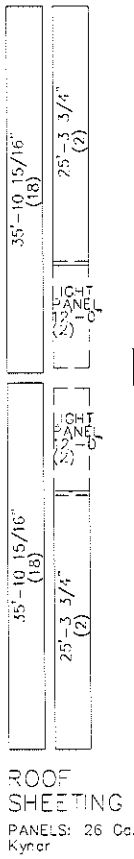
| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 22 | P-1 | 8X25Z16 | 22'-1 1/2" |
| 22 | P-2 | 8X25Z16 | 24'-3 1/2" |
| 22 | P-3 | 8X25Z16 | 22'-1 1/2" |
| 1 | P-4 | 8X25Z14 | 22'-1 1/2" |
| 2 | P-5 | 8X25Z14 | 24'-3 1/2" |
| 1 | P-6 | 8X25Z14 | 22'-1 1/2" |
| 1 | P-7 | 8X25Z12 | 22'-1 1/2" |
| 1 | P-8 | 8X25Z12 | 22'-1 1/2" |
| 2 | P-9 | 8X25Z16 | 20'-7 1/2" |
| 4 | E-1 | 8 3/8" 16GA | 19'-11 1/2" |
| 2 | E-2 | 8 3/8" 16GA | 19'-11 1/2" |
| 2 | CB-2 | 1/2" Cable | 24'-5" |
| 2 | CB-3 | 3/8" Cable | 28'-8" |
| 2 | CB-4 | 3/8" Cable | 24'-5" |
| 2 | CB-5 | 1/2" Cable | 28'-8" |

SPECIAL BOLTS
ROOF PLAN

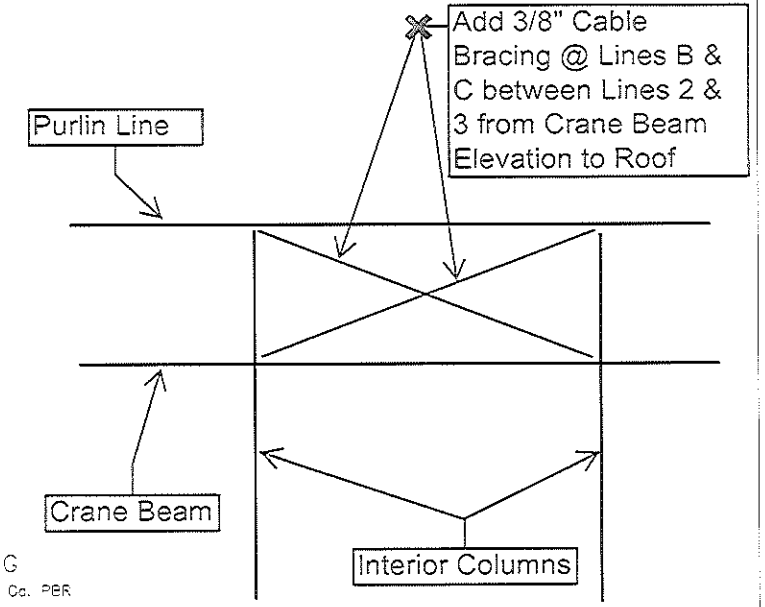
| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 1 | 2 | A325 | 1/2" | 1 1/2" | 2 |
| 2 | 4 | A325 | 1/2" | 1 1/4" | 2 |
| 3 | 2 | A325 | 1/2" | 1 1/4" | 2 |



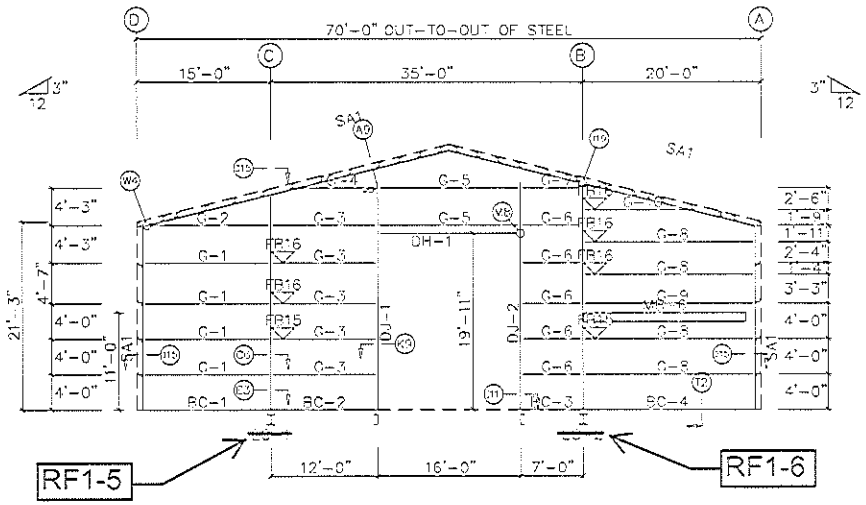

ROOF FRAMING PLAN



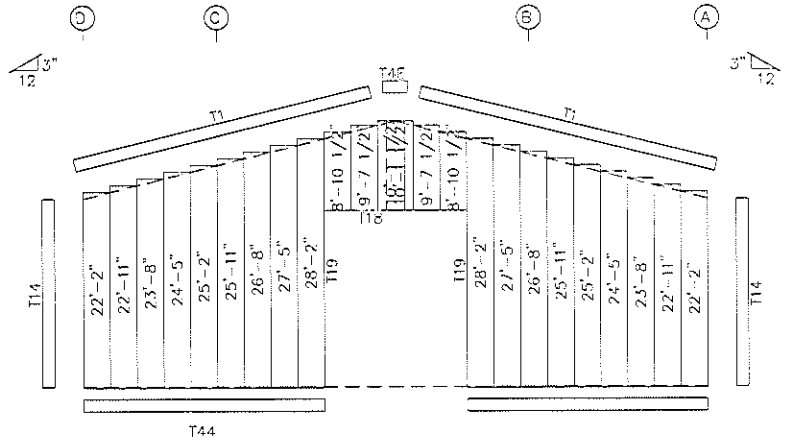

ROOF SHEETING
PANELS: 26 Ga. PBR Kynar




| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 70 | ROOF FRAMING | | |
| ID | 14136-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |




LEFT ENDWALL FRAMING: FRAME LINE 1




LEFT ENDWALL SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. PBR - Kynar

BOLT TABLE
FRAME LINE 1

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Columns/Rat | 2 | A325 | 5/8" | 1 1/2" |
| Jamb | 2 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE 1

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 1 | EC-1 | W14X61C | 24' 3 3/8" |
| 1 | EC-2 | W14X61C | 24' 3 3/8" |
| 1 | DJ-1 | C12x25 | 25'-8 3/8" |
| 1 | DJ-2 | C12x20.7 | 25'-9 3/8" |
| 1 | DH-1 | 12X35C14 | 16'-0" |
| 4 | G-1 | 10X25Z14 | 13'-0 1/8" |
| 1 | G-2 | 10X25Z14 | 7'-10 13/16" |
| 5 | G-3 | 10X25Z14 | 11'-5 7/16" |
| 1 | G-4 | 10X25Z14 | 2'-10 13/16" |
| 2 | G-5 | 10X25Z14 | 15'-11 1/2" |
| 5 | G-6 | 10X25Z14 | 6'-5 9/16" |
| 1 | G-7 | 10X25Z14 | 3'-3" |
| 4 | G-8 | 10X25Z12 | 18'-0 1/4" |
| 1 | G-9 | 10X25Z14 | 18'-0 1/4" |
| 1 | G-10 | 10X25Z14 | 6'-3" |
| 1 | BC-1 | 10X25C14 | 13'-11 1/2" |
| 1 | BC-2 | 10X25C14 | 11'-4" |
| 1 | BC-3 | 10X25C14 | 6'-4" |
| 1 | BC-4 | 10X25C14 | 18'-3 3/8" |
| 1 | MR-6 | W12x14 | 15'-2 3/4" |

TRIM TABLE
FRAME LINE 1

| QD | MARK | LENGTH |
|---|---|---|
| | T18 | 196.000 |
| | T19 | 241.000 |
| | T4E | 18.000 |
| | T1 | 225.000 |
| | T14 | 128.000 |
| | T44 | 163.000 |

FLANGE BRACE TABLE
FRAME LINE 1

| VID | MARK | LENGTH |
|---|---|---|
| 1 | FB15 | 1'-3" |
| 2 | FB16 | 1'-4" |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | ENDWALL FRAMING | |
| ID | 14186-02R1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
| SP-1 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 2'-0" |
| SP-2 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-11 1/2" |
| SP-3 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-11" |

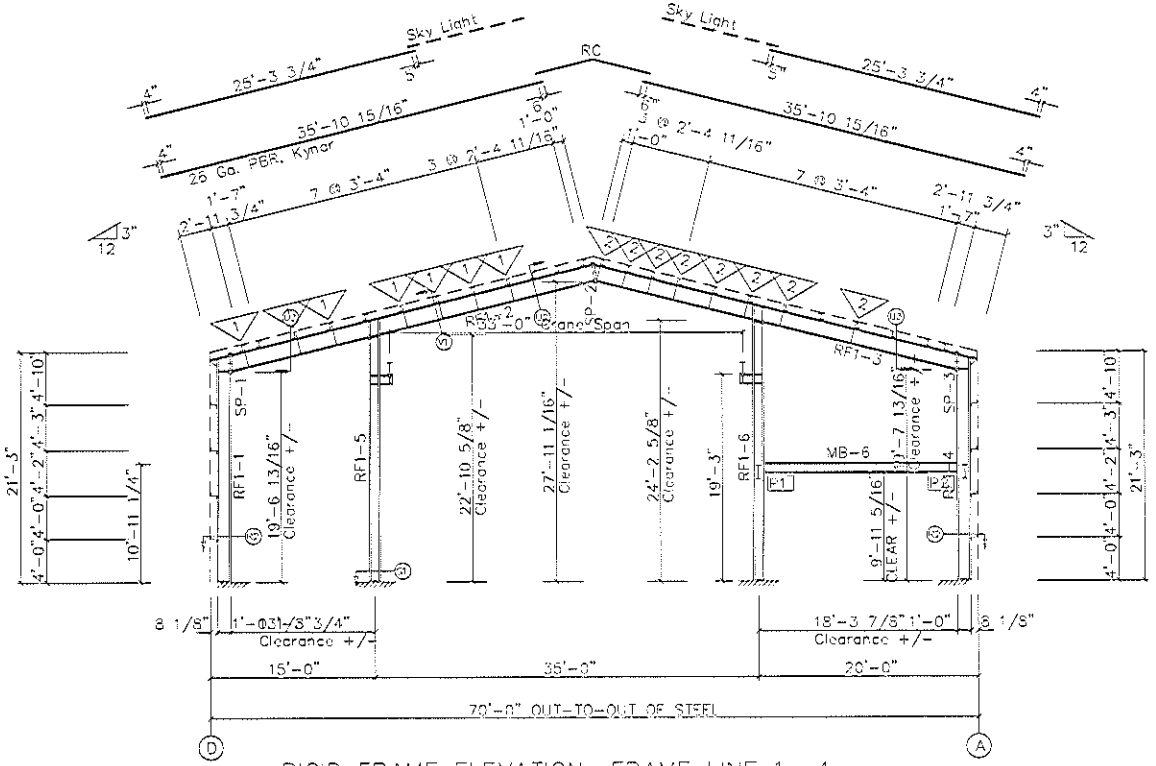
| CAP PLATE BOLTS | | | | |
|---|---|---|---|---|
| Mark | Qty | Type | Dia | Length |
| RF1-5 | 4 | A325 | 5/8" | 1 1/2" |
| RF1-6 | 4 | A325 | 5/8" | 1 1/2" |

| FLANGE BRACE TABLE<br>FRAME LINE 1 4 | | | | |
|---|---|---|---|---|
| VID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB36 | L2x2x1/8 | 2'-4" |
| 2 | 1 | FB40-4 | L2x2x1/8 | 2'-4" |

| PERIMETER BEAM BOLT TABLE | | | | |
|---|---|---|---|---|
| BID | Qty | Type | Dia | Length |
| P1 | 6 | A325 | 3/4" | 1 3/4" |
| P2 | 2 | A325 | 3/4" | 1 3/4" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF1-1 | 11.5/11.5 | 0.135 | 120.0 | 6 x 1/4" x 234.0 | 6 x 3/8" x 230.2 |
| | 11.5/11.5 | 0.135 | 119.0 | 6 x 1/4" x 14.0 | |
| | 11.5/11.5 | 0.135 | 12.0 | 6 x 1/4" x 20.4 | |
| RF1-2 | 16.0/16.0 | 0.135 | 120.0 | 6 x 1/4" x 229.9 | 5 x 1/4" x 234.0 |
| | 16.0/16.0 | 0.135 | 120.0 | 5 x 1/4" x 181.3 | 5 x 1/4" x 179.4 |
| | 16.0/16.0 | 0.135 | 120.0 | | |
| | 16.0/16.0 | 0.135 | 55.3 | | |
| RF1-3 | 15.0/15.0 | 0.135 | 55.0 | 5 x 1/4" x 181.0 | 5 x 1/4" x 175.0 |
| | 15.0/15.0 | 0.135 | 120.0 | 5 x 1/4" x 230.2 | 5 x 1/4" x 234.0 |
| | 15.0/15.0 | 0.135 | 120.0 | | |
| | 15.0/15.0 | 0.135 | 120.0 | | |
| RF1-4 | 11.5/11.5 | 0.188 | 19.1 | 5 x 1/4" x 20.4 | 5 x 1/4" x 231.8 |
| | 11.5/11.5 | 0.135 | 111.8 | 6 x 1/4" x 5.0 | |
| | 11.5/11.5 | 0.135 | 120.0 | 6 x 1/4" x 240.0 | |
| RF1-5 | W10x33 | | | | |
| RF1-6 | W10x33 | | | | |

| BEAM TABLE | | |
|---|---|---|
| Mark | Part | Length |
| MB-6 | W12x14 | 19'-2 3/4" |



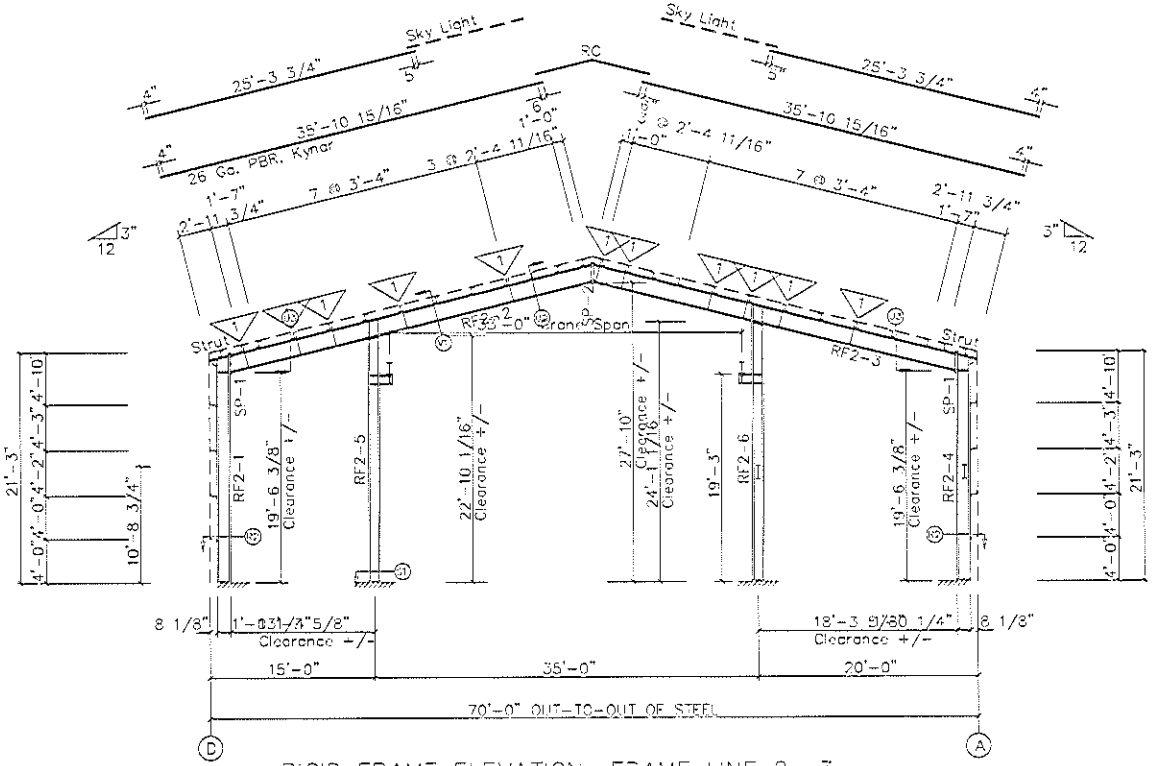

RIGID FRAME ELEVATION: FRAME LINE 1 4

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | RIGID FRAME CROSS SECTION | |
| ID | 14186-02R1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | | CAP PLATE BOLTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length | Mark | Qty | Type | Dia | Length |
| SP-1 | 4 | 4 | 2 | A325 | 5/8" | 2" | 10" | 1/2" | 2'-0 1/2" | RF2-5 | 4 | A325 | 5/8" | 1 1/2" |
| SP-2 | 4 | 4 | 2 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 2'-0 1/2" | RF2-6 | 4 | A325 | 5/8" | 1 1/2" |

| FLANGE BRACE TABLE FRAME LINE 2 3 | | | | |
|---|---|---|---|---|
| ▽ID | SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB40 | L2x2x1/8 | 2'-4" |

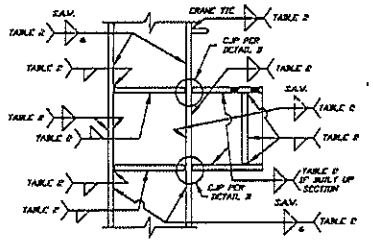
| MEMBER | ARCS | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF2-1 | 11.5/11.5 | 0.135 | 120.0 | 10 x 3/8" x 240.0 | 10 x 3/8" x 230.4 |
| | 11.5/11.5 | 0.135 | 110.4 | 10 x 3/8" x 8.0 | |
| | 11.5/11.5 | 0.250 | 20.6 | 5 x 1/4" x 20.6 | |
| RF2-2 | 16.5/16.5 | 0.135 | 120.0 | 5 x 1/4" x 229.8 | 5 x 1/4" x 234.0 |
| | 16.5/16.5 | 0.135 | 120.0 | 5 x 1/4" x 181.0 | 5 x 1/4" x 176.6 |
| | 16.5/16.5 | 0.135 | 120.0 | | |
| | 16.5/16.5 | 0.135 | 55.0 | | |
| RF2-3 | 16.5/16.5 | 0.135 | 55.0 | 5 x 1/4" x 181.0 | 5 x 1/4" x 176.6 |
| | 16.5/16.5 | 0.135 | 120.0 | 5 x 1/4" x 229.8 | 5 x 1/4" x 234.0 |
| | 16.5/16.5 | 0.135 | 120.0 | | |
| | 16.5/16.5 | 0.135 | 120.0 | | |
| RF2-4 | 11.5/11.5 | 0.188 | 20.6 | 5 x 1/4" x 20.6 | 10 x 3/8" x 230.4 |
| | 11.5/11.5 | 0.135 | 110.4 | 10 x 3/8" x 8.0 | |
| | 11.5/11.5 | 0.135 | 120.0 | 10 x 3/8" x 240.0 | |
| RF2-5 | W10x22 | | | | |
| RF2-6 | W10x22 | | | | |

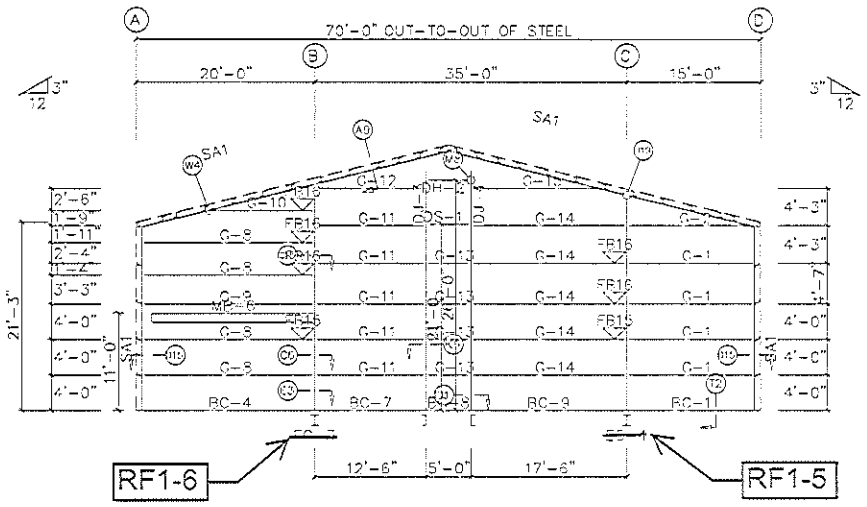



RIGID FRAME ELEVATION: FRAME LINE 2 3

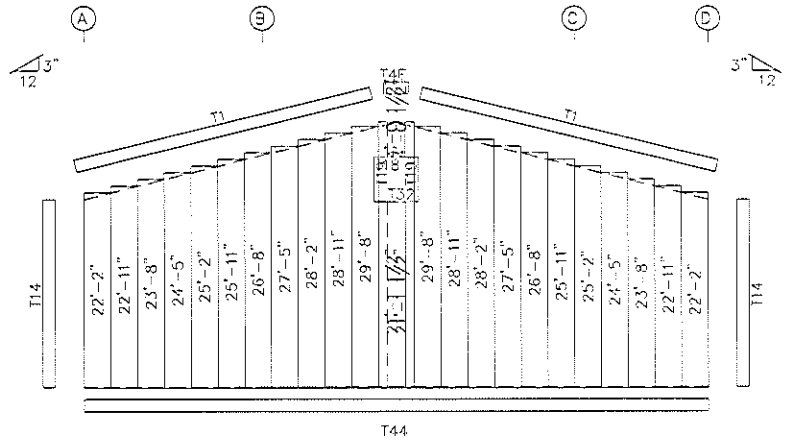
| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 70 | RIGID FRAME CROSS SECTION | | |
| ID | 14186-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

Note: All Crane Brackets to be W10x22. Connect Crane Beams to Brackets with (4) 5/8" A325 B & N's






RIGHT ENDWALL FRAMING: FRAME LINE 4




RIGHT ENDWALL SHEETING & TRIM: FRAME LINE 4

PANELS: 26 Ga. PBR - Kynar

BOLT TABLE
FRAME LINE 4

| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Columns/Rafters | 2 | A325 | 5/8" | 1 1/2" |
| Jamb | 2 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE 4

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| ~~1~~ | ~~FB5-1~~ | ~~W14x61~~ | ~~2'-6 3/8"~~ |
| ~~1~~ | ~~FB5-4~~ | ~~W14x61~~ | ~~2'-6 3/8"~~ |
| 1 | DJ-3 | C12x20.7 | 27'-1 7/8" |
| 1 | DJ-4 | C12x20.7 | 27'-0 7/8" |
| 1 | DH-2 | 12X35C14 | 5'-0" |
| 1 | DS-1 | 12X35C14 | 5'-0" |
| 4 | G-1 | 10X25Z14 | 13'-0 1/8" |
| 1 | G-2 | 10X25Z14 | 7'-10 13/16" |
| 4 | G-8 | 10X25Z12 | 18'-0 1/4" |
| 1 | G-9 | 10X25Z14 | 18'-0 1/4" |
| 1 | G-10 | 10X25Z14 | 6'-3" |
| 5 | G-11 | 10X25Z14 | 11'-11 9/16" |
| 1 | G-12 | 10X25Z14 | 8'-9" |
| 4 | G-13 | 10X25Z14 | 4'-11 1/2" |
| 5 | G-14 | 10X25Z14 | 16'-11 9/16" |
| 1 | G-15 | 10X25Z14 | 8'-4 15/16" |
| 1 | BC-1 | 10X25C14 | 13'-11 1/2" |
| 1 | BC-4 | 10X25C14 | 18'-3 3/8" |
| 1 | BC-7 | 10X25C14 | 11'-10" |
| 1 | BC-8 | 10X25C14 | 4'-11" |
| 1 | BC-9 | 10X25C14 | 16'-10" |
| 1 | MB-6 | W12x14 | 18'-2 3/4" |

TRIM TABLE
FRAME LINE 4

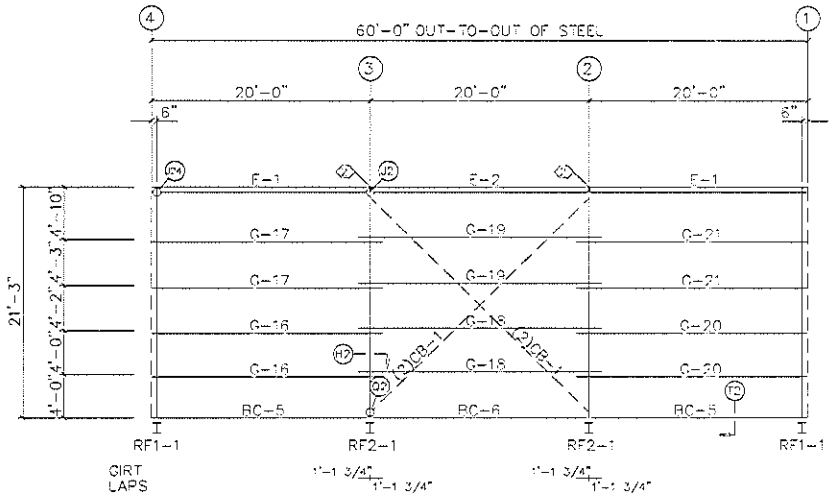
| QID | MARK | LENGTH |
|---|---|---|
| | T32 | 64.000 |
| | T18 | 64.000 |
| | T19 | 62.000 |
| | T4E | 18.000 |
| | T1 | 225.000 |
| | T14 | 128.000 |
| | T44 | 211.000 |

FLANGE BRACE TABLE
FRAME LINE 4

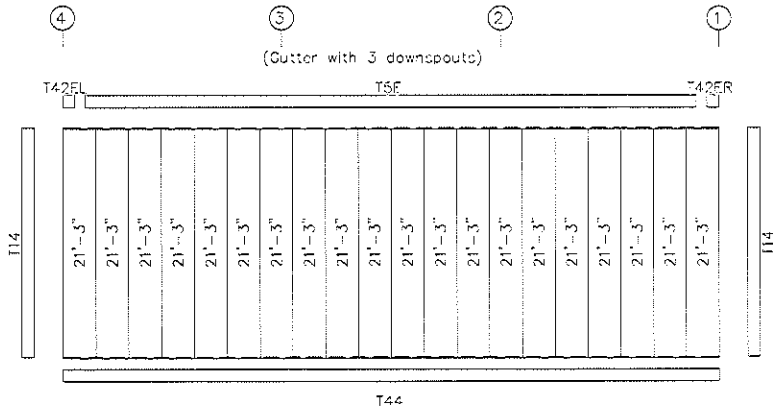
| QID | MARK | LENGTH |
|---|---|---|
| 1 | FB15 | 1'-3" |
| 2 | FB16 | 1'-4" |

RED DOT CORPORATION

| | | | | |
|---|---|---|---|---|
| PROJECT ID | 70 | ENDWALL FRAMING | | |
| | 14186-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |




BACK SIDEWALL FRAMING: FRAME LINE D




BACK SIDEWALL SHEETING & TRIM: FRAME LINE D

PANELS: 26 Ga. PBR - Kynar

MEMBER TABLE
FRAME LINE D

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 2 | E-1 | 8 3/8" 16GA | 19'-11 1/2" |
| 1 | E-2 | 8 3/8" 16GA | 19'-11 1/2" |
| 2 | G-16 | 8X25Z14 | 21'-1 1/2" |
| 2 | G-17 | 8X25Z12 | 21'-1 1/2" |
| 2 | G-18 | 8X25Z14 | 22'-3 1/2" |
| 2 | G-19 | 8X25Z12 | 22'-3 1/2" |
| 2 | G-20 | 8X25Z14 | 21'-1 1/2" |
| 2 | G-21 | 8X25Z12 | 21'-1 1/2" |
| 2 | BC-5 | 8X25C16 | 19'-11 1/4" |
| 1 | BC-6 | 8X25C16 | 19'-11 1/2" |
| 4 | CR-1 | 7/16" Cable | 28'-7" |

SPECIAL BOLTS

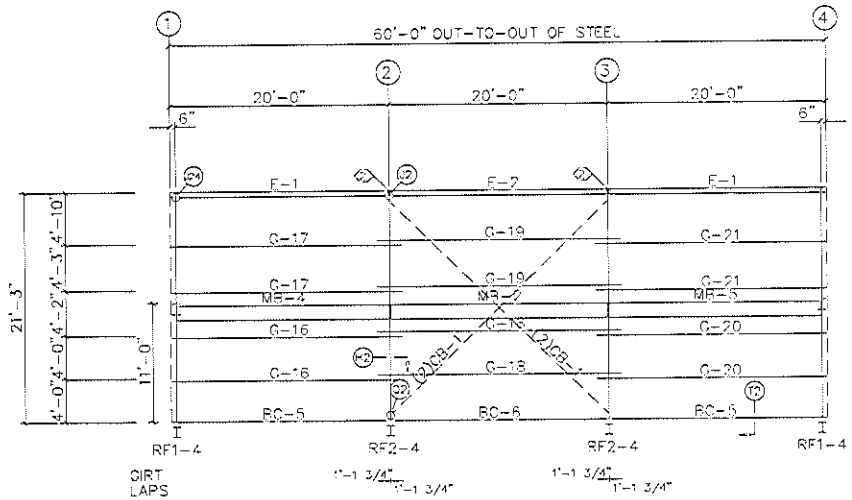
| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 2 | 2 | A325 | 1/2" | 1 1/2" | 2 |

TRIM TABLE
FRAME LINE D

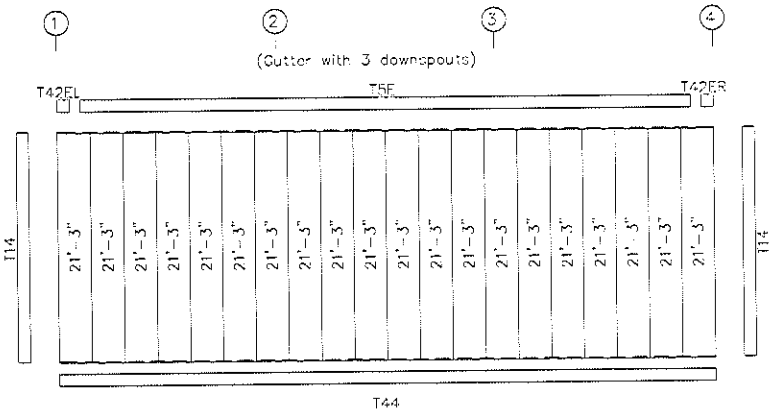
| QD | MARK | LENGTH |
|---|---|---|
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T5E | 246.000 |
| | T14 | 126.000 |
| | T44 | 241.000 |

RED DOT CORPORATION

| | | | | |
|---|---|---|---|---|
| PROJECT | 70 | SIDEWALL FRAMING | | |
| ID | 14186-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |




FRONT SIDEWALL FRAMING: FRAME LINE A




FRONT SIDEWALL SHEETING & TRIM: FRAME LINE A

PANELS: 26 Ga. PBR - Kynar

MEMBER TABLE
FRAME LINE A

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 2 | E-1 | 8 3/8" 16GA | 19'-11 1/2" |
| 1 | E-2 | 8 3/8" 16GA | 19'-11 1/2" |
| 2 | G-16 | 8X25Z14 | 21'-1 1/2" |
| 2 | G-17 | 8X25Z12 | 21'-1 1/2" |
| 2 | G-18 | 8X25Z14 | 22'-3 1/2" |
| 2 | G-19 | 8X25Z12 | 22'-3 1/2" |
| 2 | G-20 | 8X25Z14 | 21'-1 1/2" |
| 2 | G-21 | 8X25Z12 | 21'-1 1/2" |
| 2 | BC-5 | 8X25C16 | 19'-11 1/4" |
| 1 | BC-6 | 8X25C16 | 19'-11 1/2" |
| 4 | CS-1 | 7/16" Cable | 28'-7" |
| 1 | MB-2 | W16x31 | 19'-10 3/4" |
| 1 | MB-4 | W16x31 | 19'-4 3/4" |
| 1 | MB-5 | W16x31 | 19'-4 3/4" |

SPECIAL BOLTS

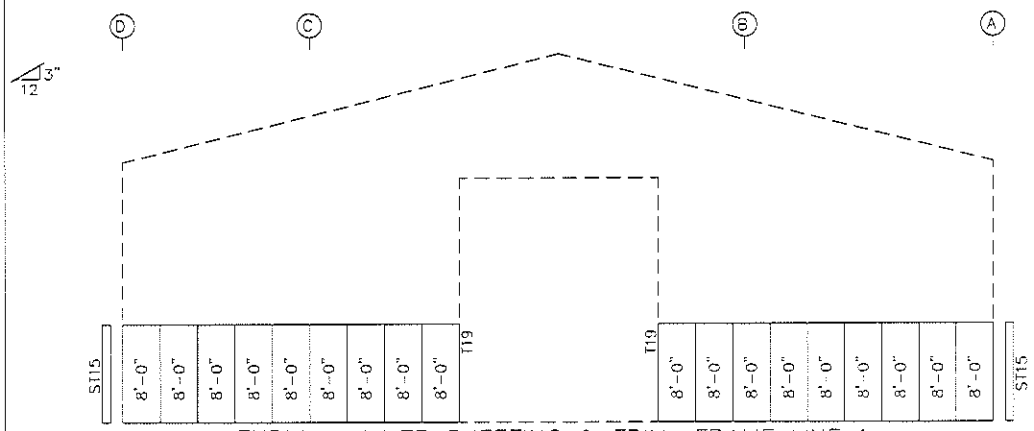
| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 2 | 2 | A325 | 1/2" | 1 1/2" | 2 |

TRIM TABLE
FRAME LINE A

| QTY | MARK | LENGTH |
|---|---|---|
| 1 | T42ER | 6.000 |
| 1 | T42EL | 6.000 |
| 1 | T5E | 240.000 |
| 2 | T14 | 126.000 |
| 1 | T44 | 241.000 |

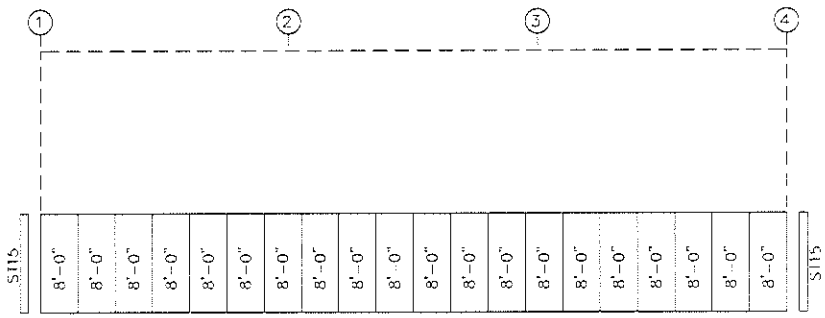
| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 70 | SIDEWALL FRAMING | | |
| ID | 14136-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET | OF |

Note: Request Verification of Location of
8' High Liner Panels on Approval Drawings



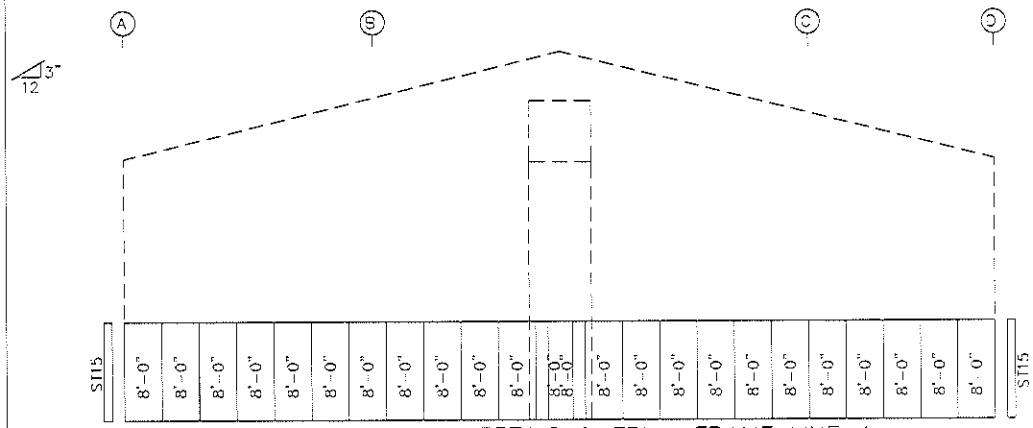

ENDWALL LINER SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. REV U – NEED COLOR



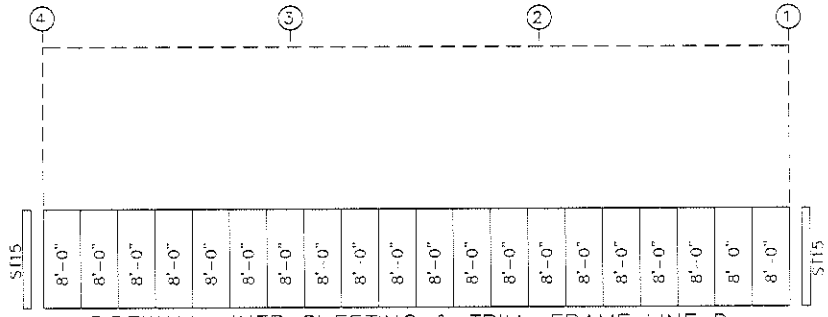

SIDEWALL LINER SHEETING & TRIM: FRAME LINE A

PANELS: 26 Ga. REV U – NEED COLOR




ENDWALL LINER SHEETING & TRIM: FRAME LINE 4

PANELS: 26 Ga. REV U – NEED COLOR

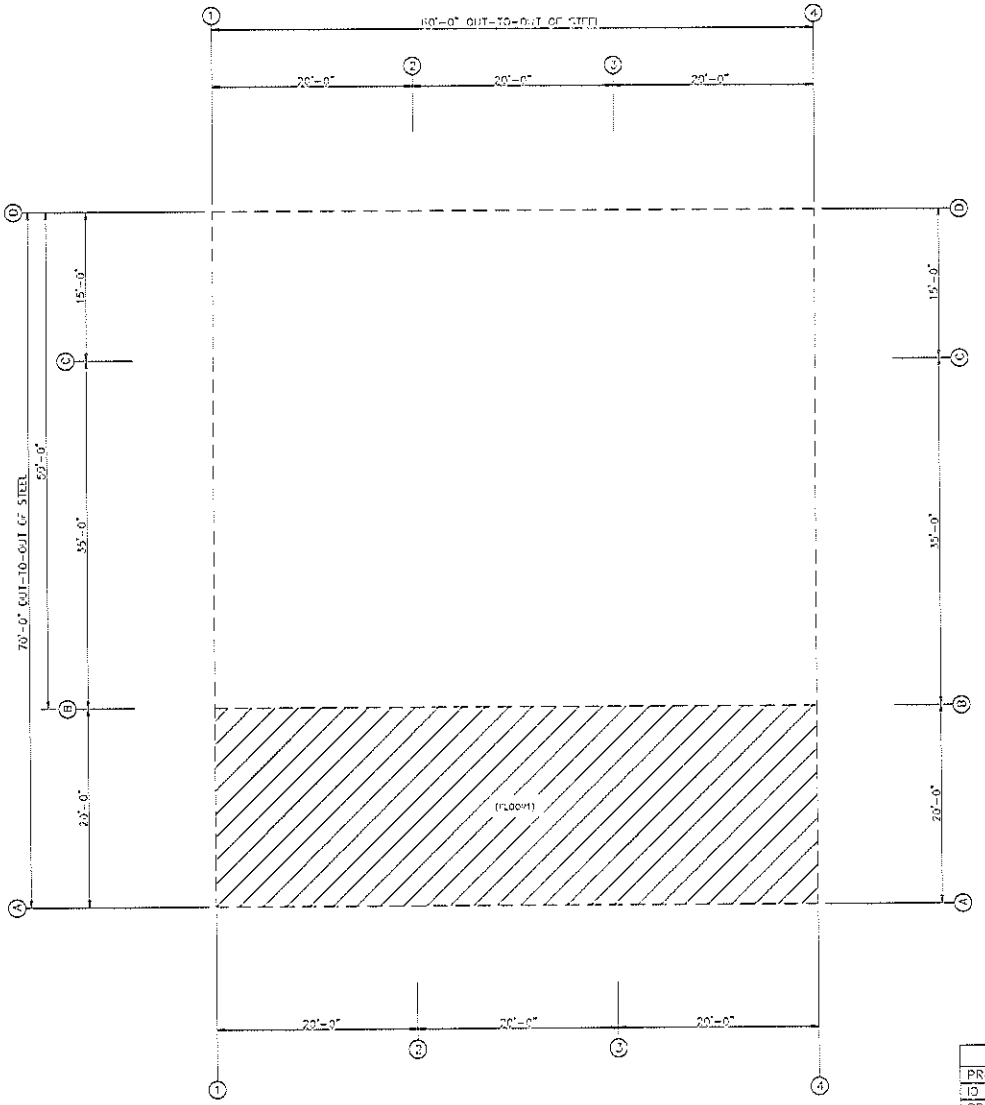



SIDEWALL LINER SHEETING & TRIM: FRAME LINE D

PANELS: 26 Ga. REV U – NEED COLOR

RED DOT CORPORATION

| | | | | |
|---|---|---|---|---|
| PROJECT | 70'x 60'x 21'– 3" | WALL LINER PANEL | | |
| ID | 14186-02R1 | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET | OF |

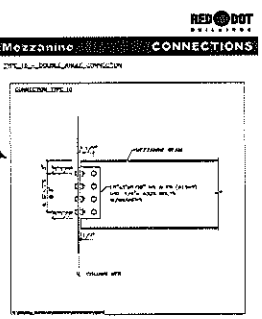


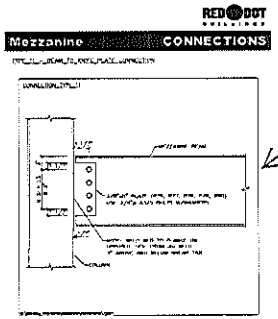

FLOOR KEY PLAN

FLOOR HEIGHT - 11'-0"

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | FLOOR KEY PLAN | |
| ID | 14186-02R1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

Connections Details S1 & S2, N = 3, (4) 3/4" A325 B & N's in each Leg



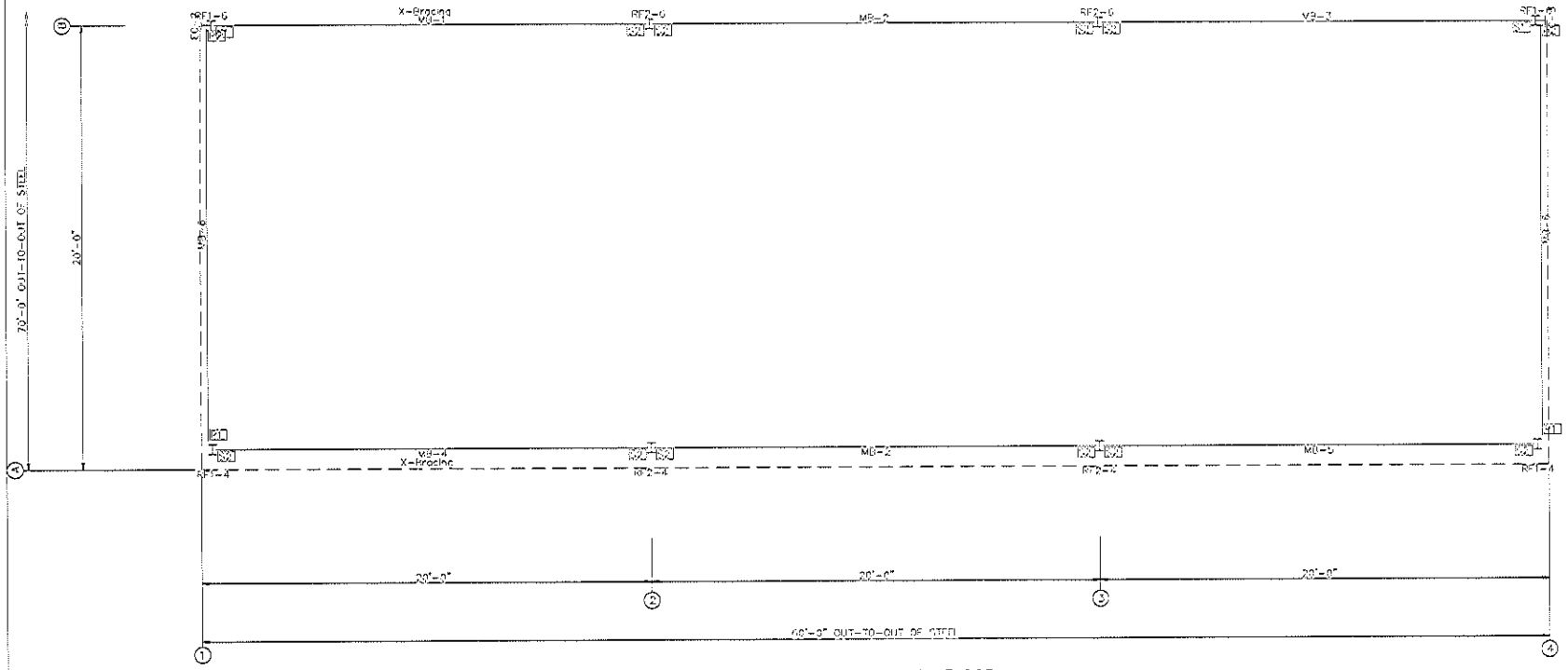




Connections Details P1 & P2, N = 2, (3) 3/4" A325 B & N's in each Leg

| BEAM TO BEAM BOLTED PLATE ASSY | | | | | |
|---|---|---|---|---|---|
| ID | Qty | Mat | Dia | Length | Mark/Part |
| P1 | 2 | A325 | 3/4" | 1 3/4" | |
| P2 | 6 | A325 | 3/4" | 1 3/4" | m2 |

| SUPPORT BEAM BOLTED PLATE ASSY | | | | | |
|---|---|---|---|---|---|
| ID | Qty | Mat | Dia | Length | Mark/Part |
| S1 | | A325 | 3/4" | 1 3/4" | |
| S2 | 6 | A325 | 3/4" | 1 3/4" | m1 |

| MEMBER LABEL | | |
|---|---|---|
| Mark | Part | Length |
| MB-1 | W16x31 | 19'-8 7/8" |
| MB-2 | W16x31 | 19'-10 3/4" |
| MB-3 | W16x31 | 19'-8 7/8" |
| MB-4 | W16x31 | 19'-4 3/4" |
| MB-5 | W16x31 | 19'-4 3/4" |
| MB-6 | W12x14 | 19'-2 3/4" |




FLOOR FRAMING & JOISTS: FLOOR 1

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 70 | FLOOR FRAMING & JOISTS | |
| ID | 14186-02R1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/28/14 | SHEET OF |

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

14366

*Description of Work:*

Targa Little Missouri #3 MCC Building

1939 125th Ave NW

Watford City, ND

*Required Inspections*

*(Inspector initial and date)*

___ Footing based on RIS provided

___ Foundation

___ Framing 9/9/14

___ Drywall 9/30/14

___ Final

___ Slab 8/15/14

*Date Issued:* 8/5/2014

Call 701.444.6494 ext. 2 for Inspections, no later than 24 hours in advance

**This Permit Expires 6 Months from Issue Date.**

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1651 126th Ave NW **Permit No.** 14Slide
**Subdivision** Targa Little Missouri **Lot No.** MCC Bldg **Date** 4/22/14
**Name** Ivan **Phone** **Time** 1400

☐Complaint ☑Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☑ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☐OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**

Shearwall sht wall (w.b. to Code
Pre-line except on corner, or Office
side - Need covered.
OK to install tape & finish
OK to proceed!
Corners covered - Approved 4/24/14

Signed Patrick Ehnle
Inspector

MCKENZIE

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1634 12th Ave NW **Permit No.** 19326
**Subdivision** Target Lot No. MFF Bldg **Date** 9/6/19
**Name** Ryan **Phone** **Time** 1:00

☐Complaint ☒Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☒ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☒ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☒OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**

Metal framing in place. Insulated
No issues or concerns noted
All framing in place per plans

Upgrade from shear wall ⇒ Approved 9/6/19
Non-framing wall.
OK to proceed

Signed Ryan J. Ystad Inspector

Page 1 of 1

MCKENZIE

Slab Only

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
For Inspections Call: 701-444-3616 x1045

Property Address 1939 123rd Ave NW Permit No. 1431slab
Subdivision Tarpon Lake Addition #3 Lot No. MCC Bldg Date 8/15/14
Name Joey Phone Time
☐Complaint ☑Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other Slab | ☒ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**
☐Prior Violation Not Corrected
☐Engineering required
Item # ____
☐Work Incomplete
☐OK to proceed without reinspection
☐Other ____

**UNABLE TO MAKE INSPECTION BECAUSE:**
☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time ____

Comments:
Corner of brussels Ave NW
#4 grid @ 18" O.C.
All tops to be at top pins

Signed [signature] Inspector

Page 1 of 1

RECEIVED
JUN 2 6 2014

*McKenzie County Building& Planning Department*
*201 5th Street NW*
*Watford City, ND 58854* mckenziecountynd
*Phone: 701-444-6494*

Permit No: 14366

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

RECEIVED
JUN 2 6 2014

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

Project Title: Targa - Little Missouri #3 mcc/control/I.A. Bldg.

Property Address: 1939 125th Ave NW City/Zip: Watford City, ND 58854

Subdivision: NW 1/4 OF SW 1/4 Lot#: N/A

Township: T149 Section: 29 Range: 98W

Name of Applicant: Mike Pratt Address/City/Zip: 25610 Clay Rd./Katy, TX 77493

Phone Numbers: 281-371-7500 Email: mike.pratt@opdepc.com

## 2. OWNER INFORMATION

Owner Name: Targa

Owner Address: 25610 Clay Rd. Address/City/Zip: Katy, TX 77493

Owner Phone Number: 281-371-7500

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
|---|---|---|---|---|

Location of Work: (ie: Floor, Level) GROUND LEVEL

Square Footage of Work Being Done: ±2325

Describe in detail work being done:

Metal Bldg Shell for offices and equipment.
B-1435
U-1196

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

General Contractor Name: OPD Phone #: 281-371-7500

ND License #: 50680

14366 footing and foundation MCC Building Notes

9-23-2014

Permit # 14366 MCC Building

OPD, contractor for the Targa Little Missouri Plant recently obtained permits for several buildings. Before being made aware that they needed inspections, they poured footing and foundation for the MCC Building. They have provided 120 pictures of the rebar in the footing and foundation for the building. After inspecting the footing and foundation for other permits on the property, I was able to go back and look at the pictures provided and compare them to the submitted plans for the footing and foundation. The photos submitted verify that the requirments in the design have been met up to but not including the hairpins around the anchor bolts or the slab.The contractor should submit additional pictures of the slab pour that verify the hairpins have been installed.

Bobbi Strait

Slab Insp. Rpt specifies Hairpins in place
No Pictures Required
Roberto Abrego

## 5. ZONING/ASSESING INFORMATION (for office use only)

| New ☐ | Addition | Alteration ☐ | Demolition ☐ | Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |
| Zoning: Industrial | Average Depth of Lot: | | Lot Area (sq ft): | |
| Easement: | | | | |
| Front Yard Setback | Side Yard Setbacks | | Rear Yard Setback | |
| | | | | |
| Area of Main: | Finished Area: | | Finished Area Aft / Add: | |
| # Required Parking Spaces | Area Required Parking: | | Total Area: | |
| **Zoning Approval Signature:** J Stuller | | | **Date:** 8/14/14 | |

## 6. BUILDING CODE INFORMATION (for office use only)

| | |
|---|---|
| Occupancy Classification: | Change of Occupancy: |
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |

## 7. PROJECT REVIEW

| |
|---|
| Reviewed By: T. Tavon |
| Project Title: |
| Address: |
| $1500 Application Submittal Fee is required. ☐ Check Rec'd No. _____ OR ☐ Payment Receipt from Treasurer |
| ☐ Payment scanned to electronic files. Date:_____ |
| Total Permit Fee Amount $4852.50 |

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature

6-26-2014
Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

# County Building Permit Fee Worksheet

**Permit #:** 14366
**Name:** Targa MCC Control Bldg
**Address:** 1939 125th Ave NW
**Subdivision:**

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| 5 | | x | | = 0 |
| 6 | | x | | = 0 |
| | | TOTAL AREA | | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| | | TOTAL AREA | | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | TOTAL AREA | | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | TOTAL AREA | | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | TOTAL AREA | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | | |
|---|---|---|---|---|---|---|---|
| Valuation of Office | B Business | IIB | $238.05 (Cost/Sqft) | x | 1435.0 (Square Footage) | = | $341,595.51 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of garage | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| * Private Garages use Utility, miscellaneous<br>Valuation of Utilitiy Area | U Utility, miscellaneous | IIB | $95.06 (Cost/Sqft) | x | 1190.0 (Square Footage) | = | $113,115.45 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | (Hours req'd for inspection) | | (Value of Structure) | = | $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustment % (+/-) 0%

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by George Williams (gwilliams@Forsgren.com / 801-403-8152) or Jason VonWeller (jvonweller@Forsgren.com / 801-837-6234).

| Reasoning for Adjustment *Required* | |
|---|---|

**TOTAL BUILDING VALUATION** $454,710.96

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $2,940.91 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $1,911.59 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $4,852.50 |
| PREPAID DEPOSIT | $0.00 |
| AMOUNT DUE | $4,852.50 |

Calculated By: Kendall Phillips Date: 8/5/2014

Signature:

McKenzie County Building & Planning Department
201 5th Street NW
Watford City, ND 58854 mckenziecounty.net
Phone: 701-444-6494

#14438
Permit No: _____

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

Submit Application Along with Submittal Requirements

| 1. PROJECT INFORMATION | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Compressor Bldg. | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW 1/4 OF SW 1/4 | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@opdepc.com |

| 2. OWNER INFORMATION | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

| 3. PROJECT DESCRIPTION | | | | |
|---|---|---|---|---|
| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
| Location of Work: (ie: Floor, Level) | GROUND LEVEL | Square Footage of Work Being Done: | | |
| Describe in detail work being done: Metal Bldg. for compressors. | | | | |
| Foundation Type: | Footing/stem walls | | | |

| 4. FEE INFORMATION | | | |
|---|---|---|---|
| General Contractor Name: | OPD | Phone #: | 281-371-7500 |
| ND License #: | 50680 | | |

Deposit $1500

*McKenzie County Building & Planning Department*
*201 5th Street NW*
*Watford City, ND 58854 mckenziecounty.net*
*Phone: 701-444-6494*

Permit No: #14437

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Warehouse Bldg. | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW 1/4 OF SW 1/4 | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@.opdepc.com |

## 2. OWNER INFORMATION

| | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
|---|---|---|---|---|

| | |
|---|---|
| Location of Work: (ie: Floor, Level) GROUND LEVEL | Square Footage of Work Being Done: |

Describe in detail work being done:

Metal Bldg for warehouse use

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

| | | | |
|---|---|---|---|
| General Contractor Name: | OPD | Phone #: | 281-371-7500 |
| ND License #: | 50680 | | |

Deposit $1000

McKenzie County Building & Planning Department
201 5th Street NW
Watford City, ND 58854 mckenziecounty.net
Phone: 701-444-6494

Permit No: #14439

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Slug Catcher Bldg | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW 1/4 OF SW 1/4 | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@.opdepc.com |

## 2. OWNER INFORMATION

| | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

## 3. PROJECT DESCRIPTION

| | | | | |
|---|---|---|---|---|
| Type of Work: check box that applies | (New Construction) | Alteration | Addition | Demolition |

Location of Work: (ie: Floor, Level) GROUND LEVEL

Square Footage of Work Being Done: 1600

Describe in detail work being done:

Metal Bldg for slug catcher equipment.

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

General Contractor Name: OPD Phone #: 281-371-7500

ND License #: 50680

Deposit $1000

McKenzie County Building & Planning Department
201 5th Street NW
Watford City, ND 58854 mckenziecounty.net
Phone: 701-444-6494

Permit No: #14438

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

Project Title: Targa - Little Missouri #3 Office Bldg

Property Address: 1939 125th Ave NW City/Zip: Watford City, ND 58854

Subdivision: NW 1/4 OF SW 1/4 Lot#: N/A

Township: T149 Section: 29 Range: 98W

Name of Applicant: Mike Pratt Address/City/Zip: 25610 Clay Rd./Katy, TX 77493

Phone Numbers: 281-371-7500 Email: mike.pratt@opdepc.com

## 2. OWNER INFORMATION

Owner Name: Targa

Owner Address: 25610 Clay Rd. Address/City/Zip: Katy, TX 77493

Owner Phone Number: 281-371-7500

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
|---|---|---|---|---|

Location of Work: (ie: Floor, Level) GROUND LEVEL

Square Footage of Work Being Done:

Describe in detail work being done:

Metal Bldg. for office use.

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

General Contractor Name: OPD Phone #: 281-371-7500

ND License #: 50680

Deposit $1000

# Receipt

## TRANSACTION SUMMARY

TRANSACTION TYPE: SALE

| PAYMENT ITEM | REFERENCE NUMBER | AMOUNT |
|---|---|---|
| NPS Convenience Fee | | $110.25 |
| Permit Fees | #14438/#14437/14436/14439/TARGA | $4500.00 |
| TOTAL: | | $4610.25 |

MCKENZIE COUNTY TREASURER
201 5TH ST NW STE 504
Waterford City,ND 58854
701-444-3616

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874273 |
| Date Processed: | 08/05/2014 15:55:43 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 009841 |
| Reference Number: | 00557875 |
| Permit Fees | $4500.00 |
| Total: | $4500.00 |

I agree to pay above total amount according to the card issuer agreement.

Signature: _____

Thank You
MUNICIPAY*SERVICE FEE MCKENZIE COUNTY
400 Technology Way
Scarborough,ME 04074
877-290-1975

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874273 |
| Date Processed: | 08/05/2014 15:55:43 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 009852 |
| Reference Number: | 00557884 |
| Convenience Fee | $110.25 |
| Total: | $110.25 |

I agree to pay above total amount according to the card issuer agreement & understand this convenience fee will be charged to allow my payment via credit card.

Signature: _____

Thank You
Printed: 08/05/2014 16:56:48

Receipt

## TRANSACTION SUMMARY

TRANSACTION TYPE: SALE

| PAYMENT ITEM | REFERENCE NUMBER | AMOUNT |
|---|---|---|
| NPS Convenience Fee | | $82.14 |
| Permit Fees | TARGA/PERMIT #14366 REMAINDER | $3352.50 |
| TOTAL: | | $3434.64 |

MCKENZIE COUNTY TREASURER
201 5TH ST NW STE 504
Waterford City,ND 58854
701-444-3616

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874318 |
| Date Processed: | 08/05/2014 16:21:17 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 057086 |
| Reference Number: | 00568763 |
| Permit Fees | $3352.50 |
| Total: | $3352.50 |

I agree to pay above total amount according to the card issuer agreement.

Signature: _____

Thank Yon
MUNICIPAY*SERVICE FEE MCKENZIE COUNTY
400 Technology Way
Scarborough,ME 04074
877-290-1975

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874318 |
| Date Processed: | 08/05/2014 16:21:17 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 057081 |
| Reference Number: | 00568762 |
| Convenience Fee | $82.14 |
| Total: | $82.14 |

I agree to pay above total amount according to the card issuer agreement & understand this convenience fee will be charged to allow my payment via credit card.

Signature: _____

Thank You
Printed: 08/05/2014 17:21:32

# County Building Permit Fee Worksheet

Permit #: 14366
Name: Targa MCC Control Bldg
Address: 1939 125th Ave NW
Subdivision:

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| 5 | x | | = | 0 |
| 6 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | |
|---|---|---|---|---|---|---|
| Valuation of Office | B Business | IIB | $238.05 (Cost/Sqft) | x | 1435.0 (Square Footage) | = $341,595.51 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of garage | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| * Private Garages use Utility, miscellaneous Valuation of Utilitiy Area | U Utility, miscellaneous | IIB | $95.06 (Cost/Sqft) | x | 1190.0 (Square Footage) | = $113,115.45 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | (Hours req'd for inspection) | | (Value of Structure) | = $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustment % (+/-) 0%

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by George Williams (gwilliams@Forsgren.com / 801-403-8152) or Jason VonWeller (jvonweller@Forsgren.com / 801-837-6234).

| Reasonlog for Adjustment *Required* | |
|---|---|

TOTAL BUILDING VALUATION $454,710.96

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $2,940.91 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $1,911.59 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

TOTAL FEE $4,852.50

PREPAID DEPOSIT $0.00 1500.00

AMOUNT DUE ~~$4,852.50~~ 3352.50

Calculated By: Kendall Phillips

Date: 8/5/2014

Signature:

# Receipt

## TRANSACTION SUMMARY

TRANSACTION TYPE: SALE

| PAYMENT ITEM | REFERENCE NUMBER | AMOUNT |
|---|---|---|
| NPS Convenience Fee | | $82.14 |
| Permit Fees | TARGA/PERMIT #14366 REMAINDER | $3352.50 |
| **TOTAL:** | | $3434.64 |

MCKENZIE COUNTY TREASURER
201 5TH ST NW STE 504
Waterford City,ND 58854
701-444-3616

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874318 |
| Date Processed: | 08/05/2014 16:21:17 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 057086 |
| Reference Number: | 00568763 |
| Permit Fees | $3352.50 |
| **Total:** | $3352.50 |

I agree to pay above total amount according to the card issuer agreement.

Signature: _____

Thank You
MUNICIPAY*SERVICE FEE MCKENZIE COUNTY
400 Technology Way
Scarborough,ME 04074
877-290-1975

JOSEPH HIGGINBOTHAM

| | |
|---|---|
| Transaction Number: | 874318 |
| Date Processed: | 08/05/2014 16:21:17 CDT |
| Transaction Type: | Credit Card |
| VISA - Key Entered | CardNumber: **********4153 |
| Authorization: | 057081 |
| Reference Number: | 00568762 |
| Convenience Fee | $82.14 |
| **Total:** | $82.14 |

I agree to pay above total amount according to the card issuer agreement & understand this convenience fee will be charged to allow my payment via credit card.

Signature: _____

Thank You
Printed: 08/05/2014 17:21:32

# County Building Permit Fee Worksheet

**Permit #:** 14366
**Name:** Targa MCC Control Bldg
**Address:** 1939 125th Ave NW
**Subdivision:**

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| 5 | | x | | = 0 |
| 6 | | x | | = 0 |
| | | | TOTAL AREA | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| | | | TOTAL AREA | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | | TOTAL AREA | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | | TOTAL AREA | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | | | TOTAL AREA | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | |
|---|---|---|---|---|---|---|
| Valuation of Office | B Business | IIB | $238.05 (Cost/Sqft) | x | 1435.0 (Square Footage) | = $341,595.51 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of garage | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| * Private Garages use Utility, miscellaneous<br>Valuation of Utilitiy Area | U Utility, miscellaneous | IIB | $95.06 (Cost/Sqft) | x | 1190.0 (Square Footage) | = $113,115.45 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | (Hours req'd for inspection) | | (Value of Structure) | = $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustment % (+/-) 0%

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by George Williams (gwilliams@Forsgren.com / 801-403-8152) or Jason VonWeller (jvonweller@Forsgren.com / 801-837-6234).

| Reasoning for Adjustment *Required* | |
|---|---|

**TOTAL BUILDING VALUATION** $454,710.96

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $2,940.91 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $1,911.59 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $4,852.50 |
| PREPAID DEPOSIT | $0.00 1500.00 |
| AMOUNT DUE | ~~$4,852.50~~ 3352.50 |

Calculated By: Kendall Phillips Date: 8/5/2014

Signature:

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

14436

*Description of Work:*

Targa No. 3 Office Bldg

1939 125th Ave

Watford City, ND

*Required Inspections*

*(Inspector initial and date)*

____ Footing

____ Foundation

____ Footing

____ Final

*Date Issued:* 8/25/2014

Call 701.444.6494 ext. 2 for Inspections, no later than 24 hours in advance

**This Permit Expires 6 Months from Issue Date.**

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1936 12Sth Ave. NW **Permit No.** 14131e
**Subdivision** Targa Little Missouri Lot No. O.L.C. Bldg **Date** 4/21/14
**Name** Ivan **Phone** _____ **Time** 2:15

☐Complaint ☐Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other _____ | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other _____ | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☐ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other Slab | ☑ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other _____ | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other _____ | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☑OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**

Hit brick pins in corners & anchor bolt.
Hit grid @ 16" o.c. on 3" concrete
brick.
Inspect & bed per code

OK to pour

Signed _____ Inspector

MCKENZIE COUNTY

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1934 125th Ave NW **Permit No.** 14113P
**Subdivision** Vinje **Lot No.** Blk 4 Lot 3 **Date** 6/4/14
**Name** Vinje **Phone** _____ **Time** 1:45

☐Complaint ☐Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other _____ | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other _____ | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☐ | ☐ | ☐ |
| 11. Footings | ☑ | ☐ | ☐ |
| 12. Foundation | ☑ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other _____ | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other _____ | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other _____ | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**

☐Prior Violation Not Corrected
☐Engineering required
Item # _____
☐Work Incomplete
☐OK to proceed without reinspection
☐Other _____

**UNABLE TO MAKE INSPECTION BECAUSE:**

☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time _____

**Comments:**

#4 rebar on 6' O.C. by #5 NC
3rd
#5 Horizontals throughout remainder
#5 Horizontals on 10' ctrs throughout
stemwall Double layer
#4 Vert's @ 12" O.C.
All in place as per plans
OK to pour

Signed Robert Gatsch Inspector

# McKenzie County Building Permit Fee Worksheet

**Permit #:** 14436
**Name:** Targa Little Missouri No.3 Office Bldg
**Address:** 1939 125th Ave, Watford City
**Subdivision:**

## SQUARE FOOTAGE COMPUTATION *(if totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| 5 | x | | = | 0 |
| 6 | x | | = | 0 |
| | TOTAL AREA | | | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| | TOTAL AREA | | | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | TOTAL AREA | | | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | TOTAL AREA | | | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | TOTAL AREA | | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | | |
|---|---|---|---|---|---|---|---|
| Valuation of main floor | B Business | VB | $181.99 (Cost/Sqft) | x | 3900.0 (Square Footage) | = | $709,748.91 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of garage * Private Garages use Utility, miscellaneous | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of deck/covered patio | N/A | N/A | $0.00 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | (Hours req'd for inspection) | | (Value of Structure | = | $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by the Building Official

Adjustment % (+/-) 0%

| Reasoning for Adjustment *Required | |
|---|---|

TOTAL BUILDING VALUATION $709,748.91

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $4,143.87 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $2,693.52 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $6,837.39 |
| PREPAID DEPOSIT | $0.00 |
| **AMOUNT DUE** | $6,837.39 |

Calculated By: Kendall Phillips Date: 8/25/2014

Signature: _____

*McKenzie County Building& Planning Department*
*201 5th Street NW*
*Watford City, ND 58854 mckenziecounty.net*
*Phone: 701-444-6494*

Permit No: #14438

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

RECEIVED
AUG 05 2014

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Office Bldg | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW ¼ OF SW ¼ | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@.opdepc.com |

## 2. OWNER INFORMATION

| | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
|---|---|---|---|---|

| | |
|---|---|
| Location of Work: (ie: Floor, Level) GROUND LEVEL | Square Footage of Work Being Done: |

Describe **in detail** work being done:

Metal Bldg. for office use.
3600SF

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

| | | | |
|---|---|---|---|
| General Contractor Name: | OPD | Phone #: | 281-371-7500 |
| ND License #: | 50680 | | |

## 5. ZONING/ASSESING INFORMATION (for office use only)

| New ☐ | Addition | Alteration ☐ | Demolition ☐ | Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |

| Zoning: per approval | Average Depth of Lot: | Lot Area (sq ft): |
|---|---|---|
| Easement: | | |
| Front Yard Setback | Side Yard Setbacks | Rear Yard Setback |
| ⊗ see site plan | | |
| Area of Main: | Finished Area: | Finished Area Alt / Add: |
| # Required Parking Spaces | Area Required Parking: | Total Area: |
| Zoning Approval Signature: Walter T Hadley | | Date: 8/25/14 |

## 6. BUILDING CODE INFORMATION (for office use only)

| Occupancy Classification: | Change of Occupancy: |
|---|---|
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |
| | |

## 7. PROJECT REVIEW

| Reviewed By: T Tarom |
|---|
| Project Title: |
| Address: |
| $1500 Application Submittal Fee is required. ☐ Check Rec'd No. _____ OR ☐ Payment Receipt from Treasurer |
| ☐ Payment scanned to electronic files. Date: _____ |
| Total Permit Fee Amount $ 6837.39 |

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature

8/7/2014
Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Office Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 3900 SF
2. Height of Building: +/- 20'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group B
5. Table 503: Allowable height: 40'/1 story. OK; Allowable area: 9000 sf. OK
6. Table 1004.1.2: Occupant load: Business ares: 1/100 sf. 2204 sf @ 1/100: 22 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 3 exits provided. OK
8. 1018.1: Exception 4: Fire Resistance rated corridor not required.
9. Doors/Windows: Refer to Legend, Targa Drawing number 903 for door/window information.
10. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
11. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
12. Gratings at exterior doors: Refer to detail 4/S2.1. Top of grating to be flush with finish floor.
13. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

14. Detail 7, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
15. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
16. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

Date 8-5-2014 Lic. No. 2163

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Office Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 3900 SF
2. Height of Building: +/- 20'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group B
5. Table 503: Allowable height: 40'/1 story. OK; Allowable area: 9000 sf. OK
6. Table 1004.1.2: Occupant load: Business ares: 1/100 sf. 2204 sf @ 1/100: 22 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 3 exits provided. OK
8. 1018.1: Exception 4: Fire Resistance rated corridor not required.
9. Doors/Windows: Refer to Legend, Targa Drawing number 903 for door/window information.
10. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
11. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
12. Gratings at exterior doors: Refer to detail 4/S2.1. Top of grating to be flush with finish floor.
13. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

14. Detail 7, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
15. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
16. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

John Biggs

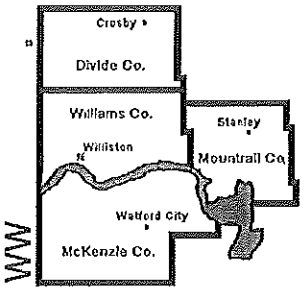
Date 8-5-2014 Lic. No. 2163

# Upper Missouri District Health Unit

*"Your Public Health Professionals"*

Date: 8/8/2013

Check #: 575661





WILLIAMS COUNTY
110 W. Bdwy, Ste 101
Williston, ND 58801-6056
Phone 701-774-6400
Fax 701-577- 8536
Toll Free 1-877-572-3763


X $100.00 Individual Permit Fee
_____ $200.00 Multi -dwelling up to 20 bedrooms
_____ $500.00 Multi-dwelling more than 20bedrooms
_____ $50.00 Holding Tank
_____ $50.00 Rebuilding Fee

AUG 15 2013 NEG

## SEWAGE TREATMENT SYSTEM PLANS
## PERMIT

OWNER Targa Badlands LLC phone 701-842-3315

INSTALL ADDRESS 1939 125th Ave NW Watford City, ND 58854

MAILING ADDRESS 1939 125th Ave NW Watford City, ND 58854

DIRECTIONS TO PROPERTY From Watford City take US 85 S approx 4.1 miles take a left onto Co. 37. After approx. 6 miles take a right and travel approx 1.7 miles to site on left.

PURCHASER N/A LENDING INSTITUTION N/A

COUNTY McKenzie TWP T149 RNG 98W SEC 29

SUBD NW 1/4 of SW 1/4 LOT N/A BLOCK N/A

LOT SIZE 40 acres # OF BEDROOMS N/A or # OF EMPLOYEES 15 WELL DEPTH N/A

If you do not include township, range and section and number of bedrooms there will be a delay in processing your permit while we have to contact you. **The building owner, contractor, plumbing contractor, and/or installer are jointly responsible for compliance with U.M.D.H.U.'s Regulations for Individual Sewage Treatment Systems. In addition, it is your responsibility to follow all city, township and county regulations.**

Owner: [signature] Date: 8/8/13

DEPTH TO RESTRICTING LAYER _____ SOIL TYPE Clay Loam

SEPTIC TANK (WORKING CAPACITY) 1,000 GAL.

**TREATMENT AREA:**

TRENCH IN SQUARE FEET

6" GRAVEL 1660 12"GRAVEL 530 18"GRAVEL 440 24"GRAVEL 380

GRAVELLESS PIPE IN LINEAR FEET:

8" 330 10" 220

CHAMBER SYSTEM IN LINEAR FEET:

12" TALL 180 15"TALL 160

MOUND IN SQUARE FEET 240

ISTS PERMIT GOOD FOR 12 MONTHS FROM DATE OF ISSUE.

APPROVED BY: _____ DATE: _____

NOTIFY THIS OFFICE AT LEAST 2 BUSINESS DAYS PRIOR TO INSTALLATION FOR INSPECTION.

# ISTS Plans

List any plan issues: _____

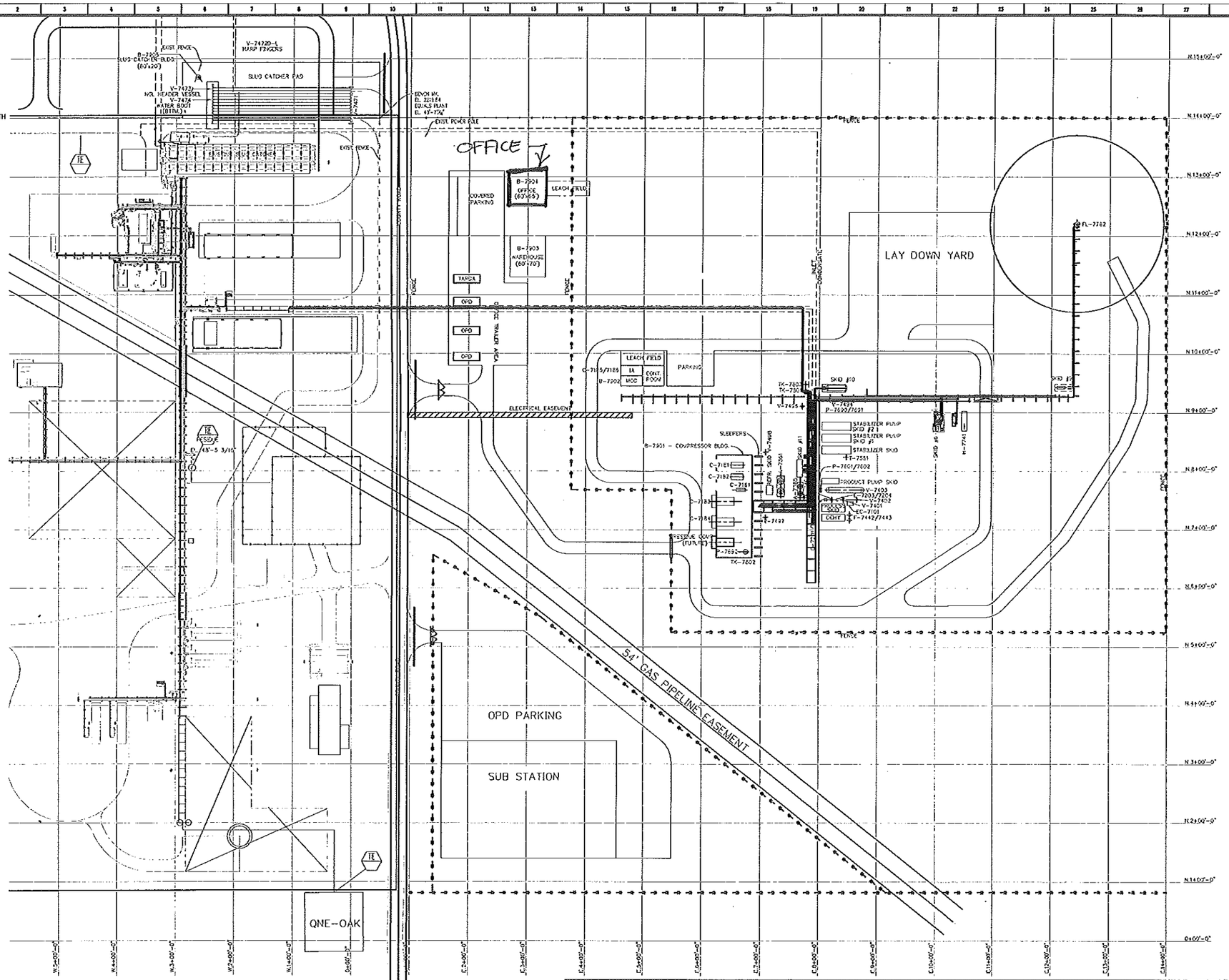
## Setbacks

| | Well <100' | Well >100' | Distribution Device | Treatment Area | Property Lines | Building |
|---|---|---|---|---|---|---|
| Bldg. Sewer | 100 | 50 | —— | —— | —— | —— |
| Septic tank | 100 | 50 | 5 | 10 | 10 | 10 |
| Distribution Device | 100 | 50 | —— | —— | 10 | 20 |
| Treatment area | 100 | 50 | 5 | —— | 10 | 10 |
| Well <100' | -- | -- | 100 | 100 | n/a | n/a |
| Well >100' | -- | -- | 50 | 50 | n/a | n/a |
| water line (pressure) | -- | -- | 10 | 10 | n/a | n/a |
| (suction) | -- | -- | 50 | 50 | n/a | n/a |
| Surface Water bodies | n/a | n/a | 100 | 100 | n/a | n/a |

## Reminders:

Rock Size: 1 to 3 inches

Cover Material: Straw or Fabric




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7449 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TEG REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7451 | REFRIGERANT SUCTION SCRUBBER |
| V-7452 | REFRIGERANT ECONOMIZER |
| V-7453 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7497 | HEAT MEDIUM FILTER |
| P-7656/7657 | HEAT MEDIUM PUMPS |
| V-7422 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7653/7654/7655 | CONDENSATE PIPELINE PUMPS |
| V-7479 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7281 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| E-7252 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7283 | STABILIZER REBOILER |
| F-7451/7452 | STABILIZER FEED FILTERS |
| F-7453/7454 | STABILIZER FEED COALESCERS |
| F-7455 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7403 | FLARE KNOCK OUT DRUM |
| P-7655/7659 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7456 | CLOSED DRAIN TANK |
| P-7657/7631 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7455 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7284 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7501 | COMPRESSOR BUILDING |
| B-7502 | CONTROL ROOM/MCC/I.A. BUILDING |
| B-7503 | WAREHOUSE BUILDING |
| B-7504 | OFFICE BUILDING |
| B-7505 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7361 | REFRIGERANT CONDENSER |
| A-7351/7354 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7359 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7181 | REFRIGERANT COMPRESSOR |
| C-7151/7152 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7155/7156 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| E-7208 | SEAL GAS HEATER |
| F-7442/7443 | MOL SIEVE DEHYDRATORS |
| F-7454 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7604/7602 | PRODUCT BOOSTER PUMPS |
| P-7609 | METHANOL INJECTION PUMP |
| P-7632 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7551 | STABILIZER |
| TK-7501 | WATER TANK |
| TK-7502 | COMPRESSOR BUILDING SUMP |
| TK-7503 | SLOP OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7421 | HEADER VESSEL |
| V-7422D-L | HARP FINGERS |
| V-7423 | NGL HEADER VESSEL |
| V-7424 | WATER BOOT |
| V-7425 | INSTRUMENT AIR RECIEVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7498 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | B | ISSUED FOR APPROVAL | RBJ | | |
| | A | ISSUED FOR BID - OPD JOB #14025 | RBJ | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

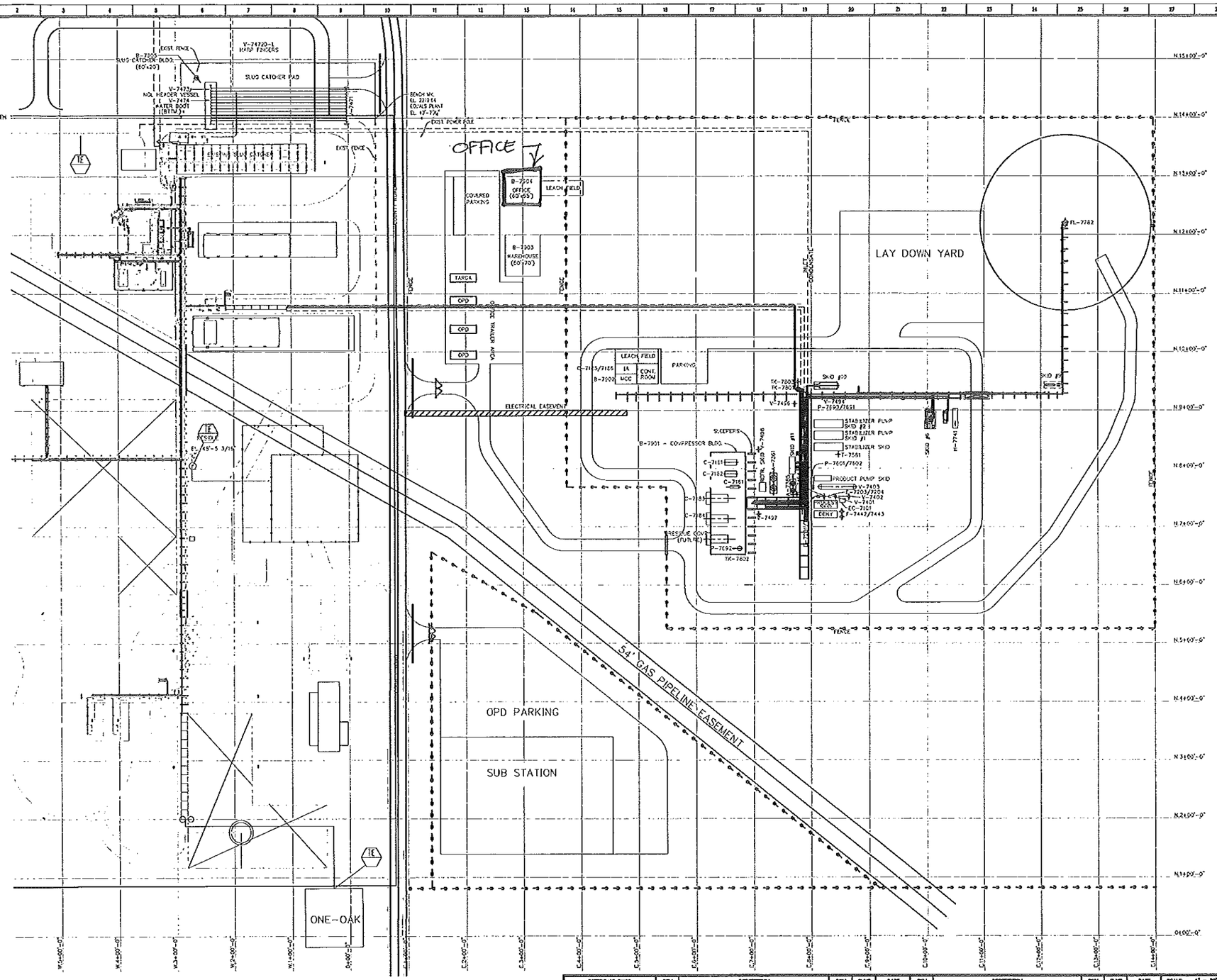
| | |
|---|---|
| SCALE: | 1" = 80' |
| DWN BY: | RBJ |
| CHKD BY: | |
| FINAL OK: | |
| ENGR: | MP |
| APPR: | |
| APPR: | |
| PLANT NAME | LITTLE MISSOURI #3 |
| DATE | 3/7/14 |

TARGA

| | |
|---|---|
| DRAWING NUMBER | LM-3000 |
| CAD FILE NAME | LM-3000 |
| REVISION | B |

# PLOT PLAN
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: –




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7341 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7445 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TOM REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7352 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7451 | REFRIGERANT SUCTION SCRUBBER |
| V-7452 | REFRIGERANT ECONOMIZER |
| V-7453 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7457 | HEAT MEDIUM FILTER |
| P-7655/7657 | HEAT MEDIUM PUMPS |
| V-7452 | HEAT MEDIUM EXPANSION TANK |
| H-7351 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7653/7654/7655 | CONDENSATE PIPELINE PUMPS |
| V-7475 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7251 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| E-7252 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7253 | STABILIZER REBOILER |
| F-7451/7452 | STABILIZER FEED FILTERS |
| F-7453/7454 | STABILIZER FEED COALESCERS |
| F-7455 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7483 | FLARE KNOCK OUT DRUM |
| P-7658/7659 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7454 | CLOSED DRAIN TANK |
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7456 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7204 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7901 | COMPRESSOR BUILDING |
| B-7902 | CONTROL ROOM/MCC/T.A. BUILDING |
| B-7903 | WAREHOUSE BUILDING |
| B-7904 | OFFICE BUILDING |
| B-7905 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7353/7354 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7355 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7151 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7205 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7202/7204 | SIDE REBOILER - REBOILER |
| E-7208 | SEAL GAS HEATER |
| F-7443/7443 | MOL SIEVE DEHYDRATORS |
| F-7454 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7341 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7609 | METHANOL INJECTION PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7561 | DEHEPTANIZER |
| T-7581 | STABILIZER |
| TK-7601 | WATER TANK |
| TK-7602 | COMPRESSOR BUILDING SUMP |
| TK-7603 | SLOP OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7471 | HEADER VESSEL |
| V-7472D-L | HARP FINGERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7455 | INSTRUMENT AIR RECEIVER |
| V-7457 | STARTING AIR VOLUME TANK |
| V-7458 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|
| | B | ISSUED FOR APPROVAL | RSJ | | |
| | A | ISSUED FOR BID – OPD JOB #14025 | RSJ | - | - |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

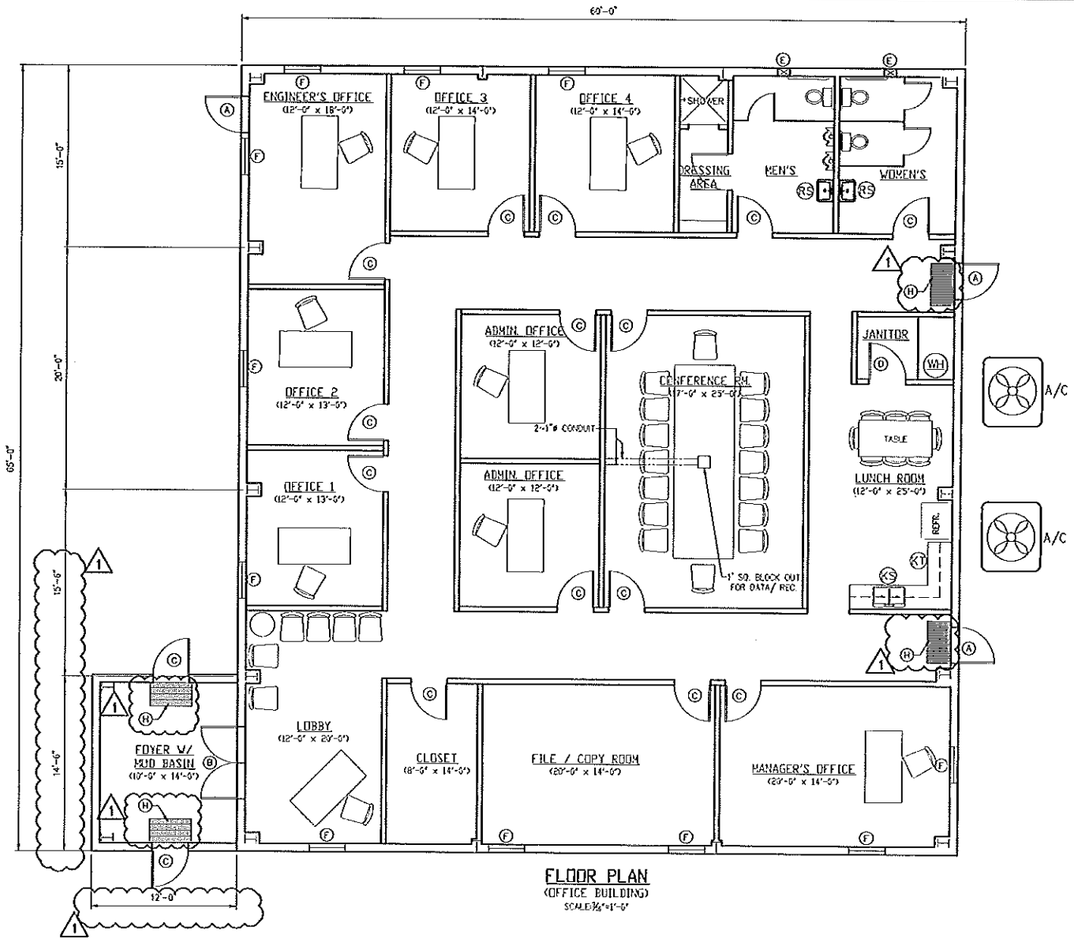
| | |
|---|---|
| SCALE: 1" = 80' | DATE |
| DWN BY: RSJ | 3/7/14 |
| CHKD BY: | |
| FINAL OK: | |
| ENGR: MP | |
| APPR#: | |
| APPR#: | |
| PLANT NAME: LITTLE MISSOURI #3 | |

TARGA

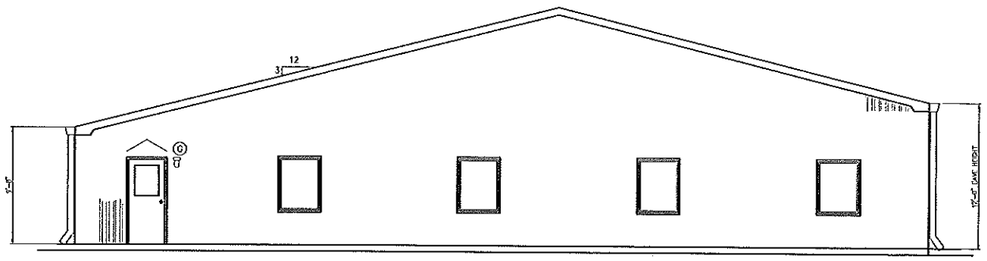
| | |
|---|---|
| DRAWING NUMBER | LM-3000 |
| CAD FILE NAME | LM-3000 |
| REVISION | B |

PLOT PLAN
LITTLE MISSOURI #3 GAS PLANT

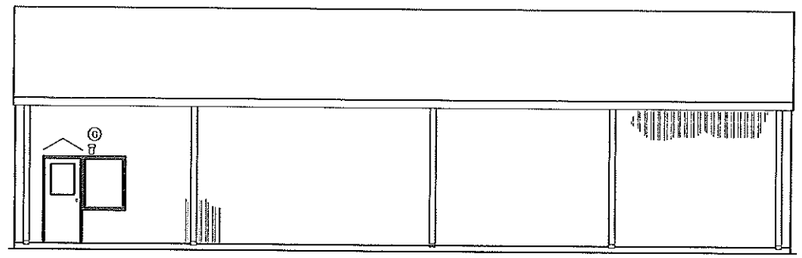
PLOT DATE: -




FLOOR PLAN
(OFFICE BUILDING)
SCALE: 3/16"=1'-0"




SOUTH ELEVATION
SCALE: 3/16"=1'-0"



WEST ELEVATION
SCALE: 3/16"=1'-0"

## NOTES:

1. DESIGN LOADS: PER IBC 2012
   WIND = 120 MPH, EXPOSURE C, RISK CAT. III
   SEISMIC: Ss=7% S1=2.6%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. RIGID FRAME TYPE BUILDING (PINNED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PAINTED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. EAVE HEIGHT = 12 FEET
8. FDN. BY OPD
9. INTERIOR WALLS TO BE 1/2" SHEET ROCK PAINTED PER CLIENTS SPECS.
10. FLOORS TO BE VCT OR TILE (U.N.O.)
11. R-21 INSULATION IN WALLS; R-49 INSULATION IN CEILINGS
12. 9'-0" GRADED CEILINGS TO BE SUSPENDED ACOUSTIC TILE. (RESTROOMS TO HAVE SHEET ROCK CEILING)
13. FLUORESCENT LIGHTING.
14. ALL EXTERIOR DOORS TO INCLUDE PANIC HARDWARE AND HYDRAULIC DOOR CLOSERS.
15. HVAC SYSTEM SHALL MAINTAIN 70°
16. CONTRACTOR TO BRING ALL PLUMBING AND ELECTRICAL 5'-0" OUTSIDE OF BUILDING.
17. FURNITURE & APPLIANCES BY OTHERS
18. BUILDING SHALL BE ADA COMPLIANT.
19. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.

## LEGEND

- (A) 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, & CLOSURE. WITH OVERHEAD EXIT SIGNS WITH EMERGENCY LIGHTING & BATTERY BACKUP (BY BUILDING VENDOR) & AWNING.
- (B) 6'-0" x 7'-0" DOUBLE EXTERIOR PERSONNEL DOORS COMPLETE WITH FULL GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, & CLOSURE. WITH OVERHEAD EXIT SIGNS WITH EMERGENCY LIGHTING & BATTERY BACKUP (BY BUILDING VENDOR) & AWNING.
- (C) 3'-0" x 7'-0" INTERIOR DOOR – WOOD, HOLLOW CORE W/ HARDWARE.
- (D) 3'-0" x 7'-0" INTERIOR DOOR – WOOD, HOLLOW CORE W/ HARDWARE & LOCK.
- (E) EXHAUST FAN.
- (F) 3' x 4' FIXED SHATTER-PROOF TINTED GLASS WINDOWS.
- (G) EXTERIOR LIGHTING AT EA. EXT. DOOR – (BY OPD)
- (H) 3'-0"x 4'-0"SUMP W/ GRATING.
- (WH) 30 GAL. ELECTRIC WATER HEATER
- (RS) STAINLESS STEEL DOUBLE BOWL SINK W/ SINGLE HANDLE FAUCET
- (KT) 1 PIECE, FORMICA (OR EQUIVALENT) COUNTER TOP W/ INTEGRATED 4" MIN. BACK-SPLASH
- (KS) STAINLESS STEEL DOUBLE BOWL SINK W/ SINGLE HANDLE FAUCET

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | 1 | REVISED AS SHOWN | JMH | JMD | 6/23/14 |
| | 0 | ISSUE FOR CONSTRUCTION | JMH | JMD | 4/22/14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN
PROJECT NUMBER: 14025

| SCALE: NOTED | DATE |
|---|---|
| DWN BY: TT | 3/27/14 |
| CHKD BY: JMD | 4/1/14 |
| FINAL OK: – | – |
| ENGR.: – | – |
| APPR.: | |
| APPR.: – | – |

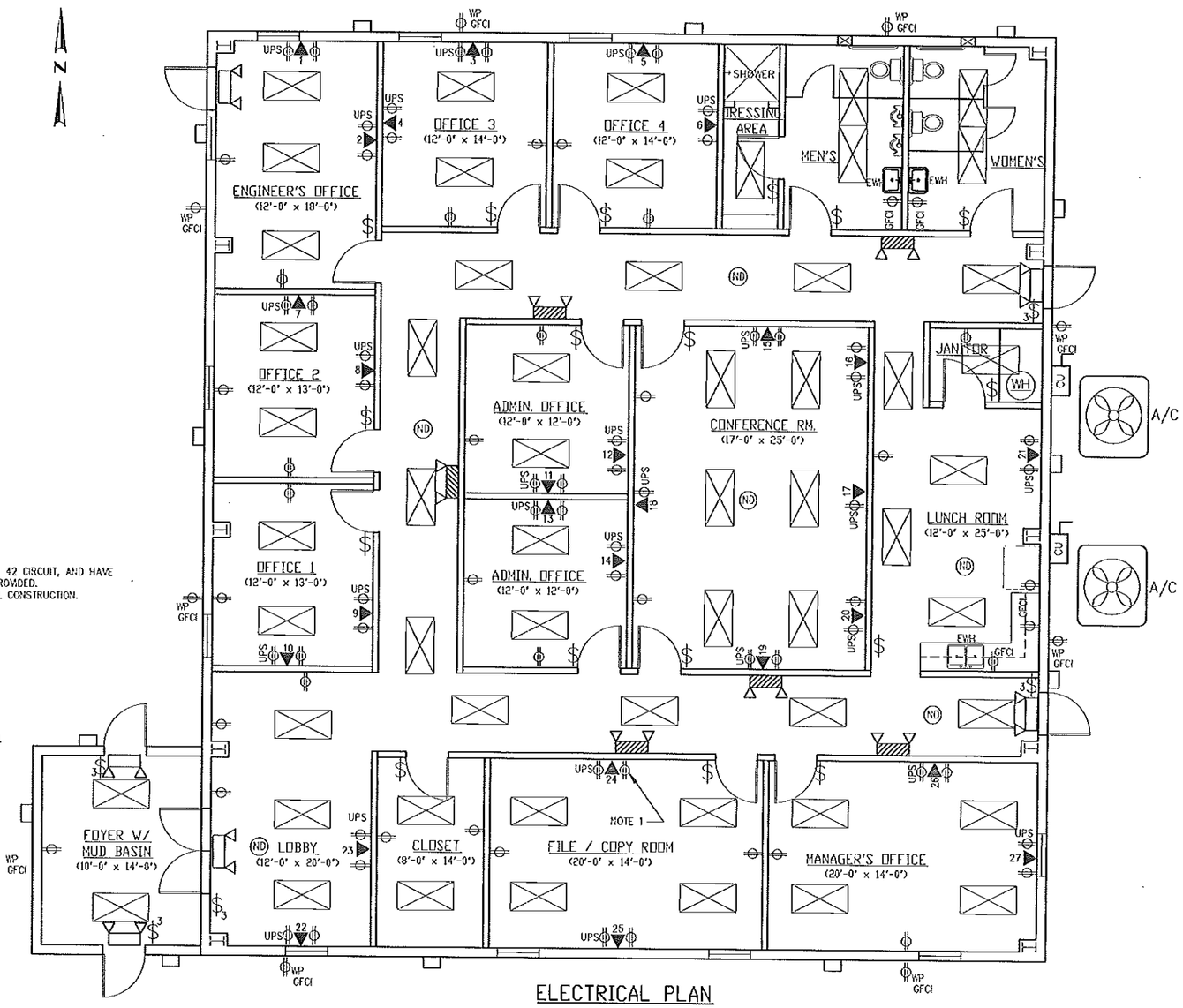
PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

DRAWING NUMBER: 14025-A-903
CAD FILE NAME: 14025-A-903
REVISION: 1

OFFICE BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: –




ELECTRICAL PLAN

SCALE: ¼"=1'-0"

ELECTRICAL NOTES:

1. BOTH LIGHTING AND POWER/ RECEPTACLE PANELS NEED TO BE CUTLER HAMMOND 42 CIRCUIT, AND HAVE A MAIN POWER DISCONNECT. 25 PERCENT SPARE 20 AMP BREAKERS NEED TO BE PROVIDED.
2. BUILDING LIGHTING AND POWER PANEL SCHEDULES TO BE PROVIDED BEFORE FINAL CONSTRUCTION.
3. DEDICATED COPIER CIRCUIT.
4. ALL LATEST LOCAL & NATIONAL ELECTRICAL CODES TO BE FOLLOWED.

REQUIRED INFORMATION FROM SUCCESSFUL BIDDER:

1. TOTAL ELECTRICAL LOAD
2. HVAC DUCTING LAYOUT
3. BUILDING VENDOR IS RESPONSIBLE FOR ALL ELECTRICAL, LIGHTING, PHONE & DATA OUTLETS IN THE OFFICES AND CONTROL ROOM. OPD IS RESPONSIBLE FOR THE MCC & COMPRESSOR ROOMS.
4. LEAVE BOXES W/ CIRCUITS IDENTIFIED IN CEILING FOR OPD HOVERUN CONNECTION.
5. ALL OUTSIDE LIGHTING & RECEPTACLES BY BUILDING VENDOR.

LEGEND:

- (ND) — SMOKE DETECTOR (BY BLDG VENDOR)
- ⊠ — FAN (BY BLDG VENDOR)
- $ — LIGHT SWITCH (BY BLDG VENDOR)
- ▭ — LUMARK OR = LPIOC ED17 100WATT, METAL HALIDE, 120VAC WALL PACK W/PHOTO CELL (BY BLDG VENDOR)
- DUAL EMERGENCY LIGHT WITH BATTERY BACK-UP UNH 1 R 120 DH (BY BLDG VENDOR)
- EXIT LIGHT WHITE WITH RED LETTER & DUAL EMERGENCY LIGHT WITH BATTERY BACK-UP SURE-LITE OR = 120V EXIT LIGHT UNH 1 R 120 DH (BY BLDG VENDOR)
- ⊠ — METALUX OR = 2GR8-232A-UNV-L8735-EB81-U 2' X 4' LAYIN FIXTURE W/2 T-8 LAMPS (BY BLDG VENDOR)
- WP — 120VAC OUTLET (WEATHER PROOF) DUPLEX (BY BLDG VENDOR)
- 120VAC OUTLET (WHITE) DUPLEX (BY BLDG VENDOR)
- DATA AND PHONE OUTLET CAT6 (BY OPD) 1
- POWER DISCONNECT SWITCH (BY BLDG VENDOR)

NOTES:

1. DEDICATED COPIER CIRCUIT.

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 1 | REVISED LEGEND | JAH | JMD | 5/8/14 |
| | | | | | | 0 | ISSUE FOR CONSTRUCTION | JAH | JMD | 4/29/14 |

| | |
|---|---|
| SCALE: NOTED | DATE |
| DWN BY: JAH | 4/29/14 |
| CHKD BY: JMD | 4/29/14 |
| FINAL OK: -- | -- |
| ENGR.: -- | -- |
| APPVD: | |
| APPVD: -- | -- |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

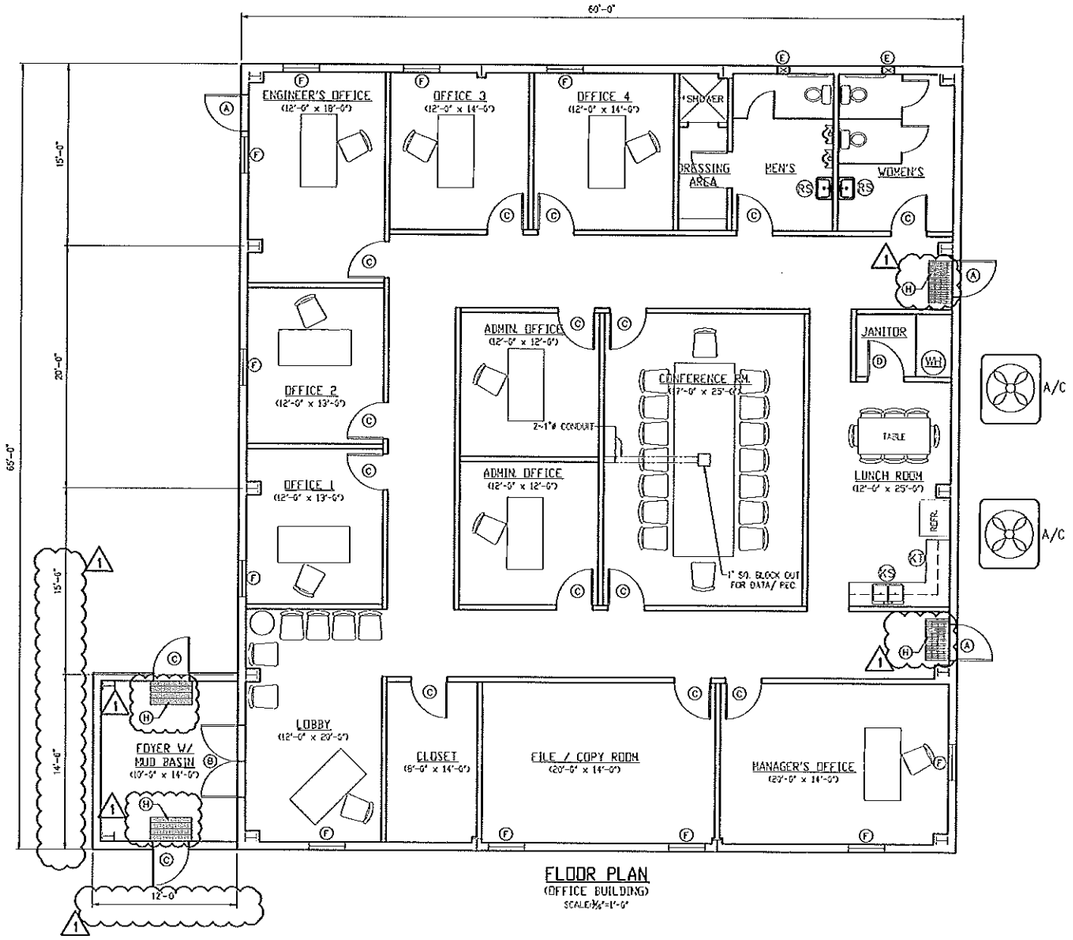
OFFICE BUILDING
LITTLE MISSOURI #3 GAS PLANT

DRAWING NUMBER: 14025-A-903A

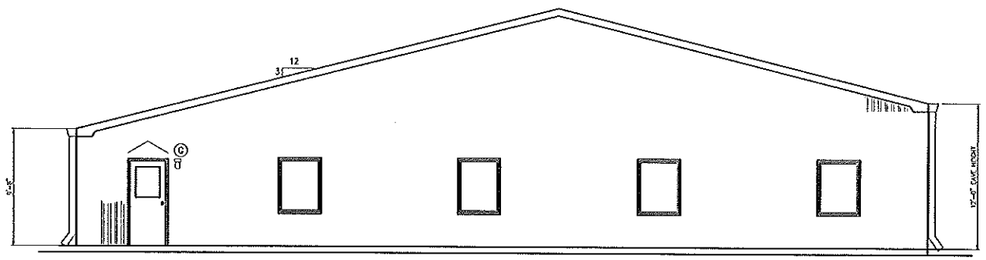
CAD FILE NAME: 14025-A-903

REVISION: 1

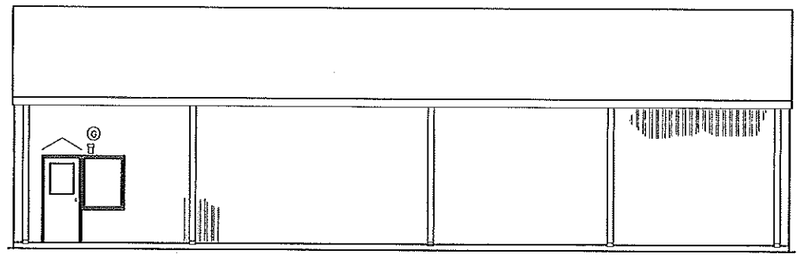
PLOT DATE: --




FLOOR PLAN
(OFFICE BUILDING)
SCALE: 1/4"=1'-0"




SOUTH ELEVATION
SCALE: 1/4"=1'-0"



WEST ELEVATION
SCALE: 1/4"=1'-0"

## NOTES:

1. DESIGN LOADS: PER (1) (OC 2012)
   WIND = 120 MPH, EXPOSURE C, RISK CAT. III
   SEISMIC: Ss=7% S1=2.6%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. RIGID FRAME TYPE BUILDING (PINNED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. EAVE HEIGHT = 12 FEET
8. PEN. BY OPD
9. INTERIOR WALLS TO BE 1/2" SHEET ROCK PAINTED PER CLIENTS SPECS.
10. FLOORS TO BE NON TILE (UNO)
11. R-21 INSULATION IN WALLS; R-49 INSULATION IN CEILINGS
12. 9'-0" CEILING HEIGHT TO BE SUSPENDED ACOUSTICAL TILE. (RESTROOMS TO HAVE SHEET ROCK CEILING)
13. FLUORESCENT LIGHTING.
14. ALL EXTERIOR DOORS TO INCLUDE PANIC HARDWARE AND HYDRAULIC DOOR CLOSERS.
15. HVAC SYSTEM SHALL MAINTAIN 70°
16. CONTRACTOR TO BRING ALL PLUMBING AND ELECTRICAL 5'-0" OUTSIDE OF BUILDING.
17. FURNITURE & APPLIANCES BY OTHERS
18. BUILDING SHALL BE ADA COMPLIANT.
19. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.

## LEGEND

- (A)- 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, & CLOSURE. WITH OVERHEAD EXIT SIGNS WITH EMERGENCY LIGHTING & BATTERY BACKUP (BY BUILDING VENDOR) & AWNING.
- (B)- 6'-0" x 7'-0" DOUBLE EXTERIOR PERSONNEL DOORS COMPLETE WITH FULL GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, & CLOSURE. WITH OVERHEAD EXIT SIGNS WITH EMERGENCY LIGHTING & BATTERY BACKUP (BY BUILDING VENDOR) & AWNING.
- (C)- 3'-0" x 7'-0" INTERIOR DOOR – WOOD, HOLLOW CORE W/ HARDWARE.
- (D)- 3'-0" x 7'-0" INTERIOR DOOR – WOOD, HOLLOW CORE W/ HARDWARE & LOCK.
- (E)- EXHAUST FAN.
- (F)- 3' x 4' FIXED SHATTER-PROOF TINTED GLASS WINDOWS.
- (G)- EXTERIOR LIGHTING AT EA. EXT. DOOR – (BY OPD)
- (H)- 3'-0"x 4'-0"SUMP W/ GRATING.
- (WH)- 30 GAL. ELECTRIC WATER HEATER
- (RS)- STAINLESS STEEL DOUBLE BOWL SINK W/ SINGLE HANDLE FAUCET
- (KT)- 1 PIECE, FORMICA (OR EQUIVALENT) COUNTER TOP W/ INTEGRATED 4" MIN. BACK-SPLASH
- (KS)- STAINLESS STEEL DOUBLE BOWL SINK W/ SINGLE HANDLE FAUCET

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 1 | REVISED AS SHOWN | JWH | JMD | 6/23/14 |
| | | | | | | 0 | ISSUE FOR CONSTRUCTION | JWH | JMD | 4/29/14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

| SCALE: NOTED | DATE |
|---|---|
| DWN BY: TT | 3/27/14 |
| CHKD BY: JMD | 4/2/14 |
| FINAL OK: – | – |
| ENGR.: – | – |
| APPRV.: | |
| APPRV.: – | – |

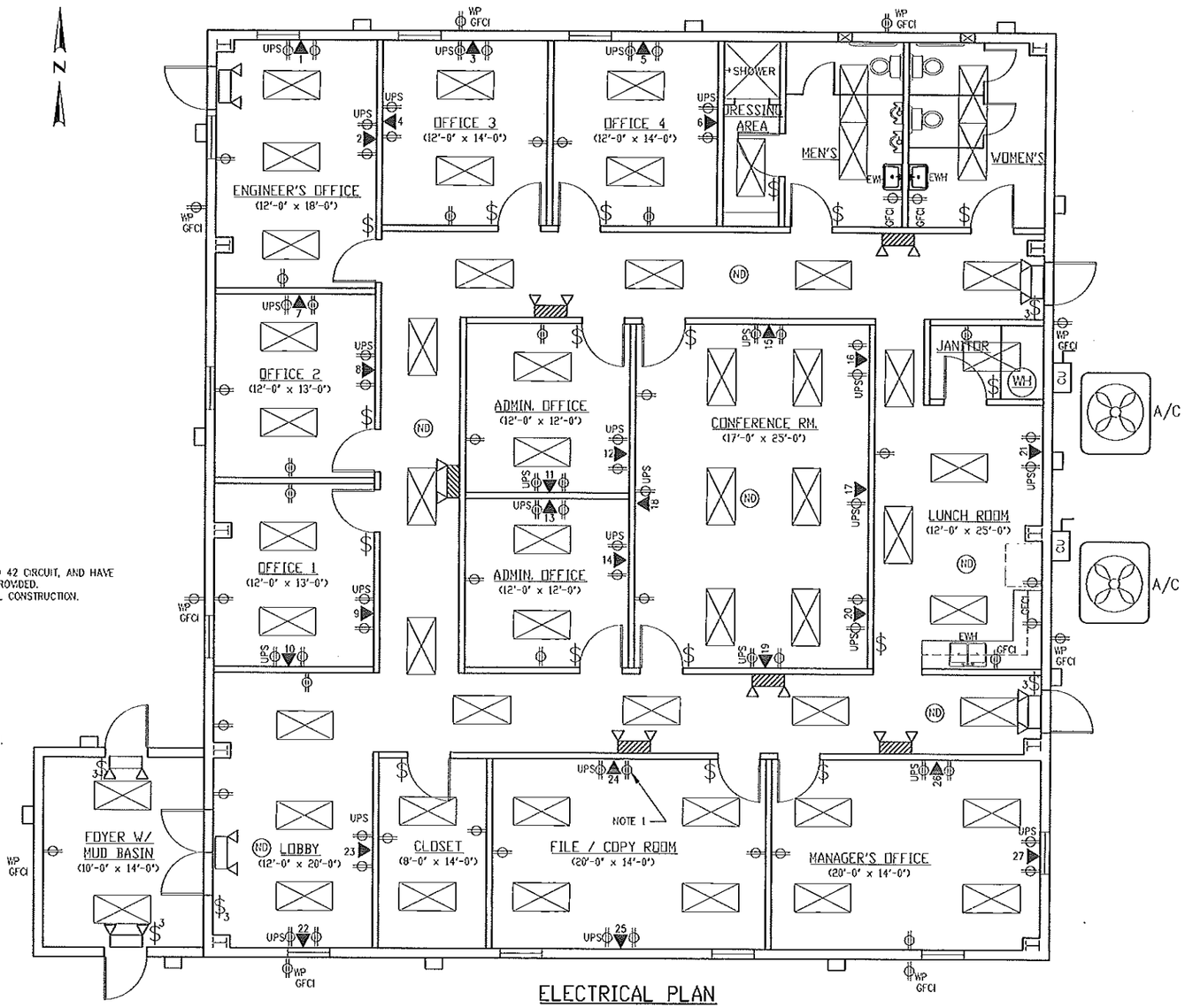
PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

DRAWING NUMBER: 14025-A-903
CAD FILE NAME: 14025-A-903
REVISION: 1

OFFICE BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: –




## ELECTRICAL PLAN

SCALE: 1/4"=1'-0"

ELECTRICAL NOTES:

1. BOTH LIGHTING AND POWER/ RECEPTACLE PANELS NEED TO BE CUTLER HAMMOND 42 CIRCUIT, AND HAVE A MAIN POWER DISCONNECT. 25 PERCENT SPARE 20 AMP BREAKERS NEED TO BE PROVIDED.
2. BUILDING LIGHTING AND POWER PANEL SCHEDULES TO BE PROVIDED BEFORE FINAL CONSTRUCTION.
3. DEDICATED COPIER CIRCUIT.
4. ALL LATEST LOCAL & NATIONAL ELECTRICAL CODES TO BE FOLLOWED.

REQUIRED INFORMATION FROM SUCCESSFUL BIDDER:

1. TOTAL ELECTRICAL LOAD
2. HVAC DUCTING LAYOUT
3. BUILDING VENDOR IS RESPONSIBLE FOR ALL ELECTRICAL, LIGHTING, PHONE & DATA OUTLETS IN THE OFFICES AND CONTROL ROOM. OPD IS RESPONSIBLE FOR THE MCC & COMPRESSOR ROOMS.
4. LEAVE BOXES W/ CIRCUITS IDENTIFIED IN CEILING FOR OPD HOVERUN CONNECTION.
5. ALL OUTSIDE LIGHTING & RECEPTACLES BY BUILDING VENDOR.

LEGEND:

- (ND) — SMOKE DETECTOR (BY BLDG VENDOR)
- ⊠ — FAN (BY BLDG VENDOR)
- $ — LIGHT SWITCH (BY BLDG VENDOR)
- ▭ — LUMARK OR = LPIOC ED17 100WATT, METAL HALIDE, 120VAC WALL PACK W/PHOTO CELL (BY BLDG VENDOR)
- DUAL EMERGENCY LIGHT WITH BATTERY BACK-UP UNH 1 R 120 DH (BY BLDG VENDOR)
- EXIT LIGHT WHITE WITH RED LETTER & DUAL EMERGENCY LIGHT WITH BATTERY BACK-UP SURE-LITE OR = 120V EXIT LIGHT UNH 1 R 120 DH (BY BLDG VENDOR)
- METALUX OR = 2GR8-232A-UNV-L8735-EB81-U 2' X 4' LAYIN FIXTURE W/2 T-8 LAMPS (BY BLDG VENDOR)
- WP — 120VAC OUTLET (WEATHER PROOF) DUPLEX (BY BLDG VENDOR)
- 120VAC OUTLET (WHITE) DUPLEX (BY BLDG VENDOR)
- DATA AND PHONE OUTLET CAT6 (BY OPD) 1
- POWER DISCONNECT SWITCH (BY BLDG VENDOR)

NOTES:

1. DEDICATED COPIER CIRCUIT.

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | 1 | REVISED LEGEND | JWH | JWD | 5/9/14 |
| | 0 | ISSUE FOR CONSTRUCTION | JWH | JWD | 4/28/14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

| | |
|---|---|
| SCALE: NOTED | DATE |
| DWN BY: JWH | 4/21/14 |
| CHKD BY: JWD | 4/21/14 |
| ENGR: -- | -- |
| APPR: | |
| APPR: -- | -- |

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

DRAWING NUMBER: 14025-A-903A

CAD FILE NAME: 14025-A-903

REVISION: 1

OFFICE BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: --

RED DOT BUILDINGS

P.O. Box 1240

Athens, Texas 75751

(800) 657 – 2234

# PEMB Calculations

# Job No. 14186-04

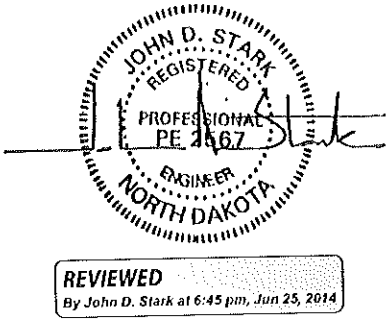
# C & H Buildings

# Office Building

# Watford City

# McKenzie County

# North Dakota




REVIEWED
By John D. Stark at 6:45 pm, Jun 25, 2014

PEMB DESIGN CALCULATIONS

FOR

C & H Buildings

60'x 65'x 12'

14186-04AR1

BUILDING LAYOUT

Width (ft)= 60.0

Length (ft)= 65.0

Eave Height (ft)= 12.0/ 12.0

Roof Slope (rise/12 )= 3.00/ 3.00

BUILDING LOADS

Roof Dead Load (psf )= 2.0

Wall Dead Load

Left Endwall (psf )= 2.0

Right Endwall (psf )= 2.0

Front Sidewall(psf )= 2.0

Back Sidewall(psf )= 2.0

Roof Live Load (psf )= 20.0

Frame Live Load (psf )= 15.3

Collateral Load (psf )= 3.0

Snow Load (psf )= 23.1

Wind Speed (mph )= 120.0

Wind Code = IBC 12

Closed/Open = C

Exposure = C

Internal Wind Coeff = -0.18, +0.18

Risk Category = II Normal

Importance - Seismic = 1.25

Seismic Design Category= A

==========

14186-04AR1 Design Loads For Building Components: 6/26/14 10:16am

==========

FRONT SIDEWALL:

---

BASIC LOADS:

| Basic Wind | -----Edge_Strip_Ratio----- Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 30.9 | 0.40 | 1.00 | 6.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long | |
|---|---|---|---|
| 30.1 | -33.2 | .. | Girt/Header |
| 36.5 | -39.6 | .. | Panel |
| 29.4 | -32.1 | .. | Jamb |
| 46.3 | -30.9 | .. | Parapet |

BACK SIDEWALL:

---

BASIC LOADS:

| Basic Wind | -----Edge_Strip_Ratio----- Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
|---|---|---|---|---|---|---|
| 30.9 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long |
|---|---|---|

30.1 -33.2 .. Girt/Header

36.5 -39.6 .. Panel

29.4 -32.1 .. Jamb

46.3 -30.9 .. Parapet

LEFT ENDWALL:

---

BASIC LOADS:

| | | | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.9 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 | 1.07 |

BASIC LOADS AT EAVE:

| Seis | ---Torsion--- |
|---|---|
| Load | Wind Seismic |
| 0.00 | 0.00 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 29.4 | -32.5 | .. Column |
| 30.1 | -33.2 | .. Girt/Header |
| 29.4 | -32.1 | .. Jamb |
| 36.5 | -39.6 | .. Panel |
| 46.3 | -30.9 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf Id | Wind_1 Left | Right | Wind_2 Left | Right | Wind_2 Left | Right | Long Wind | Surface Friction |
| 1 | 0.53 | -0.73 | 0.89 | -0.37 | 0.54 | -0.74 | -0.63 | 0.00 |
| 2 | -1.24 | -0.80 | -0.88 | -0.44 | -1.24 | -0.80 | -0.87 | 0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | -0.80 | -1.24 | -0.44 | -0.88 | -0.80 | -1.24 | -0.87 | 0.00 |
| 4 | -0.73 | 0.53 | -0.37 | 0.89 | -0.74 | 0.54 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | Wind_2 | Long_Wind | | Column_Wind | | Long | Tran | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 31 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 12 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 13 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 22 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| | 23 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| | 24 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| | 25 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| | 26 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| | 27 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 29 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

RAFTER DESIGN LOADS:

| Load | | | --Add_Snow- | | | Wind_1 | | Wind_2 | | Long | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow Drift | Slide | Rain | Left | Right | Left Right | Wind | Seis Id | Coef |
| 52 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 3 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 4 | 1.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| | 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| | 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| | 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| | 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 37 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 51 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 52 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

AUXILIARY LOADS:

| No. Aux Aux | | No. | Add_Load | |
|---|---|---|---|---|
| Aux Id | Name | Load | Id | Coeff |
| 6 | 1 E1UNB_SL_L | 3 | 1 | 0.30 |
| | | 2 | | 1.00 |
| | | 3 | | 0.72 |
| | 2 E1UNB_SL_R | 3 | 2 | 0.30 |

| | | | | |
|---|---|---|---|---|
| | | 1 | 1.00 | |
| | | 4 | 0.72 | |
| 3 | LWIND1_L | 1 | 5 | 1.00 |
| 4 | LWIND1_R | 1 | 6 | 1.00 |
| 5 | LWIND2_L | 1 | 5 | 1.00 |
| 6 | LWIND2_R | 1 | 6 | 1.00 |

ADDITIONAL LOADS:

| No. Add | Loc Id | Basic Id | Load Type | Fx W1 | Fy W2 | Mom Co | X Dl1 | Y Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 3 | U_SNOW D | -0.16 | -0.16 | -0.25 | 0.00 | 30.92 | |
| 2 | 2 | | U_SNOW D | -0.16 | -0.16 | 0.25 | 0.00 | 30.92 | |
| 3 | 2 | | U_SNOW D | -0.16 | -0.16 | 0.25 | 21.00 | 30.92 | |
| 4 | 3 | | U_SNOW D | -0.16 | -0.16 | -0.25 | 0.00 | 9.92 | |
| 5 | 2 | | U_WIND D | 0.09 | 0.09 | 0.00 | 0.00 | 12.00 | |
| 6 | 3 | | U_WIND D | 0.09 | 0.09 | 0.00 | 18.92 | 30.92 | |
| 7 | 2 | | WINDL1 D | -0.10 | -0.10 | 0.00 | 30.00 | 30.92 | |
| 8 | 2 | | WINDL2 D | -0.10 | -0.10 | 0.00 | 30.00 | 30.92 | |
| 9 | 3 | | WINDR1 D | -0.10 | -0.10 | 0.00 | 0.00 | 0.92 | |
| 10 | 3 | | WINDR2 D | -0.10 | -0.10 | 0.00 | 0.00 | 0.92 | |

RIGHT ENDWALL:

---

BASIC LOADS:

| | | | | | | ----Edge_Strip_Ratio---- | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Col/ Panel Jamb |
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.9 | 0.70 | 1.00 | 6.00 | 1.12 | 1.23 1.07 |

BASIC LOADS AT EAVE:

| Seis | ---Torsion--- | |
|---|---|---|
| Load | Wind | Seismic |
| 0.00 | 0.00 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 29.4 | -32.5 | .. Column |
| 30.1 | -33.2 | .. Girt/Header |
| 29.4 | -32.1 | .. Jamb |
| 36.5 | -39.6 | .. Panel |
| 46.3 | -30.9 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf | Wind_1 | | Wind_2 | | Wind_2 | | Long | Surface |
| Id | Left | Right | Left | Right | Left | Right | Wind | Friction |
| 1 | 0.53 | -0.73 | 0.89 | -0.37 | 0.54 | -0.74 | -0.63 | 0.00 |
| 2 | -1.23 | -0.80 | -0.87 | -0.44 | -1.23 | -0.80 | -0.87 | 0.00 |
| 3 | -0.80 | -1.23 | -0.44 | -0.87 | -0.80 | -1.23 | -0.87 | 0.00 |
| 4 | -0.73 | 0.53 | -0.37 | 0.89 | -0.74 | 0.54 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | | Wind_2 | | Long_Wind | Column_Wind | | Long | Tran | Aux_Load |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll Roof | Floor | Snow | Drift Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press Suct | Seis | Seis | Id Coef |
| 31 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 0.00 |
| | 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 0.00 |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 13 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 28 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 29 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

RAFTER DESIGN LOADS:

| Load | | | --Add_Snow- | | | | Wind_1 | | Wind_2 | | Long | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis Id | Coef |
| 52 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 2 | | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 3 | | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 4 | | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 5 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 6 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 7 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 8 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 9 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 3 | 1.00 |
| 10 | | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 4 | 1.00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 34 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 35 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 36 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 37 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 38 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 39 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 40 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |
| 41 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 3 | 0.75 |
| 42 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 4 | 0.75 |
| 43 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 0.75 |
| 44 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 0.75 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 46 | 1.02 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 47 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0 | 0.00 |
| 48 | 1.02 | 1.02 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.75 | 0 | 0.00 |
| 49 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 50 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 51 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| 52 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Coeff |
|---|---|---|---|---|---|
| 6 | 1 | E2UNB_SL_L | 3 | 1 | 0.30 |
| | | | 2 | 1.00 | |
| | | | 3 | 0.72 | |
| | 2 | E2UNB_SL_R | 3 | 2 | 0.30 |
| | | | 1 | 1.00 | |
| | | | 4 | 0.72 | |
| | 3 | LWIND1_L | 1 | 5 | 1.00 |
| | 4 | LWIND1_R | 1 | 6 | 1.00 |
| | 5 | LWIND2_L | 1 | 5 | 1.00 |
| | 6 | LWIND2_R | 1 | 6 | 1.00 |

ADDITIONAL LOADS:

| No. Add Id | Loc Id | Basic Load | Load Type | Fx W1 | Fy W2 | Mom Co | X Dl1 | Y Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 3 | U_SNOW D | -0.17 | -0.17 | -0.25 | 0.00 | 30.92 | |
| 2 | 2 | | U_SNOW D | -0.17 | -0.17 | 0.25 | 0.00 | 30.92 | |
| 3 | 2 | | U_SNOW D | -0.17 | -0.17 | 0.25 | 21.00 | 30.92 | |
| 4 | 3 | | U_SNOW D | -0.17 | -0.17 | -0.25 | 0.00 | 9.92 | |
| 5 | 2 | | U_WIND D | 0.09 | 0.09 | 0.00 | 0.00 | 12.00 | |
| 6 | 3 | | U_WIND D | 0.09 | 0.09 | 0.00 | 18.92 | 30.92 | |
| 7 | 2 | | WINDL1 D | 0.00 | 0.00 | 0.00 | 30.00 | 30.92 | |
| 8 | 2 | | WINDL2 D | 0.00 | 0.00 | 0.00 | 30.00 | 30.92 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 3 | WINDR1 | D | 0.00 | 0.00 | 0.00 | 0.00 | 0.92 | |
| 10 | 3 | WINDR2 | D | 0.00 | 0.00 | 0.00 | 0.00 | 0.92 | |

ROOFDES:

---

BASIC LOADS:

| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Surface Factor | Sels Friction | % Factor | Snow |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.9 | 0.70 | 1.00 | 0.00 | 1.000 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Suct_Roof | |
|---|---|---|---|
| 14.8 | -30.3 | | .. Purlins |
| 0.0 | -68.0 | | .. Gable Extensions |
| 21.0 | -33.4 | | .. Panels |
| 17.9 | -3.4 | -21.3 | .. Long Bracing, Building |
| 24.4 | -7.7 | | .. Long Bracing, Wall Edge Zone |
| 46.3 | -30.9 | 24.7 | .. Long Bracing, Facia/Parapet |

EDGE & CORNER ZONE WIND:

| Wind Id | Surf Id | No. Zone | Zone Id | --Purlin--- Width | Length | ---Panel--- Press | Suct | Press | Suct |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 9 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | | 3 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 4 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 5 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 6 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 |
| | | | 7 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 8 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 9 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| | | | 10 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 |
| 3 | 9 | 1 | | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 4 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 5 | 0.00 | 6.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 6 | 6.00 | 0.00 | 1.00 | 1.41 | 1.00 | 1.73 | | | | |
| | | 7 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 8 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 9 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| | | 10 | 6.00 | 6.00 | 1.00 | 2.22 | 1.00 | 2.57 | | | | |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |
| | 3 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |

EDGE & CORNER ZONE WIND: LONGITUDINAL

| Wind Surf Id | No. Zone Id | Zone Id | Purlin Width | Purlin Length | Suct |
|---|---|---|---|---|---|
| 1 | 2 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 0.00 | 0.00 | 1.00 |
| 2 | 2 | 1 | 0.00 | 0.00 | 1.00 |
| | 3 | 1 | 0.00 | 0.00 | 1.00 |

PURLIN DESIGN LOADS:

| Surf Id | --Load- No. | Id | Dead | Coll | Live | --Add_Snow- Snow | Drift | Slide | Rain | Wind Press | Wind Suct | Aux_Load Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 17 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 14 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 15 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | 16 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | 17 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 3 | 17 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 12 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 14 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 15 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | -1.00 |
| | 16 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | -1.00 |
| | 17 | 1.00 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |

BRACING DESIGN LOADS:

| --Load- | | | | --Add_Snow- | | | Wind | Wind | Seis | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Press | Suct | Load | Id | Coef |
| 11 | 1 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux | No. | Add_Load | |
|---|---|---|---|---|
| Aux Id | Name | Load | Id | Coef |
| 6 1 | PAT_SL_1 | 1 | 1 | 0.50 |
| 2 | PAT_SL_2 | 1 | 4 | 0.50 |
| 3 | PAT_SL_3 | 2 | 1 | 0.50 |
| | | 2 | 0.50 | |
| 4 | PAT_SL_4 | 2 | 2 | 0.50 |
| | | 3 | 0.50 | |
| 5 | PAT_SL_5 | 2 | 3 | 0.50 |
| | | 4 | 0.50 | |
| 6 | UNB_SL | 4 | 5 | 1.00 |
| | | 6 | 0.72 | |
| | | 7 | 1.00 | |
| | | 8 | 0.72 | |

ADDITIONAL LOADS:

| No. Add | Surf | Basic Load | Fy | | Dx | | .. Conc |
|---|---|---|---|---|---|---|---|
| Add Id | Id | Load Type | W1 | W2 | Dx1 | Dx2 | .. Dist |
| 8 1 | 0 | U_SNOW D | -23.1 | -23.1 | 0.0 | 14.5 | |
| 2 | 0 | U_SNOW D | -23.1 | -23.1 | 14.5 | 30.0 | |
| 3 | 0 | U_SNOW D | -23.1 | -23.1 | 30.0 | 50.0 | |
| 4 | 0 | U_SNOW D | -23.1 | -23.1 | 50.0 | 65.0 | |
| 5 | 2 | U_SNOW D | -23.1 | -23.1 | 0.0 | 30.9 | |
| 6 | 2 | U_SNOW D | -23.1 | -23.1 | 21.0 | 30.9 | |
| 7 | 3 | U_SNOW D | -23.1 | -23.1 | 0.0 | 30.9 | |
| 8 | 3 | U_SNOW D | -23.1 | -23.1 | 0.0 | 9.9 | |

RIGID FRAME #1:

---

BASIC LOADS:

| Dead | Coll | Live | Snow | Rain | Wind | Basic Defl Ratio | Temperature Change |
|---|---|---|---|---|---|---|---|
| 2.0 | 3.0 | 15.3 | 23.1 | 0.0 | 30.9 | 0.70 | 0 |

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |
| 3 | -0.80 | -1.25 | -0.44 | -0.89 | -0.87 | -0.51 | 0.00 |
| 4 | -0.73 | 0.54 | -0.37 | 0.90 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- No. | Id | ---Live--- Dead | Coll | --Add_Snow- Roof | Floor | Snow | Drift | Slide | Rain | --Wind_1- Lt | Rt | --Wind_2- Lt | Rt | Long_Wind Lt | Rt | --Seismic- Long | Tran | Temp | Aux_Load Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1 1.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

22 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1 1.00

28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 4 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

100 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

101 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

102 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10 1.00

103 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5 1.00

104 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5 1.00

105 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 6 1.00

106 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 6 1.00

107 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 7 1.00

108 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 7 1.00

109 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8 1.00

110 1.00 1.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8 1.00

AUXILIARY LOADS:

| No. Aux | Aux | Aux | No. | Add_Load |
|---|---|---|---|---|
| Aux | Id | Name | Load | Id | Coeff |
| 10 | 1 | LWIND1_L2E | 1 | 1 | 1.00 |

| | | | | |
|---|---|---|---|---|
| 2 | LWIND1_R2E | 1 | 2 | 1.00 |
| 3 | LWIND2_L2E | 1 | 1 | 1.00 |
| 4 | LWIND2_R2E | 1 | 2 | 1.00 |
| 5 | F1PAT_LL_1 | 3 | 7 | 1.00 |
| | | 8 | 1.00 | |
| | | 9 | 1.00 | |
| 6 | F1PAT_LL_2 | 3 | 8 | 1.00 |
| | | 9 | 1.00 | |
| | | 10 | 1.00 | |
| 7 | F1PAT_LL_3 | 2 | 7 | 1.00 |
| | | 10 | 1.00 | |
| 8 | F1PAT_LL_4 | 2 | 8 | 1.00 |
| | | 9 | 1.00 | |
| 9 | F1UNB_SL_L | 3 | 11 | 0.30 |
| | | 12 | 1.00 | |
| | | 13 | 0.72 | |
| 10 | F1UNB_SL_R | 3 | 12 | 0.30 |
| | | 11 | 1.00 | |
| | | 14 | 0.72 | |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Id | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 1 | 2 | U_WIND | D | 0.09 | 0.09 | 0.000 | 0.00 | 12.00 |
| | 2 | 3 | U_WIND | D | 0.09 | 0.09 | 0.000 | 18.92 | 30.92 |
| | 3 | 2 | WINDL1 | D | -0.10 | -0.10 | 0.000 | 30.00 | 30.92 |
| | 4 | 2 | WINDL2 | D | -0.10 | -0.10 | 0.000 | 30.00 | 30.92 |
| | 5 | 3 | WINDR1 | D | -0.10 | -0.10 | 0.000 | 0.00 | 0.92 |
| | 6 | 3 | WINDR2 | D | -0.10 | -0.10 | 0.000 | 0.00 | 0.92 |
| | 7 | 2 | U_LIVE | D | -0.11 | -0.11 | 0.250 | 0.00 | 20.62 |
| | 8 | 2 | U_LIVE | D | -0.11 | -0.11 | 0.250 | 20.62 | 30.92 |
| | 9 | 3 | U_LIVE | D | -0.11 | -0.11 | -0.250 | 0.00 | 10.31 |
| | 10 | 3 | U_LIVE | D | -0.11 | -0.11 | -0.250 | 10.31 | 30.92 |
| | 11 | 3 | U_SNOW | D | -0.16 | -0.16 | -0.250 | 0.00 | 30.92 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | 2 | U_SNOW | D | -0.16 | -0.16 | 0.250 | 0.00 | 30.92 |
| 13 | 2 | U_SNOW | D | -0.16 | -0.16 | 0.250 | 21.00 | 30.92 |
| 14 | 3 | U_SNOW | D | -0.16 | -0.16 | -0.250 | 0.00 | 9.92 |
| 15 | 1 | DEAD | C | 0.00 | -0.30 | 0.00 | 0.67 | 11.00 |
| 16 | 1 | COLLAT | C | 0.00 | -0.10 | 0.00 | 0.67 | 11.00 |
| 17 | 1 | LIVE | C | 0.00 | -1.00 | 0.00 | 0.67 | 11.00 |
| 18 | 1 | SNOW | C | 0.00 | -1.10 | 0.00 | 0.67 | 11.00 |

RIGID FRAME #2:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 3.0 | 12.0 | 23.1 | 0.0 | 30.9 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |
| 3 | -0.61 | -0.87 | -0.25 | -0.51 | -0.87 | -0.51 | 0.00 |
| 4 | -0.55 | 0.30 | -0.19 | 0.66 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 102 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |

4 1.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

5 1.00 1.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

6 1.00 1.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

7 1.00 1.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

8 1.00 1.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

9 1.00 1.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

10 1.00 1.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

11 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

12 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

13 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1 1.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

22 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1 1.00

28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5 1.00

100 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5 1.00

101 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 6 1.00

102 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 6 1.00

AUXILIARY LOADS:

No. Aux Aux No. Add_Load

| Aux Id | Name | Load Id | Coeff |
|---|---|---|---|
| 6 1 | LWIND1_L2E | 1 1 | 1.00 |
| 2 | LWIND1_R2E | 1 2 | 1.00 |
| 3 | LWIND2_L2E | 1 1 | 1.00 |
| 4 | LWIND2_R2E | 1 2 | 1.00 |
| 5 | F2UNB_SL_L | 3 7 | 0.30 |
| | | 8 | 1.00 |
| | | 9 | 0.72 |
| 6 | F2UNB_SL_R | 3 8 | 0.30 |
| | | 7 | 1.00 |
| | | 10 | 0.72 |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Load Type | Fx | Fy | Mom | Dx | Dy .. | Conc |
|---|---|---|---|---|---|---|---|---|
| Add Id | Id | Type | W1 | W2 | Co | Dl1 | Dl2 .. | Dist |
| 14 1 | 2 | U_WIND D | 0.17 | 0.17 | 0.000 | 0.00 | 12.00 | |
| 2 | 3 | U_WIND D | 0.17 | 0.17 | 0.000 | 18.92 | 30.92 | |
| 3 | 2 | WINDL1 D | -0.12 | -0.12 | 0.000 | 30.00 | 30.92 | |
| 4 | 2 | WINDL2 D | -0.12 | -0.12 | 0.000 | 30.00 | 30.92 | |
| 5 | 3 | WINDR1 D | -0.12 | -0.12 | 0.000 | 0.00 | 0.92 | |
| 6 | 3 | WINDR2 D | -0.12 | -0.12 | 0.000 | 0.00 | 0.92 | |
| 7 | 3 | U_SNOW D | -0.32 | -0.32 | -0.250 | 0.00 | 30.92 | |
| 8 | 2 | U_SNOW D | -0.32 | -0.32 | 0.250 | 0.00 | 30.92 | |
| 9 | 2 | U_SNOW D | -0.32 | -0.32 | 0.250 | 21.00 | 30.92 | |
| 10 | 3 | U_SNOW D | -0.32 | -0.32 | -0.250 | 0.00 | 9.92 | |
| 11 | 1 | DEAD C | 0.00 | -0.30 | 0.00 | 0.67 | 11.00 | |
| 12 | 1 | COLLAT C | 0.00 | -0.10 | 0.00 | 0.67 | 11.00 | |
| 13 | 1 | LIVE C | 0.00 | -1.00 | 0.00 | 0.67 | 11.00 | |
| 14 | 1 | SNOW C | 0.00 | -1.10 | 0.00 | 0.67 | 11.00 | |

RIGID FRAME #3:

---

BASIC LOADS:

| Basic | Defl | Temperature |
|---|---|---|

| Dead | Coll | Live | Snow | Rain | Wind | Ratio | Change |
|---|---|---|---|---|---|---|---|
| 2.0 | 3.0 | 12.0 | 23.1 | 0.0 | 30.9 | 0.70 | 0 |

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 17.72 | 0.43 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.30 | -0.55 | 0.66 | -0.19 | -0.63 | -0.27 | 0.00 |
| 2 | -0.87 | -0.61 | -0.51 | -0.25 | -0.87 | -0.51 | 0.00 |
| 3 | -0.61 | -0.87 | -0.25 | -0.51 | -0.87 | -0.51 | 0.00 |
| 4 | -0.55 | 0.30 | -0.19 | 0.66 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- No. | Id | ---Live--- Dead | Coll | --Add_Snow- Roof | Floor | Snow | Drift | Slide | Rain | --Wind_1- Lt | Rt | --Wind_2- Lt | Rt | Long_Wind Lt | Rt | --Seismic- Long | Tran | Temp | Aux_Load Id | Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 4 1.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

22 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

23 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

25 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

26 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0 0.00

27 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1 1.00

28 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 2 1.00

29 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 1 1.00

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 0.00 2 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

| | | |

ADDITIONAL LOADS:

| No. Add | Surf Id | Basic Load Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 2 | U_WIND | D | 0.21 | 0.21 | 0.000 | 0.00 | 12.00 |
| 2 | | 3 | U_WIND | D | 0.21 | 0.21 | 0.000 | 18.92 | 30.92 |
| 3 | | 2 | WINDL1 | D | -0.14 | -0.14 | 0.000 | 30.00 | 30.92 |
| 4 | | 2 | WINDL2 | D | -0.14 | -0.14 | 0.000 | 30.00 | 30.92 |
| 5 | | 3 | WINDR1 | D | -0.14 | -0.14 | 0.000 | 0.00 | 0.92 |
| 6 | | 3 | WINDR2 | D | -0.14 | -0.14 | 0.000 | 0.00 | 0.92 |
| 7 | | 3 | U_SNOW | D | -0.39 | -0.39 | -0.250 | 0.00 | 30.92 |
| 8 | | 2 | U_SNOW | D | -0.39 | -0.39 | 0.250 | 0.00 | 30.92 |
| 9 | | 2 | U_SNOW | D | -0.39 | -0.39 | 0.250 | 21.00 | 30.92 |
| 10 | | 3 | U_SNOW | D | -0.39 | -0.39 | -0.250 | 0.00 | 9.92 |

RIGID FRAME #4:

---

BASIC LOADS:

| Dead | Coll | Live | Snow | Rain | Basic Wind | Defl Ratio | Temperature Change |
|---|---|---|---|---|---|---|---|
| 2.0 | 3.0 | 15.0 | 23.1 | 0.0 | 30.9 | 0.70 | 0 |

BASIC LOADS AT EAVE:

| Seismic Load | Weak_Axis_L Wind | Weak_Axis_L Seis | Weak_Axis_R Wind | Weak_Axis_R Seis | --Torsion-- Wind | --Torsion-- Seis | --EW_Brace- Wind | --EW_Brace- Seis |
|---|---|---|---|---|---|---|---|---|
| 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf Id | --Wind_1--- Left | Right | --Wind_2--- Left | Right | Long_Wind 1 | 2 | Surface Friction |
|---|---|---|---|---|---|---|---|
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |
| 3 | -0.80 | -1.25 | -0.44 | -0.89 | -0.87 | -0.51 | 0.00 |
| 4 | -0.73 | 0.54 | -0.37 | 0.90 | -0.63 | -0.27 | 0.00 |

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 110 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 29 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 30 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 31 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 3 | 1.00 |

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 3 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-1.00 0.00 0.00 0.00 4 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

99 1.00 1.00 0.00 0.00 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1.00

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 | 1.00 |
| 101 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |
| 102 | 1.00 | 1.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10 | 1.00 |
| 103 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 104 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 | 1.00 |
| 105 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 106 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 | 1.00 |
| 107 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 108 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 | 1.00 |
| 109 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |
| 110 | 1.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 | 1.00 |

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Coeff |
|---|---|---|---|---|---|
| 10 | 1 | LWIND1_L2E | 1 | 1 | 1.00 |
| | 2 | LWIND1_R2E | 1 | 2 | 1.00 |
| | 3 | LWIND2_L2E | 1 | 1 | 1.00 |
| | 4 | LWIND2_R2E | 1 | 2 | 1.00 |
| | 5 | F4PAT_LL_1 | 3 | 7 | 1.00 |
| | | | | 8 | 1.00 |
| | | | | 9 | 1.00 |
| | 6 | F4PAT_LL_2 | 3 | 8 | 1.00 |
| | | | | 9 | 1.00 |
| | | | | 10 | 1.00 |
| | 7 | F4PAT_LL_3 | 2 | 7 | 1.00 |
| | | | | 10 | 1.00 |
| | 8 | F4PAT_LL_4 | 2 | 8 | 1.00 |
| | | | | 9 | 1.00 |
| | 9 | F4UNB_SL_L | 3 | 11 | 0.30 |
| | | | | 12 | 1.00 |
| | | | | 13 | 0.72 |
| | 10 | F4UNB_SL_R | 3 | 12 | 0.30 |
| | | | | 11 | 1.00 |

14 0.72

ADDITIONAL LOADS:

| No. Add Surf Basic Load | Fx | Fy | Mom | Dx | Dy .. Conc |
|---|---|---|---|---|---|
| Add Id Id Type Type | W1 | W2 | Co | Dl1 | Dl2 .. Dist |
| 14 1 2 U_WIND D | 0.09 | 0.09 | 0.000 | 0.00 | 12.00 |
| 2 3 U_WIND D | 0.09 | 0.09 | 0.000 | 18.92 | 30.92 |
| 3 2 WINDL1 D | -0.11 | -0.11 | 0.000 | 30.00 | 30.92 |
| 4 2 WINDL2 D | -0.11 | -0.11 | 0.000 | 30.00 | 30.92 |
| 5 3 WINDR1 D | -0.11 | -0.11 | 0.000 | 0.00 | 0.92 |
| 6 3 WINDR2 D | -0.11 | -0.11 | 0.000 | 0.00 | 0.92 |
| 7 2 U_LIVE D | -0.11 | -0.11 | 0.250 | 0.00 | 20.62 |
| 8 2 U_LIVE D | -0.11 | -0.11 | 0.250 | 20.62 | 30.92 |
| 9 3 U_LIVE D | -0.11 | -0.11 | -0.250 | 0.00 | 10.31 |
| 10 3 U_LIVE D | -0.11 | -0.11 | -0.250 | 10.31 | 30.92 |
| 11 3 U_SNOW D | -0.17 | -0.17 | -0.250 | 0.00 | 30.92 |
| 12 2 U_SNOW D | -0.17 | -0.17 | 0.250 | 0.00 | 30.92 |
| 13 2 U_SNOW D | -0.17 | -0.17 | 0.250 | 21.00 | 30.92 |
| 14 3 U_SNOW D | -0.17 | -0.17 | -0.250 | 0.00 | 9.92 |

14186-04AR1 Reactions, Anchor Bolts, & Base Plates: 6/20/14 10:18am

| Frame Line | Col Line | Foundation_Loads(k) Max_Pos_Val Id | Horz | Vert | Max_Neg_Val Id | Horz | Vert | Anc._Bolt No. | Diam | Base_Plate Width | Len | Thick |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 24 | 5.0 | -2.1 | 25 | -4.7 | -3.8 | 4 | 0.750 | 8.00 | 12.00 | 0.375 |
| | | 26 | 0.2 | 5.7 | 27 | 4.9 | -5.7 | | | | | |
| 1 | D | 24 | 5.0 | -2.1 | 25 | -4.7 | -3.8 | 4 | 0.750 | 8.00 | 12.00 | 0.375 |
| | | 28 | 0.2 | 5.7 | 22 | 4.9 | -5.7 | | | | | |
| 5 | D | 24 | 5.0 | -2.2 | 25 | -4.7 | -4.0 | 4 | 0.750 | 8.00 | 12.00 | 0.375 |
| | | 29 | 0.2 | 5.9 | 27 | 4.9 | -5.9 | | | | | |
| 5 | C | 24 | 5.0 | -2.2 | 25 | -4.7 | -4.0 | 4 | 0.750 | 8.00 | 12.00 | 0.375 |
| | | 30 | 0.2 | 5.9 | 22 | 4.9 | -5.9 | | | | | |
| 1 | B | 1 | 0.3 | 2.5 | 2 | -1.0 | -2.5 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | 3 | 0.3 | 3.8 | 4 | -0.7 | -2.9 | | | | | |
| 1 | E | 5 | 1.6 | -1.7 | 6 | -1.0 | -2.2 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | 7 | -0.3 | 2.3 | 8 | 1.0 | -2.5 | | | | | |
| 2 | B | 3 | 9.5 | 14.7 | 9 | -7.9 | -10.1 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | | | | 4 | -5.6 | -12.5 | | | | | |
| 2 | E | 8 | 7.9 | -10.3 | 3 | -9.5 | 13.2 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | 7 | -9.5 | 13.2 | 2 | 5.6 | -12.7 | | | | | |
| 3* | B | 10 | 12.4 | 7.4 | 11 | -16.5 | -16.7 | 4 | 0.875 | 8.00 | 8.00 | 0.500 |
| | | 3 | 11.8 | 15.9 | 12 | -15.9 | -18.4 | | | | | |
| 3* | E | 4 | 16.3 | -10.7 | 13 | -12.6 | 11.9 | 4 | 0.875 | 8.00 | 8.00 | 0.500 |
| | | 3 | -11.8 | 15.9 | 14 | 13.1 | -18.6 | | | | | |
| 5 | B | 15 | 1.2 | -1.4 | 16 | -1.9 | -2.1 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | 7 | 0.3 | 2.4 | 9 | -1.7 | -3.3 | | | | | |

5 E 5 1.9 -2.1 17 -1.2 -1.4 4 0.750 8.00 8.00 0.375

3 -0.3 2.4 8 1.7 -3.3

1 C 9 0.0 -4.8 9 0.0 -4.8 4 0.750 8.00 12.00 0.375

18 0.0 5.7

1 D 8 0.0 -5.3 8 0.0 -5.3 4 0.750 8.00 12.00 0.375

19 0.0 5.8

5 C 9 0.0 -4.6 9 0.0 -4.6 4 0.750 8.00 12.00 0.375

20 0.0 5.9

5 D 8 0.0 -4.6 8 0.0 -4.6 4 0.750 8.00 12.00 0.375

21 0.0 5.9

---

3* Frame Lines:3 4

LOAD COMBINATIONS:

| Id | Combination |
|---|---|
| 1 | Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Slide_Snow |
| 2 | 0.6Dead-Wind_Long1+LWIND1_R2E |
| 3 | Dead+Collateral+Snow+Slide_Snow |
| 4 | 0.6Dead-Wind_Long1+LWIND1_L2E |
| 5 | 0.6Dead+Wind_Right2 |
| 6 | Dead-Wind_Long1+LWIND1_R2E |
| 7 | Dead+Collateral+Snow |
| 8 | 0.6Dead+Wind_Right1 |
| 9 | 0.6Dead+Wind_Left1 |
| 10 | Dead+Collateral+0.75Snow+0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_L2E |
| 11 | 0.6Dead+Wind_Long1+LWIND1_R2E |
| 12 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 13 | Dead+Collateral+0.75Snow-0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_R2E |
| 14 | 0.6Dead+Wind_Long2+LWIND2_R2E |

15 Dead+Wind_Right1

16 0.6Dead+Wind_Left2

17 Dead+Wind_Left1

18 Dead+Collateral+F1UNB_SL_L

19 Dead+Collateral+F1UNB_SL_R

20 Dead+Collateral+F4UNB_SL_L

21 Dead+Collateral+F4UNB_SL_R

22 0.6Dead+Wind_Right2+Wind_Suction

23 0.6Dead+Wind_Pressure+Wind_Long2

24 0.6Dead+Wind_Suction+Wind_Long2

25 0.6Dead+Wind_Pressure+Wind_Long1

26 Dead+Collateral+E1UNB_SL_L

27 0.6Dead+Wind_Left2+Wind_Suction

28 Dead+Collateral+E1UNB_SL_R

29 Dead+Collateral+E2UNB_SL_L

30 Dead+Collateral+E2UNB_SL_R

==========

14186-04AR1 Bracing Reactions Report: 6/20/14 10:18am

==========

BUILDING BRACING REACTIONS:

---

------Reactions(k )-------

---Wall-- Col ----Wind---- --Seismic--- Panel_Shear(lb/ft)

Loc Line Line Horz Vert Horz Vert Wind Seismic

---- ---- ------- ----- ----- ----- ----- ------ -------

L_EW 1 Rigid Frame At Endwall

F_SW E 3 ,4 11.81 6.10 0.31 0.16

R_EW 5 Rigid Frame At Endwall

B_SW B Torsional Bracing Used!

---

14186-04AR1 Additional Reactions Report: 6/20/14 10:18am

Rigid Frame Column Reactions

| Frame Line | Col Line | ----Dead--- Horz | Vert | Collateral Horz | Vert | ----Live--- Horz | Vert | ----Snow--- Horz | Vert | Wind_Left1 Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | 0.0 | 0.7 | 0.0 | 0.3 | 0.1 | 2.1 | 0.2 | 2.8 | -0.6 | -3.2 |
| 1 | E | 0.0 | 0.4 | 0.0 | 0.2 | -0.1 | 1.1 | -0.2 | 1.6 | -0.7 | -2.2 |
| 1 | C | 0.0 | 0.8 | 0.0 | 0.5 | 0.0 | 2.3 | 0.0 | 3.5 | 0.0 | -5.2 |
| 1 | D | 0.0 | 0.8 | 0.0 | 0.5 | 0.0 | 2.4 | 0.0 | 3.6 | 0.0 | -3.5 |

| Frame Line | Col Line | Wind_Right1 Horz | Vert | Wind_Left2 Horz | Vert | Wind_Right2 Horz | Vert | Wind_Long1 Horz | Vert | Wind_Long2 Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | -0.3 | -1.9 | -0.2 | -2.0 | 0.2 | -0.7 | -0.8 | -2.7 | -0.4 | -1.5 |
| 1 | E | 1.0 | -2.7 | -0.1 | -1.4 | 1.6 | -2.0 | -0.9 | -1.9 | -0.4 | -1.2 |
| 1 | C | 0.0 | -3.7 | 0.0 | -4.0 | 0.0 | -2.5 | 0.0 | -3.2 | 0.0 | -2.0 |
| 1 | D | 0.0 | -5.8 | 0.0 | -1.6 | 0.0 | -4.0 | 0.0 | -4.3 | 0.0 | -2.5 |

| Frame Line | Col Line | -Seis_Left- Horz | Vert | -Seis_Right Horz | Vert | LWIND1_L2E Horz | Vert | LWIND1_R2E Horz | Vert | LWIND2_L2E Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | -0.7 | -0.2 | -0.2 | 0.1 | -0.7 |
| 1 | E | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | -0.2 | -0.1 | -0.7 | 0.2 | -0.2 |
| 1 | C | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | 0.0 | 0.3 | 0.0 | -0.5 |
| 1 | D | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | -0.5 | 0.0 | 0.3 |

| Frame | Col | LWIND2_R2E | | F1PAT_LL_1 | | F1PAT_LL_2 | | F1PAT_LL_3 | | F1PAT_LL_4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 1 | B | -0.2 | -0.2 | 0.1 | 1.0 | 0.1 | 0.0 | 0.2 | 1.3 | 0.0 | -0.2 |
| 1 | E | -0.1 | -0.7 | -0.1 | 0.0 | -0.1 | 1.0 | -0.2 | 1.3 | 0.0 | -0.2 |
| 1 | C | 0.0 | 0.3 | 0.0 | 2.6 | 0.0 | 1.0 | 0.0 | 1.0 | 0.0 | 1.3 |
| 1 | D | 0.0 | -0.5 | 0.0 | 1.0 | 0.0 | 2.6 | 0.0 | 1.0 | 0.0 | 1.3 |

| Frame | Col | F1UNB_SL_L | | F1UNB_SL_R | |
|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert |
| 1 | B | 0.1 | 1.5 | 0.1 | 0.5 |
| 1 | E | -0.1 | 0.5 | -0.1 | 1.5 |
| 1 | C | 0.0 | 4.5 | 0.0 | 1.5 |
| 1 | D | 0.0 | 1.5 | 0.0 | 4.5 |

---

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2 | B | 1.0 | 1.9 | 1.0 | 1.5 | 3.9 | 6.3 | 7.5 | 11.3 | -8.5 | -11.2 |
| 2 | E | -1.0 | 1.6 | -1.0 | 1.4 | -3.9 | 5.3 | -7.5 | 10.2 | 4.7 | -8.9 |

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2 | B | -4.7 | -8.9 | -6.2 | -6.3 | -2.5 | -4.0 | -6.2 | -11.9 | -4.0 | -7.0 |

2 E 8.5 -11.2 2.5 -4.0 6.2 -6.3 6.2 -11.9 4.0 -7.0

| Frame Col | | -Seis_Left- | | -Seis_Right | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 2 | B | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.7 | -0.5 | -0.3 | 0.0 | -1.7 |
| 2 | E | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | -0.3 | 0.0 | -1.7 | 0.5 | -0.3 |

| Frame Col | | LWIND2_R2E | | F2UNB_SL_L | | F2UNB_SL_R | |
|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert |
| 2 | B | -0.5 | -0.3 | 6.2 | 9.8 | 6.2 | 5.8 |
| 2 | E | 0.0 | -1.7 | -6.2 | 5.8 | -6.2 | 9.8 |

---

| Frame Col | | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | B | 1.2 | 1.9 | 1.2 | 1.6 | 4.8 | 6.4 | 9.3 | 12.3 | -10.5 | -13.5 |
| 3* | E | -1.2 | 1.9 | -1.2 | 1.6 | -4.8 | 6.4 | -9.3 | 12.3 | 5.9 | -10.7 |

| Frame Col | | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | B | -5.9 | -10.7 | -7.7 | -7.6 | -3.1 | -4.8 | -16.6 | -17.5 | 3.9 | -5.2 |
| 3* | E | 10.5 | -13.5 | 3.1 | -4.8 | 7.7 | -7.6 | -1.1 | -17.2 | 13.8 | -17.7 |

| Frame Col | | -Seis_Left- | | -Seis_Right | | -Seis_Long- | | LWIND1_L2E | | LWIND1_R2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | B | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.1 | 0.0 | -2.1 | -0.6 | -0.3 |
| 3* | E | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.1 | 0.6 | -0.3 | 0.0 | -2.1 |

| Frame | Col | LWIND2_L2E | | LWIND2_R2E | | F3UNB_SL_L | | F3UNB_SL_R | |
|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 3* | B | 0.0 | -2.1 | -0.6 | -0.3 | 7.8 | 11.8 | 7.8 | 7.0 |
| 3* | E | 0.6 | -0.3 | 0.0 | -2.1 | -7.8 | 7.0 | -7.8 | 11.8 |

---

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5 | B | 0.0 | 0.4 | 0.0 | 0.2 | 0.2 | 1.1 | 0.2 | 1.7 | -1.7 | -3.5 |
| 5 | E | 0.0 | 0.4 | 0.0 | 0.2 | -0.2 | 1.1 | -0.2 | 1.7 | -1.2 | -1.8 |
| 5 | C | 0.0 | 0.8 | 0.0 | 0.5 | 0.0 | 2.4 | 0.0 | 3.7 | 0.0 | -5.1 |
| 5 | D | 0.0 | 0.8 | 0.0 | 0.5 | 0.0 | 2.4 | 0.0 | 3.7 | 0.0 | -4.2 |

| Frame | Col | Wind_Right1 | | Wind_Left2 | | Wind_Right2 | | Wind_Long1 | | Wind_Long2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5 | B | 1.2 | -1.8 | -2.0 | -2.4 | 0.9 | -0.7 | 0.4 | -2.6 | 0.1 | -1.5 |
| 5 | E | 1.7 | -3.5 | -0.9 | -0.7 | 2.0 | -2.4 | -0.4 | -2.6 | -0.1 | -1.5 |
| 5 | C | 0.0 | -4.2 | 0.0 | -3.7 | 0.0 | -2.8 | 0.0 | -3.7 | 0.0 | -2.2 |
| 5 | D | 0.0 | -5.1 | 0.0 | -2.8 | 0.0 | -3.7 | 0.0 | -3.7 | 0.0 | -2.2 |

| Frame | Col | -Seis_Left- | | -Seis_Right | | LWIND1_L2E | | LWIND1_R2E | | LWIND2_L2E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |
| 5 | B | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | -0.7 | -0.2 | -0.2 | 0.1 | -0.7 |
| 5 | E | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | -0.2 | -0.1 | -0.7 | 0.2 | -0.2 |
| 5 | C | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | 0.0 | 0.3 | 0.0 | -0.5 |
| 5 | D | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | -0.5 | 0.0 | 0.3 |

| Frame | Col | LWIND2_R2E | | F4PAT_LL_1 | | F4PAT_LL_2 | | F4PAT_LL_3 | | F4PAT_LL_4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | B | -0.2 | -0.2 | 0.1 | 1.0 | 0.1 | 0.0 | 0.2 | 1.3 | 0.0 | -0.2 |
| 5 | E | -0.1 | -0.7 | -0.1 | 0.0 | -0.1 | 1.0 | -0.2 | 1.3 | 0.0 | -0.2 |
| 5 | C | 0.0 | 0.3 | 0.0 | 2.7 | 0.0 | 1.0 | 0.0 | 1.1 | 0.0 | 1.3 |
| 5 | D | 0.0 | -0.5 | 0.0 | 1.0 | 0.0 | 2.7 | 0.0 | 1.1 | 0.0 | 1.3 |

| Frame Line | Col Line | F4UNB_SL_L Horz | F4UNB_SL_L Vert | F4UNB_SL_R Horz | F4UNB_SL_R Vert |
|---|---|---|---|---|---|
| 5 | B | 0.1 | 1.5 | 0.1 | 0.5 |
| 5 | E | -0.1 | 0.5 | -0.1 | 1.5 |
| 5 | C | 0.0 | 4.6 | 0.0 | 1.5 |
| 5 | D | 0.0 | 1.5 | 0.0 | 4.6 |

---

3* Frame Lines:3 4

Endwall Column Reactions

| Frame Line | Col Line | Dead Vert | Collat Vert | Live Vert | Snow Vert | Wind Left1 Vert | Wind Right1 Vert | Wind Left2 Vert | Wind Right2 Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 0.5 | 0.5 | 3.2 | 3.7 | -6.0 | -3.9 | -6.0 | -3.9 |
| 1 | D | 0.5 | 0.5 | 3.2 | 3.7 | -3.9 | -6.0 | -3.9 | -6.0 |

| Frame Line | Col Line | Wind Press Horz | Wind Suct Horz | Wind Long1 Vert | Wind Long2 Vert | Seismic Left Vert | Seismic Right Vert | -E1UNB_SL_L- Horz | -E1UNB_SL_L- Vert |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | C | -4.6 | 5.0 | -4.2 | -2.5 | 0.0 | 4.6 |
| 1 | D | -4.6 | 5.0 | -4.2 | -2.5 | 0.0 | 1.6 |

| Frame Line | Col Line | -E1UNB_SL_R- Horz | Vert | --LWIND1_L-- Horz | Vert | --LWIND1_R-- Horz | Vert | --LWIND2_L-- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 0.0 | 1.6 | 0.0 | -0.4 | 0.0 | 0.1 | 0.0 | -0.4 |
| 1 | D | 0.0 | 4.6 | 0.0 | 0.1 | 0.0 | -0.4 | 0.0 | 0.1 |

| Frame Line | Col Line | --LWIND2_R-- Horz | Vert |
|---|---|---|---|
| 1 | C | 0.0 | 0.1 |
| 1 | D | 0.0 | -0.4 |

---

| Frame Line | Col Line | Dead Vert | Collat Vert | Live Vert | Snow Vert | Wind Left1 Vert | Wind Right1 Vert | Wind Left2 Vert | Wind Right2 Vert |
|---|---|---|---|---|---|---|---|---|---|
| 5 | D | 0.6 | 0.5 | 3.4 | 3.9 | -6.2 | -4.1 | -6.3 | -4.1 |
| 5 | C | 0.6 | 0.5 | 3.4 | 3.9 | -4.1 | -6.2 | -4.1 | -6.3 |

| Frame Line | Col Line | Wind Press Horz | Wind Suct Horz | Wind Long1 Vert | Wind Long2 Vert | Seismic Left Vert | Seismic Right Vert | -E2UNB_SL_L- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 5 | D | -4.6 | 5.0 | -4.3 | -2.5 | 0.0 | 4.8 | | |
| 5 | C | -4.6 | 5.0 | -4.3 | -2.5 | 0.0 | 1.6 | | |

| Frame Line | Col Line | -E2UNB_SL_R- Horz | Vert | --LWIND1_L-- Horz | Vert | --LWIND1_R-- Horz | Vert | --LWIND2_L-- Horz | Vert |
|---|---|---|---|---|---|---|---|---|---|
| 5 | D | 0.0 | 1.6 | 0.0 | -0.5 | 0.0 | 0.1 | 0.0 | -0.5 |

5 C 0.0 4.8 0.0 0.1 0.0 -0.5 0.0 0.1

Frame Col --LWIND2_R--

Line Line Horz Vert

----- ---- ----- -----

5 D 0.0 0.1

5 C 0.0 -0.5

---

==========

14186-04AR1 Seismic Design Report: 6/20/14 10:18am

==========

Building Data

---

Code =IBC 12

Length = 65.00

Width = 60.00

Left Eave Height = 12.00

Right Eave Height = 12.00

Seismic Formula

---

Base Shear, V = 0.01*W

Vmin = 0.044*Sds*Ie*W

Vmax = Sd1*Ie*W/(T*R)

T(Moment_Frame) = 0.204

T(Braced_Frame) = 0.129

Shear Force, E = V

(Rigid frame, endwall frame, wind bent, wind column & base reactions)

Shear Force, Em = Omega*V

(Wall diagonal bracing, splice at rigid frame & wind bent knee)

Note: Applied load is seismic force multiplied by load combination

Zone/Design Category= A

S1 = 0.026

Sd1 = 0.042

Sds = 0.078

Seismic Dead Load, W

---

Snow Factor = 0.000

Roof Dead+Collateral= 5.00 (psf )

Frame Dead = 2.00 (psf )

Roof Total = 7.00 (psf ) , Weight= 27.30 (k )

L_EW Dead = 2.00 (psf ) , Weight= 0.94 (k )

F_SW Dead = 2.00 (psf ) , Weight= 0.78 (k )

R_EW Dead = 2.00 (psf ) , Weight= 0.94 (k )

B_SW Dead = 2.00 (psf ) , Weight= 0.78 (k )

---

Total = 30.75 (k )

Seismic Forces

---

Roof Bracing

Cs = 0.0100

W = 29.19 (k )

Force, V = 0.29 (k ) (Vmin)

Force, E = 0.29 (k )

Sidewall Bracing

Front Omega= 3.00

Cs = 0.0100

W = 30.75 (k )

Force, V = 0.31 (k ) (Vmin)

Force, Em = 0.92 (k )

Force, E = 0.31 (k )

Rigid Frames

Cs = 0.0100

Frame 1 W = 4.00 (k )

Force, V = 0.04 (k ) (Vmin)

Force, E = 0.04 (k )

Frame 2 W = 6.00 (k )

Force, V = 0.06 (k ) (Vmin)

Force, E = 0.06 (k )

Frame 3 W = 8.00 (k )

Force, V = 0.08 (k ) (Vmin)

Force, E = 0.08 (k )

Frame 4 W = 4.00 (k )

Force, V = 0.04 (k ) (Vmin)

Force, E = 0.04 (k )

End Plates

Frame Omega= 3.00

Total Base Shear

Longitudinal

Force, V = 0.31 (k )

Transverse

Force, V = 0.30 (k )

PEMB DESIGN CALCULATIONS

FOR

C & H Buildings

12'x 15'x 9' LS

14186-04BR1

BUILDING LAYOUT

Width (ft)= 12.7

Length (ft)= 15.0

Eave Height (ft)= 9.0/ 12.2

Roof Slope (rise/12 )= 3.00

BUILDING LOADS

Roof Dead Load (psf )= 2.0

Wall Dead Load

Left Endwall (psf )= 2.0

Right Endwall (psf )= 2.0

Front Sidewall(psf )= 2.0

Back Sidewall(psf )= 2.0

Live Load (psf )= 20.0

Collateral Load (psf )= 3.0

Snow Load (psf )= 23.1

Wind Speed (mph )= 120.0

Wind Code = IBC 12

Closed/Open = C

Exposure = C

Internal Wind Coeff = -0.18, +0.18

Risk Category = II Normal

Importance - Seismic = 1.25

Seismic Design Category= A

14186-04BR1 Design Loads For Building Components: 6/26/14 9:14am

FRONT SIDEWALL:

BASIC LOADS:

| Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Col/ Panel | Jamb |
|---|---|---|---|---|---|---|
| | -----Edge_Strip_Ratio----- | | | | | |
| 30.6 | 0.40 | 1.00 | 3.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long | |
|---|---|---|---|
| 29.8 | -32.9 | | .. Girt/Header |
| 36.1 | -39.2 | | .. Panel |
| 29.1 | -31.9 | | .. Jamb |
| 45.9 | -30.6 | | .. Parapet |

BACK SIDEWALL:

BASIC LOADS:

| Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Col/ Panel | Jamb |
|---|---|---|---|---|---|---|
| | -----Edge_Strip_Ratio----- | | | | | |
| 30.6 | 0.70 | 1.00 | 3.00 | 1.12 | 1.23 | 1.07 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Long |
|---|---|---|

29.8 -32.9 .. Girt/Header

36.1 -39.2 .. Panel

29.1 -31.9 .. Jamb

45.9 -30.6 .. Parapet

LEFT ENDWALL:

---

BASIC LOADS:

| | | | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Wind_Load_Ratio Deflect | Factor | Zone Width | Girt | Panel | Col/ Jamb |
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.6 | 0.70 | 1.00 | 3.00 | 1.12 | 1.23 | 1.07 |

BASIC LOADS AT EAVE:

| Seis Load | ---Torsion--- Wind | Seismic |
|---|---|---|
| 0.00 | 0.75 | 0.01 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | |
|---|---|---|
| 29.1 | -32.2 | .. Column |
| 29.8 | -32.9 | .. Girt/Header |
| 29.1 | -31.9 | .. Jamb |
| 36.1 | -39.2 | .. Panel |
| 45.9 | -30.6 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf Id | Wind_1 Left | Right | Wind_2 Left | Right | Wind_2 Left | Right | Long Wind | Surface Friction |
| 1 | 0.45 | -0.67 | 0.81 | -0.31 | 0.45 | -0.67 | -0.63 | 0.00 |
| 2 | -1.11 | -0.74 | -0.75 | -0.38 | -1.11 | -0.74 | -0.87 | 0.00 |

3 -0.67 0.45 -0.31 0.81 -0.67 0.45 -0.63 0.00

COLUMN & BRACING DESIGN LOADS:

| Load | ---Live--- | | --Add_Snow- | | | Wind_1 | Wind_2 | Long_Wind | | Column_Wind | | Long | | Tran | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id | Coef |
| 41 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 8 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 12 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 13 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| 22 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 23 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 |
| 24 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 25 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |
| 26 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 27 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 28 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 30 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0 | 0.00 |
| 31 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0 | 0.00 |
| 32 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 33 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 34 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 35 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 36 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0 | 0.00 |
| 37 | 1.00 | 1.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.52 | 0.00 | 0 | 0.00 |
| 38 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 | |
| 39 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0 | 0.00 | |
| 40 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 0 | 0.00 |
| 41 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.70 | 0.00 | 0 | 0.00 |

RAFTER DESIGN LOADS:

| Load | | --Add_Snow- | | | | Wind_1 | Wind_2 | | Long | | Aux_Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis | Id | Coef |
| 62 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 2 | 1.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |

18 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

19 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

20 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

21 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

22 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

23 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

24 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0 0.00

25 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0 0.00

26 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0 0.00

27 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0 0.00

28 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0 0.00

29 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0 0.00

30 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

31 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

32 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

33 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

34 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

35 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

36 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

37 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

38 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

39 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

40 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

41 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

42 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

43 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

45 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0 0.00

46 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0 0.00

47 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0 0.00

50 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0 0.00

51 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.02 1.02 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.02 1.02 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.02 1.02 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.02 1.02 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.02 1.02 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.02 1.02 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

59 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

60 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

61 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

62 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

AUXILIARY LOADS:

| No. Aux | Aux | No. | Add_Load |
|---|---|---|---|
| Aux Id | Name | Load Id | Coeff |
| 4 1 | LWIND1_L | 1 1 | 1.00 |
| 2 | LWIND1_R | 1 2 | 1.00 |
| 3 | LWIND2_L | 1 1 | 1.00 |
| 4 | LWIND2_R | 1 2 | 1.00 |

ADDITIONAL LOADS:

| No. Add Loc | Basic Load | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|
| Add Id Id | Load Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 2 1 2 | U_WIND D | 0.09 | 0.09 | 0.00 | 0.00 | 6.00 | |
| 2 | 2 U_WIND D | 0.09 | 0.09 | 0.00 | 7.07 | 13.07 | |

RIGHT ENDWALL:

---

BASIC LOADS:

| | | | | | | ----Edge_Strip_Ratio---- | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dead Load | Coll Load | Live Load | Snow Load | Rain Load | Basic Wind | Load_Ratio Deflect | Zone Factor | Width | Col/ Girt Panel Jamb |
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.6 | 0.70 | 1.00 | 3.00 | 1.12 1.23 1.07 |

BASIC LOADS AT EAVE:

| Seis | ---Torsion--- |
|---|---|
| Load | Wind Seismic |
| 0.00 | 0.75 0.01 |

WIND PRESSURE/SUCTION:

| Wind | Wind | |
|---|---|---|
| Press | Suct | |
| 29.1 | -32.2 | .. Column |
| 29.8 | -32.9 | .. Girt/Header |
| 29.1 | -31.9 | .. Jamb |
| 36.1 | -39.2 | .. Panel |
| 45.9 | -30.6 | .. Parapet |

WIND COEFFICIENTS:

| | Column/Rafter | | Rafter | | Column/Brace | | | |
|---|---|---|---|---|---|---|---|---|
| Surf | Wind_1 | | Wind_2 | | Wind_2 | | Long | Surface |
| Id | Left | Right | Left | Right | Left | Right | Wind | Friction |
| 1 | 0.45 | -0.67 | 0.81 | -0.31 | 0.45 | -0.67 | -0.63 | 0.00 |
| 2 | -0.74 | -1.11 | -0.38 | -0.75 | -0.74 | -1.11 | -0.87 | 0.00 |
| 3 | -0.67 | 0.45 | -0.31 | 0.81 | -0.67 | 0.45 | -0.63 | 0.00 |

COLUMN & BRACING DESIGN LOADS:

| Load | | ---Live--- | | --Add_Snow- | | | Wind_1 | | Wind_2 | | Long_Wind | | Column_Wind | | Long | Tran | Aux_Load |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Left | Right | Left | Right | 1 | 2 | Press | Suct | Seis | Seis Id Coef |
| 41 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |

8 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

9 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

10 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

11 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

12 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

13 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

14 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0 0.00

15 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 1.00 0.00 0.00 0.00 0 0.00

16 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00 0 0.00

17 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 1.00 0.00 0.00 0 0.00

18 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

19 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

20 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

21 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 1.00 0.00 0.00 0 0.00

22 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

23 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

24 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

25 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

26 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

27 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

28 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

29 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

30 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0 0.00

31 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0 0.00

32 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

33 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

34 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

35 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

36 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

37 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

38 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

39 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

40 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

41 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

RAFTER DESIGN LOADS:

| Load | | --Add_Snow- | | | | Wind_1 | Wind_2 | Long | Aux_Load | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Id | Dead | Coll | Live | Snow | Drift | Slide | Rain | Left | Right | Left | Right | Wind | Seis | Id | Coef |
| 62 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1 | 1.00 |
| | 10 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 2 | 1.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 13 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 16 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |
| | 17 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 1 | 0.75 |
| | 18 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 2 | 0.75 |
| | 19 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 | 0.75 |
| | 20 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 | 0.75 |
| | 21 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 22 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 23 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 28 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 29 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 30 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0 | 0.00 |

31 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

32 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0 0.00

33 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

34 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

35 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

36 1.00 1.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

37 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

38 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

39 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

40 1.00 1.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

41 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 1 0.75

42 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 2 0.75

43 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4 0.75

45 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0 0.00

46 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0 0.00

47 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.02 1.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0 0.00

50 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0 0.00

51 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.02 1.02 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.02 1.02 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.02 1.02 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.02 1.02 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.02 1.02 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.02 1.02 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.02 1.02 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

59 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0 0.00

60 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0 0.00

61 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

62 0.59 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

AUXILIARY LOADS:

| No. Aux | Aux | No. | Add_Load |
|---|---|---|---|
| Aux Id | Name | Load Id | Coeff |
| 4 1 | LWIND1_L | 1 1 | 1.00 |
| 2 | LWIND1_R | 1 2 | 1.00 |
| 3 | LWIND2_L | 1 1 | 1.00 |
| 4 | LWIND2_R | 1 2 | 1.00 |

ADDITIONAL LOADS:

| No. Add Loc | Basic Load | Fx | Fy | Mom | X | Y | .. Conc |
|---|---|---|---|---|---|---|---|
| Add Id Id | Load Type | W1 | W2 | Co | Dl1 | Dl2 | .. Dist |
| 2 1 2 | U_WIND D | 0.09 | 0.09 | 0.00 | 0.00 | 6.00 | |
| 2 | 2 U_WIND D | 0.09 | 0.09 | 0.00 | 7.07 | 13.07 | |

ROOFDES:

---

BASIC LOADS:

| Dead Coll | Live | Snow | Rain | Basic | Wind_Load_Ratio | Surface | Seis | % |
|---|---|---|---|---|---|---|---|---|
| Load Load | Load | Load | Load | Wind | Deflect Factor | Friction | Factor | Snow |
| 2.0 3.0 | 20.0 | 23.1 | 0.0 | 30.6 | 0.70 1.00 | 0.00 | 1.000 | 0.00 |

WIND PRESSURE/SUCTION:

| Wind Press | Wind Suct | Wind Suct_Roof | |
|---|---|---|---|
| 14.7 | -39.2 | | .. Purlins |
| 0.0 | -67.4 | | .. Gable Extensions |
| 17.8 | -45.3 | | .. Panels |
| 17.8 | -3.4 | -21.1 | .. Long Bracing, Building |
| 24.2 | -7.7 | | .. Long Bracing, Wall Edge Zone |
| 45.9 | -30.6 | 24.5 | .. Long Bracing, Facia/Parapet |

EDGE & CORNER ZONE WIND:

| Wind Surf | No. Zone | | --Purlin--- | | ---Panel--- | |
|---|---|---|---|---|---|---|
| Id Id | Zone Id | Width | Length | Press Suct | Press | Suct |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 0.00 | 0.00 | 1.00 | 1.08 | 1.00 | 1.20 | |
| | | | 3 | 0.00 | 12.00 | 1.00 | 1.70 | 1.00 | 2.08 | |
| | | | 5 | 0.00 | 12.00 | 1.00 | 1.70 | 1.00 | 2.08 | |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 | 1.64 | 1.00 | 1.20 | |

EDGE & CORNER ZONE WIND: LONGITUDINAL

| Wind Surf Id | No. Zone Id | Zone Id | Purlin Width | Purlin Length | Suct |
|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 0.00 | 0.00 | 1.08 |
| 2 | 2 | 1 | 1 | 0.00 | 0.00 | 1.00 |

PURLIN DESIGN LOADS:

| Surf Id | --Load- No. | Id | Dead | Coll | Live | --Add_Snow- Snow | Drift | Slide | Rain | Wind Press | Wind Suct | Aux_Load Id | Aux_Load Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 11 | 1 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | | 5 | 1.00 | 1.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 6 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 7 | 1.00 | 1.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 8 | 1.00 | 1.00 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0.75 | 0.00 | 0 | 0.00 |
| | | 9 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0 | 0.00 |
| | | 10 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | | 11 | 1.00 | 1.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |

BRACING DESIGN LOADS:

| --Load- No. | Id | Dead | Coll | Live | --Add_Snow- Snow | Drift | Slide | Rain | Wind Press | Wind Suct | Seis Load | Aux_Load Id | Aux_Load Coef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 7 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0 | 0.00 |
| 8 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| 9 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 10 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |
| 11 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0 | 0.00 |

AUXILIARY LOADS:

| No. Aux | Aux | No. | Add_Load |
|---|---|---|---|
| Aux Id | Name | Load Id | Coef |
| 1 1 | PAT_SL_1 | 1 1 | 0.50 |

ADDITIONAL LOADS:

| No. Add | Surf | Basic Load | Fy | Dx | .. Conc |
|---|---|---|---|---|---|
| Add Id | Id | Load Type | W1 W2 | Dx1 Dx2 | .. Dist |
| 1 1 | 0 | U_SNOW D | -23.1 -23.1 | 0.0 15.0 | |

RIGID FRAME #1:

---

BASIC LOADS:

| | | | | | | Basic | Defl | Temperature |
|---|---|---|---|---|---|---|---|---|
| Dead | Coll | Live | Snow | Rain | Wind | Ratio | | Change |
| 2.0 | 3.0 | 20.0 | 23.1 | 0.0 | 30.6 | 0.70 | | 0 |

BASIC LOADS AT EAVE:

| Seismic | Weak_Axis_L | | Weak_Axis_R | | --Torsion-- | | --EW_Brace- | |
|---|---|---|---|---|---|---|---|---|
| Load | Wind | Seis | Wind | Seis | Wind | Seis | Wind | Seis |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.90 | 0.01 | 0.00 | 0.00 |

WIND COEFFICIENTS:

| Surf | --Wind_1--- | | --Wind_2--- | | Long_Wind | | Surface |
|---|---|---|---|---|---|---|---|
| Id | Left | Right | Left | Right | 1 | 2 | Friction |
| 1 | 0.54 | -0.73 | 0.90 | -0.37 | -0.63 | -0.27 | 0.00 |
| 2 | -1.25 | -0.80 | -0.89 | -0.44 | -0.87 | -0.51 | 0.00 |

3 0.00 0.00 0.00 0.00 0.00 0.00 0.00

DESIGN LOADS:

| -Load- | | ---Live--- | | --Add_Snow- | | --Wind_1- | | --Wind_2- | | Long_Wind | | --Seismic- | | Aux_Load | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Id | Dead | Coll | Roof | Floor | Snow | Drift | Slide | Rain | Lt | Rt | Lt | Rt | Lt | Rt | Long | Tran | Temp | Id | Coef |
| 98 | 1 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 2 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 3 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 4 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 5 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 6 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 7 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 8 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 9 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 10 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 11 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 12 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 13 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 14 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 15 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 16 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 17 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 18 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 19 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 20 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 21 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 3 | 1.00 |
| | 22 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 4 | 1.00 |
| | 23 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 24 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 25 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 26 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| | 27 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |
| | 28 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 2 | 1.00 |
| | 29 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.00 | 0.00 | 0.00 | 0.00 | 1 | 1.00 |

30 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -1.00 0.00 0.00 0.00 0.00 2 1.00

31 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 3 1.00

32 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 4 1.00

33 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -1.00 0.00 0.00 0.00 3 1.00

34 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -1.00 0.00 0.00 0.00 4 1.00

35 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

36 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

37 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

38 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

39 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

40 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

41 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 1 0.75

42 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 2 0.75

43 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

44 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

45 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 3 0.75

46 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 4 0.75

47 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

48 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

49 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

50 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

51 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

52 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

53 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

54 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

55 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0 0.00

56 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

57 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

58 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0 0.00

59 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

60 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

61 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 1 0.75

62 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.75 0.00 0.00 0.00 0.00 2 0.75

63 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

64 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

65 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

66 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

67 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 1 0.75

68 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 2 0.75

69 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 1 0.75

70 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 0.00 2 0.75

71 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

72 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

73 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

74 1.00 1.00 0.00 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

75 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

76 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

77 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

78 1.00 1.00 0.00 0.00 0.75 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

79 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 3 0.75

80 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.75 0.00 0.00 0.00 4 0.75

81 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 3 0.75

82 1.00 1.00 0.00 0.00 0.75 0.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00-0.75 0.00 0.00 0.00 4 0.75

83 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

84 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

85 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

86 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

87 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0 0.00

88 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0 0.00

89 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0 0.00

90 0.60 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0 0.00

91 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

92 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

93 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

94 1.00 1.00 0.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

95 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.00 0 0.00

96 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.52 0.00 0.00 0 0.00

97 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.70 0.00 0.00 0 0.00

98 0.60 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 -0.70 0.00 0.00 0 0.00

AUXILIARY LOADS:

| No. Aux | Aux Id | Aux Name | No. Load | Add_Load Id | Coeff |
|---|---|---|---|---|---|
| 4 | 1 | LWIND1_L2E | 1 | 1 | 1.00 |
| | 2 | LWIND1_R2E | 1 | 2 | 1.00 |
| | 3 | LWIND2_L2E | 1 | 1 | 1.00 |
| | 4 | LWIND2_R2E | 1 | 2 | 1.00 |

ADDITIONAL LOADS:

| No. Add Id | Surf Id | Basic Type | Load Type | Fx W1 | Fy W2 | Mom Co | Dx Dl1 | Dy Dl2 | .. Conc .. Dist |
|---|---|---|---|---|---|---|---|---|---|
| 2 1 | 2 | U_WIND | D | 0.09 | 0.09 | 0.000 | 0.00 | 6.00 | |
| 2 | 2 | U_WIND | D | 0.09 | 0.09 | 0.000 | 7.07 | 13.07 | |

14186-04BR1 Reactions, Anchor Bolts, & Base Plates: 6/20/14 10:17am

| Frame Line | Col Line | Foundation_Loads(k) Max_Pos_Val Id | Horz | Vert | Max_Neg_Val Id | Horz | Vert | Anc._Bolt No. | Diam | Base_Plate Width | Len | Thick |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 1 | 0.7 | -1.2 | 2 | -0.9 | -1.0 | 4 | 0.750 | 8.00 | 8.00 | 0.375 |
| | | 3 | 0.0 | 1.6 | 4 | 0.6 | -2.0 | | | | | |

1* Frame Lines:1 2

LOAD COMBINATIONS:

| Id | Combination |
|---|---|
| 1 | Dead+Wind_Right1 |
| 2 | 0.6Dead+Wind_Left2 |
| 3 | Dead+Collateral+Snow+Slide_Snow |
| 4 | 0.6Dead-Wind_Long1+LWIND1_L2E |
| 5 | Dead+Wind_Left2 |
| 6 | Dead+Collateral+Snow |
| 7 | 0.6Dead+Wind_Left1 |
| 8 | 0.6Dead+Wind_Right2+Wind_Suction |
| 9 | 0.6Dead+Wind_Pressure+Wind_Long2 |

14186-04BR1 Bracing Reactions Report: 6/20/14 10:17am

BUILDING BRACING REACTIONS:

| | | | ------Reactions(k )------- | | | | | |
|---|---|---|---|---|---|---|---|---|
| ---Wall-- | Col | ----Wind---- | | --Seismic--- | | Panel_Shear(lb/ft) | |
| Loc | Line | Line | Horz | Vert | Horz | Vert | Wind | Seismic |
| L_EW 1 | | Rigid Frame At Endwall | | | | | | |
| F_SW B | | (a) | | | | | | |
| R_EW 2 | | Rigid Frame At Endwall | | | | | | |
| B_SW A | | Torsional Bracing Used! | | | | | | |

(a)Bracing loads must be applied to supporting building

14186-04BR1 Additional Reactions Report: 6/20/14 10:17am

Rigid Frame Column Reactions

| Frame | Col | ----Dead--- | | Collateral | | ----Live--- | | ----Snow--- | | Wind_Left1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Line | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert | Horz | Vert |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 0.0 | 0.3 | 0.0 | 0.2 | 0.0 | 1.0 | 0.0 | 1.2 | -0.5 | -1.9 |

| Frame Line | Col Line | Wind_Right1 Horz | Wind_Right1 Vert | Wind_Left2 Horz | Wind_Left2 Vert | Wind_Right2 Horz | Wind_Right2 Vert | Wind_Long1 Horz | Wind_Long1 Vert | Wind_Long2 Horz | Wind_Long2 Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 0.7 | -1.5 | -0.9 | -1.2 | 0.3 | -0.8 | 0.6 | -1.5 | 0.2 | -1.0 |

| Frame Line | Col Line | LWIND1_L2E Horz | LWIND1_L2E Vert | LWIND1_R2E Horz | LWIND1_R2E Vert | LWIND2_L2E Horz | LWIND2_L2E Vert | LWIND2_R2E Horz | LWIND2_R2E Vert |
|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 0.0 | -0.4 | 0.0 | -0.1 | 0.0 | -0.4 | 0.0 | -0.1 |

---

1* Frame Lines:1 2

Endwall Column Reactions

---

==========

14186-04BR1 Seismic Design Report: 6/20/14 10:17am

==========

Building Data

---

Code =IBC 12

Length = 15.00

Width = 12.68

Left Eave Height = 9.00

Right Eave Height = 12.17

Seismic Formula

---

Base Shear, V = 0.01*W

Vmin = 0.044*Sds*Ie*W

Vmax = Sd1*Ie*W/(T*R)

T(Moment_Frame) = 0.185

T(Braced_Frame) = 0.117

Shear Force, E = V

(Rigid frame, endwall frame, wind bent, wind column & base reactions)

Shear Force, Em = Omega*V

(Wall diagonal bracing, splice at rigid frame & wind bent knee)

Note: Applied load is seismic force multiplied by load combination

Zone/Design Category= A

S1 = 0.026

Sd1 = 0.042

Sds = 0.078

Seismic Dead Load, W

---

Snow Factor = 0.000

Roof Dead+Collateral= 5.00 (psf )

Frame Dead = 2.00 (psf )

Roof Total = 7.00 (psf ) , Weight= 1.33 (k )

L_EW Dead = 2.00 (psf ) , Weight= 0.13 (k )

F_SW Dead = 2.00 (psf ) , Weight= 0.18 (k )

R_EW Dead = 2.00 (psf ) , Weight= 0.13 (k )

B_SW Dead = 2.00 (psf ) , Weight= 0.14 (k )

---

Total = 1.92 (k )

Seismic Forces

---

Roof Bracing

Cs = 0.0100

W = 1.60 (k )

Force, V = 0.02 (k ) (Vmin)

Force, E = 0.02 (k )

Rigid Frames

Cs = 0.0100

Frame 1 W = 0.00 (k )

Force, V = 0.00 (k ) (Vmin)

Force, E = 0.00 (k )

End Plates

Frame Omega= 3.00

**Design to Drafting Package**

Job No. 14186-04
Customer: C & H Buildings
Designed By: JDS on 06/27/14

**Building Description**

Building A: 60' - 0" x 65' - 0" x 12' - 0" Gable Framed
Building B: 12' - 0" x 15' - 0" x 9' - 0" LS Single Slope

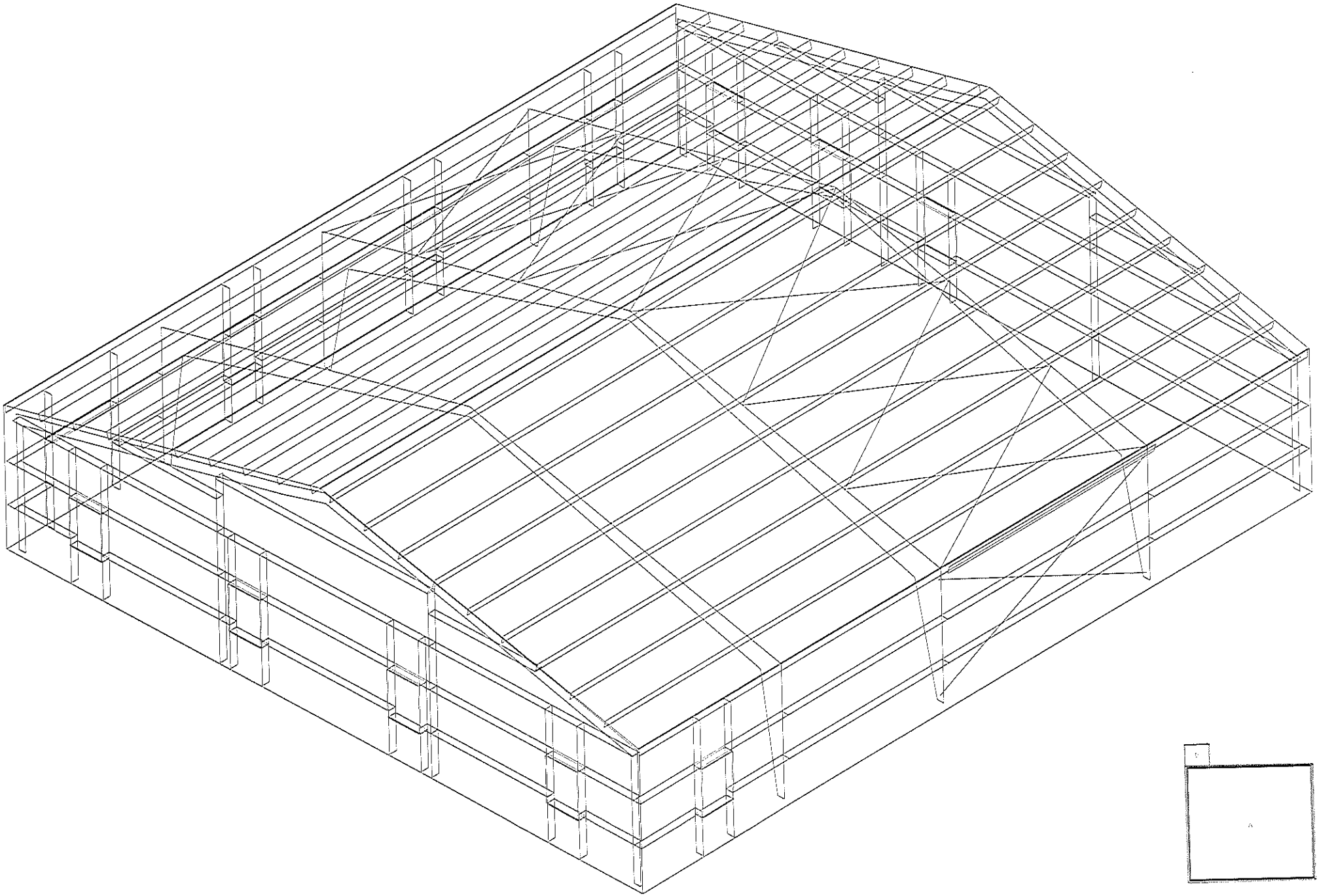
**Design Notes for Drafting**

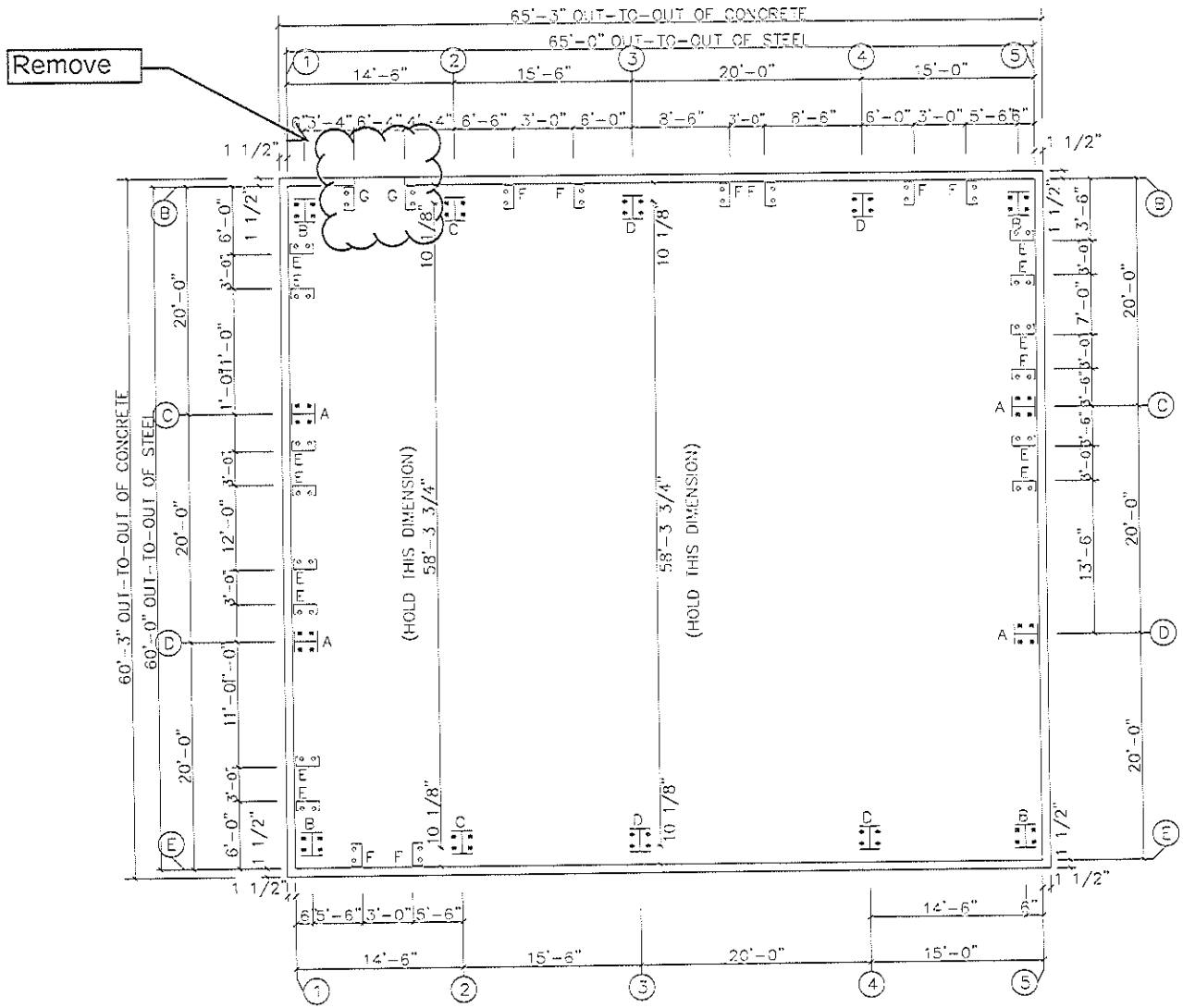
1) Please clean up any MBS overstrikes on drawings
2) Follow Notations on the Following Pages
3) MBS Start Marks

| | |
|---|---|
| 14186-04A: | 0 |
| 14186-04B | 100 |

**Table of Contents**

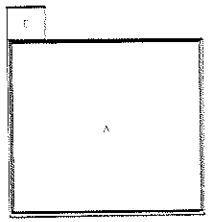

| | Page | File |
|---|---|---|
| Design to Drafting Cover Sheet | 1 | Design to Drafting Cover Sheet 062714.xls |
| **Building A** | | |
| 3D Model | 2 | 14186-04A / 3DBuild.dwg |
| Anchor Bolt Plan | 3 | 14186-04A / AnDwg-1.dwg |
| Anchor Bolt Details | 4 | 14186-04A / AnDwg-2.dwg |
| Reactions | 5 | 14186-04AR1 / AnDwg-3.dwg |
| Roof Framing and Sheeting | 6 | 14186-04A / RoofDwg.dwg |
| LEW Framing and Sheeting | 7 | 14186-04A / EwDwg-L.dwg |
| Rigid Frame Cross Section | 8 | 14186-04A / RfDwg-1.dwg |
| Rigid Frame Cross Section | 9 | 14186-04A / RfDwg-2.dwg |
| Rigid Frame Cross Section | 10 | 14186-04A / RfDwg-3.dwg |
| Rigid Frame Cross Section | 11 | 14186-04A / RfDwg-4.dwg |
| REW Framing and Sheeting | 12 | 14186-04A / EwDwg-R.dwg |
| BSW Framing and Sheeting | 13 | 14186-04A / SwDwg-B.dwg |
| FSW Framing and Sheeting | 14 | 14186-04A / SwDwg-F.dwg |
| **Building B** | | |
| 3D Model | 15 | 14186-04B / 3DBuild.dwg |
| Anchor Bolt Plan | 16 | 14186-04B / AnDwg-1.dwg |
| Anchor Bolt Details and Reactions | 17 | 14186-04BR1 / AnDwg-2.dwg |
| Roof Framing and Sheeting | 18 | 14186-04B / RoofDwg.dwg |
| LEW Framing and Sheeting | 19 | 14186-04B / EwDwg-L.dwg |
| Rigid Frame Cross Section | 20 | 14186-04B / RfDwg-1.dwg |
| REW Framing and Sheeting | 21 | 14186-04B / EwDwg-R.dwg |
| BSW Framing and Sheeting | 22 | 14186-04B / SwDwg-B.dwg |
| FSW Framing and Sheeting | 23 | 14186-04B / SwDwg-F.dwg |



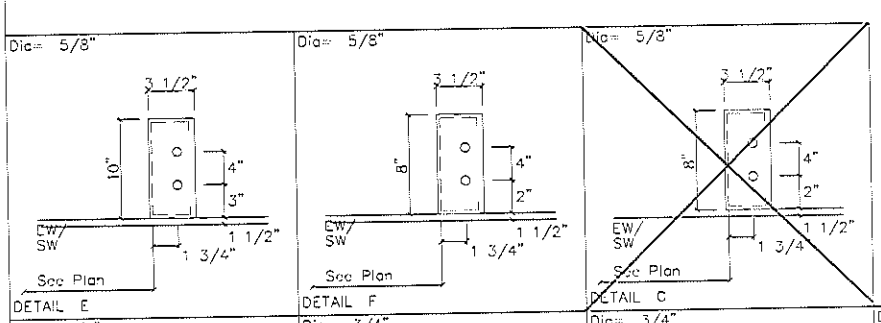


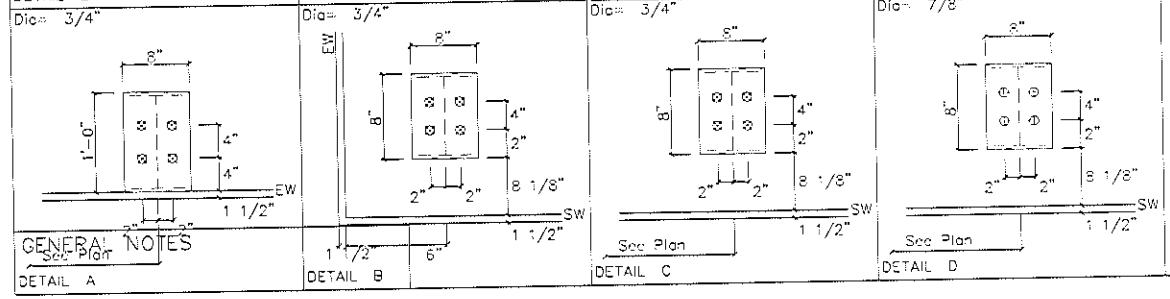

ANCHOR BOLT PLAN

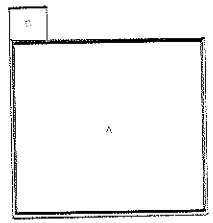
NOTE: All Base Plates @ 100'-0" (U.N.)



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | ANCHOR BOLT PLAN | |
| ID | 14136-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |




GENERAL NOTES

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT ID | 60 14186-04A | ANCHOR BOLT DETAILS | |
| | | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3* | B | 16 | 12.4 | 7.4 | 8 | −16.5 | −16.7 | 4 | 0.875 | 8.000 | 8.000 | 0.500 | 0.0 |
| | | 2 | 11.8 | 15.9 | 7 | −15.9 | −18.4 | | | | | | |
| 3* | E | 9 | 16.3 | −10.7 | 17 | −12.6 | 11.9 | 4 | 0.875 | 8.000 | 8.000 | 0.500 | 0.0 |
| | | 2 | −11.8 | 15.9 | 11 | 13.1 | −18.6 | | | | | | |

3* Frame lines: 3 4

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | B | 13 | 1.2 | −1.4 | 5 | −1.9 | −2.1 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 1 | 0.3 | 2.4 | 3 | −1.7 | −3.3 | | | | | | |
| 5 | E | 6 | 1.9 | −2.1 | 12 | −1.2 | −1.4 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 2 | −0.3 | 2.4 | 4 | 1.7 | −3.3 | | | | | | |
| 5 | C | 3 | 0.0 | −4.6 | 3 | 0.0 | −4.6 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 20 | 0.0 | 5.9 | | | | | | | | | |
| 5 | D | 4 | 0.0 | −4.6 | 4 | 0.0 | −4.6 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 21 | 0.0 | 5.9 | | | | | | | | | |

## NOTES FOR REACTIONS

Building reactions are based on the following building data:

| | | |
|---|---|---|
| Width (ft) | = | 60.0 |
| Length (ft) | = | 65.0 |
| Eave Height (ft) | = | 12.0/ 12.0 |
| Roof Slope (Rise/12 ) | = | 3.0/ 3.0 |
| Dead Load (psf ) | = | 2.0 |
| Collateral Load (psf ) | = | 3.0 |
| Roof Live Load(psf ) | = | 20.0 |
| Frame Live Load(psf ) | = | 12.0 |
| Snow Load (psf ) | = | 23.1 |
| Wind Speed (mph ) | = | 120.0 |
| Wind Code | = | IBC 12 |
| Exposure | = | C |
| Closed/Open | = | C |
| [illegible] Wind | = | Low |
| Importance Seismic | = | 1.25 |
| Seismic Zone | = | A |

Replace this with "Risk Category: II - Normal"

| ID | Description |
|---|---|
| 1 | Dead+Collateral+Snow |
| 2 | Dead+Collateral+Snow+Slide_Snow |
| 3 | 0.6Dead+Wind_Left1 |
| 4 | 0.6Dead+Wind_Right1 |
| 5 | 0.6Dead+Wind_Left2 |
| 6 | 0.6Dead+Wind_Right2 |
| 7 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 8 | 0.6Dead+Wind_Long1+LWIND1_R2E |
| 9 | 0.6Dead−Wind_Long1+LWIND1_L2E |
| 10 | 0.6Dead−Wind_Long1+LWIND1_R2E |
| 11 | 0.6Dead+Wind_Long2+LWIND2_R2E |
| 12 | Dead+Wind_Left1 |
| 13 | Dead+Wind_Right1 |
| 14 | Dead−Wind_Long1+LWIND1_R2E |
| 15 | Dead+Collateral+0.75Snow+0.75Wind_Right2+0.75Slide_Snow |
| 16 | Dead+Collateral+0.75Snow+0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_L2E |
| 17 | Dead+Collateral+0.75Snow−0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_R2E |
| 18 | Dead+Collateral+F1UNB_SL_L |
| 19 | Dead+Collateral+F1UNB_SL_R |
| 20 | Dead+Collateral+F4UNB_SL_L |
| 21 | Dead+Collateral+F4UNB_SL_R |
| 22 | 0.6Dead+Wind_Suction+Wind_Long2 |
| 23 | 0.6Dead+Wind_Pressure+Wind_Long1 |
| 24 | Dead+Collateral+E1UNB_SL_L |
| 25 | 0.6Dead+Wind_Left2+Wind_Suction |
| 26 | Dead+Collateral+E1UNB_SL_R |
| 27 | 0.6Dead+Wind_Right2+Wind_Suction |
| 28 | Dead+Collateral+E2UNB_SL_L |
| 29 | Dead+Collateral+E2UNB_SL_R |

## BUILDING BRACING REACTIONS

| Wall Loc | Col Line | Col Line | ± Reactions (k) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|---|
| L_EW | 1 | Rigid Frame At Endwall | | | | | | |
| F_SW | E | 3,4 | 11.8 | 6.1 | 0.3 | 0.2 | | |
| R_EW | 5 | Rigid Frame At Endwall | | | | | | |
| B_SW | B | Torsional Bracing Used | | | | | | |

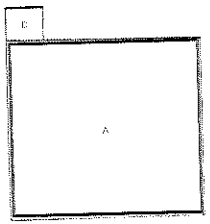
## ENDWALL COLUMN REACTIONS(k)

| | | |
|---|---|---|
| MAXIMUM VERTICAL Dead+Collateral+Snow | = | 4.9 |
| MAXIMUM VERTICAL Dead+Wind | = | −5.7 |
| MAXIMUM HORIZONTAL Dead+Wind | = | 0.0 |

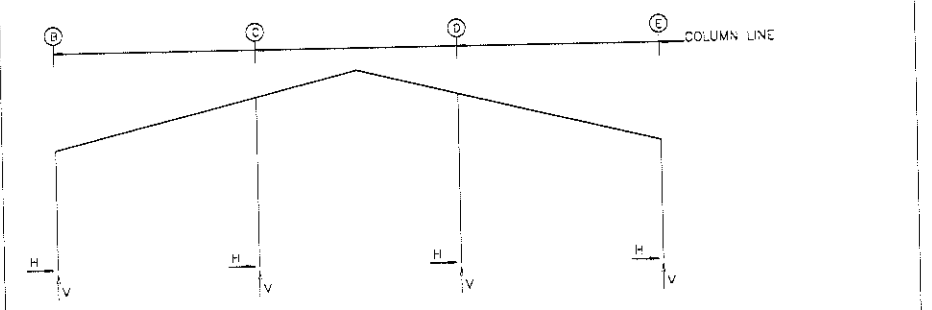
## ANCHOR BOLT SUMMARY

| | Qty | Locate | Dia (in) | Type | Total Len (in) | Bend Len (in) | Proj (in) |
|---|---|---|---|---|---|---|---|
| ○ | 44 | Jamb | 5/8" | A307 | 12.0 | 2.00 | 2.00 |
| ⊠ | 16 | Endwall | 3/4" | A307 | 15.0 | 2.50 | 2.00 |
| ⊠ | 24 | Frame | 3/4" | A307 | 15.0 | 2.50 | 2.00 |
| ⊕ | 16 | Frame | 7/8" | A307 | 18.0 | 3.50 | 2.00 |

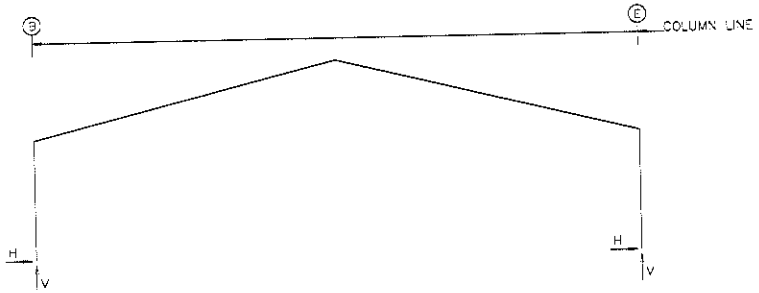
Remove




FRAME LINES: 1 5




FRAME LINES: 2 3 4




## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

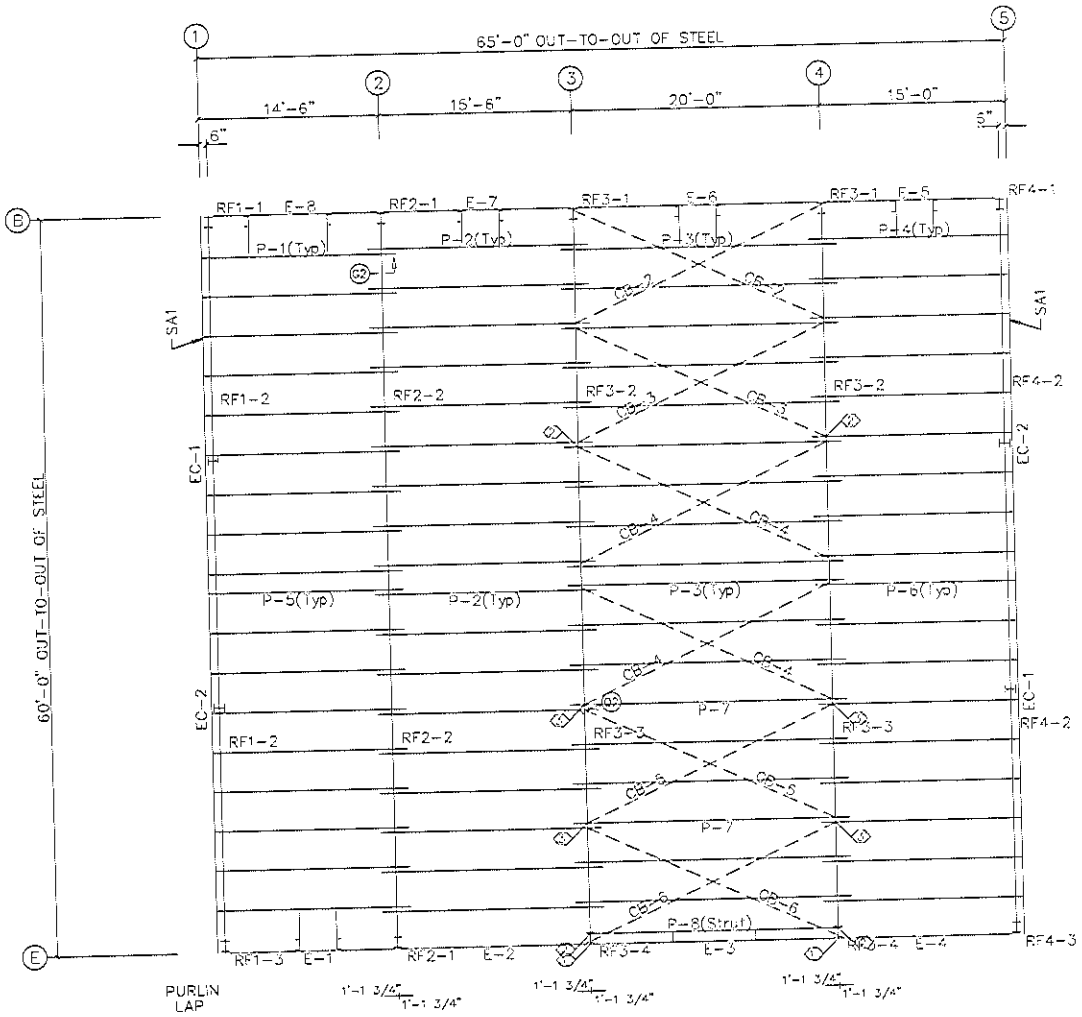
| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | 15 | 0.3 | 2.5 | 10 | −1.0 | −2.5 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 2 | 0.3 | 3.8 | 9 | −0.7 | −2.9 | | | | | | |
| 1 | E | 6 | 1.6 | −1.7 | 14 | −1.0 | −2.2 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 1 | −0.3 | 2.3 | 4 | 1.0 | −2.5 | | | | | | |
| 1 | C | 3 | 0.0 | −4.8 | 3 | 0.0 | −4.8 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 18 | 0.0 | 5.7 | | | | | | | | | |
| 1 | D | 4 | 0.0 | −5.3 | 4 | 0.0 | −5.3 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 19 | 0.0 | 5.8 | | | | | | | | | |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | B | 2 | 9.5 | 14.7 | 3 | −7.9 | −10.1 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | | | | 9 | −5.6 | −12.5 | | | | | | |
| 2 | E | 4 | 7.9 | −10.3 | 2 | −9.5 | 13.2 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 1 | −9.5 | 13.2 | 10 | 5.6 | −12.7 | | | | | | |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | ANCHOR BOLT REACTIONS | |
| ID | 14186-04AR1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 6/25/14 | SHEET OF |

Omit all Jamb Back Braces




ROOF FRAMING PLAN

MEMBER TABLE
ROOF PLAN

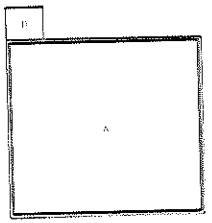
| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 9 | P-1 | 8X25Z16 | 15'-7 1/2" |
| 18 | P-2 | 8X25Z16 | 17'-9 1/2" |
| 16 | P-3 | 8X25Z16 | 22'-3 1/2" |
| 9 | P-4 | 8X25Z16 | 16'-1 1/2" |
| 9 | P-5 | 8X25Z16 | 15'-7 1/2" |
| 9 | P-6 | 8X25Z16 | 16'-1 1/2" |
| 2 | P-7 | 8X25Z12 | 22'-3 1/2" |
| 1 | P-8 | 8X25Z16 | 20'-7 1/2" |
| 1 | E-1 | 8 3/8" 16GA | 14'-5 1/2" |
| 1 | E-2 | 8 3/8" 16GA | 15'-5 1/2" |
| 1 | E-3 | 8 3/8" 16GA | 19'-11 1/2" |
| 1 | E-4 | 8 3/8" 16GA | 14'-11 1/2" |
| 1 | E-5 | 8 3/8" 16GA | 14'-11 1/2" |
| 1 | E-6 | 8 3/8" 16GA | 19'-11 1/2" |
| 1 | E-7 | 8 3/8" 16GA | 15'-5 1/2" |
| 1 | E-8 | 8 3/8" 16GA | 14'-5 1/2" |
| 2 | CB-2 | 3/8" Cable | 22'-3" |
| 2 | CB-3 | 3/8" Cable | 22'-5" |
| 4 | CB-4 | 3/8" Cable | 22'-7" |
| 2 | CB-5 | 1/2" Cable | 22'-5" |
| 2 | CB-6 | 1/2" Cable | 22'-3" |

SPECIAL BOLTS
ROOF PLAN

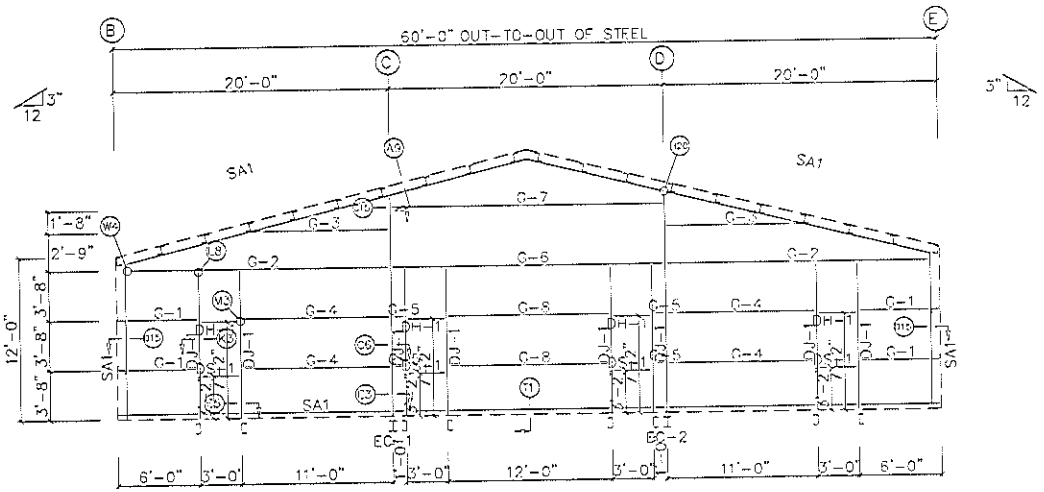
| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 1 | 2 | A325 | 1/2" | 1 1/2" | 2 |
| 2 | 2 | A325 | 1/2" | 1 1/4" | 2 |
| 3 | 4 | A325 | 1/2" | 1 1/4" | 2 |

8 3/8" 12 GA

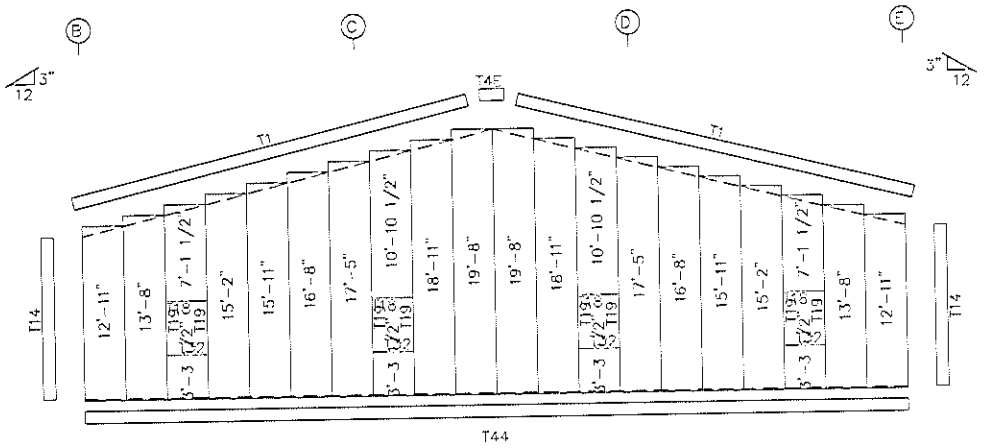
ROOF SHEETING
PANELS: 26 Ga. PBR
Kynar



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | ROOF FRAMING | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |




LEFT ENDWALL FRAMING: FRAME LINE 1




LEFT ENDWALL SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. PBR - Kynar

BOLT TABLE
FRAME LINE 1

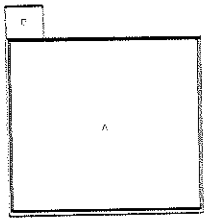
| LOCATION | QUAN | TYPE | DIA | LENGTH |
|---|---|---|---|---|
| Columns/Rafters | 4 | A325 | 5/8" | 1 1/2" |

MEMBER TABLE
FRAME LINE 1

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 1 | EC-1 | W12X5X14 | 15'-5 7/16" |
| 1 | EC-2 | W12X5X14 | 15'-5 7/16" |
| 8 | DJ-1 | 10X25C14 | 11'-6" |
| 4 | DH-1 | 10X25C14 | 3'-0" |
| 4 | DS-1 | 10X25C14 | 3'-0" |
| 4 | G-1 | 10X25Z14 | 4'-4 3/4" |
| 2 | G-2 | 10X25Z12 | 17'-4 1/16" |
| 2 | G-3 | 10X25Z14 | 6'-4 1/16" |
| 4 | G-4 | 10X25Z14 | 10'-6 1/2" |
| 4 | G-5 | 10X25Z14 | 6 1/2" |
| 1 | G-6 | 10X35Z12 | 19'-6 1/2" |
| 1 | G-7 | 10X25Z12 | 19'-9 11/16" |
| 2 | G-8 | 10X25Z14 | 11'-6 1/2" |

TRIM TABLE
FRAME LINE 1

| QTY | MARK | LENGTH |
|---|---|---|
| | T32 | 40.000 |
| | T15 | 40.000 |
| | T19 | 50.000 |
| | T45 | 18.000 |
| | T1 | 195.000 |
| | T14 | 144.000 |
| | T44 | 241.000 |



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT ID | 60 14186-04A | ENDWALL FRAMING | |
| | | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

SPLICE PLATE & BOLT TABLE

| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
|---|---|---|---|---|---|---|---|---|---|
| SP-1 | 4 | 4 | 0 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-6" |

CAP PLATE BOLTS

| Mark | Qty | Type | Dia | Length |
|---|---|---|---|---|
| EC-1 | 4 | A325 | 5/8" | 1 1/2" |
| EC-2 | 4 | A325 | 5/8" | 1 1/2" |

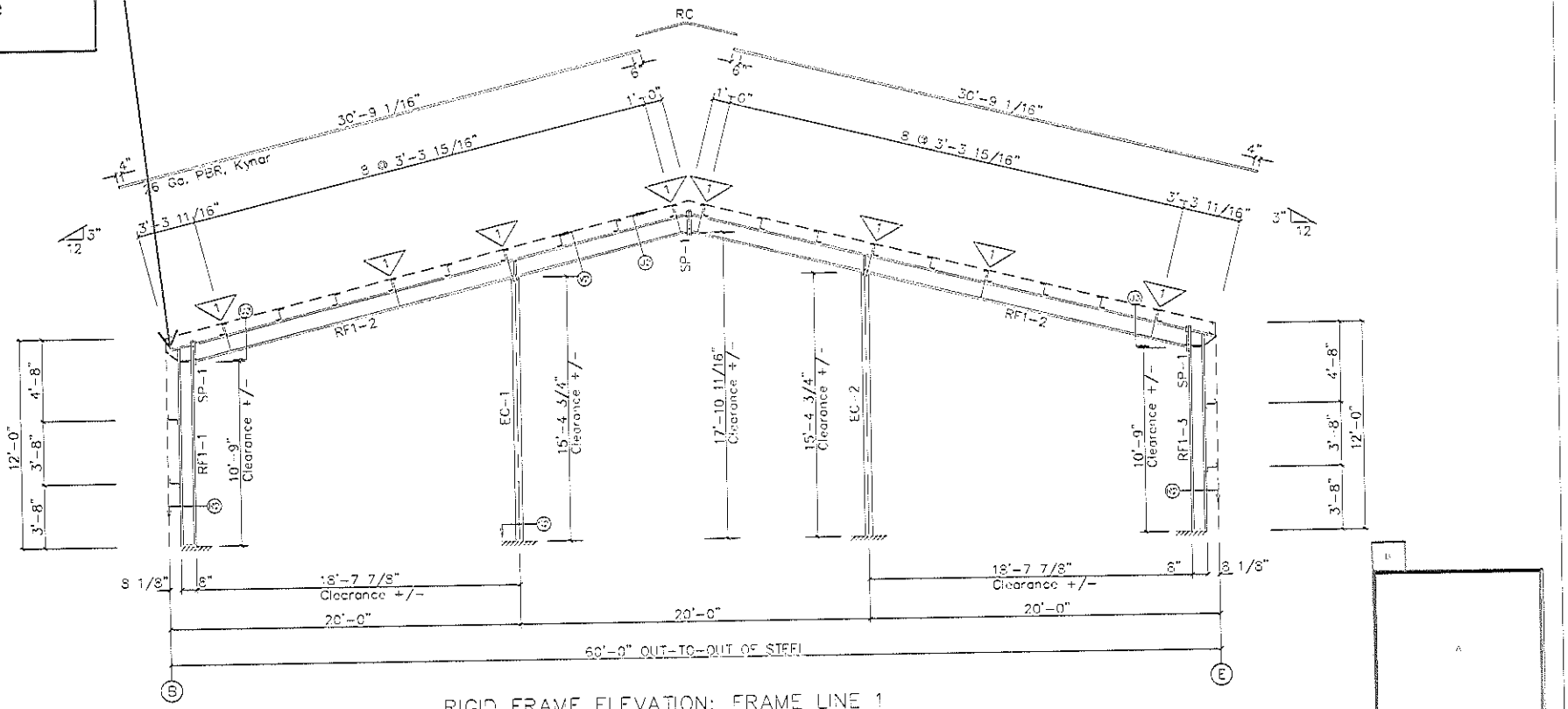
FLANGE BRACE TABLE
FRAME LINE 1

| VID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
|---|---|---|---|---|
| 1 | 1 | FB40 | L2x2x1/8 | 2'-4" |

MEMBER TABLE

| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
|---|---|---|---|---|---|
| RF1-1 | 7.5/ 7.5 | 0.135 | 120.0 | 5 x 1/4" x 137.0 | 5 x 1/4" x 124.9 |
| | 7.5/ 7.5 | 0.135 | 19.0 | 5 x 1/4" x 16.3 | |
| RF1-2 | 10.0/10.0 | 0.135 | 120.0 | 5 x 1/4" x 231.4 | 5 x 1/4" x 234.0 |
| | 10.0/10.0 | 0.135 | 120.0 | 5 x 1/4" x 122.1 | 5 x 1/4" x 119.5 |
| | 10.0/10.0 | 0.135 | 116.1 | | |
| RF1-3 | 7.5/ 7.5 | 0.135 | 19.0 | 5 x 1/4" x 16.3 | 5 x 1/4" x 124.9 |
| | 7.5/ 7.5 | 0.135 | 120.0 | 5 x 1/4" x 137.0 | |
| EC-1 | W12X5X14 | | | | |
| EC-2 | W12X5X14 | | | | |

Remove Flange Extension and Splice In 6" x 3/8" Connection Plate to Receive RF1-101




RIGID FRAME ELEVATION: FRAME LINE 1

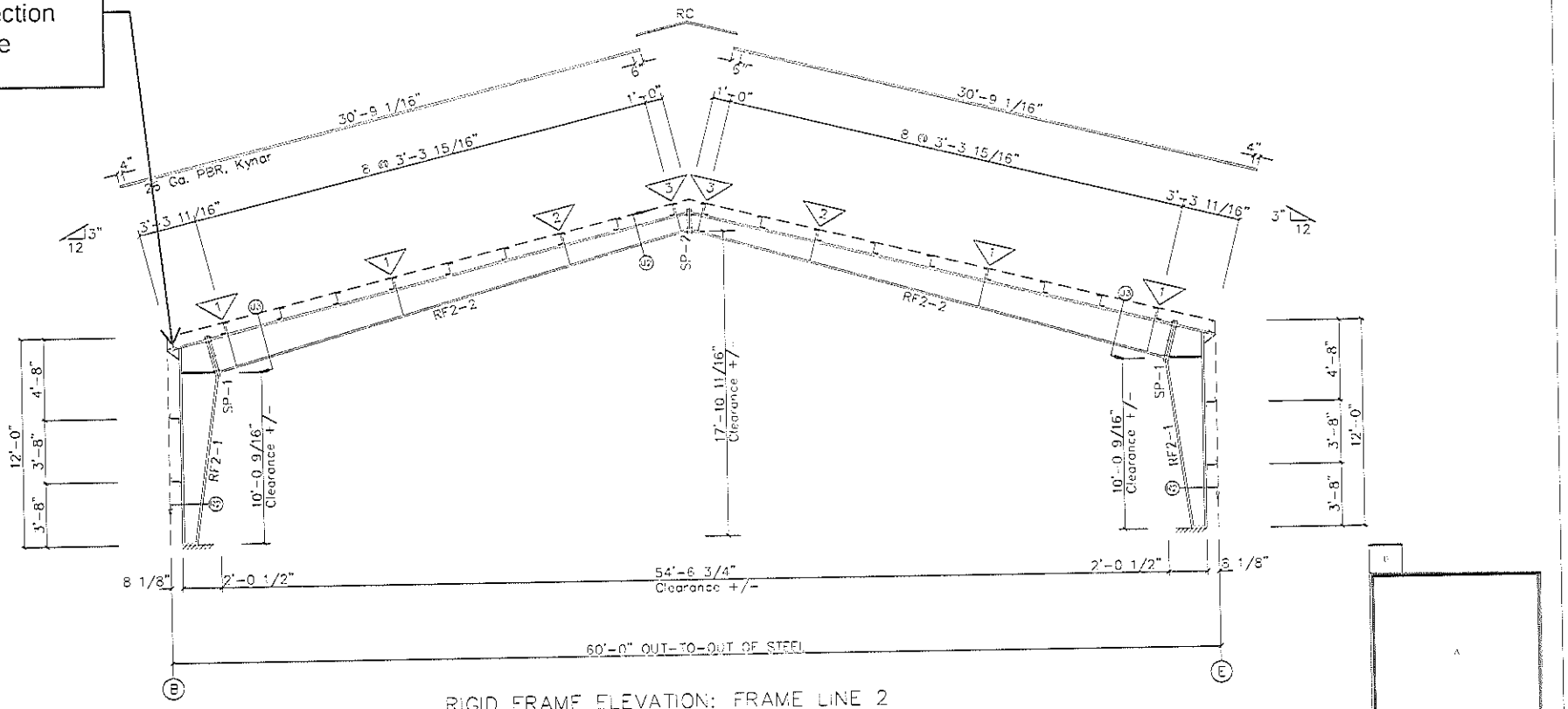
| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | RIGID FRAME CROSS SECTION | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
| SP-1 | 4 | 4 | 2 | A325 | 5/8" | 2" | 6" | 1/2" | 2'-5 1/2" |
| SP-2 | 4 | 4 | 0 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-6" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF2-1 | 7.5/24.0 | 0.188 | 19.5 | 5 x 1/4" x 117.0 | 5 x 1/4" x 117.7 |
| RF2-2 | 24.0/17.8 | 0.188 | 25.0 | 5 x 1/4" x 26.9 | |
| | 22.0/18.4 | 0.188 | 102.8 | 5 x 1/4" x 240.0 | 5 x 1/4" x 240.0 |
| | 18.4/14.1 | 0.135 | 120.0 | 5 x 1/4" x 102.8 | 5 x 1/4" x 100.4 |
| | 14.1/20.0 | 0.135 | 120.0 | | |

| FLANGE BRACE TABLE FRAME LINE 2 | | | | |
|---|---|---|---|---|
| MID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB40-4 | L2x2x1/8 | 2'-4" |
| 2 | 1 | FB35 | L2x2x1/8 | 2'-4" |
| 3 | 1 | FB40 | L2x2x1/8 | 2'-4" |

Remove Flange Extension and Splice In 6" x 3/8" Connection Plate to Receive RF1-101



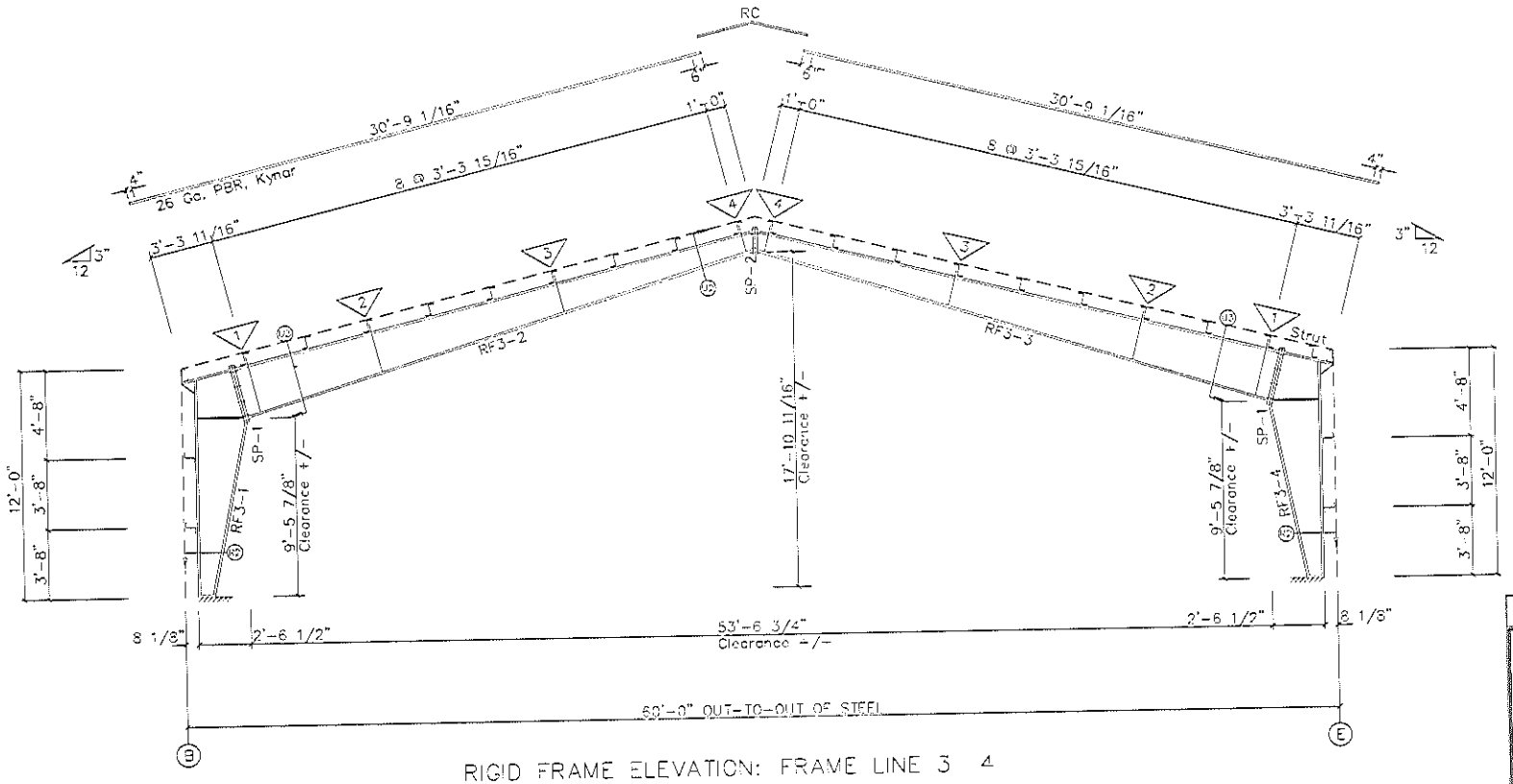

RIGID FRAME ELEVATION: FRAME LINE 2

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | RIGID FRAME CROSS SECTION | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
| SP-1 | 4 | 4 | 4 | A325 | 3/4" | 2 1/4" | 6" | 5/8" | 3'-1 1/2" |
| SP-2 | 4 | 4 | 0 | A325 | 5/8" | 1 3/4" | 5" | 3/8" | 1'-6" |

| FLANGE BRACE TABLE<br>FRAME LINE 3 4 | | | | |
|---|---|---|---|---|
| ▽ID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 2 | FB46 | L2x2x1/8 | 2'-4" |
| 2 | 1 | FB46-4 | L2x2x1/8 | 2'-4" |
| 3 | 1 | FB40-4 | L2x2x1/8 | 2'-4" |
| 4 | 1 | FB48 | L2x2x1/8 | 2'-4" |

| MEMBER TABLE | | | | | |
|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF3-1 | 7.5/30.0 | 0.250 | 109.6 | 5 x 1/4" x 136.9 | 5 x 1/4" x 111.9 |
| | 30.0/21.6 | 0.250 | 32.8 | 5 x 1/4" x 31.0 | |
| RF3-2 | 30.0/24.1 | 0.188 | 98.3 | 5 x 1/4" x 240.0 | 5 x 1/4" x 240.0 |
| | 24.1/17.0 | 0.135 | 120.0 | 5 x 1/4" x 98.3 | 5 x 1/2" x 96.4 |
| | 17.0/10.0 | 0.135 | 120.0 | | |
| RF3-3 | 10.0/17.0 | 0.135 | 120.0 | 5 x 1/4" x 98.3 | 5 x 1/4" x 96.4 |
| | 17.0/24.1 | 0.135 | 120.0 | 5 x 1/4" x 240.0 | 5 x 1/4" x 240.0 |
| | 24.1/30.0 | 0.188 | 98.3 | | |
| RF3-4 | 21.6/30.0 | 0.250 | 32.8 | 5 x 1/4" x 31.0 | 5 x 1/4" x 111.9 |
| | 30.0/ 7.5 | 0.250 | 109.6 | 5 x 1/4" x 136.9 | |




RIGID FRAME ELEVATION: FRAME LINE 3 4

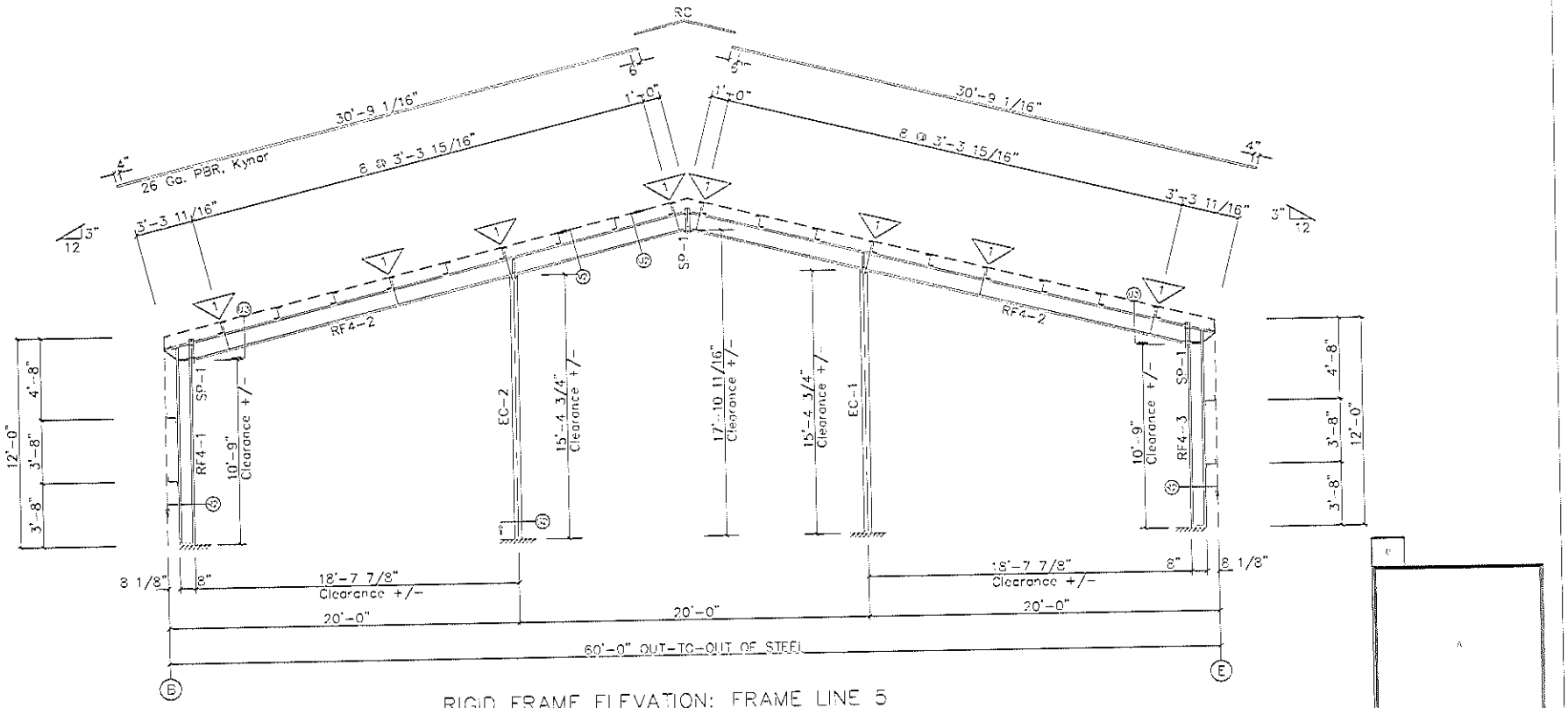
| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | RIGID FRAME CROSS SECTION | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

| SPLICE PLATE & BOLT TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
| SP-1 | 4 | 4 | 0 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 1'-6" |

| CAP PLATE BOLTS | | | | |
|---|---|---|---|---|
| Mark | Qty | Type | Dia | Length |
| EC-2 | 4 | A325 | 5/8" | 1 1/2" |
| EC-1 | 4 | A325 | 5/8" | 1 1/2" |

| FLANGE BRACE TABLE FRAME LINE 5 | | | | |
|---|---|---|---|---|
| ▽ID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
| 1 | 1 | FB40 | L2x2x1/8 | 2'-4" |

| MEMBER TABLE | | | | | | |
|---|---|---|---|---|---|---|
| Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
| RF4-1 | 7.5/ 7.5 | 0.135 | 120.0 | 5 x 1/4" x 137.0 | 5 x 1/4" x 124.9 |
| | 7.5/ 7.5 | 0.135 | 19.0 | 5 x 1/4" x 16.3 | |
| RF4-2 | 10.0/10.0 | 0.135 | 120.0 | 5 x 1/4" x 231.4 | 5 x 1/4" x 234.0 |
| | 10.0/10.0 | 0.135 | 120.0 | 5 x 1/4" x 122.1 | 5 x 1/4" x 119.5 |
| | 10.0/10.0 | 0.135 | 116.1 | | |
| RF4-3 | 7.5/ 7.5 | 0.135 | 19.0 | 5 x 1/4" x 16.3 | 5 x 1/4" x 124.9 |
| | 7.5/ 7.5 | 0.135 | 120.0 | 5 x 1/4" x 137.0 | |
| EC-2 | W12X5X14 | | | | |
| EC-1 | W12X5X14 | | | | |



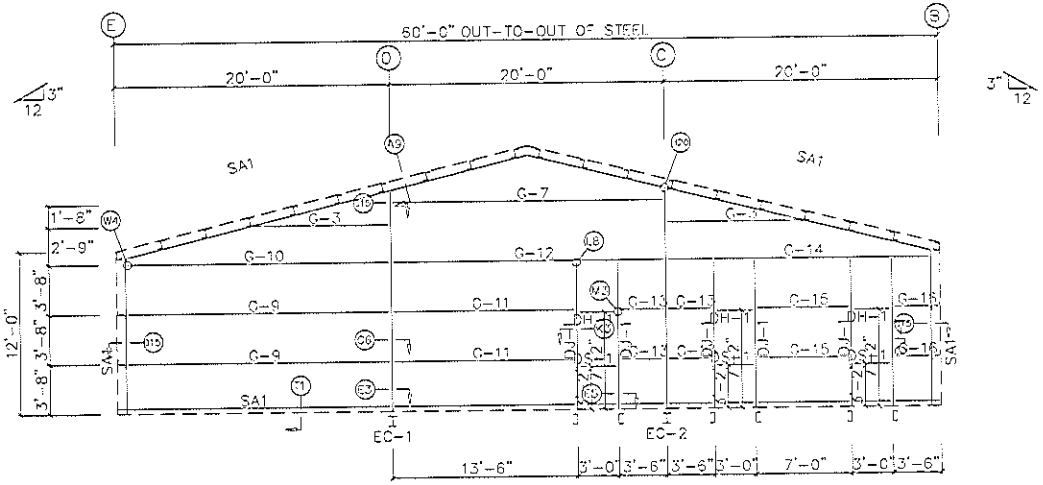

RIGID FRAME ELEVATION: FRAME LINE 5

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | RIGID FRAME CROSS SECTION | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

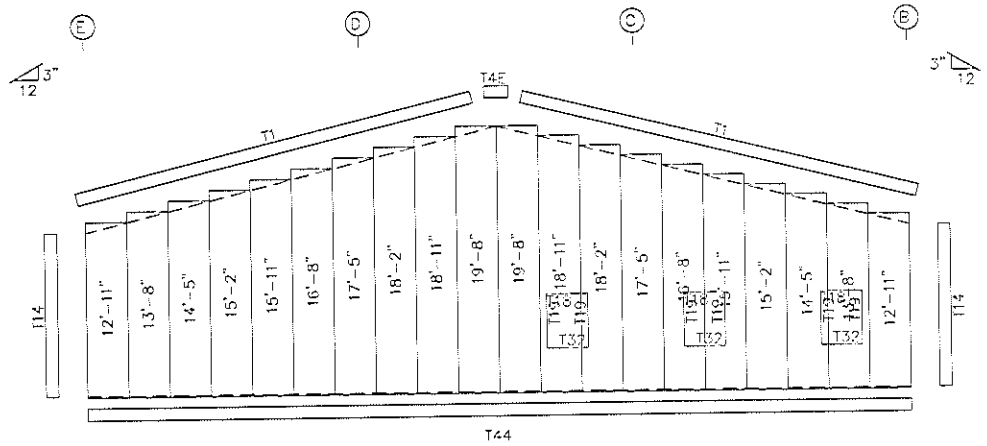
| BOLT TABLE FRAME LINE 5 | | | | |
|---|---|---|---|---|
| LOCATION | QUAN | TYPE | DIA | LENGTH |
| Columns/Rgt | 4 | A325 | 5/8" | 1 1/2" |

| MEMBER TABLE FRAME LINE 5 | | | |
|---|---|---|---|
| QUAN | MARK | PART | LENGTH |
| 1 | EC-1 | W12X5X14 | 15'-5 7/16" |
| 1 | EC-2 | W12X5X14 | 15'-5 7/16" |
| 6 | DJ-1 | 10X25C14 | 11'-0" |
| 3 | DH-1 | 10X25C14 | 3'-0" |
| 3 | DS-1 | 10X25C14 | 3'-0" |
| 2 | G-3 | 10X25Z14 | 6'-4 1/16" |
| 1 | G-7 | 10X25Z12 | 19'-9 11/16" |
| 2 | G-9 | 10X25Z14 | 13'-4 3/4" |
| 1 | G-10 | 10X25Z14 | 17'-4 1/16" |
| 2 | G-11 | 10X25Z14 | 13'-0 1/2" |
| 1 | G-12 | 10X35Z12 | 19'-6 1/2" |
| 4 | G-13 | 10X25Z14 | 3'-0 1/2" |
| 1 | G-14 | 10X25Z12 | 17'-4 1/16" |
| 2 | G-15 | 10X25Z14 | 6'-6 1/2" |
| 2 | G-16 | 10X25Z14 | 1'-10 3/4" |

| TRIM TABLE FRAME LINE 5 | | |
|---|---|---|
| QTY | MARK | LENGTH |
| | T32 | 40.000 |
| | T18 | 40.000 |
| | T19 | 50.000 |
| | T4E | 15.000 |
| | T1 | 195.000 |
| | T14 | 144.000 |
| | T44 | 241.000 |

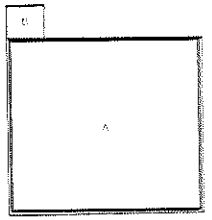



RIGHT ENDWALL FRAMING: FRAME LINE 5

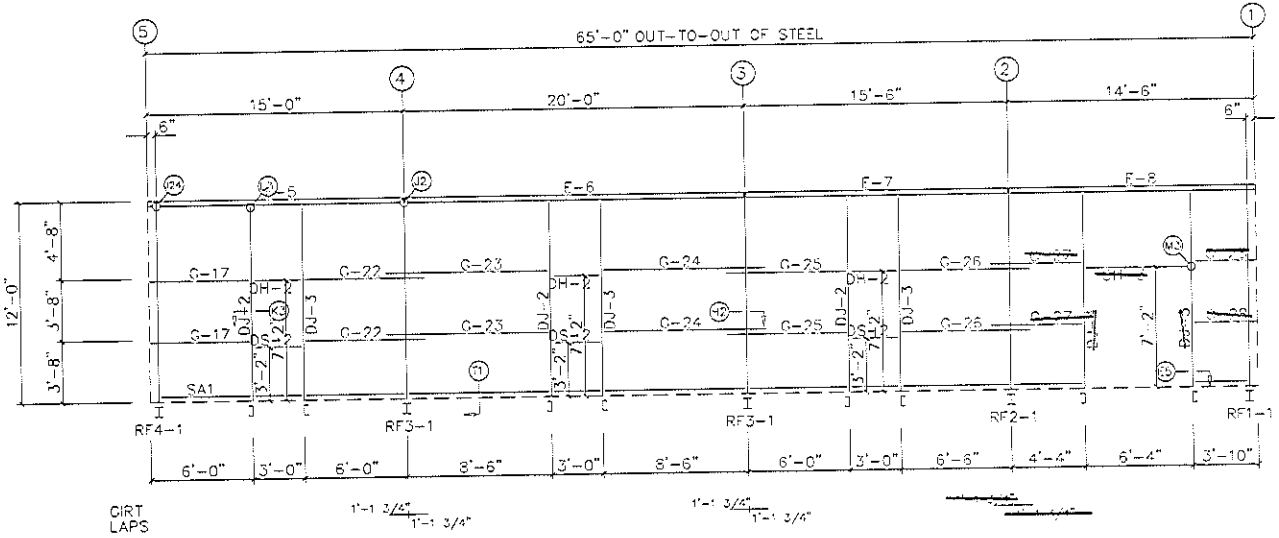



RIGHT ENDWALL SHEETING & TRIM: FRAME LINE 5

PANELS: 26 Ga. PBR – Kynar



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | ENDWALL FRAMING | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |




BACK SIDEWALL FRAMING: FRAME LINE B

8 3/8" 12 GA

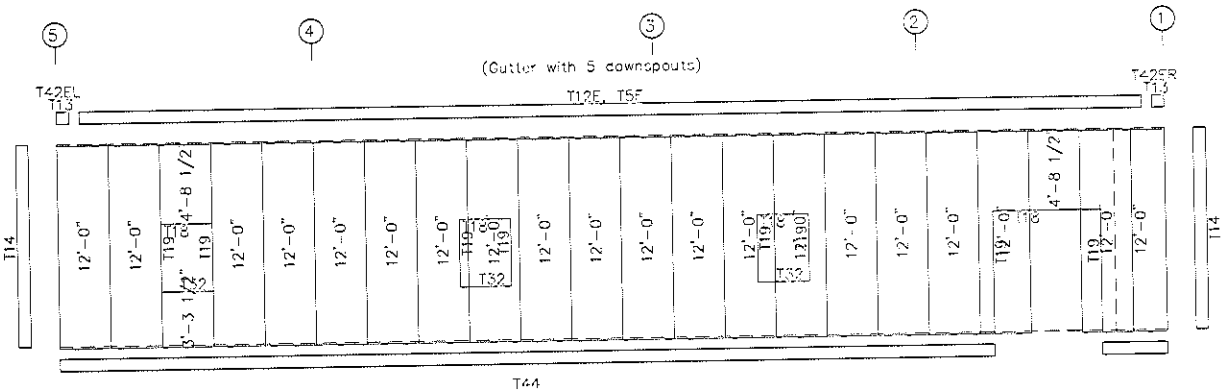
MEMBER TABLE
FRAME LINE B

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 3 | DJ-2 | 8X25C16 | 11'-5 5/8" |
| 3 | DJ-3 | 8X25C16 | 11'-5 5/8" |
| 3 | DH-2 | 8X25C16 | 3'-0" |
| 3 | DS-2 | 8X25C16 | 3'-0" |
| 1 | E-5 | 8 3/8" 16GA | 14'-11 1/2" |
| 1 | E-6 | 8 3/8" 16GA | 18'-11 1/2" |
| 1 | E-7 | 8 3/8" 16GA | 15'-5 1/2" |
| 1 | E-8 | 8 3/8" 16GA | 14'-5 1/2" |
| 2 | G-17 | 8X25Z16 | 5'-9" |
| 2 | G-22 | 8X25Z16 | 6'-11" |
| 2 | G-23 | 8X25Z16 | 8'-5" |
| 2 | G-24 | 8X25Z16 | 9'-5" |
| 2 | G-25 | 8X25Z16 | 6'-11" |
| 2 | G-26 | 8X25Z16 | 7'-5" |

This material omitted in CO #1

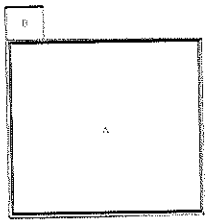
TRIM TABLE
FRAME LINE B

| QD | MARK | LENGTH |
|---|---|---|
| | T18 | 80.000 |
| | T19 | 88.000 |
| | T32 | 40.000 |
| | T19 | 40.000 |
| | T19 | 50.000 |
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T13 | 6.000 |
| | T5E | 200.000 |
| | T12E | 196.000 |
| | T14 | 144.000 |
| | T44 | 46.000 |
| | T44 | 220.000 |

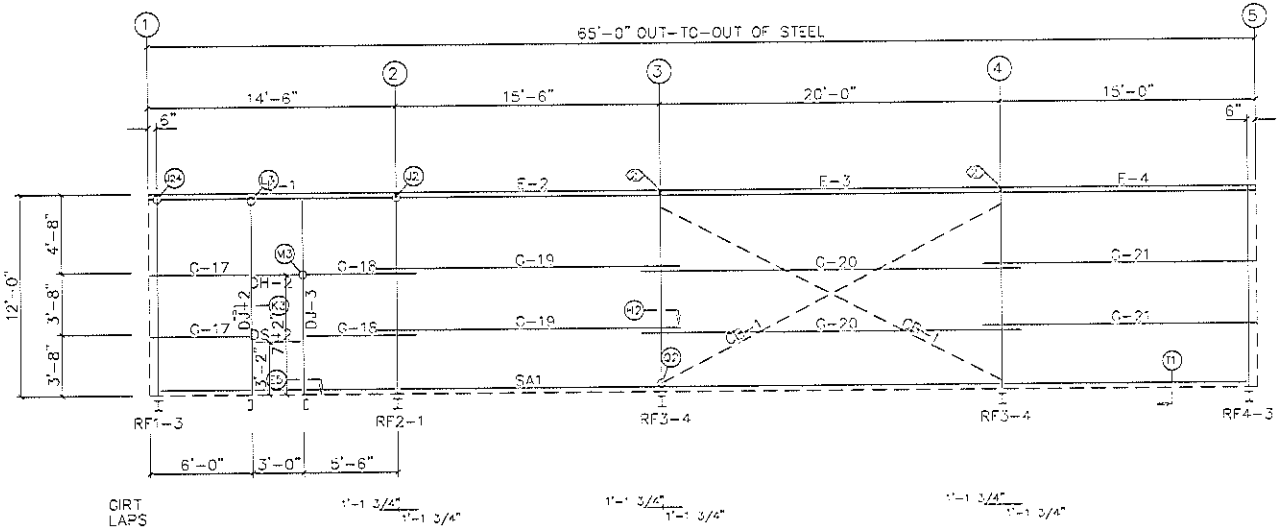



BACK SIDEWALL SHEETING & TRIM: FRAME LINE B

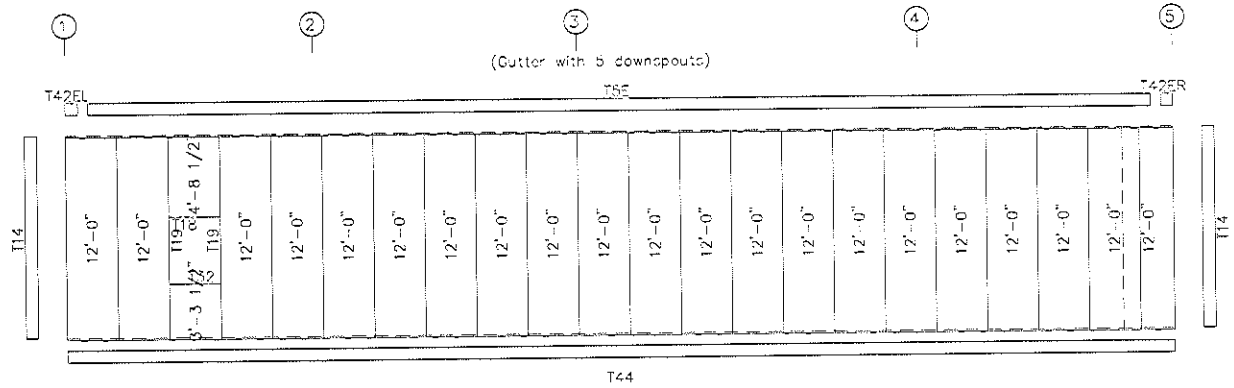
PANELS: 26 Ga. PBR - Kynar



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | SIDEWALL FRAMING | |
| ID | 14186-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |




FRONT SIDEWALL FRAMING: FRAME LINE E




FRONT SIDEWALL SHEETING & TRIM: FRAME LINE E

PANELS: 26 Ga. PBR – Kynar

MEMBER TABLE
FRAME LINE E

| QUAN | MARK | PART | LENGTH |
|---|---|---|---|
| 1 | DJ-2 | 8X25C16 | 11'-5 5/8" |
| 1 | DJ-3 | 8X25C16 | 11'-5 5/8" |
| 1 | DH-2 | 8X25C16 | 3'-0" |
| 1 | DS-2 | 8X25C16 | 3'-0" |
| 1 | E-1 | 6 3/8" 16GA | 14'-5 1/2" |
| 1 | E-2 | 6 3/8" 16GA | 15'-5 1/2" |
| 1 | E-3 | 6 3/8" 16GA | 19'-11 1/2" |
| 1 | E-4 | 6 3/8" 16GA | 14'-11 1/2" |
| 2 | G-17 | 8X25Z16 | 5'-9" |
| 2 | G-18 | 8X25Z16 | 6'-5" |
| 2 | G-19 | 8X25Z16 | 17'-9 1/2" |
| 2 | G-20 | 8X25Z16 | 22'-3 1/2" |
| 2 | G-21 | 8X25Z16 | 16'-1 1/2" |
| 2 | CB-1 | 1/2" Cable | 23'-1" |

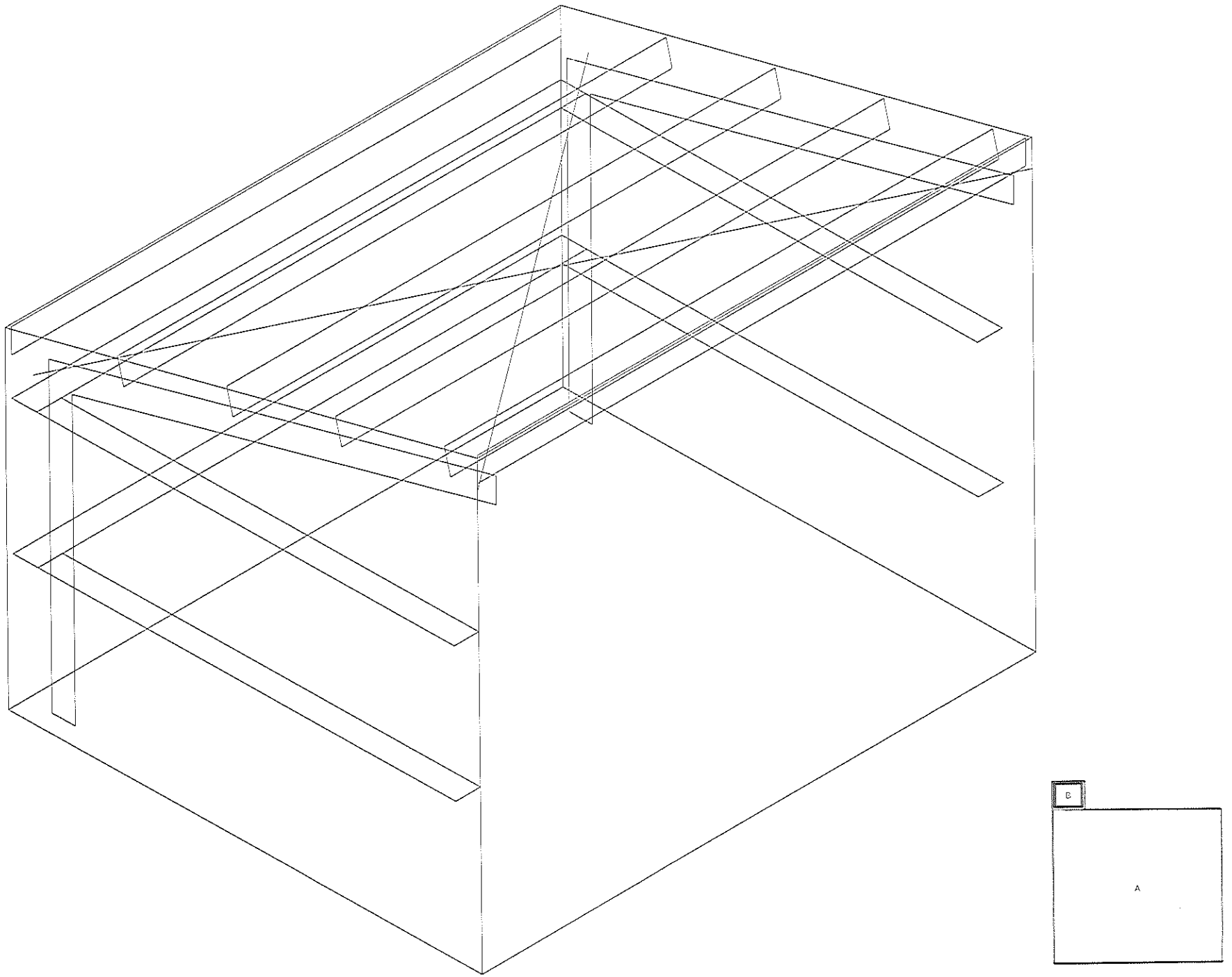
SPECIAL BOLTS

| ID | QUAN | TYPE | DIA | LENGTH | WASH |
|---|---|---|---|---|---|
| 2 | 2 | A325 | 1/2" | 1 1/2" | 2 |

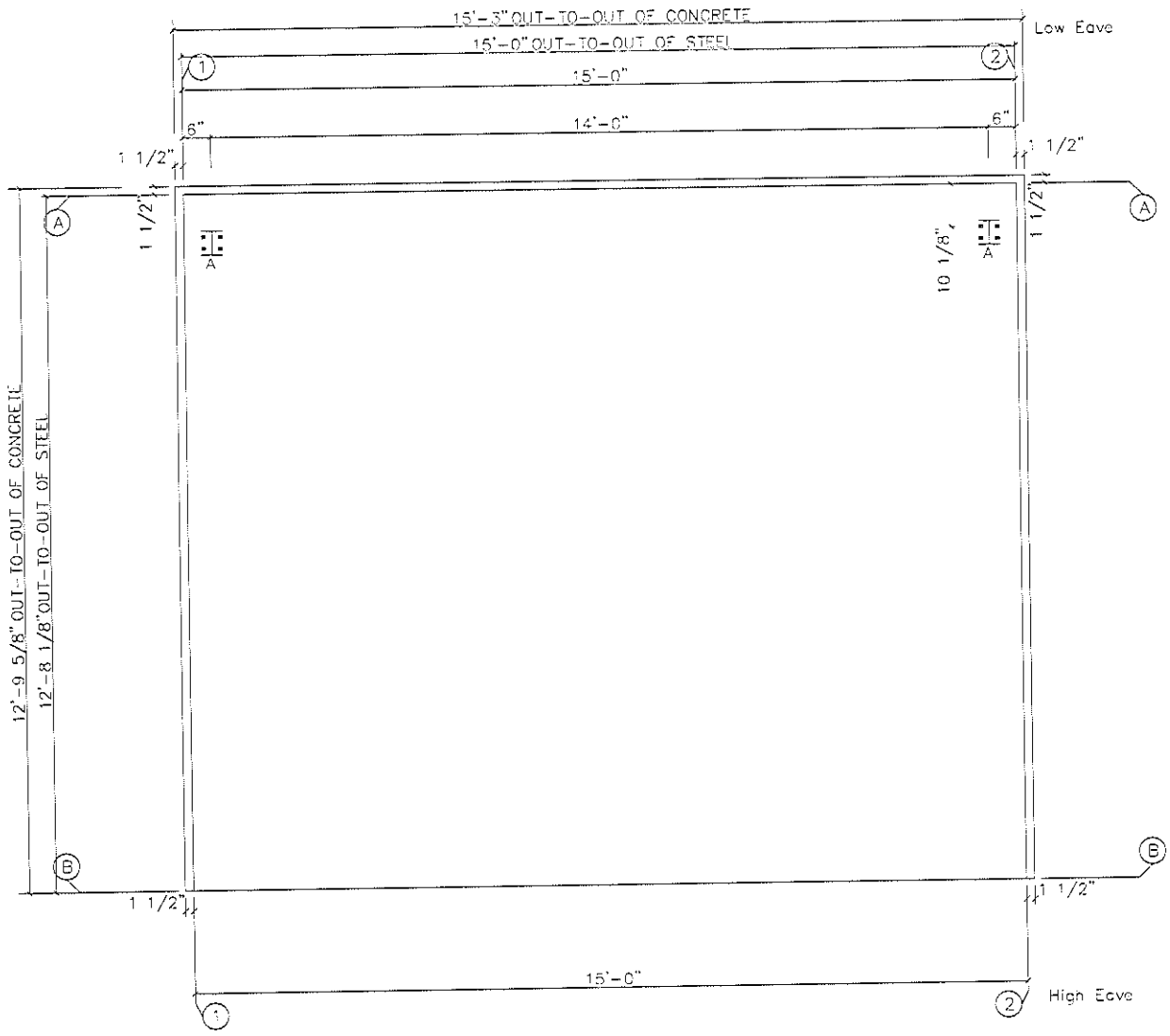
TRIM TABLE
FRAME LINE E

| ID | MARK | LENGTH |
|---|---|---|
| | T32 | 40.000 |
| | T15 | 40.000 |
| | T19 | 50.000 |
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T5E | 200.000 |
| | T14 | 144.000 |
| | T44 | 196.000 |

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 60 | SIDEWALL FRAMING | |
| ID | 14166-04A | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

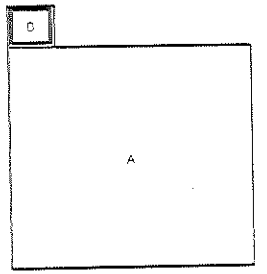

B
A

⊗ Dia= 3/4"




ANCHOR BOLT PLAN

NOTE: All Base Plates @ 100'-0" (U.N.)




| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | ANCHOR BOLT PLAN | |
| ID | 14196-048 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

Remove

## ANCHOR BOLT SUMMARY

| Qty | Locate | Dia (in) | Type | Total Len (in) | Bend Len (in) | Proj (in) |
|---|---|---|---|---|---|---|
| @ 8 | Frame | 3/4" | A307 | 15.0 | 2.50 | 2.00 |

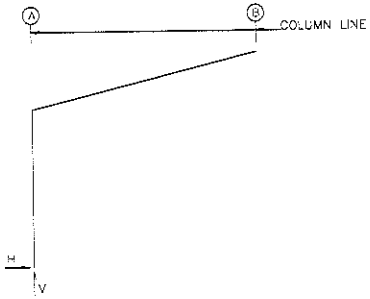
## GENERAL NOTES

## BUILDING BRACING REACTIONS

| Wall Loc | Wall Line | Col Line | ± Reactions: (k) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|---|
| L_EW | 1 | | Rigid Frame At Endwall | | | | | |
| F_SW | B | | (a) | | | | | |
| R_EW | 2 | | Rigid Frame At Sidewall | | | | | |
| B_SW | A | | Torsional Bracing Used | | | | | |

(a)Bracing loads are applied to adjacent building

FRAME LINES: 1 2




## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 6 | 0.7 | -1.2 | 4 | -0.9 | -1.0 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 2 | 0.0 | 1.6 | 5 | 0.6 | -2.0 | | | | | | |

1* Frame lines: 1 2

## RIGID FRAME: BASIC COLUMN REACTIONS (k)

| Frame Line | Column Line | Dead Horiz | Dead Vert | Collateral Horiz | Collateral Vert | Live Horiz | Live Vert | Snow Horiz | Snow Vert | Wind_Left1 Horiz | Wind_Left1 Vert | Wind_Right1 Horiz | Wind_Right1 Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | 0.0 | 0.3 | 0.0 | 0.2 | 0.6 | 1.0 | 0.0 | 1.2 | -0.5 | -1.9 | 0.7 | -1.5 |

| Frame Line | Column Line | Wind_Left2 Horiz | Wind_Left2 Vert | Wind_Right2 Horiz | Wind_Right2 Vert | Wind_Long1 Horiz | Wind_Long1 Vert | Wind_Long2 Horiz | Wind_Long2 Vert | LWIND1_L2E Horiz | LWIND1_L2E Vert | LWIND1_R2E Horiz | LWIND1_R2E Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | A | -0.9 | -1.2 | 0.3 | -0.8 | 0.6 | -1.5 | 0.2 | -1.0 | 0.0 | -0.4 | 0.0 | -0.1 |

| Frame Line | Column Line | LWIND2_L2E Horiz | LWIND2_L2E Vert | LWIND2_R2E Horiz | LWIND2_R2E Vert |
|---|---|---|---|---|---|
| 1* | A | 0.0 | -0.4 | 0.0 | -0.1 |

1* Frame lines: 1 2

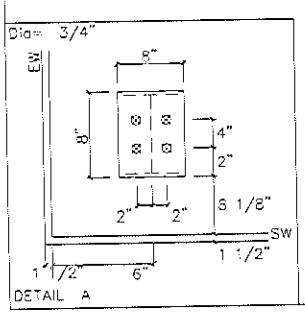
## NOTES FOR REACTIONS

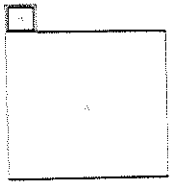
Building reactions are based on the following building data:

| | | |
|---|---|---|
| Width (ft) | = | 12.7 |
| Length (ft) | = | 15.0 |
| Eave Height: (ft) | = | 9.0/ 12.2 |
| Roof Slope (rise/12) | = | 3.0 |
| Dead Load (psf) | = | 2.0 |
| Collateral Load (psf) | = | 3.0 |
| Live Load (psf) | = | 20.0 |
| Snow Load (psf) | = | 23.1 |
| Wind Speed (mph) | = | 120.0 |
| Wind Code | = | IBC 12 |
| Exposure | = | C |
| Closed/Open | = | C |
| [illegible] | = | [illegible] |
| Importance Seismic | = | 1.25 |
| Seismic Zone | = | A |

Replace this with "Risk Category = II - Normal"

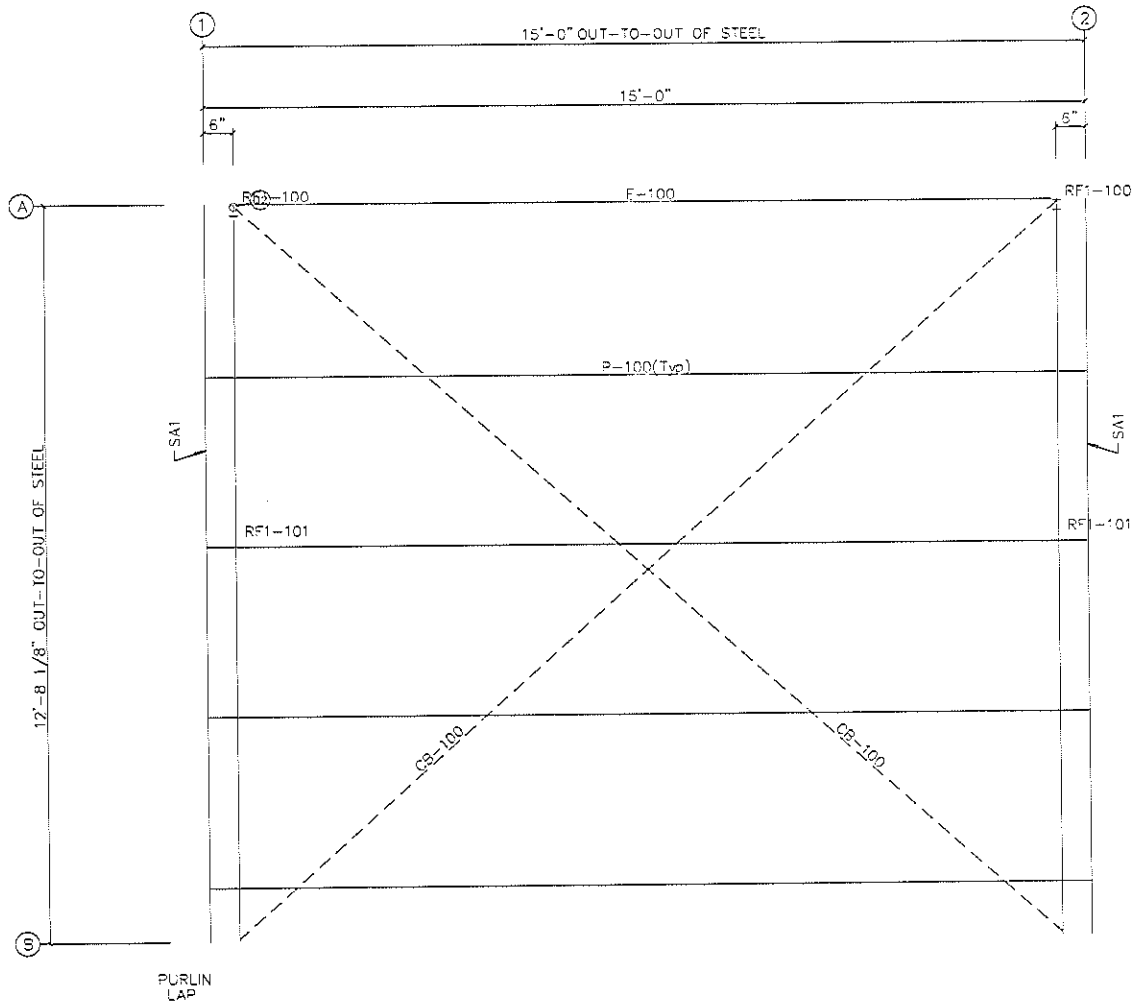
| ID | Description |
|---|---|
| 1 | Dead+Collateral+Snow |
| 2 | Dead+Collateral+Snow+Slide_Snow |
| 3 | 0.6Dead+Wind_Left1 |
| 4 | 0.6Dead+Wind_Left2 |
| 5 | 0.6Dead+Wind_Long1+LWIND1_L2E |
| 6 | Dead+Wind_Right1 |
| 7 | Dead+Wind_Left2 |




| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | ANCHOR BOLT DETAILS & REACTIONS | |
| ID | 14186-04BR1 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 6/25/14 | SHEET OF |

| MEMBER TABLE ROOF PLAN | | | |
|---|---|---|---|
| QUAN | MARK | PART | LENGTH |
| 4 | P-100 | 8X25Z12 | 14'-11 1/2" |
| 1 | E-100 | 6 3/8" 16GA | 14'-11 1/2" |
| 2 | CB-100 | 3/8" Cable | 18'-1" |

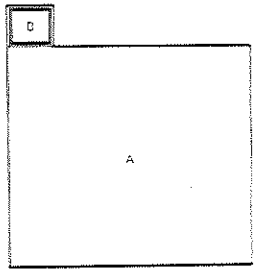



ROOF FRAMING PLAN




ROOF SHEETING

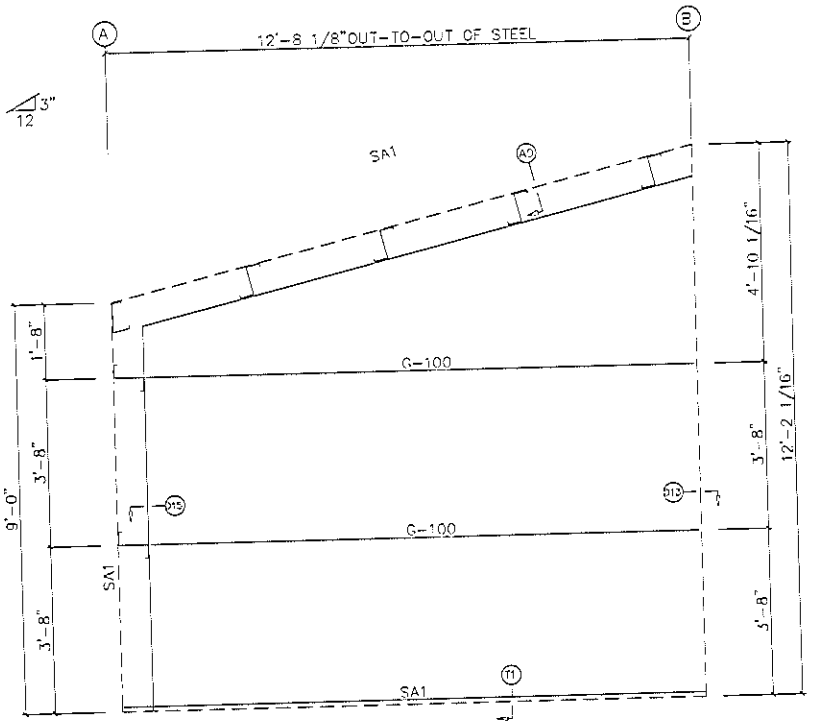
PANELS: 26 Ga. PBR Kynar



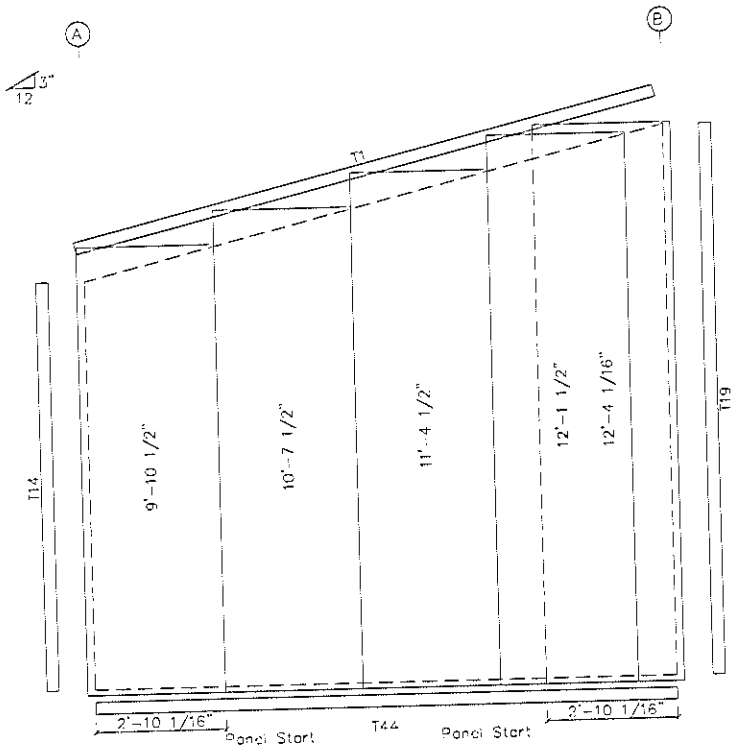

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT ID | 12 14186-04B | ROOF FRAMING | |
| | | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

| MEMBER TABLE FRAME LINE 1 | | | |
|---|---|---|---|
| QUAN | MARK | PART | LENGTH |
| 2 | G-100 | 8X25/16 | 11'-5 3/8" |

| TRIM TABLE FRAME LINE 1 | | |
|---|---|---|
| ØD | MARK | LENGTH |
| | T1 | 173.000 |
| | T19 | 147.000 |
| | T14 | 108.000 |
| | T44 | 153.000 |

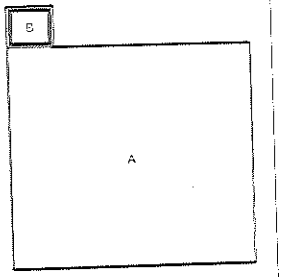



LEFT ENDWALL FRAMING: FRAME LINE 1




LEFT ENDWALL SHEETING & TRIM: FRAME LINE 1

PANELS: 26 Ga. PBR – Kynar




| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | ENDWALL FRAMING | |
| ID | 14186-04B | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

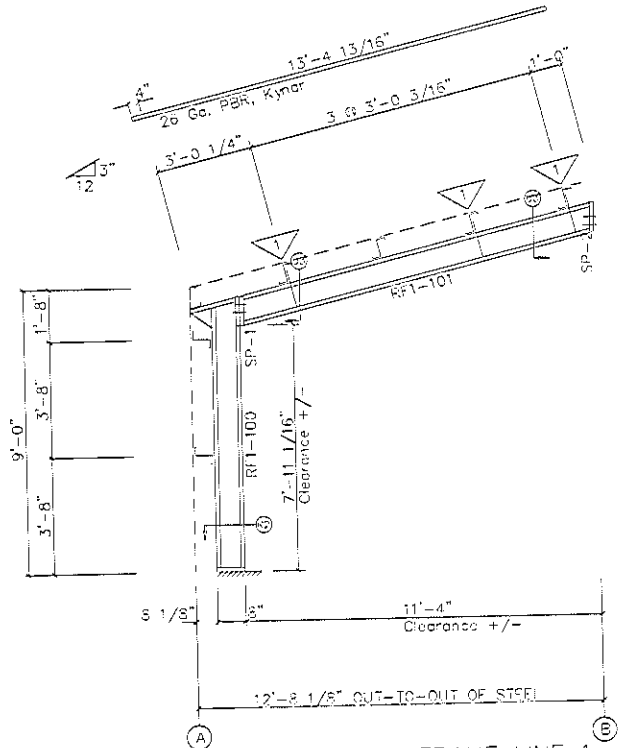
SPLICE PLATE & BOLT TABLE

| Mark | Qty Top | Bot | Int | Type | Dia | Length | Width | Thick | Length |
|---|---|---|---|---|---|---|---|---|---|
| SP-1 | 4 | 0 | 0 | A325 | 5/8" | 1 3/4" | 6" | 3/8" | 9" |
| SP-2 | 4 | 0 | 0 | A325 | 5/8" | 1 1/2" | 6" | 3/8" | 9" |

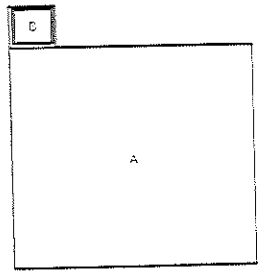
FLANGE BRACE TABLE
FRAME LINE 1 2

| ▽ID | # SIDES | MARK | PART | CL FRM TO FB BOLT |
|---|---|---|---|---|
| 1 | 1 | FB17.5 | L2x2x1/8 | 1'-4" |

| MEMBER TABLE Mark | Web Depth Start/End | Web Plate Thick | Web Plate Length | Outside Flange W x Thk x Length | Inside Flange W x Thk x Length |
|---|---|---|---|---|---|
| RF1-100 | 7.5/ 7.5 | 0.135 | 103.0 | 5 x 1/4" x 101.0<br>5 x 1/4" x 16.3 | 5 x 1/4" x 94.4 |
| RF1-101 | 8.0/ 8.0<br>8.0/ 8.0 | 0.135<br>0.135 | 120.0<br>21.3 | 5 x 1/4" x 139.2 | 5 x 1/4" x 139.2 |



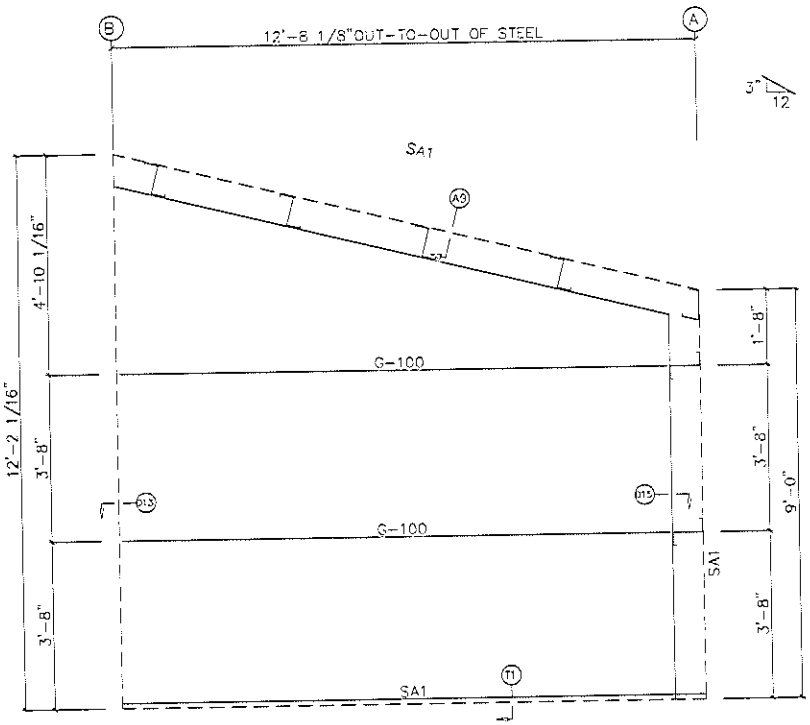

RIGID FRAME ELEVATION: FRAME LINE 1 2



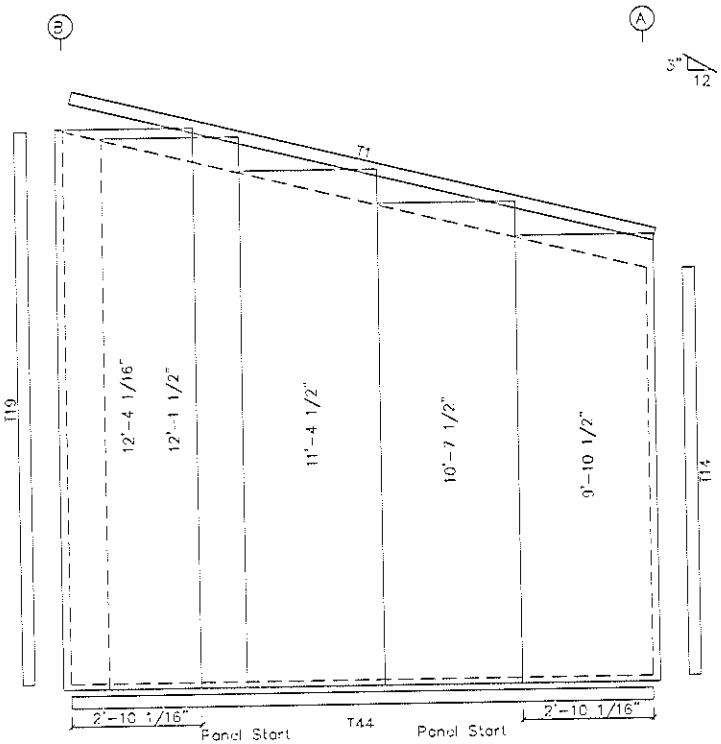

| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | RIGID FRAME CROSS SECTION | |
| ID | 14186-04B | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

| MEMBER TABLE FRAME LINE 2 | | | |
|---|---|---|---|
| QUAN | MARK | PART | LENGTH |
| 2 | G-100 | 9X25/16 | 11'-5 5/8" |

| TRIM TABLE FRAME LINE 2 | | |
|---|---|---|
| QID | MARK | LENGTH |
| | T1 | 173.000 |
| | T14 | 106.000 |
| | T19 | 147.000 |
| | T44 | 153.000 |

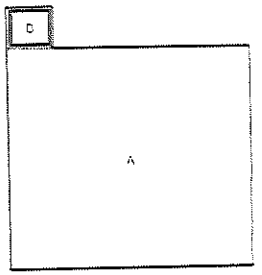



RIGHT ENDWALL FRAMING: FRAME LINE 2




RIGHT ENDWALL SHEETING & TRIM: FRAME LINE 2

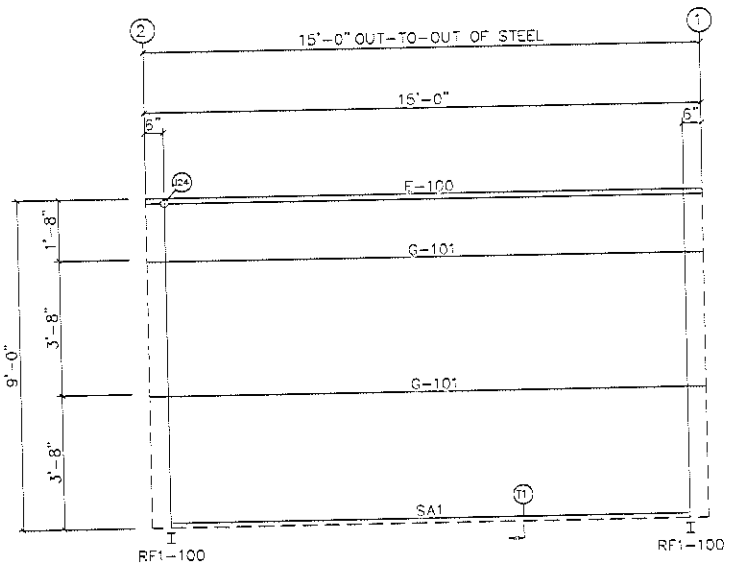
PANELS: 26 Ga. PBR - Kynar



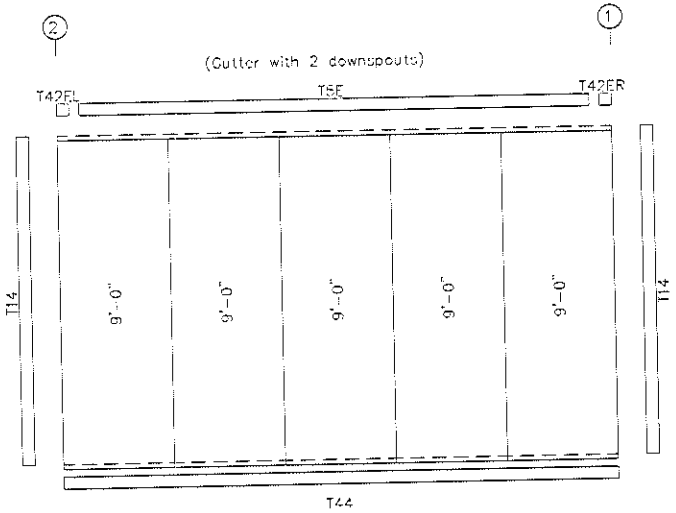

| RED DOT CORPORATION | | | | |
|---|---|---|---|---|
| PROJECT | 12 | ENDWALL FRAMING | | |
| ID | 14136-04B | DESIGN: | DRAFT: | CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET | OF |

| MEMBER TABLE FRAME LINE A | | | |
|---|---|---|---|
| QUAN | MARK | PART | LENGTH |
| 1 | E-100 | 8 3/8" 16GA | 14'-11 1/2" |
| 2 | G-101 | 8X2.5X16 | 14'-11 1/2" |

| TRIM TABLE FRAME LINE A | | |
|---|---|---|
| QTY | MARK | LENGTH |
| | T42ER | 6.000 |
| | T42EL | 6.000 |
| | T5E | 196.000 |
| | T14 | 108.000 |
| | T44 | 150.000 |

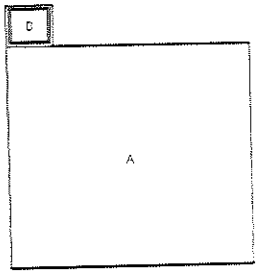



BACK SIDEWALL FRAMING: FRAME LINE A



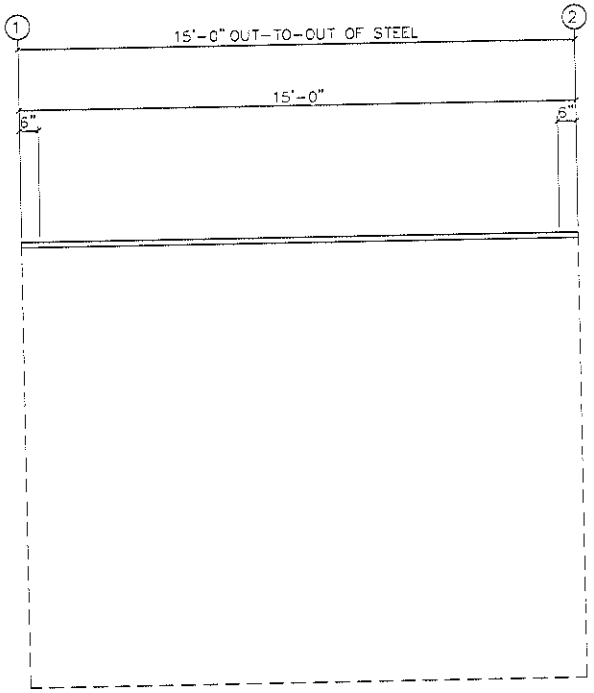

BACK SIDEWALL SHEETING & TRIM: FRAME LINE A

PANELS: 26 Ga. PBR - Kynar

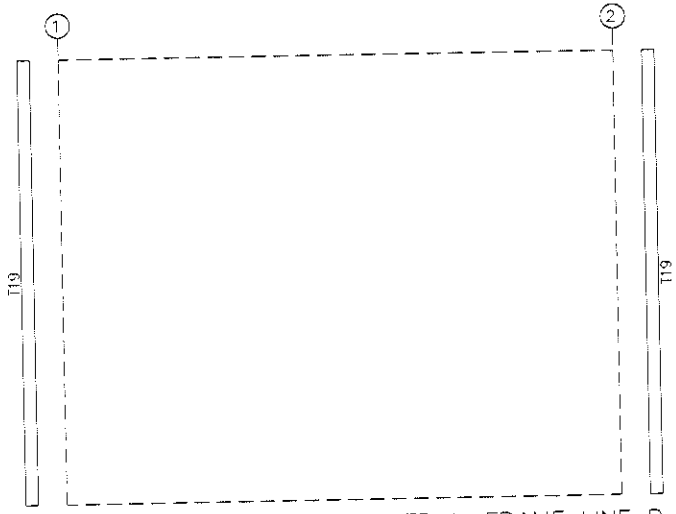



| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | SIDEWALL FRAMING | |
| ID | 14186-048 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

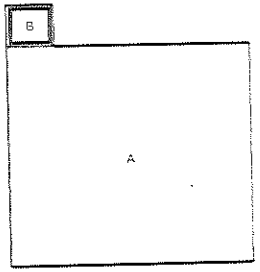
| TRIM TABLE FRAME LINE B | | |
|---|---|---|
| QTY | MARK | LENGTH |
| | T19 | 147.000 |




FRONT SIDEWALL FRAMING: FRAME LINE B




FRONT SIDEWALL SHEETING & TRIM: FRAME LINE B




| RED DOT CORPORATION | | | |
|---|---|---|---|
| PROJECT | 12 | SIDEWALL FRAMING | |
| ID | 14186-048 | DESIGN: | DRAFT: CHECK: |
| PROJECT ADDRESS | | DATE: 5/29/14 | SHEET OF |

July 14, 2014

Jerry W. Divin, P.E., M.ASCE
Manager Civil/Structural Department
Optimized Process Designs, LLC
25610 Clay Road
Katy, TX 77493
Jerry.Divin@opdepc.com

RE: Building Foundation, Little Missouri #3, Office Building
Watford City, North Dakota

Dear Mr. Divin,

This letter is to state the foundation for the Office Building, shown in Drawings S1.0, S1.1, S2.1, and S2.2 dated June 11, 2014 provided to you by EIKON, has been designed based on the metal building foundation reactions by Red Dot Buildings, dated May 30, 2014, for the above referenced building. The foundation loads were based on a Building Risk Category of Category III. The building foundation complies with the 2012 International Building Code, Building Risk Category III.

If you have any questions, please feel free to contact us.

Sincerely,

R. Craig McKee

Brad Isbell, P.E.

REGISTERED PROFESSIONAL ENGINEER
BRADLEY J. ISBELL
7199
DATE 7/14/14
NORTH DAKOTA

# CALCULATIONS
# For
# Building Foundation

## Targa Little Missouri #3
## Office Building
## Watford City, North Dakota

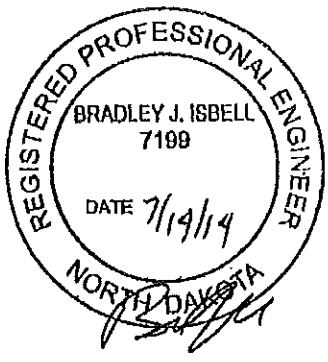
Project #14009

July 14, 2014

# STRUCTURAL CALCULATIONS
# FOR
## Building Foundation

### Targa Little Missouri #3 Office Building

## Watford City, North Dakota



## NOTES FOR REACTIONS

Building reactions are based on the following building data:

| | |
|---|---|
| Width (ft) | 80.0 |
| Length (ft) | 80.0 |
| Eave Height (ft) | 12.0 / 12.0 |
| Roof Slope (rise/12) | 0.5 / 0.5 |
| Dead Load (psf) | 2.0 |
| Collateral Load (psf) | 3.0 |
| Roof Live Load (psf) | 20.0 |
| Frame Live Load (psf) | 20.0 |
| Snow Load (psf) | 28.0 |
| Wind Speed (mph) | 90.0 |
| Wind Code | ASCE 7-05 |
| Exposure | C |
| Closed/Open | Closed |
| Importance Wind | 1.15 |
| Importance Seismic | 1.00 |
| Seismic Design Category | A |

| ID | Description |
|---|---|
| 1 | Dead+Collateral |
| 2 | Dead+Collateral+Snow |
| 3 | Dead+Collateral+Snow+Slide_Snow |
| 4 | 0.6Dead+Wind_Left |
| 5 | 0.6Dead+Wind_Right |
| 6 | 0.6Dead+Wind_Left2 |
| 7 | 0.6Dead+Wind_Right2 |
| 8 | 0.6Dead+Wind_Long1+LWIND1_L2R |
| 9 | 0.6Dead+Wind_Long1+LWIND1_R2R |
| 10 | 0.6Dead+Wind_Long1+LWIND1_R2L |
| 11 | 0.6Dead+Wind_Long1+LWIND1_L2L |
| 12 | 0.6Dead+Wind_Long2+LWIND2_R2L |
| 13 | Dead+Wind_Left |
| 14 | Dead+Wind_Right |
| 15 | Dead+Collateral+0.75Snow+0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_L2L |
| 16 | Dead+Collateral+0.75Snow+0.75Wind_Long2+0.75Slide_Snow+0.75LWIND2_R2R |
| 17 | Dead+Collateral+FOUND_SLL |
| 18 | Dead+Collateral+FOUND_SLR |
| 19 | Dead+Collateral+F4UNB_SLL |
| 20 | Dead+Collateral+F4UNB_SLR |
| 21 | 0.6Dead+Wind_Suction+Wind_Long2 |
| 22 | 0.6Dead+Wind_Pressure+Wind_Long |
| 23 | Dead+Collateral+CUNB_SLL |
| 24 | 0.6Dead+Wind_Left2+Wind_Section |
| 25 | Dead+Collateral+CUNB_SLR |
| 26 | 0.6Dead+Wind_Right2+Wind_Section |
| 27 | Dead+Collateral+EQUNB_SLL |
| 28 | Dead+Collateral+EQUNB_SLR |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3* | B | 16 | 12.4 | 7.4 | 6 | +16.5 | +16.7 | 4 | 0.875 | 8.000 | 8.000 | 0.500 | 0.0 |
| | | 2 | 11.8 | 15.9 | 7 | +15.9 | +16.4 | | | | | | |
| 3* | E | 4 | 16.3 | +10.7 | 15 | +15.6 | 11.9 | 4 | 0.875 | 8.000 | 8.000 | 0.500 | 0.0 |
| | | 2 | +11.5 | 15.9 | 11 | 13.1 | +16.4 | | | | | | |

3* Frame Lines: B & E

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

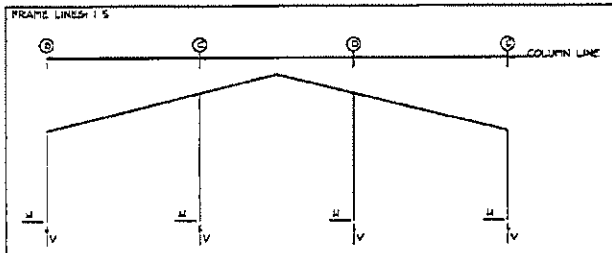
| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | B | 15 | 1.6 | +1.4 | 5 | +1.9 | +20.1 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 3 | 0.8 | 2.4 | 3 | +1.7 | +20.3 | | | | | | |
| 5 | E | 16 | 1.4 | +2.1 | 15 | +1.5 | +1.4 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 2 | +0.3 | 2.4 | 11 | 1.7 | +3.3 | | | | | | |
| 6 | C | 15 | 0.0 | +4.6 | 3 | 0.0 | +4.6 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 16 | 0.0 | 5.4 | | | | | | | | | |
| 5 | D | 1 | 0.0 | +4.6 | 4 | 0.0 | +4.6 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 15 | 0.0 | 5.4 | | | | | | | | | |

## ENDWALL COLUMN: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

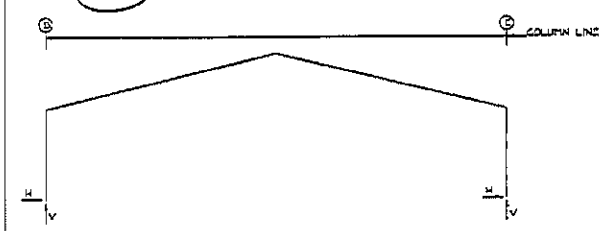
| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | C * | 28 | 5.0 | +2.1 | 23 | +4.7 | +5.6 | | | | | | |
| | | 23 | 0.0 | 6.7 | 23 | 4.7 | +5.7 | | | | | | |
| 1 | D * | 28 | 5.0 | +2.1 | 23 | +4.7 | +5.6 | | | | | | |
| | | 24 | 0.0 | 6.7 | 28 | 4.6 | 6.7 | | | | | | |
| 5 | D * | 28 | 5.0 | +2.2 | 23 | +4.7 | +5.6 | | | | | | |
| | | 28 | 0.0 | 6.8 | 23 | 4.8 | 5.8 | | | | | | |
| 5 | C * | 28 | 5.0 | +2.2 | 23 | +4.7 | +5.6 | | | | | | |
| | | 23 | 0.0 | 6.8 | 23 | 4.8 | 5.8 | | | | | | |

*See Rigid Frame Interior Column Reactions

FRAME LINES: 1 5




FRAME LINES: 2 3 4




## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | 15 | 1.9 | +1.0 | 5 | +1.8 | +1.9 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 3 | 0.8 | 2.6 | 3 | +1.6 | +20.0 | | | | | | |
| 1 | E | 6 | 1.8 | +2.0 | 12 | +1.9 | +1.5 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 1 | +0.3 | 2.8 | 4 | 1.4 | +3.1 | | | | | | |
| 1 | C | 15 | 0.0 | +4.5 | 3 | 0.0 | +4.5 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 16 | 0.0 | 5.7 | | | | | | | | | |
| 1 | D | 4 | 0.0 | +4.5 | 4 | 0.0 | +4.5 | 4 | 0.750 | 8.000 | 12.00 | 0.375 | 0.0 |
| | | 17 | 0.0 | 5.8 | | | | | | | | | |

## RIGID FRAME: MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc. Bolt Qty | Anc. Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | B | 2 | 4.3 | 14.7 | 3 | +7.9 | +10.1 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | | | | 9 | +5.6 | +12.5 | | | | | | |
| 2 | E | 4 | 7.8 | +10.3 | 2 | +8.5 | +11.5 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 1 | +4.5 | 15.2 | 80 | 5.6 | +12.7 | | | | | | |

## BUILDING BRACING REACTIONS

| Wall Line | Col Line | ± Reactions (k) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|
| 1 | Rigid Frame At Endwall | | | | | | |
| 5 | | 11.8 | 6.1 | 0.3 | 0.2 | | |
| 1 | Rigid Frame At Endwall | | | | | | |
| | Torsional Bracing Used | | | | | | |

BLDG A REACTIONS

01/1

# General Footing

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235 Licensee : EIKON Consultant Group, LLC

Description : Typical Building Footing (office)

## Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : IBC 2012

## General Information

### Material Properties

| | | |
|---|---|---|
| f'c : Concrete 28 day strength | = | 4.50 ksi |
| fy : Rebar Yield | = | 60.0 ksi |
| Ec : Concrete Elastic Modulus | = | 3,122.0 ksi |
| Concrete Density | = | 145.0 pcf |
| φ Values Flexure | = | 0.90 |
| Shear | = | 0.750 |

### Analysis Settings

| | | |
|---|---|---|
| Min Steel % Bending Reinf. | = | |
| Min Allow % Temp Reinf. | = | 0.00180 |
| Min. Overturning Safety Factor | = | 1.0 : 1 |
| Min. Sliding Safety Factor | = | 1.0 : 1 |
| Add Ftg Wt for Soil Pressure | : | Yes |
| Use ftg wt for stability, moments & shears | : | Yes |
| Add Pedestal Wt for Soil Pressure | : | Yes |
| Use Pedestal wt for stability, mom & shear | : | Yes |

### Soil Design Values

| | | |
|---|---|---|
| Allowable Soil Bearing | = | 3.0 ksf |
| Increase Bearing By Footing Weight | = | No |
| Soil Passive Resistance (for Sliding) | = | 250.0 pcf |
| Soil/Concrete Friction Coeff. | = | 0.30 |

Increases based on footing Depth

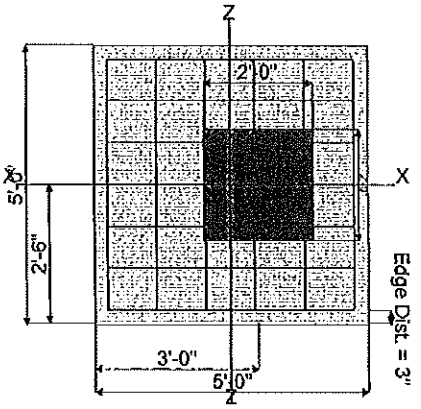
| | | |
|---|---|---|
| Footing base depth below soil surface | = | 4.0 ft |
| Allowable pressure increase per foot of depth | = | 0.0 ksf |
| when footing base is below | = | 0.0 ft |

Increases based on footing plan dimension

| | | |
|---|---|---|
| Allowable pressure increase per foot of depth | = | 0.0 ksf |
| when maximum length or width is greater | = | 0.0 ft |

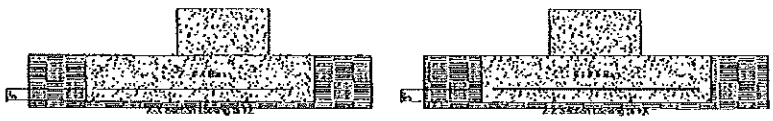
## Dimensions

| | | |
|---|---|---|
| Width parallel to X-X Axis | = | 5.0 ft |
| Length parallel to Z-Z Axis | = | 5.0 ft |
| Footing Thicknes | = | 12.0 in |
| Load location offset from footing center... | | |
| ex : Pril to X-X Axis | = | 6 in |
| Pedestal dimensions... | | |
| px : parallel to X-X Axis | = | 24.0 in |
| pz : parallel to Z-Z Axis | = | 24.0 in |
| Height | = | 12.0 in |
| Rebar Centerline to Edge of Concrete.. | | |
| at Bottom of footing | = | 3.0 in |




## Reinforcing

| | | |
|---|---|---|
| Bars parallel to X-X Axis | | |
| Number of Bars | = | 7.0 |
| Reinforcing Bar Size | = | # 4 |
| Bars parallel to Z-Z Axis | | |
| Number of Bars | = | 6.0 |
| Reinforcing Bar Size | = | # 5 |



**Bandwidth Distribution Check (ACI 15.4.4.2)**

| | |
|---|---|
| Direction Requiring Closer Separation | n/a |
| # Bars required within zone | n/a |
| # Bars required on each side of zone | n/a |

## Applied Loads

| | | D | Lr | L | S | W | E | H |
|---|---|---|---|---|---|---|---|---|
| P : Column Load | = | 0.0 | 0.0 | 0.0 | 14.70 | 0.0 | 0.0 | 0.0 k |
| OB : Overburden | = | 0.360 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 ksf |
| M-xx | = | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 k-ft |
| M-zz | = | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 k-ft |
| V-x | = | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 k |
| V-z | = | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 k |

# General Footing

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235 — Licensee : EIKON Consultant Group, LLC

Description : Typical Building Footing (office)

## DESIGN SUMMARY

**Design OK**

| | Min. Ratio | Item | Applied | Capacity | Governing Load Combination |
|---|---|---|---|---|---|
| PASS | 0.4617 | Soil Bearing | 1.385 ksf | 3.0 ksf | +D+S+H about Z-Z axis |
| PASS | n/a | Overturning - X-X | 0.0 k-ft | 0.0 k-ft | No Overturning |
| PASS | n/a | Overturning - Z-Z | 0.0 k-ft | 0.0 k-ft | No Overturning |
| PASS | n/a | Sliding - X-X | 0.0 k | 0.0 k | No Sliding |
| PASS | n/a | Sliding - Z-Z | 0.0 k | 0.0 k | No Sliding |
| PASS | n/a | Uplift | 0.0 k | 0.0 k | No Uplift |
| PASS | 0.06925 | Z Flexure (+X) | 0.7693 k-ft | 11.109 k-ft | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.1224 | Z Flexure (-X) | 1.360 k-ft | 11.109 k-ft | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.08239 | X Flexure (+Z) | 1.208 k-ft | 14.659 k-ft | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.08239 | X Flexure (-Z) | 1.208 k-ft | 14.659 k-ft | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.02470 | 1-way Shear (+X) | 2.485 psi | 100.623 psi | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.1235 | 1-way Shear (-X) | 12.425 psi | 100.623 psi | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.07409 | 1-way Shear (+Z) | 7.455 psi | 100.623 psi | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.07409 | 1-way Shear (-Z) | 7.455 psi | 100.623 psi | +1.20D+0.50L+1.60S+1.60H |
| PASS | 0.07621 | 2-way Punching | 15.337 psi | 201.246 psi | +1.20D+0.50L+1.60S+1.60H |

## Detailed Results

### Soil Bearing

| Rotation Axis & Load Combination... | Gross Allowable | Xecc | Zecc | Actual Soil Bearing Stress Bottom, -Z | Top, +Z | Left, -X | Right, +X | Actual / Allowable Ratio |
|---|---|---|---|---|---|---|---|---|
| X-X, +D+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+L+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+Lr+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+S+H | 3.0 | n/a | 0.0 | 1.059 | 1.059 | n/a | n/a | 0.353 |
| X-X, +D+0.750Lr+0.750L+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+0.750L+0.750S+H | 3.0 | n/a | 0.0 | 0.9116 | 0.9116 | n/a | n/a | 0.304 |
| X-X, +D+0.60W+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D-0.60W+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+0.70E+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D-0.70E+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+0.750Lr+0.750L+0.450W+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+0.750Lr+0.750L-0.450W+H | 3.0 | n/a | 0.0 | 0.4706 | 0.4706 | n/a | n/a | 0.157 |
| X-X, +D+0.750L+0.750S+0.450W+H | 3.0 | n/a | 0.0 | 0.9116 | 0.9116 | n/a | n/a | 0.304 |
| X-X, +D+0.750L+0.750S-0.450W+H | 3.0 | n/a | 0.0 | 0.9116 | 0.9116 | n/a | n/a | 0.304 |
| X-X, +D+0.750L+0.750S+0.525E+H | 3.0 | n/a | 0.0 | 0.9116 | 0.9116 | n/a | n/a | 0.304 |
| X-X, +D+0.750L+0.750S-0.5250E+H | 3.0 | n/a | 0.0 | 0.9116 | 0.9116 | n/a | n/a | 0.304 |
| X-X, +0.60D+0.60W+0.60H | 3.0 | n/a | 0.0 | 0.2824 | 0.2824 | n/a | n/a | 0.094 |
| X-X, +0.60D-0.60W+0.60H | 3.0 | n/a | 0.0 | 0.2824 | 0.2824 | n/a | n/a | 0.094 |
| X-X, +0.60D+0.70E+0.60H | 3.0 | n/a | 0.0 | 0.2824 | 0.2824 | n/a | n/a | 0.094 |
| X-X, +0.60D-0.70E+0.60H | 3.0 | n/a | 0.0 | 0.2824 | 0.2824 | n/a | n/a | 0.094 |
| Z-Z, +D+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+L+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+Lr+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+S+H | 3.0 | 3.138 | n/a | n/a | n/a | 0.7320 | 1.385 | 0.462 |
| Z-Z, +D+0.750Lr+0.750L+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+0.750L+0.750S+H | 3.0 | 2.676 | n/a | n/a | n/a | 0.6717 | 1.151 | 0.384 |
| Z-Z, +D+0.60W+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D-0.60W+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+0.70E+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D-0.70E+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+0.750Lr+0.750L+0.450W+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+0.750Lr+0.750L-0.450W+H | 3.0 | -0.4386 | n/a | n/a | n/a | 0.4909 | 0.4503 | 0.164 |
| Z-Z, +D+0.750L+0.750S+0.450W+H | 3.0 | 2.676 | n/a | n/a | n/a | 0.6717 | 1.151 | 0.384 |
| Z-Z, +D+0.750L+0.750S-0.450W+H | 3.0 | 2.676 | n/a | n/a | n/a | 0.6717 | 1.151 | 0.384 |
| Z-Z, +D+0.750L+0.750S+0.525E+H | 3.0 | 2.676 | n/a | n/a | n/a | 0.6717 | 1.151 | 0.384 |
| Z-Z, +D+0.750L+0.750S-0.5250E+H | 3.0 | 2.676 | n/a | n/a | n/a | 0.6717 | 1.151 | 0.384 |
| Z-Z, +0.60D+0.60W+0.60H | 3.0 | -0.2414 | n/a | n/a | n/a | 0.2891 | 0.2757 | 0.096 |
| Z-Z, +0.60D-0.60W+0.60H | 3.0 | -0.2414 | n/a | n/a | n/a | 0.2891 | 0.2757 | 0.096 |
| Z-Z, +0.60D+0.70E+0.60H | 3.0 | -0.2414 | n/a | n/a | n/a | 0.2891 | 0.2757 | 0.096 |
| Z-Z, +0.60D-0.70E+0.60H | 3.0 | -0.2414 | n/a | n/a | n/a | 0.2891 | 0.2757 | 0.096 |

# General Footing

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235 — Licensee : EIKON Consultant Group, LLC

Description : Typical Building Footing (office)

## Overturning Stability

| Rotation Axis & Load Combination... | Overturning Moment | Resisting Moment | Stability Ratio | Status |
|---|---|---|---|---|
| Footing Has NO Overturning | | | | |

## Sliding Stability

All units k

| Force Application Axis Load Combination... | Sliding Force | Resisting Force | Sliding SafetyRatio | Status |
|---|---|---|---|---|
| Footing Has NO Sliding | | | | |

## Footing Flexure

| Flexure Axis & Load Combination | Mu k-ft | Which Side ? | Tension @ Bot or Top ? | As Req'd in^2 | Gvrn. As in^2 | Actual As in^2 | PhiMn k-ft | Status |
|---|---|---|---|---|---|---|---|---|
| X-X, +1.40D+1.60H | 0.1742 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.40D+1.60H | 0.1742 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50Lr+1.60L+1.60H | 0.1493 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50Lr+1.60L+1.60H | 0.1493 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60L+0.50S+1.60H | 0.4801 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60L+0.50S+1.60H | 0.4801 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60Lr+0.50L+1.60H | 0.1493 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60Lr+0.50L+1.60H | 0.1493 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60Lr+0.50W+1.60H | 0.1493 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60Lr+0.50W+1.60H | 0.1493 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+1.60S+1.60H | 1.208 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+1.60S+1.60H | 1.208 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60S+0.50W+1.60H | 1.208 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+1.60S+0.50W+1.60H | 1.208 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50Lr+0.50L+W+1.60H | 0.1493 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50Lr+0.50L+W+1.60H | 0.1493 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+0.50S+W+1.60H | 0.4801 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+0.50S+W+1.60H | 0.4801 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+0.70S+E+1.60H | 0.6124 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +1.20D+0.50L+0.70S+E+1.60H | 0.6124 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +0.90D+W+0.90H | 0.1120 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +0.90D+W+0.90H | 0.1120 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +0.90D+E+0.90H | 0.1120 | +Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| X-X, +0.90D+E+0.90H | 0.1120 | -Z | Bottom | 0.2592 | Min Temp % | 0.3720 | 14.659 | OK |
| Z-Z, +1.40D+1.60H | 0.3602 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.40D+1.60H | 0.06249 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50Lr+1.60L+1.60H | 0.3058 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50Lr+1.60L+1.60H | 0.05443 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60L+0.50S+1.60H | 0.6352 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60L+0.50S+1.60H | 0.2778 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60Lr+0.50L+1.60H | 0.3058 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60Lr+0.50L+1.60H | 0.05443 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60Lr+0.50W+1.60H | 0.3058 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60Lr+0.50W+1.60H | 0.05443 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+1.60S+1.60H | 1.360 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+1.60S+1.60H | 0.7693 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60S+0.50W+1.60H | 1.360 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+1.60S+0.50W+1.60H | 0.7693 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H | 0.3058 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H | 0.05443 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+0.50S+W+1.60H | 0.6352 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+0.50S+W+1.60H | 0.2778 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+0.70S+E+1.60H | 0.7669 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +1.20D+0.50L+0.70S+E+1.60H | 0.3672 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +0.90D+W+0.90H | 0.2243 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +0.90D+W+0.90H | 0.04233 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +0.90D+E+0.90H | 0.2243 | -X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |
| Z-Z, +0.90D+E+0.90H | 0.04233 | +X | Bottom | 0.2592 | Min Temp % | 0.280 | 11.109 | OK |

## One Way Shear

| Load Combination... | Vu @ -X | Vu @ +X | Vu @ -Z | Vu @ +Z | Vu:Max | Phi Vn | Vu / Phi*Vn | Status |
|---|---|---|---|---|---|---|---|---|
| +1.40D+1.60H | 1.792 psi | 0.3584 psi | 1.075 psi | 1.075 psi | 1.792 psi | 100.623 psi | 0.01781 | OK |
| +1.20D+0.50Lr+1.60L+1.60H | 1.536 psi | 0.3072 psi | 0.9217 psi | 0.9217 psi | 1.536 psi | 100.623 psi | 0.01527 | OK |

## General Footing

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28

Lic. # : KW-06010235 — Licensee : EIKON Consultant Group, LLC

Description : Typical Building Footing (office)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 4.939 psi | 0.9878 psi | 2.963 psi | 2.963 psi | 4.939 psi | 100.623 psi | 0.04908 | OK |
| +1.20D+1.60Lr+0.50L+1.60H | 1.536 psi | 0.3072 psi | 0.9217 psi | 0.9217 psi | 1.536 psi | 100.623 psi | 0.01527 | OK |

## General Footing

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235 — Licensee : EIKON Consultant Group, LLC

Description : Typical Building Footing (office)

### One Way Shear

| Load Combination... | Vu @ -X | Vu @ +X | Vu @ -Z | Vu @ +Z | Vu:Max | Phi Vn | Vu / Phi*Vn | Status |
|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60Lr+0.50W+1.60H | 1.536 psi | 0.3072 psi | 0.9217 psi | 0.9217 psi | 1.536 psi | 100.623 psi | 0.01527 | OK |
| +1.20D+0.50L+1.60S+1.60H | 12.425 psi | 2.485 psi | 7.455 psi | 7.455 psi | 12.425 psi | 100.623 psi | 0.1235 | OK |
| +1.20D+1.60S+0.50W+1.60H | 12.425 psi | 2.485 psi | 7.455 psi | 7.455 psi | 12.425 psi | 100.623 psi | 0.1235 | OK |
| +1.20D+0.50Lr+0.50L+W+1.60H | 1.536 psi | 0.3072 psi | 0.9217 psi | 0.9217 psi | 1.536 psi | 100.623 psi | 0.01527 | OK |
| +1.20D+0.50L+0.50S+W+1.60H | 4.939 psi | 0.9878 psi | 2.963 psi | 2.963 psi | 4.939 psi | 100.623 psi | 0.04908 | OK |
| +1.20D+0.50L+0.70S+E+1.60H | 6.3 psi | 1.26 psi | 3.78 psi | 3.78 psi | 6.3 psi | 100.623 psi | 0.06261 | OK |
| +0.90D+W+0.90H | 1.152 psi | 0.2304 psi | 0.6913 psi | 0.6913 psi | 1.152 psi | 100.623 psi | 0.01145 | OK |
| +0.90D+E+0.90H | 1.152 psi | 0.2304 psi | 0.6913 psi | 0.6913 psi | 1.152 psi | 100.623 psi | 0.01145 | OK |

### Punching Shear

All units k

| Load Combination... | Vu | Phi*Vn | Vu / Phi*Vn | Status |
|---|---|---|---|---|
| +1.40D+1.60H | 2.212 psi | 201.246psi | 0.01099 | OK |
| +1.20D+0.50Lr+1.60L+1.60H | 1.896 psi | 201.246psi | 0.009422 | OK |
| +1.20D+1.60L+0.50S+1.60H | 6.096 psi | 201.246psi | 0.03029 | OK |
| +1.20D+1.60Lr+0.50L+1.60H | 1.896 psi | 201.246psi | 0.009422 | OK |
| +1.20D+1.60Lr+0.50W+1.60H | 1.896 psi | 201.246psi | 0.009422 | OK |
| +1.20D+0.50L+1.60S+1.60H | 15.337 psi | 201.246psi | 0.07621 | OK |
| +1.20D+1.60S+0.50W+1.60H | 15.337 psi | 201.246psi | 0.07621 | OK |
| +1.20D+0.50Lr+0.50L+W+1.60H | 1.896 psi | 201.246psi | 0.009422 | OK |
| +1.20D+0.50L+0.50S+W+1.60H | 6.096 psi | 201.246psi | 0.03029 | OK |
| +1.20D+0.50L+0.70S+E+1.60H | 7.776 psi | 201.246psi | 0.03864 | OK |
| +0.90D+W+0.90H | 1.422 psi | 201.246psi | 0.007066 | OK |
| +0.90D+E+0.90H | 1.422 psi | 201.246psi | 0.007066 | OK |

www.hilti.us

**Profis Anchor 2.4.7**

| | | | |
|---|---|---|---|
| Company: | EIKON | Page: | 1 |
| Specifier: | RCM | Project: | Litte Mo Targa |
| Address: | | Sub-Project I Pos. No.: | Office Building ABs |
| Phone I Fax: | \| | Date: | 7/14/2014 |
| E-Mail: | | | |

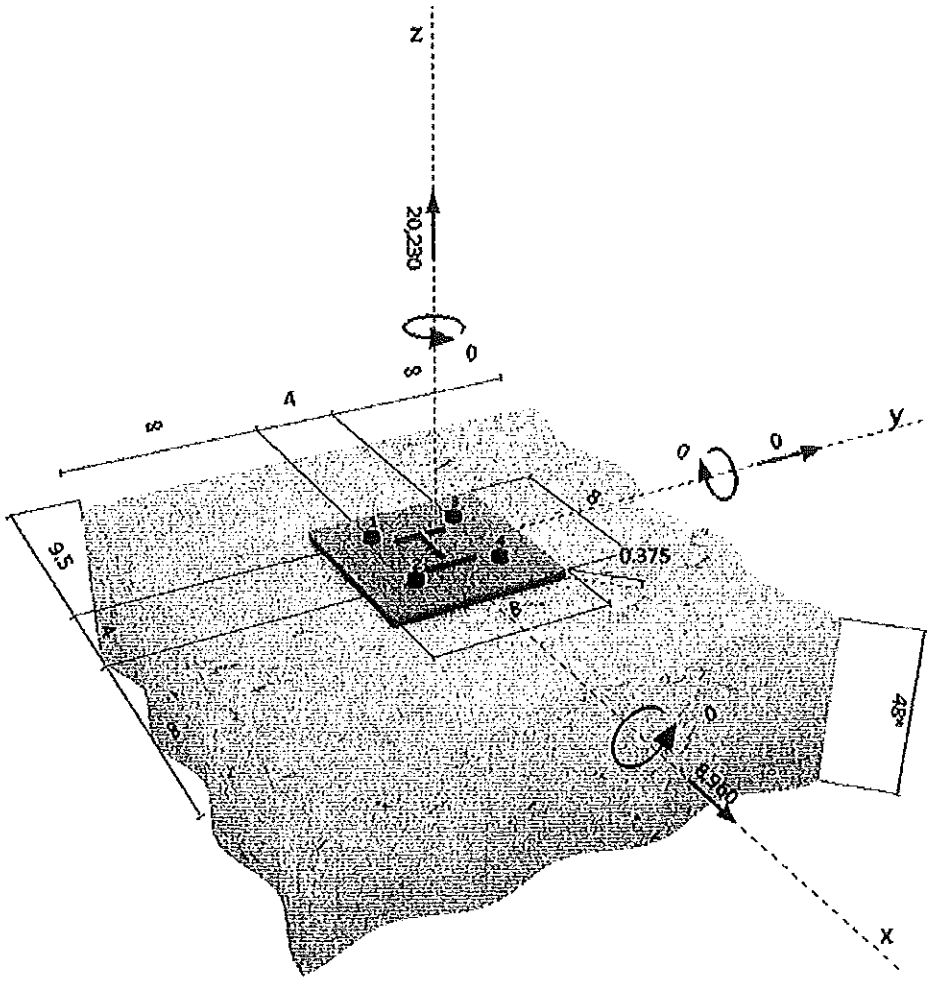
**Specifier's comments:**

## 1 Input data



| | |
|---|---|
| **Anchor type and diameter:** | **Hex Head ASTM F 1554 GR. 36 3/4** |
| Effective embedment depth: | $h_{ef}$ = 4.724 in. |
| Material: | ASTM F 1554 |
| Proof: | design method ACI 318-08 / CIP |
| Stand-off installation: | $e_b$ = 0.000 in. (no stand-off); t = 0.375 in. |
| Anchor plate: | $l_x$ x $l_y$ x t = 8.000 in. x 8.000 in. x 0.375 in.; (Recommended plate thickness: not calculated) |
| Profile: | S shape (AISC); (L x W x T x FT) = 3.000 in. x 2.330 in. x 0.170 in. x 0.260 in. |
| Base material: | uncracked concrete, 4000, $f_c'$ = 4000 psi; h = 48.000 in. |
| Reinforcement: | tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar |
| Seismic loads (cat. C, D, E, or F) | no |

**Geometry [in.] & Loading [lb, in.lb]**



| | | | |
|---|---|---|---|
| Company: | EIKON | Page: | 2 |
| Specifier: | RCM | Project: | Litte Mo Targa |
| Address: | | Sub-Project I Pos. No.: | Office Building ABs |
| Phone I Fax: | I | Date: | 7/14/2014 |
| E-Mail: | | | |

## 2 Proof I Utilization (Governing Cases)

| | | Design values [lb] | | Utilization | |
|---|---|---|---|---|---|
| Loading | Proof | Load | Capacity | $\beta_N$ / $\beta_V$ [%] | Status |
| Tension | Concrete Breakout Strength | 20230 | 22423 | 91 / - | OK |
| Shear | Steel Strength | 2240 | 7555 | - / 30 | OK |

| Loading | $\beta_N$ | $\beta_V$ | $\zeta$ | Utilization $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|---|
| Combined tension and shear loads | 0.902 | 0.296 | 5/3 | 98 | OK |

## 3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

## Fastening meets the design criteria!

## 4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.


PROFIS Anchor ( c ) 2003-2009 Hilti AG, FL-9494 Schaan Hilti is a registered Trademark of Hilti AG, Schaan

EIKON Consultant Group

PROJECT Targa/Office
PROJECT # 14090
NAME RCM
DATE 7/14/14 SHEET 9 OF 10

## Footing Uplift Check

NET column Uplift = -12.7$^k$

**Weight of FND:** • Footing: 1' × 5' × 5' × 145#/ft$^3$ = 3.6$^k$
- Weight of Wall = 1' × 4.67 × 20' × 145#/ft$^3$ = 13.5$^k$
10.0' BOTH SIDES of footing
Weight of Pedestal: 1' × 2' × 4.67 × 145#/ft$^3$ 1.3$^k$
Soil: Awall = 1' × 5' = 5ft$^2$
Aped = 1' × 2' = 2ft$^2$
Asoil = 5' × 5' − 5ft$^2$ − 2ft$^2$ = 18ft$^2$
90#/ft$^3$ × 4.67 × 18ft$^2$ = 7.6 k
Weight of Cont ftg.: 1.5' × 15' × 145#/ft$^2$ = 3.2$^k$

$\Sigma W = 31.6^k + 13.5^k + 1.3^k + 7.6 + 3.2^k = 29.2^k$

F.S Uplift = $\frac{29.2 \times 0.6}{12.7}$ = 1.37 > 1.0 OK

EIKON Consultant Group

PROJECT TARGA / OFFICE

PROJECT # 14070

NAME RCM

DATE 7/14/14 SHEET 10 OF 10

## CHECK HAIRPIN REINF

$V_n = 9.5^k \times 1.6 = 15.2^k$

$T_{BAR} = 15.2/2\,BARS \times 1/0.707 = 10.74^k/BAR$

$A_{s\,req'd} = 10.74/0.9/60 = 0.19in^2 < A_{prov'd} = 0.44in^2$ OK

## CHECK HAIRPIN LENGTH:

SLAB STEEL = #8 @ 18 → $\phi A_s f_y = 0.9 \times 0.11 \times 60 = 5.94^k/BAR$

#BARS IN SLAB TO RESIST THRUST = $10.74 \times 0.707 / 5.94 = 2\,BARS$

MIN LENGTH = $2 \times 18 / 0.707 = 50.9''$

$L_{PROVIDED} = 60'' > L_{req'd}$ OK

RED DOT BUILDINGS

Better building systems.
*You have our word on it*

# Letter of Certification

Date: June 27, 2014
Customer: C & H Buildings
Project: (E) Office Building
Project Address: Watford City, McKenzie County, North Dakota 58854

Red Dot Job Number: 14186-04

| Building | Type | Width | Length | Eave Height | Roof Slope |
|---|---|---|---|---|---|
| A | DS | 60'-0" | 65'-0" | 12'-0" | 3:12 |
| B | SS | 12'-0" | 15'-0" | 9'-0" | 3:12 |

This is to certify that the above described building/buildings has/have been designed for the following loads and deflections:

**Design Notes:**

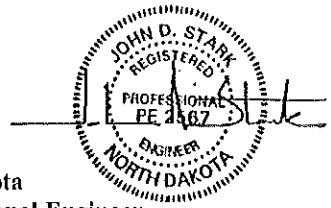
| | | | |
|---|---|---|---|
| Building Code | 2012 International Building Code | | |
| Dead Load | 2.0 psf – Weight of roof material such as panel, insulation and purlins | | |
| Collateral Load | 3.0 psf | | |
| Live Load | 20 psf – Reducible per applicable building code | | |
| Wind Speed | 120 mph – Ultimate | | |
| Exposure | C | Risk Category | II - Normal |
| Enclosure | Enclosed | | |
| Ground Snow | 30 psf | Importance Factor | 1.10 |
| Seismic | | | |
| Site Class | D | | |
| Design Category | A | Importance Factor | 1.25 |
| $S_S$ | 0.0730 | $S_{DS}$ | 0.0779 |
| $S_1$ | 0.0260 | $S_{D1}$ | 0.0416 |
| $C_S$ | 0.0100 | | |
| Transverse SFRS | OSMF R=3 | | |
| Longitudinal SFRS | OSCBF/OSMF R=3 | | |
| Analysis Procedure | Equivalent Lateral Force | | |

| Building | Drift – Lateral and Longitudinal | Vertical Frame | | Purlin Deflection | | Girt Deflection | Panel Deflection |
|---|---|---|---|---|---|---|---|
| | | Live Load | Total Load | Live Load | Total Load | | |
| A | H/60 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |
| B | H/60 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |

Loads are applied in accordance with the 2006 MBMA Low Rise Systems Manual and/or the 2012 Edition of the International Building Code. Design is in accordance with the applicable sections of the 2005 AISC and 2007 NAUS specifications.

It is the responsibility of the buyer to protect all openings from wind-borne debris during high wind load conditions. All wall framing by others and overhead doors are required to be wind load rated to wind speed and exposure specified above, to ensure "enclosed building" conditions are maintained

This certification is limited to the design of the metal building components and specifically excludes an analysis of the foundation and parts that may be supplied by anyone other than Red Dot Buildings located in Athens, TX. This certification is for design only, no inspection or supervision is implied.




**State of North Dakota**
**Registered Professional Engineer**
**Red Dot Corporation**

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

14439

*Description of Work:*

Targa No. 3 Slug
Catcher Bldg
1939 125th Ave
Watford City, ND

*Required Inspections*

*(Inspector initial and date)*

____Footing

____Foundation

____Footing

____Final

*Date Issued: 8/25/2014*

Call 701.444.6494 ext. 2 for Inspections, no later than 24 hours in advance

**This Permit Expires 6 Months from Issue Date.**

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
For Inspections Call: 701-444-3616 x1045

Property Address 1939 129th Ave NW Permit No. 21139
Subdivision Targa Gas Plant Lot No. Sludge Bldg Date 8/10/21
Name Dpr Phone Time 3:15p

☐Complaint ☐Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED |
|---|---|---|---|
| **Clearances** | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ |
| 2. Bond Release | ☐ | ☐ | ☐ |
| 3. Other | ☐ | ☐ | ☐ |
| **Land Use** | | | |
| 4. Side Setback | ☐ | ☐ | ☐ |
| 5. Front Setback | ☐ | ☐ | ☐ |
| 6. Rear Setback | ☐ | ☐ | ☐ |
| 7. Right of Way | ☐ | ☐ | ☐ |
| 8. Building Height/FFE | ☐ | ☐ | ☐ |
| 9. Other | ☐ | ☐ | ☐ |
| **Inspections** | | | |
| Sub-rough: | | | |
| 10. Excavation | ☑ | ☐ | ☐ |
| 11. Footings | ☑ | ☐ | ☐ |
| 12. Foundation | ☐ | ☐ | ☐ |
| 13. Mechanical | ☐ | ☐ | ☐ |
| 14. Other | ☐ | ☐ | ☐ |
| Rough: | | | |
| 15. Building | ☐ | ☐ | ☐ |
| 16. Shear Walls | ☐ | ☐ | ☐ |
| 17. Mechanical | ☐ | ☐ | ☐ |
| 18. Insulation | ☐ | ☐ | ☐ |
| 19. Drywall | ☐ | ☐ | ☐ |
| 20. Lath | ☐ | ☐ | ☐ |
| 21. Bond Beam | ☐ | ☐ | ☐ |
| 22. Ceiling Grid | ☐ | ☐ | ☐ |
| 23. Above Grid | ☐ | ☐ | ☐ |
| 24. Gas Line | ☐ | ☐ | ☐ |
| 25. Other | ☐ | ☐ | ☐ |
| **Final** | | | |
| 26. Building | ☐ | ☐ | ☐ |
| 27. Mechanical | ☐ | ☐ | ☐ |
| 28. Water Meter Box | ☐ | ☐ | ☐ |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ |
| 30. Landscaping | ☐ | ☐ | ☐ |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ |
| 32. Other | ☐ | ☐ | ☐ |

**SPECIAL COMMENTS**
☐Prior Violation Not Corrected
☐Engineering required
Item # ____
☐Work Incomplete
☑OK to proceed without reinspection
☐Other ____

**UNABLE TO MAKE INSPECTION BECAUSE:**
☐Approved plan/permit not available
☐Building not identified
☐Building locked or work inaccessible
☐Cannot locate structure
☐Party missed appointment
Time ____

**Comments:**
34' deep hole w/ 3½" rebar pier
#8 Verts @ 16" O.C. around perimeter
with #4 horizontals @ 12" O.C. in hole
and suspended above base by 2"'s
(starting 1" above grade)

Signed Robert A. Lamp Inspector

*McKenzie County Building& Planning Department*
*201 5th Street NW*
*Watford City, ND 58854* *mckenziecounty.net*
*Phone: 701-444-6494*

Permit No: #14134139

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

RECEIVED
AUG 05 2014

Submit Application Along with Submittal Requirements

| 1. PROJECT INFORMATION | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Slug Catcher Bldg | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW 1/4 OF SW 1/4 | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@opdepc.com |

| 2. OWNER INFORMATION | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

Zoning Verification

| 3. PROJECT DESCRIPTION | | | | |
|---|---|---|---|---|
| Type of Work: check box that applies | (New Construction) | Alteration | Addition | Demolition |
| Location of Work: (ie: Floor, Level) | GROUND LEVEL | Square Footage of Work Being Done: | 1600 | |
| Describe in detail work being done: | Metal Bldg for slug catcher equipment. | | | |
| Foundation Type: | Footing/stem walls | | | |

| 4. FEE INFORMATION | | | |
|---|---|---|---|
| General Contractor Name: | OPD | Phone #: | 281-371-7500 |
| ND License #: | 50680 | | |

## 5. ZONING/ASSESING INFORMATION (for office use only)

| New | Addition | Alteration | Demolition | Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |

| | | |
|---|---|---|
| Zoning: | Average Depth of Lot: | Lot Area (sq ft): |
| Easement: | | |
| Front Yard Setback | Side Yard Setbacks | Rear Yard Setback |
| | | |
| Area of Main: | Finished Area: | Finished Area Alt / Add: |
| # Required Parking Spaces | Area Required Parking: | Total Area. |
| **Zoning Approval Signature:** | | **Date:** |

## 6. BUILDING CODE INFORMATION (for office use only)

| | |
|---|---|
| Occupancy Classification: | Change of Occupancy: |
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |
| | |

## 7. PROJECT REVIEW

| |
|---|
| Reviewed By: T Tovoh |
| Project Title: |
| Address: |
| $1500 Application Submittal Fee is required. ☐ Check Rec'd No. _____ OR ☐ Payment Receipt from Treasurer |
| ☐ Payment scanned to electronic files. Date:_____ |
| Total Permit Fee Amount _____ |

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature

8/7/2014
Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

Approved

Kendee Dalz 8/18/14

## Jennifer Shelden

**From:** Jennifer Shelden
**Sent:** Friday, August 08, 2014 9:40 AM
**To:** 'mike.pratt@opdepc.com'
**Subject:** Targa - Little Missouri

Mike,

We received your building plans for Targa – Little Missouri; we need you to submit a site plan that includes a lighting, landscaping, and fencing. As soon as this is provided, we will submit your plans to the building department for plan review.

Thanks,

*Jennifer Shelden*
Assistant Planner / Code Enforcement
McKenzie County
(701) 444-6494 ext. 1051

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Slug Catcher Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 1600 SF
2. Height of Building: +/- 27'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group F-1
5. Table 503: Allowable height: 40'/1 story. Allowable area: 8500 sf. OK
6. Table 1004.1.2: Occupant load: equipment: 1/300 sf. 1600 sf @ 1/300: 5 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 2 exits provided. OK
8. Doors/Windows: Refer to Legend, Targa Drawing number 905 for door/window information.
9. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
10. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
11. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

12. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
13. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
14. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.
John Biggs
Date 8-5-2014 Lic. No. 2163

# McKenzie County Building Permit Fee Worksheet

**Permit #:** 14439
**Name:** Targa Little Missouri No.3 Slug Catcher Bldg
**Address:** 1939 125th Ave, Watford City
**Subdivision:**

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| 5 | x | | = | 0 |
| 6 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| 3 | x | | = | 0 |
| 4 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | x | | = | 0 |
| 2 | x | | = | 0 |
| | | TOTAL AREA | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | | |
|---|---|---|---|---|---|---|---|
| Valuation of main floor | F-1 Factory and industrial, moderate hazard | VB | $96.58 (Cost/Sqft) | x | 1600.0 (Square Footage) | = | $154,532.40 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of garage * Private Garages use Utility, miscellaneous | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation of deck/covered patio | N/A | N/A | $0.00 (Cost/Sqft) | x | (Square Footage) | = | $0.00 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | (Hours req'd for inspection) | | (Value of Structure | = | $0.00 (Valuation-Sq. Ft) |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustment % (+/-) 0%

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by the Building Official

| Reasoning for Adjustment *Required | |
|---|---|

**TOTAL BUILDING VALUATION** $154,532.40

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $1,289.93 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $838.45 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $2,128.38 |
| PREPAID DEPOSIT | $0.00 |
| **AMOUNT DUE** | $2,128.38 |

Calculated By: Kendall Phillips Date: 8/25/2014

Signature:

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Slug Catcher Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 1600 SF
2. Height of Building: +/- 27'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group F-1
5. Table 503: Allowable height: 40'/1 story. Allowable area: 8500 sf. OK
6. Table 1004.1.2: Occupant load: equipment: 1/300 sf. 1600 sf @ 1/300: 5 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 2 exits provided. OK
8. Doors/Windows: Refer to Legend, Targa Drawing number 905 for door/window information.
9. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
10. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
11. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

12. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
13. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
14. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

John Biggs

Date 8-5-2014 Lic. No. 2163

RED DOT BUILDINGS

Better building systems.
*You have our word on it*

# Letter of Certification

Date: July 15, 2014
Customer: C & H Buildings
Project: (A) Commercial
Project Address: Watford City, McKenzie County, North Dakota 58854

Red Dot Job Number: 14186-05

| Building | Type | Width | Length | Eave Height | Roof Slope |
|---|---|---|---|---|---|
| A | DS | 20'-0" | 80'-0" | 25'-0" | 3:12 |

This is to certify that the above described building/buildings has/have been designed for the following loads and deflections:

**Design Notes:**

| | | | | |
|---|---|---|---|---|
| Building Code | 2012 International Building Code | | | |
| Dead Load | 2.0 psf – Weight of roof material such as panel, insulation and purlins | | | |
| Collateral Load | 3.0 psf | | | |
| Live Load | 20 psf – Reducible per applicable building code | | | |
| Wind Speed | 120 mph – Ultimate | | | |
| Exposure | C | Risk Category | II - Normal | |
| Enclosure | Enclosed | | | |
| Ground Snow | 30 psf | Importance Factor | 1.10 | |
| Seismic | | | | |
| Site Class | D | | | |
| Design Category | A | Importance Factor | 1.25 | |
| $S_S$ | 0.0730 | $S_{DS}$ | 0.0779 | |
| $S_1$ | 0.0260 | $S_{D1}$ | 0.0416 | |
| $C_S$ | 0.0100 | | | |
| Transverse SFRS | OSMF R=3 | | | |
| Longitudinal SFRS | OSCBF/OSMF R=3 | | | |
| Analysis Procedure | Equivalent Lateral Force | | | |

| Building | Drift – Lateral and Longitudinal | Vertical Frame | | Purlin Deflection | | Girt Deflection | Panel Deflection |
|---|---|---|---|---|---|---|---|
| | | Live Load | Total Load | Live Load | Total Load | | |
| A | H/60 | L/240 | L/180 | L/240 | L/180 | L/240 | L/180 |

Loads are applied in accordance with the 2006 MBMA Low Rise Systems Manual and/or the 2012 Edition of the International Building Code. Design is in accordance with the applicable sections of the 2005 AISC and 2007 NAUS specifications.

It is the responsibility of the buyer to protect all openings from wind-borne debris during high wind load conditions. All wall framing by others and overhead doors are required to be wind load rated to wind speed and exposure specified above, to ensure "enclosed building" conditions are maintained

This certification is limited to the design of the metal building components and specifically excludes an analysis of the foundation and parts that may be supplied by anyone other than Red Dot Buildings located in Athens, TX. This certification is for design only, no inspection or supervision is implied.

JOHN D. STARK REGISTERED PROFESSIONAL PE 2567 ENGINEER NORTH DAKOTA

**John D. Stark**
**State of North Dakota**
**Registered Professional Engineer**
**Red Dot Corporation**



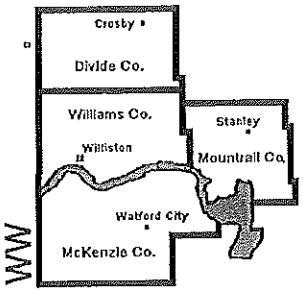
MBMA

# Upper Missouri District Health Unit

*"Your Public Health Professionals"*

Date: 8/8/2013

Check #: 575661





WILLIAMS COUNTY
110 W. Bdwy, Ste 101
Williston, ND 58801-6056
Phone 701-774-6400
Fax 701-577- 8536
Toll Free 1-877-572-3763


X $100.00 Individual Permit Fee
____ $200.00 Multi -dwelling up to 20 bedrooms
____ $500.00 Multi-dwelling more than 20bedrooms
____ $50.00 Holding Tank
____ $50.00 Rebuilding Fee

AUG 15 2013, NEG

## SEWAGE TREATMENT SYSTEM PLANS
## PERMIT

OWNER Targa Badlands LLC phone 701-842-3315

INSTALL ADDRESS 1939 125th Ave NW Watford City, ND 58854

MAILING ADDRESS 1939 125th Ave NW Watford City, ND 58854

DIRECTIONS TO PROPERTY From Watford City take US 85 S approx 4.1 miles take a left onto Co. 37. After approx .5 miles take a right and travel approx 1.7 miles to site on left.

PURCHASER N/A LENDING INSTITUTION N/A

COUNTY McKenzie TWP T149 RNG 98W SEC 29

SUBD NW 1/4 of SW 1/4 LOT N/A BLOCK N/A

LOT SIZE 40 acres # OF BEDROOMS N/A or # OF EMPLOYEES 15 WELL DEPTH N/A

If you do not include township, range and section and number of bedrooms there will be a delay in processing your permit while we have to contact you **The building owner, contractor, plumbing contractor, and/or installer are jointly responsible for compliance with U.M.D.H.U.'s Regulations for Individual Sewage Treatment Systems. In addition, it is your responsibility to follow all city, township and county regulations.**

Owner: [signature] Date: 8/8/13

DEPTH TO RESTRICTING LAYER ____ SOIL TYPE Clay Loam

SEPTIC TANK (WORKING CAPACITY) 1,000 GAL.

**TREATMENT AREA:**

TRENCH IN SQUARE FEET

6" GRAVEL 1620 12"GRAVEL 530 18"GRAVEL 440 24"GRAVEL 380

GRAVELLESS PIPE IN LINEAR FEET:

8" 330 10" 220

CHAMBER SYSTEM IN LINEAR FEET:

12" TALL 180 15"TALL 160

MOUND IN SQUARE FEET 240

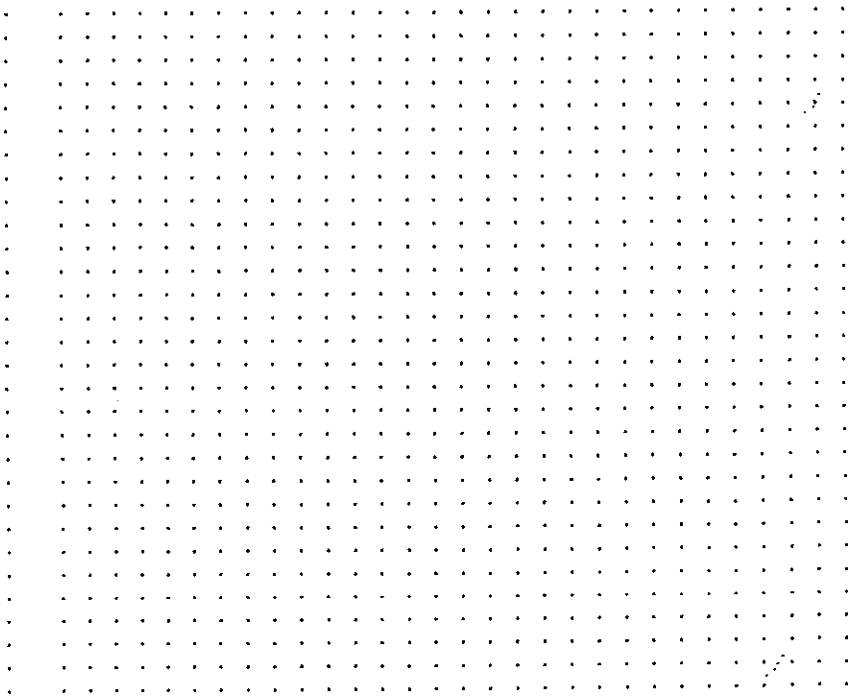
ISTS PERMIT GOOD FOR 12 MONTHS FROM DATE OF ISSUE.

APPROVED BY: ____ DATE: ____

NOTIFY THIS OFFICE AT LEAST 2 BUSINESS DAYS PRIOR TO INSTALLATION FOR INSPECTION.

# ISTS Plans

List any plan issues: _____



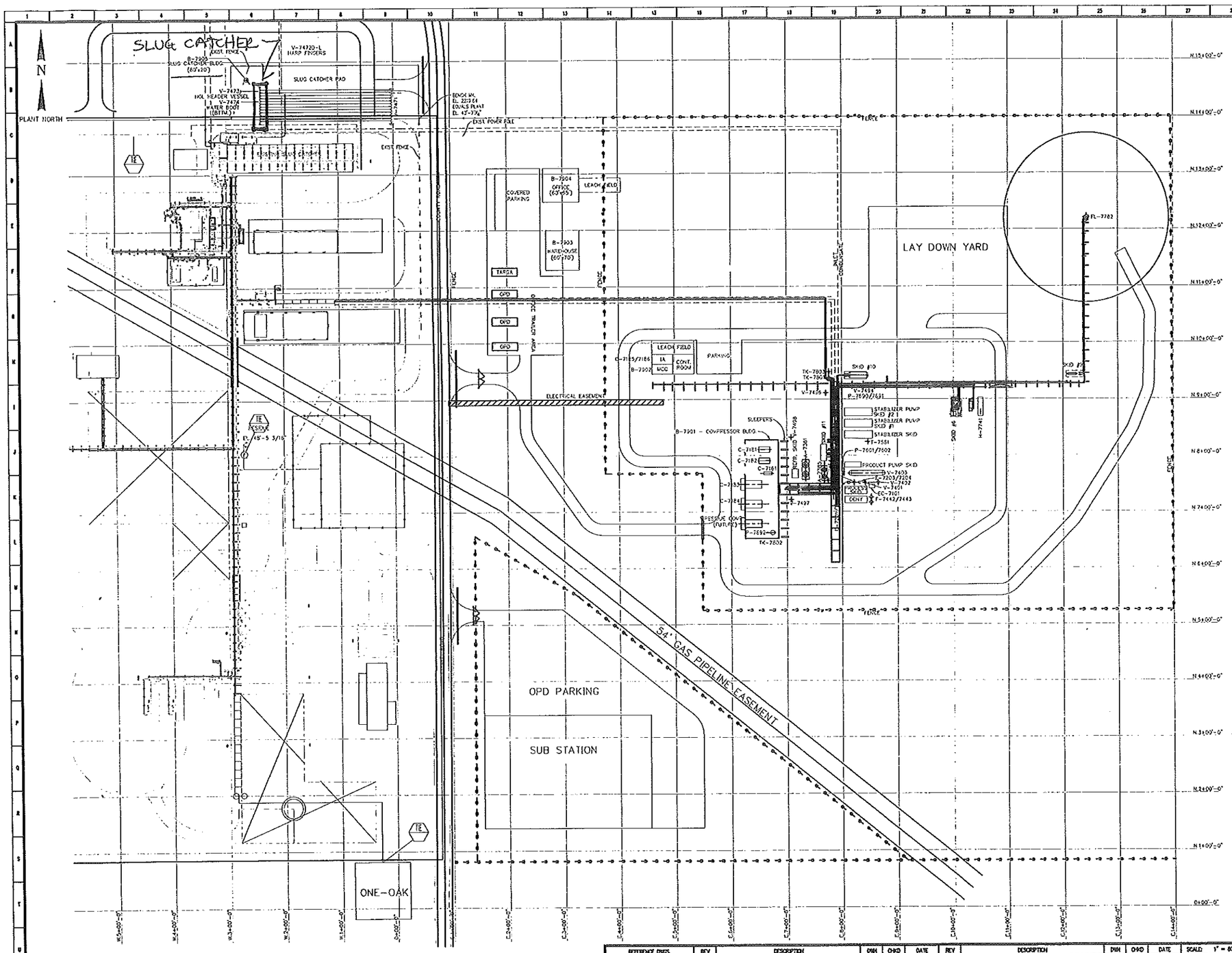
## Setbacks

| | Well <100' | Well >100' | Distribution Device | Treatment Area | Property Lines | Building |
|---|---|---|---|---|---|---|
| Bldg. Sewer | 100 | 50 | —— | —— | —— | —— |
| Septic tank | 100 | 50 | 5 | 10 | 10 | 10 |
| Distribution Device | 100 | 50 | —— | —— | 10 | 20 |
| Treatment area | 100 | 50 | 5 | —— | 10 | 10 |
| Well <100' | -- | -- | 100 | 100 | n/a | n/a |
| Well >100' | -- | -- | 50 | 50 | n/a | n/a |
| water line (pressure) | -- | -- | 10 | 10 | n/a | n/a |
| (suction) | -- | -- | 50 | 50 | n/a | n/a |
| Surface Water bodies | n/a | n/a | 100 | 100 | n/a | n/a |

## Reminders:

Rock Size: 1 to 3 inches

Cover Material: Straw or Fabric




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7341 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7445 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TRIM REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7605/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7451 | REFRIGERANT SUCTION SCRUBBER |
| V-7452 | REFRIGERANT ECONOMIZER |
| V-7453 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7457 | HEAT MEDIUM FILTER |
| P-7656/7657 | HEAT MEDIUM PUMPS |
| V-7452 | HEAT MEDIUM EXPANSION TANK |
| H-7781 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7693/7694/7695 | CONDENSATE PIPELINE PUMPS |
| V-7475 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7251 | STABILIZER FEED/COND. DOCM EXCHANGER |
| E-7252 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7253 | STABILIZER REBOILER |
| F-7451/7452 | STABILIZER FEED FILTERS |
| F-7453/7454 | STABILIZER FEED COALESCERS |
| F-7455 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7493 | FLARE KNOCK OUT DRUM |
| P-7658/7659 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7454 | CLOSED DRAIN TANK |
| P-7650/7651 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7456 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7204 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7201 | COMPRESSOR BUILDING |
| B-7202 | CONTROL ROOM/MCC/I.A. BUILDING |
| B-7203 | WAREHOUSE BUILDING |
| B-7204 | OFFICE BUILDING |
| B-7205 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7353/7354 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7355 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7181 | REFRIGERANT COMPRESSOR |
| C-7182/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| E-7208 | SEAL GAS HEATER |
| F-7441/7443 | MOL SIEVE DEHYDRATORS |
| F-7454 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7659 | METHANOL INJECTION PUMP |
| P-7692 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7551 | STABILIZER |
| TK-7801 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | SLOP OIL TANK |
| V-7421 | COLD SEPARATOR |
| V-7422 | WARM GAS SEPARATOR |
| V-7423 | PRODUCT SURGE TANK |
| V-7471 | HEADER VESSEL |
| V-7420-L | HARP FINGERS |
| V-7423 | NGL HEADER VESSEL |
| V-7424 | WATER BOOT |
| V-7425 | INSTRUMENT AIR RECEIVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7498 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DSN | CHKD | DATE |
|---|---|---|---|---|---|
| | B | ISSUED FOR APPROVAL | RBJ | | |
| | A | ISSUED FOR BID - OPD JOB #14025 | RBJ | | |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

SCALE: 1" = 80'

DATE: 3/7/14

DSN BY: RBJ

CHKD BY:

FINAL CK:

ENGR: MP

APPR:

APPR:

PLANT NAME: LITTLE MISSOURI #3

TARGA

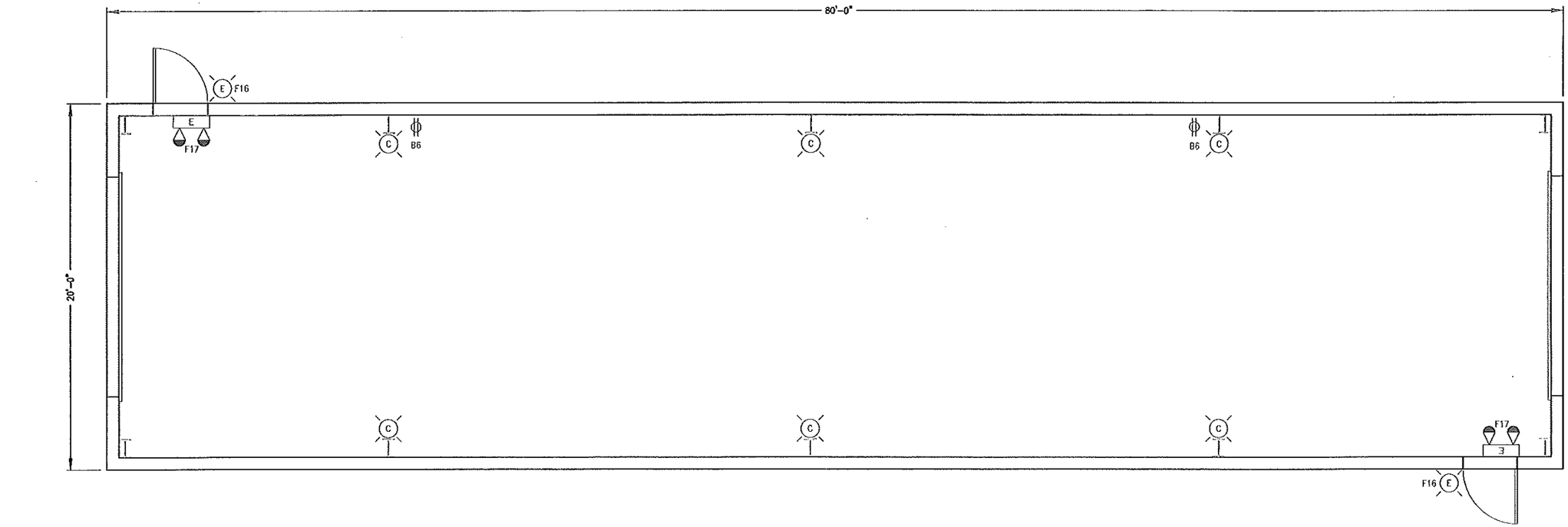
DRAWING NUMBER: LM-3000

CAD FILE NAME: LM-3000

REVISION: B

# PLOT PLAN
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: --




SLUG CATCHER BLDG.

| | | | |
|---|---|---|---|
| A | CEILING MOUNT 175W MH 208V. PULSE START | CROUSE-HINDS | VMVM2C175GP/MT 5828/5826 |
| C | WALL MOUNT 175W MH 208V. PULSE START | CROUSE-HINDS | VMVM2TW1736P/MT S8226/S828 |
| D | PENDANT MOUNT 400W MH 208V. PULSE START | CROUSE-HINDS | VMVM2A4006R305/208CM S826/ S828 |
| E | WALL MOUNT 70W MH 208V. | CROUSE-HINDS | LMVM2TW070GP/S826/S828 |
| | FLOOD LIGHT 400W MH 208V. PULSE START | CROUSE-HINDS | FMVMY400/MT765828 |
| | FACTORY SEALED RECEPTACLE, 20 AMP, 125VAC | CROUSE-HINDS | ENRC21201 |
| E | EXIT/EMERGENCY LIGHT WITH BATT. BACK-UP. | LITHONIA | LHZ618S1R |

NOTES:
1. SEE DWG. LM-EL-70009 FOR BILL OF MATERIALS.

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| LM-EL-72548 | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | A | ISSUED FOR BID - OPD JOB #14025 | RK | AVD | 7-18-14 |

| | |
|---|---|
| SCALE: 3/8" = 1'-0" | DATE |
| DRN BY: RK | 6-5-14 |
| CHKD BY: LS | 6-5-14 |
| FINAL OK: | |
| ENGR: | |
| APPR: | |
| APPR: | |
| PLANT NAME: LITTLE MISSOURI #3 GAS PLANT | |
| MCKENZIE COUNTY, NORTH DAKOTA | |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGNS

PROJECT NUMBER: 14025

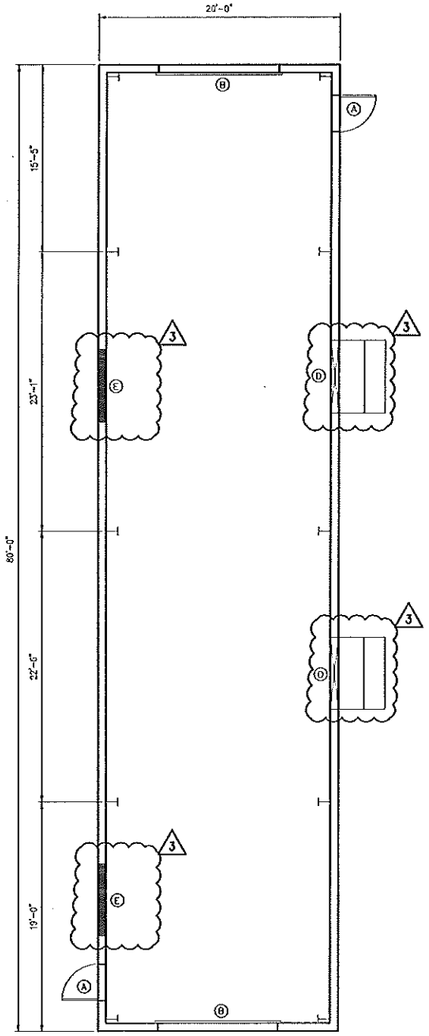
TARGA

DRAWING NUMBER: LM-EL-73116
CAD FILE NAME: LM-EL-73116
REVISION: A

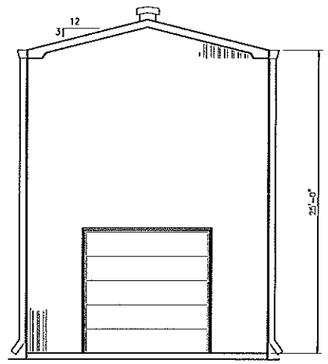
LIGHTING PLAN
SLUG CATCHER BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE:

H:\14025\OPD Drawings\Electrical\LM-EL-73116.dwg ~ 7-22-14 15:00 ~ RK




FLOOR PLAN
(SLUG CATCHER BUILDING)
SCALE: 3/16"=1'-0"




NORTH / SOUTH ELEVATION
SCALE: 3/16"=1'-0"

## NOTES:

1. DESIGN LOADS: PER IBC 2012;
   WIND = 120 MPH, EXPOSURE C, RISK CAT. II
   SEISMIC: Sx=.7% Ss=.26%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. PEMB FRAME TYPE BUILDING (PINNED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. 6" INSULATION IN THE WALLS AND ROOF.
8. FDN. BY O.P.D.
9. 8'-0" HIGH WALL LINER PANEL
10. ELECTRICAL BY OPD.
11. CONTINUOUS RIDGE VENT W/ BIRD SCREEN & CHAIN OPERATED DAMPER.
12. 5'-0" WALL LIGHT BAND TRANSLUCENT PANEL AROUND THE PERIMETER OF THE BUILDING
13. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF CABLE DESIGNED TO PROTECT PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.
14. PROVIDE FLASHING AROUND PIPE PENETRATIONS

## LEGEND

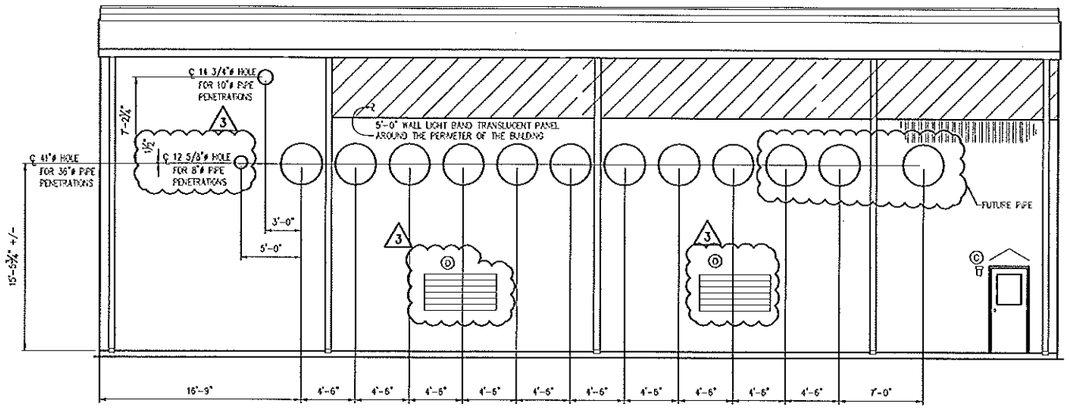
(A)- 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.

(B)- 10'-0"W x 10'-0"H ROLL-UP DOOR

(C)- EXTERIOR LIGHTING AT EA. EXT. DOOR - (BY OPD)

3 (D)- EXHAUST FANS SHALL BE 1 - SPEED DIRECT DRIVE 1180-HP 460V 1150 RPM, TEFC, SUITABLE FOR CL. 1, DIV. 2, GROUP D. MOTOR NAME PLATE SHALL INCLUDE ELECTRICAL CLASSIFICATION. FAN AIR FLOW TO MATCH SAME FLOW DIRECTION AS TEFC MOTOR FAN AIR. FANS SHALL BE DESIGNED SO THAT 1 OF THE 2 FANS WILL PROVIDE THE NECESSARY AIR CHANGE OUTS (EVERY 10 MINS.) THE 2ND FAN WILL BE THE SAME SIZE AND ACT AS A SPARE IN CASE ONE FAN IS INOPERABLE FANS SHALL BE EQUIPPED WITH DIFFUSERS. NO MANUAL SWITCH ON THE FANS.

(E)- INTAKE VENTILATION LOUVERS TO MATCH FAN DESIGN GRAVITY OPERATED




EAST ELEVATION
SCALE: 3/16"=1'-0"

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|
| 3 | REVISED AS SHOWN | JNH | JND | 7/29/14 |
| 2 | REVISED AS SHOWN | JNH | TT | 6/24/14 |
| 1 | RESIZED COLUMN LOCATIONS PER PEPMO | TT/BSB | TT | 6/4/14 |
| 0 | ISSUE FOR CONSTRUCTION | JNH | JND | 4/29/14 |

| | |
|---|---|
| SCALE: NOTED | DATE |
| DWN BY: TT | 3/27/14 |
| CHKD BY: JND | 4/1/14 |
| FINAL CK: JND | 4/2/14 |
| ENGR: JNH | 3/27/14 |
| APPR'D: | |
| APPR'D: -- | -- |

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

TARGA

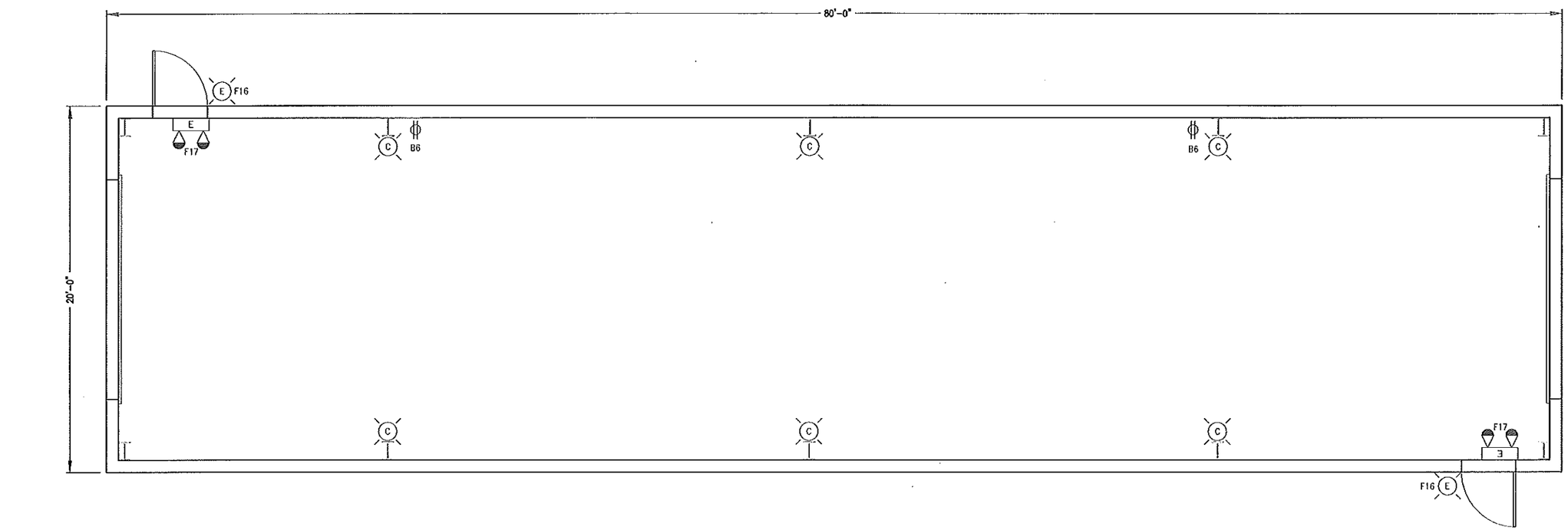
DRAWING NUMBER: 14025-A-904

CAD FILE NAME: 14025-A-904

REVISION: 3

SLUG CATCHER BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: --




SLUG CATCHER BLDG.

| | | | |
|---|---|---|---|
| A | CEILING MOUNT 175W MH 208V. PULSE START | CROUSE-HINDS | VMVM2C175GP/MT 5828/5826 |
| C | WALL MOUNT 175W MH 208V. PULSE START | CROUSE-HINDS | VMVM2TW1736P/MT S8226/S828 |
| D | PENDANT MOUNT 400W MH 208V. PULSE START | CROUSE-HINDS | VMVM2A4006R305/208GM S826/ S828 |
| E | WALL MOUNT 70W MH 208V. | CROUSE-HINDS | LMVM2TW070GP/S826/S828 |
| | FLOOD LIGHT 400W MH 208V. PULSE START | CROUSE-HINDS | FMVMY400/MT765828 |
| | FACTORY SEALED RECEPTACLE, 20 AMP, 125VAC | CROUSE-HINDS | ENRC21201 |
| E | EXIT/EMERGENCY LIGHT WITH BATT. BACK-UP. | LITHONIA | LHZ618S1R |

NOTES:
1. SEE DWG. LM-EL-70009 FOR BILL OF MATERIALS.

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| LM-EL-72548 | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | A | ISSUED FOR BID – OPD JOB #14025 | RK | JWD | 7-18-14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGNS | PROJECT NUMBER: 14025

SCALE: 3/8" = 1'-0" | DATE
DWN BY: RK | 6-5-14
CHKD BY: LS | 6-5-14
FINAL CK:
ENGR:
APPVD:
APPVD:
PLANT NAME: LITTLE MISSOURI #3 GAS PLANT
MCKENZIE COUNTY, NORTH DAKOTA

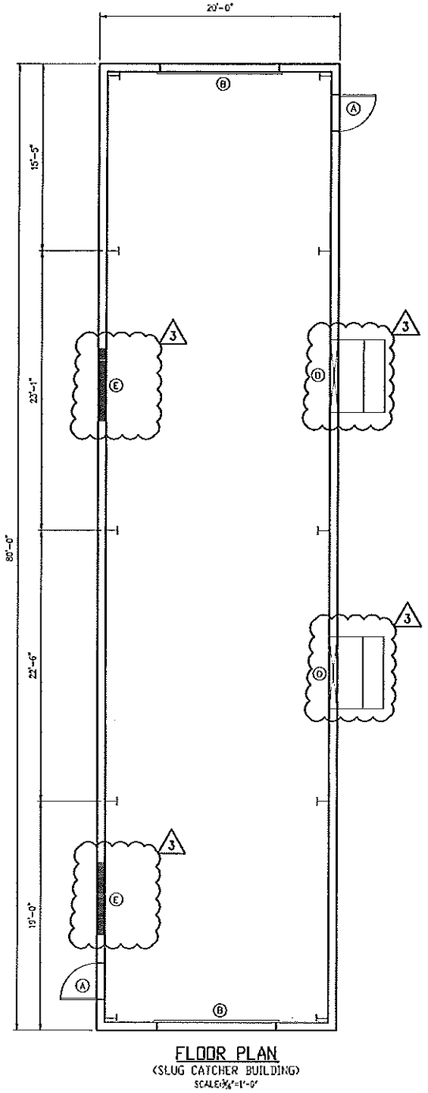
TARGA

DRAWING NUMBER: LM-EL-73116
CAD FILE NAME: LM-EL-73116
REVISION: A

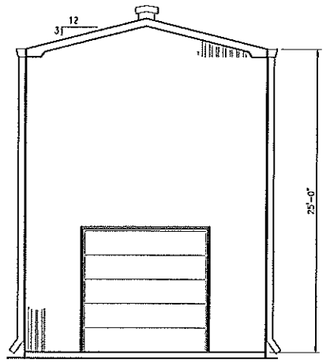
LIGHTING PLAN
SLUG CATCHER BUILDING
LITTLE MISSOURI #3 GAS PLANT

PLOT DATE:

H:\14025\OPD Drawings\Electrical\LM-EL-73116.dwg ~ 7-22-14 15:00 ~ RK




FLOOR PLAN
(SLUG CATCHER BUILDING)
SCALE: 3/16"=1'-0"




NORTH / SOUTH ELEVATION
SCALE: 3/16"=1'-0"

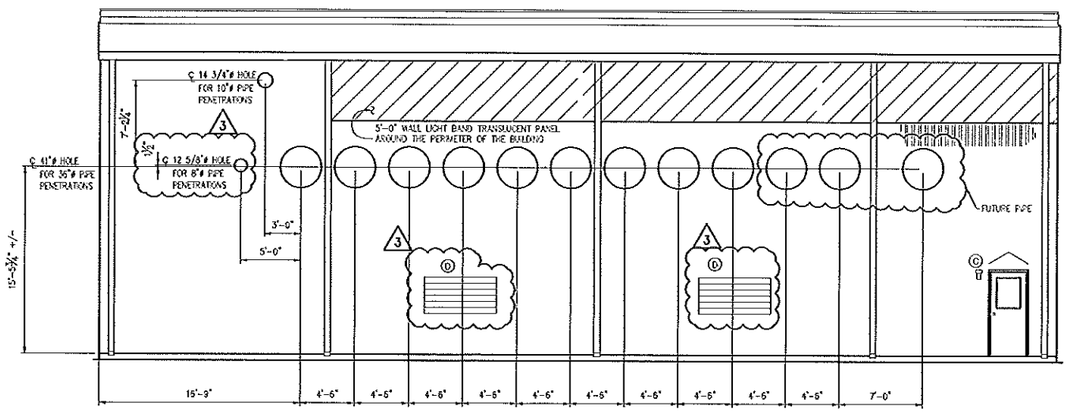
## NOTES:

1. DESIGN LOADS: PER IBC 2012;
   WIND = 120 MPH, EXPOSURE C, RISK CAT. II
   SEISMIC: Ss=7% S1=2.6%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. RIGID FRAME TYPE BUILDING (PINNED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. 6" INSULATION IN THE WALLS AND ROOF.
8. FDN. BY D.P.D.
9. 8'-0" HIGH WALL LINER PANEL.
10. ELECTRICAL BY OPD.
11. CONTINUOUS RIDGE VENT W/ BIRD SCREEN & CHAIN OPERATED DAMPER.
12. 5'-0" WALL LIGHT BAND TRANSLUCENT PANEL AROUND THE PERIMETER OF THE BUILDING
13. EACH PERSONEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT PERSONEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.
14. PROVIDE FLASHING AROUND PIPE PENETRATIONS

## LEGEND

3

- (A)- 3'-0" x 7'-0" INSULATED PERSONEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.
- (B)- 10'-0"W x 10'-0"H ROLL-UP DOOR
- (C)- EXTERIOR LIGHTING AT EA. EXT. DOOR -- (BY OPD)
- (D)- EXHAUST FANS SHALL BE 1 - SPEED DIRECT DRIVE 180-HP 460V 1150 RPM, TEFC, SUITABLE FOR CL. 1, DIV. 2, GROUP D. MOTOR NAME PLATE SHALL INCLUDE ELECTRICAL CLASSIFICATION. FAN AIR FLOW TO MATCH SAME FLOW DIRECTION AS TEFC MOTOR FAN AIR. FANS SHALL BE DESIGNED SO THAT 1 OF THE 2 FANS WILL PROVIDE THE NECESSARY AIR CHANGE CUTS (EVERY 10 MINS.) THE 2:0 FAN WILL BE THE SAME SIZE AND ACT AS A SPARE IN CASE ONE FAN IS INOPERABLE. FANS SHALL BE EQUIPPED WITH DIFFUSERS. NO MANUAL SWITCH ON THE FANS.
- (E)- INTAKE VENTILATION LOUVERS TO MATCH FAN DESIGN GRAVITY OPERATED




EAST ELEVATION
SCALE: 3/16"=1'-0"

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 3 | REVISED AS SHOWN | JNH | JMD | 7/29/14 |
| | | | | | | 2 | REVISED AS SHOWN | JNH | TT | 6/24/14 |
| | | | | | | 1 | RESIZED COLUMN LOCATIONS PER PIPING | TT/BB | TT | 6/4/14 |
| | | | | | | 0 | ISSUE FOR CONSTRUCTION | JNH | JMD | 4/29/14 |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

| | |
|---|---|
| SCALE: NOTED | DATE |
| DWN BY: TT | 3/27/14 |
| CHKD BY: JMD | 4/2/14 |
| FINAL CK: JMD | 4/2/14 |
| ENGR.: JNH | 3/27/14 |
| APPRV. | |
| APPRV. – | – |

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

SLUG CATCHER BUILDING
LITTLE MISSOURI #3 GAS PLANT

DRAWING NUMBER: 14025-A-904
CAD FILE NAME: 14025-A-904
REVISION: 3

PLOT DATE: –

August 1, 2014

Jerry W. Divin, P.E., M.ASCE
Manager Civil/Structural Department
Optimized Process Designs, LLC
25610 Clay Road
Katy, TX 77493
Jerry.Divin@opdepc.com

RE: Building Foundation, Little Missouri #3, Slug Catcher Building
Watford City, North Dakota

Dear Mr. Divin,

This letter is to state the foundation for the Slug Catcher Building, shown in Drawings S1.0, S1.1, S2.1, and S2.2 dated July 28, 2014 provided to you by EIKON, has been designed based on the metal building foundation reactions by Red Dot Buildings, dated July 20, 2014, for the above referenced building. The building foundation complies with the 2012 International Building Code, Building Risk Category III.

If you have any questions, please feel free to contact us.

Sincerely,

R. Craig McKee

Brad Isbell, P.E.



# CALCULATIONS
# For
# Building Foundation

## Targa Little Missouri #3
## Slug Catcher Building
## Watford City, North Dakota

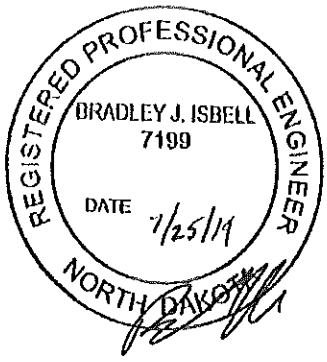
Project #14090

July 25, 2014

# STRUCTURAL CALCULATIONS
# FOR
## Building Foundation

### Targa Little Missouri #3 Slug Catcher Building

## Watford City, North Dakota



## NOTES FOR REACTIONS

Building reactions are based on the following building data:

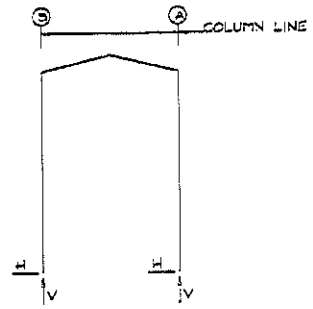
| | |
|---|---|
| Width (ft) | 20.0 |
| Length (ft) | 30.0 |
| Eave Height (ft) | 25.0/ 25.0 |
| Roof Slope (rise/12 ) | 3.0/ 3.0 |
| Dead Load (psf ) | 2.0 |
| Collateral Load (psf ) | 2.0 |
| Roof Live Load(psf ) | 20.0 |
| Frame Live Load(psf ) | 16.3 |
| Snow Load (psf ) | 21.0 |
| Wind Speed (mph ) | 120.0 |
| Wind Code | IBC 12 |
| Exposure | C |
| Closed/Open | Normal |
| Risk Category II | 1.00 |
| Importance Seismic | A |
| Seismic Zone | |

| ID | Description |
|---|---|
| 1 | Dead+0.6Wind_Left1 |
| 2 | Dead+0.6Wind_Right1 |
| 3 | Dead+Collateral+0.75Snow+0.45Wind_Left2+0.75Side_Snow |
| 4 | Dead+Collateral+0.75Snow+0.45Wind_Right2 |
| 5 | Dead+Collateral+0.75Snow+0.45Wind_Right2+0.75Side_Snow |
| 6 | 0.6Dead+0.6Wind_Left1 |
| 7 | 0.6Dead+0.6Wind_Right1 |
| 8 | 0.6Dead+0.6Wind_Left2 |
| 9 | 0.6Dead+0.6Wind_Right2 |

## BUILDING BRACING REACTIONS

| Wall Loc | Wall Line | Col Line | Reactions (k) Wind Horz | Wind Vert | Seismic Horz | Seismic Vert | Panel Shear (lb/ft) Wind | Seis |
|---|---|---|---|---|---|---|---|---|
| FT_SW | 1 | Rigid Frame At Endwall | | | | | | |
| FT_SW | A | 1,2 | 3.5 | 4.4 | 0.1 | 0.1 | | |
| RR_SW | 5 | Rigid Frame At Endwall | | | | | | |
| BT_SW | B | 3,2 | 3.5 | 3.6 | 0.1 | 0.1 | | |

FRAME LINES: 2 3 4 5




## RIGID FRAME MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | B | 2 | 2.7 | 2.8 | 8 | -3.3 | -4.5 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 4 | 1.7 | 4.5 | 6 | -2.6 | -5.1 | | | | | | |
| 1* | A | 9 | 3.3 | -4.5 | 1 | -2.7 | 2.8 | 4 | 0.750 | 8.000 | 8.000 | 0.375 | 0.0 |
| | | 3 | -1.7 | 4.5 | 7 | 2.6 | -5.1 | | | | | | |

1* Frame lines: 1 5

## RIGID FRAME MAXIMUM REACTIONS, ANCHOR BOLTS, & BASE PLATES

| Frm Line | Col Line | Column Reactions (k) Load ID | Hmax H | V Vmax | Load ID | Hmin H | V Vmin | Anc Qty | Bolt Dia | Base Plate (in) Width | Length | Thick | Grout (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | B | 2 | 4.6 | 4.1 | 8 | -5.4 | -6.8 | 4 | 0.750 | 8.000 | 9.000 | 0.375 | 0.0 |
| | | 5 | 2.7 | 8.5 | 6 | -3.8 | -8.3 | | | | | | |
| 2* | A | 9 | 5.4 | -6.8 | 1 | -4.6 | -4.1 | 4 | 0.750 | 8.000 | 9.000 | 0.375 | 0.0 |
| | | 3 | -2.7 | 8.5 | 7 | 3.8 | -8.3 | | | | | | |

2* Frame lines: 2 3 4

## RIGID FRAME BASIC COLUMN REACTIONS (k)

| Frame Line | Column Line | Dead Horiz | Dead Vert | Collateral Horiz | Collateral Vert | Live Horiz | Live Vert | Snow Horiz | Snow Vert | Wind_Left1 Horiz | Wind_Left1 Vert | Wind_Right1 Horiz | Wind_Right1 Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | B | 0.0 | 0.8 | 0.0 | 0.2 | 0.2 | 1.9 | 0.2 | 2.0 | -4.4 | -9.3 | 4.5 | 3.4 |
| 1* | A | 0.0 | 0.8 | 0.0 | 0.2 | -0.2 | 2.0 | -0.2 | 2.0 | -7.5 | 3.4 | 4.4 | -9.3 |

| Frame Line | Column Line | Wind_Left2 Horiz | Wind_Left2 Vert | Wind_Right2 Horiz | Wind_Right2 Vert | Wind_Long1 Horiz | Wind_Long1 Vert | Wind_Long2 Horiz | Wind_Long2 Vert | Seismic_Left Horiz | Seismic_Left Vert | Seismic_Right Horiz | Seismic_Right Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | B | -6.5 | -8.2 | 3.4 | 4.4 | 2.1 | -2.0 | 1.9 | -2.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1* | A | -3.4 | 4.4 | 6.5 | -8.2 | -1.9 | -6.6 | -2.1 | -6.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Frame Line | Column Line | Seismic_Long Horiz | Seismic_Long Vert | F1UNB_SL_L Horiz | F1UNB_SL_L Vert | F1UNB_SL_R Horiz | F1UNB_SL_R Vert |
|---|---|---|---|---|---|---|---|
| 1* | B | 0.0 | 0.0 | 0.2 | 2.6 | 0.2 | 1.3 |
| 1* | A | 0.0 | -0.1 | -0.2 | 1.3 | -0.2 | 2.6 |

| Frame Line | Column Line | Dead Horiz | Dead Vert | Collateral Horiz | Collateral Vert | Live Horiz | Live Vert | Snow Horiz | Snow Vert | Wind_Left1 Horiz | Wind_Left1 Vert | Wind_Right1 Horiz | Wind_Right1 Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | B | 0.1 | 1.1 | 0.0 | 0.5 | 0.4 | 3.7 | 0.5 | 4.8 | -6.5 | -14.9 | 7.5 | 4.9 |
| 2* | A | -0.1 | 1.1 | 0.0 | 0.5 | -0.4 | 3.7 | -0.5 | 4.8 | -7.5 | 4.9 | 6.5 | -14.9 |

| Frame Line | Column Line | Wind_Left2 Horiz | Wind_Left2 Vert | Wind_Right2 Horiz | Wind_Right2 Vert | Wind_Long1 Horiz | Wind_Long1 Vert | Wind_Long2 Horiz | Wind_Long2 Vert | Seismic_Left Horiz | Seismic_Left Vert | Seismic_Right Horiz | Seismic_Right Vert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2* | B | -9.1 | -12.5 | 4.9 | 7.4 | 4.9 | -8.5 | 4.3 | -8.6 | 0.0 | -0.1 | 0.0 | 0.1 |
| 2* | A | -4.9 | 7.4 | 9.1 | -12.5 | -4.3 | -9.4 | -4.9 | -9.0 | 0.0 | 0.1 | 0.0 | -0.1 |

| Frame Line | Column Line | Seismic_Long Horiz | Seismic_Long Vert | F2UNB_SL_L Horiz | F2UNB_SL_L Vert | F2UNB_SL_R Horiz | F2UNB_SL_R Vert |
|---|---|---|---|---|---|---|---|
| 2* | B | 0.0 | -0.1 | 0.5 | 6.1 | 0.5 | 3.0 |
| 2* | A | 0.0 | -0.1 | -0.5 | 3.0 | -0.5 | 9.1 |

1* Frame lines: 1 5
2* Frame lines: 2 3 4

## ANCHOR BOLT SUMMARY

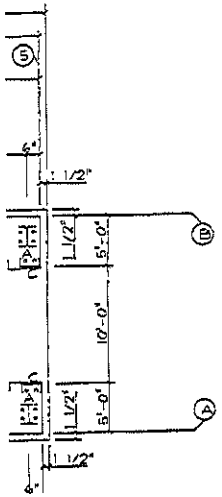
| Qty | Locate | Dia (in) | Type | Total Len (in) | Proj (in) |
|---|---|---|---|---|---|
| 0 & 8 | Jamb | 5/8" | A307 | 13.0 | 2.00 |
| 8 & 40 | Frame | 3/4" | A307 | 15.0 | 2.00 |

ANCHOR BOLTS TO BE DESIGNED AND SUPPLIED BY OTHERS.

ANCHOR BOLTS SHOWN ARE ASSUMED FOR THE PURPOSES OF ANCHOR BOLT FABRICATION, RED DOT SHALL BE NOTIFIED IMMEDIATELY IF THE SELECTED BOLT SIZES OR PATTERNS DIFFER FROM THAT SHOWN HEREIN.

**APPROVAL REQUIRED**

☐ NO EXCEPTION TAKEN
☐ REJECTED
☐ MAKE CORRECTION NOTED




RED-DOT BUILDING
REACTIONS

By: RCM
Date: July 24, 2014

Little Missouri Gas Plant
Slug Catcher
Pier Design

EIKON

PIER REACTIONS:

| Allowable Pier Loads | | |
|---|---|---|
| ROW | SIZE | CAPACITY (kips) |
| 1 | 30 inch | 69 |
| | | |

| Pier # | Realarm (kips) | Pilaster (kips) | TL of Front Wall (ft) | Pinewall (kips) | Piptel (kips) | Min Pier Diameter |
|---|---|---|---|---|---|---|
| 1 | 9.5 | 1.125 | 23 | 6.8 | 17.5 | 30 inch |

| | | | | | | |
|---|---|---|---|---|---|---|
| BORING | B-19 | | DIAMETER OF PIER | 2.5 | FT | PIER DEPTH BELOW FFE 30 FT |
| EXISTING GRADE ELEV | 2217.7 | FT | PIER DEPTH (BELOW BOTTOM OF BEAM) | 28 | FT | |
| FINAL GRADE ELEV | 2221 | FT | BEAM DEPTH | 2 | FT | |
| DELTA GRADE | 3.3 | FILL | DEPTH OF SKIN FRICTION TO OMIT | 5 | FT | |
| ALLOWABLE END BEARING | 7400 | PSF | TOP OF PIER ELEV | 2219 | FT | |
| MINIMUM TIP ELEVATION | 2193 | FT | TOP OF SKIN FRICTION | 2214 | FT | |
| | | | TIP ELEVATION | 2191 | FT | |

CHECK TIP ELEVATION — TIP ELEV OK

| DEPTH (below existing grade) | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 2 | 2217.7 | 2215.7 | 2 | 300 | 2 | 150 | 0 | 0.0 |
| 6.5 | 2215.7 | 2211.2 | 4.5 | 500 | 2 | 250 | 2.8 | 5497.8 |
| 19 | 2211.2 | 2198.7 | 12.5 | 200 | 2 | 100 | 12.5 | 9817.5 |
| 23 | 2198.7 | 2194.7 | 4 | 600 | 2 | 300 | 7.7 | 18142.7 |
| 26 | 2194.7 | 2189.7 | 5 | 1800 | 2 | 900 | 0 | 0.0 |
| 31 | 2189.7 | 2186.7 | 3 | 1800 | 2 | 900 | 0 | 0.0 |
| | | | | | | | TOTAL SKIN FRICTION | 33458.0 |
| | | | | | | | TOTAL END BEARING | 36324.7 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 69 |

UPLIFT CHECK
Uplift (Concrete = 145 PCF)
Thickness of slab — 0 in
Net Column Uplift Force — 0.3 kips

Area of slab to Resist Uplift — 0 sqft
Weight of Slab — 0 pounds (15'x15' square)
Weight of Front Wall — 5800 pounds (20' each side of column)
Weight of Pilaster — 1027.5 pounds
Weight of Pier — 19020 pounds
Total Weight of Concrete — 25847.9734 pounds

F.S. for Uplift 1.938570752 (0.5*weight of concrete/net uplift) OK

By: RCM
Date: July 24, 2014

Little Missouri Gas Plant
Slug Catcher
Pier Design

EIKON

PIER REACTIONS:

| Allowable Pier Loads | | |
|---|---|---|
| ROW | SIZE | CAPACITY (kips) |
| 1 | 18 inch | 33 |
| | | |

| Pier # | Rbeam (kips) | Pcolumn (kips) | TL of Frost Wall (ft) | Pfrostwall (kips) | Ptotal (kips) | Min Pier Diameter |
|---|---|---|---|---|---|---|
| 1 | 29 | 0 | 0 | 0.0 | 29.0 | 18 inch |

| | | | | | |
|---|---|---|---|---|---|
| BORING | B-19 | | DIAMETER OF PIER | 1.5 | FT |
| EXISTING GRADE ELEV | 2217.7 | FT | PIER DEPTH (BELOW BOTTOM OF BEAM) | 26 | FT |
| FINAL GRADE ELEV | 2221 | FT | BEAM DEPTH | 2 | FT |
| DELTA GRADE | 3.3 | FILL | DEPTH OF SKIN FRICTION TO OMIT | 5 | FT |
| ALLOWABLE END BEARING | 7400 | PSF | TOP OF PIER ELEV | 2219 | FT |
| MINIMUM TIP ELEVATION | 2193 | FT | TOP OF SKIN FRICTION | 2214 | FT |
| | | | TIP ELEVATION | 2191 | FT |

PIER DEPTH BELOW FFE 30 FT

CHECK TIP ELEVATION TIP ELEV OK

| DEPTH (below existing grade) | T/ELEV | B/ELEV | THICKNESS OF LAYER | ULTIMATE SKIN (PSF) | F.S. | ALLOWABLE SKIN FRICTION (PSF) | DEPTH IN LAYER FOR SKIN FRICTION | ALLOWABLE SKIN FRICTION (POUNDS) |
|---|---|---|---|---|---|---|---|---|
| 2 | 2217.7 | 2215.7 | 2 | 300 | 2 | 150 | 0 | 0.0 |
| 6.5 | 2215.7 | 2211.2 | 4.5 | 500 | 2 | 250 | 2.8 | 3298.7 |
| 19 | 2211.2 | 2198.7 | 12.5 | 200 | 2 | 100 | 12.5 | 5890.5 |
| 23 | 2198.7 | 2194.7 | 4 | 600 | 2 | 300 | 7.7 | 10895.6 |
| 28 | 2194.7 | 2189.7 | 5 | 1800 | 2 | 900 | 0 | 0.0 |
| 31 | 2189.7 | 2186.7 | 3 | 1800 | 2 | 900 | 8 | 0.0 |
| | | | | | | | TOTAL SKIN FRICTION | 20074.8 |
| | | | | | | | TOTAL END BEARING | 13076.9 |
| | | | | | | | TOTAL END + SKIN (KIPS) | 33 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235
Licensee : EIKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

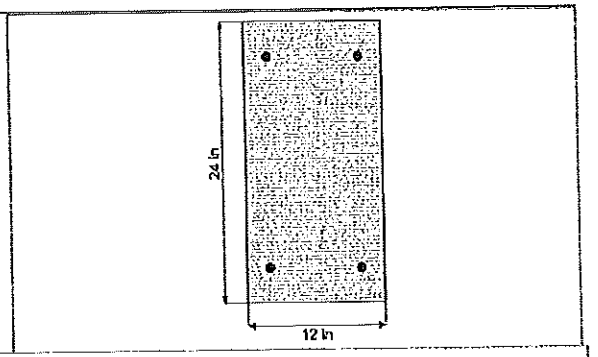
### CODE REFERENCES

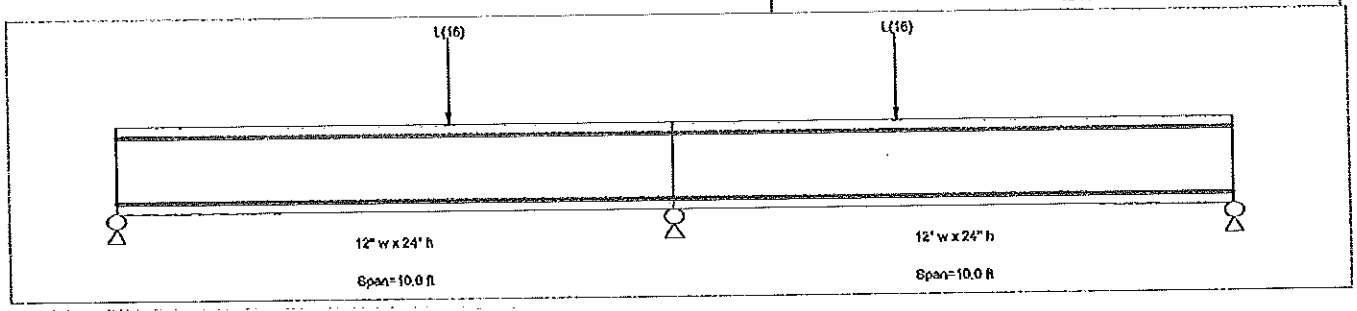
Calculations per ACI 318-11, IBC 2012, ASCE 7-10
Load Combination Set : ASCE 7-05

### Material Properties

| | | | | | |
|---|---|---|---|---|---|
| f'c | = | 4.50 ksi | ϕ Phi Values | Flexure : | 0.90 |
| fr = f'c^1/2 * 7.50 | = | 603.12 psi | | Shear : | 0.750 |
| ψ Density | = | 145.0 pcf | $\beta_1$ | = | 0.8250 |
| λ LWt Factor | = | 1.0 | | | |
| Elastic Modulus | = | 3,122.0 ksi | Fy - Stirrups | | 60.0 ksi |
| | | | E - Stirrups | = | 29,000.0 ksi |
| fy - Main Rebar | = | 60.0 ksi | Stirrup Bar Size # | = | # 3 |
| E - Main Rebar | = | 29,000.0 ksi | Number of Resisting Legs Per Stirrup | = | 2 |

Load Combination ASCE 7-05




### Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#7 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#7 at 3.0 in from Top, from 0.0 to 10.0 ft in this span
Span #2 Reinforcing....
2-#7 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#7 at 3.0 in from Top, from 0.0 to 10.0 ft in this span

### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

**Beam self weight calculated and added to loads**
**Load for Span Number 1**
Point Load : L = 16.0 k @ 6.0 ft
**Load for Span Number 2**
Point Load : L = 16.0 k @ 4.0 ft

### DESIGN SUMMARY

**Design OK**

| | | | | | |
|---|---|---|---|---|---|
| Maximum Bending Stress Ratio | = | 0.481 : 1 | Maximum Deflection | | |
| Section used for this span | | Typical Section | Max Downward L+Lr+S Deflection | 0.005 in | Ratio = 24416 |
| Mu : Applied | | -53.502 k-ft | Max Upward L+Lr+S Deflection | 0.000 in | Ratio = 0 <360 |
| Mn * Phi : Allowable | | 111.124 k-ft | Max Downward Total Deflection | 0.008 in | Ratio = 21709 |
| Load Combination | | +1.20D+0.50Lr+1.60L+1.60H | Max Upward Total Deflection | 0.000 in | Ratio = 999 |
| Location of maximum on span | | 0.000 ft | | | |
| Span # where maximum occurs | | Span # 2 | | | |

### Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 | Support 3 |
|---|---|---|---|
| Overall MAXimum | 4.415 | 28.969 | 4.416 |
| Overall MINimum | 0.653 | 2.175 | 0.653 |
| +D | 1.088 | 3.625 | 1.088 |
| +D+L+H | 4.415 | 28.969 | 4.416 |
| +D+Lr+H | 1.088 | 3.625 | 1.088 |
| +D+S+H | 1.088 | 3.625 | 1.088 |
| +D+0.750Lr+0.750L+H | 3.583 | 22.633 | 3.584 |
| +D+0.750L+0.750S+H | 3.583 | 22.633 | 3.584 |
| +D+W+H | 1.088 | 3.625 | 1.088 |
| +D+0.70E+H | 1.088 | 3.625 | 1.088 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235
Licensee : EIKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

### Vertical Reactions - Unfactored

Support notation : Far left is #1

| Load Combination | Support 1 | Support 2 | Support 3 |
|---|---|---|---|
| +D+0.750Lr+0.750L+0.750W+H | 3.583 | 22.633 | 3.584 |
| +D+0.750L+0.750S+0.750W+H | 3.583 | 22.633 | 3.584 |
| +D+0.750Lr+0.750L+0.525E+H | 3.583 | 22.633 | 3.584 |
| +D+0.750L+0.750S+0.525E+H | 3.583 | 22.633 | 3.584 |
| +0.60D+W+H | 0.653 | 2.175 | 0.653 |
| +0.60D+0.70E+H | 0.653 | 2.175 | 0.653 |
| D Only | 1.088 | 3.625 | 1.088 |
| Lr Only | | | |
| L Only | 3.328 | 25.344 | 3.328 |
| S Only | | | |
| W Only | | | |
| E Only | | | |
| H Only | | | |
| +D | 1.088 | 3.625 | 1.088 |
| +D+L+H | 4.415 | 28.969 | 4.416 |
| +D+Lr+H | 1.088 | 3.625 | 1.088 |
| +D+S+H | 1.088 | 3.625 | 1.088 |
| +D+0.750Lr+0.750L+H | 3.583 | 22.633 | 3.584 |
| +D+0.750L+0.750S+H | 3.583 | 22.633 | 3.584 |
| +D+W+H | 1.088 | 3.625 | 1.088 |
| +D+0.70E+H | 1.088 | 3.625 | 1.088 |
| +D+0.750Lr+0.750L+0.750W+H | 3.583 | 22.633 | 3.584 |

### Shear Stirrup Requirements

Between 0.00 to 6.00 ft, Vu < PhiVc/2, Req'd Vs = Not Reqd 11.4.6.1, use stirrups spaced at 0.000 in
Between 6.05 to 14.00 ft, PhiVc/2 < Vu <= PhiVc, Req'd Vs = Min 11.4.6.1, use stirrups spaced at 10.000 in
Between 14.05 to 19.95 ft, Vu < PhiVc/2, Req'd Vs = Not Reqd 11.4.6.1, use stirrups spaced at 0.000 in

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Location (ft) in Span | Bending Stress Results (k-ft) Mu : Max | Phi*Mnx | Stress Ratio |
|---|---|---|---|---|---|
| MAXimum BENDING Envelope | | | | | |
| Span # 1 | 1 | 10.000 | -52.43 | 111.12 | 0.47 |
| Span # 2 | 2 | 10.000 | -53.50 | 111.12 | 0.48 |
| +1.40D | | | | | |
| Span # 1 | 1 | 10.000 | -4.95 | 111.12 | 0.04 |
| Span # 2 | 2 | 10.000 | -5.07 | 111.12 | 0.05 |
| +1.20D+0.50Lr+1.60L+1.60H | | | | | |
| Span # 1 | 1 | 10.000 | -52.43 | 111.12 | 0.47 |
| Span # 2 | 2 | 10.000 | -53.50 | 111.12 | 0.48 |
| +1.20D+1.60L+0.50S+1.60H | | | | | |
| Span # 1 | 1 | 10.000 | -52.43 | 111.12 | 0.47 |
| Span # 2 | 2 | 10.000 | -53.50 | 111.12 | 0.48 |
| +1.20D+1.60Lr+0.50L | | | | | |
| Span # 1 | 1 | 10.000 | -19.31 | 111.12 | 0.17 |
| Span # 2 | 2 | 10.000 | -19.71 | 111.12 | 0.18 |
| +1.20D+1.60Lr+0.80W | | | | | |
| Span # 1 | 1 | 10.000 | -4.25 | 111.12 | 0.04 |
| Span # 2 | 2 | 10.000 | -4.35 | 111.12 | 0.04 |
| +1.20D+0.50L+1.60S | | | | | |
| Span # 1 | 1 | 10.000 | -19.31 | 111.12 | 0.17 |
| Span # 2 | 2 | 10.000 | -19.71 | 111.12 | 0.18 |
| +1.20D+1.60S+0.80W | | | | | |
| Span # 1 | 1 | 10.000 | -4.25 | 111.12 | 0.04 |
| Span # 2 | 2 | 10.000 | -4.35 | 111.12 | 0.04 |
| +1.20D+0.50Lr+0.50L+1.60W | | | | | |
| Span # 1 | 1 | 10.000 | -19.31 | 111.12 | 0.17 |
| Span # 2 | 2 | 10.000 | -19.71 | 111.12 | 0.18 |
| +1.20D+0.50L+0.50S+1.60W | | | | | |
| Span # 1 | 1 | 10.000 | -19.31 | 111.12 | 0.17 |
| Span # 2 | 2 | 10.000 | -19.71 | 111.12 | 0.18 |
| +1.20D+0.50L+0.20S+E | | | | | |
| Span # 1 | 1 | 10.000 | -10.31 | 111.12 | 0.17 |
| Span # 2 | 2 | 10.000 | -19.71 | 111.12 | 0.18 |
| +0.90D+1.60W+1.60H | | | | | |
| Span # 1 | 1 | 10.000 | -3.19 | 111.12 | 0.03 |
| Span # 2 | 2 | 10.000 | -3.26 | 111.12 | 0.03 |

# Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235
Licensee : ElKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

| Load Combination Segment Length | Span # | Location (ft) In Span | Bending Stress Results (k-ft) Mu : Max | Phi*Mnx | Stress Ratio |
|---|---|---|---|---|---|
| +0.90D+E+1.60H | | | | | |
| Span # 1 | 1 | 10.000 | -3.19 | 111.12 | 0.03 |
| Span # 2 | 2 | 10.000 | -3.26 | 111.12 | 0.03 |

## Overall Maximum Deflections - Unfactored Loads

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| L Only | 1 | 0.0049 | 4.833 | | 0.0000 | 0.000 |
| L Only | 2 | 0.0049 | 5.167 | | 0.0000 | 0.000 |

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.00 | 21.00 | 6.63 | 6.63 | 0.00 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.05 | 21.00 | 6.61 | 6.61 | 0.32 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.10 | 21.00 | 6.60 | 6.60 | 0.63 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.14 | 21.00 | 6.58 | 6.58 | 0.94 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.19 | 21.00 | 6.56 | 6.56 | 1.26 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.24 | 21.00 | 6.55 | 6.55 | 1.57 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.29 | 21.00 | 6.53 | 6.53 | 1.88 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.33 | 21.00 | 6.51 | 6.51 | 2.19 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.38 | 21.00 | 6.50 | 6.50 | 2.50 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.43 | 21.00 | 6.48 | 6.48 | 2.81 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.48 | 21.00 | 6.46 | 6.46 | 3.12 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.52 | 21.00 | 6.45 | 6.45 | 3.42 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.57 | 21.00 | 6.43 | 6.43 | 3.73 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.62 | 21.00 | 6.41 | 6.41 | 4.04 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.67 | 21.00 | 6.40 | 6.40 | 4.34 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.71 | 21.00 | 6.38 | 6.38 | 4.65 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.76 | 21.00 | 6.36 | 6.36 | 4.95 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.81 | 21.00 | 6.35 | 6.35 | 5.25 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.86 | 21.00 | 6.33 | 6.33 | 5.55 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.90 | 21.00 | 6.31 | 6.31 | 5.86 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 0.95 | 21.00 | 6.30 | 6.30 | 6.16 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.00 | 21.00 | 6.28 | 6.28 | 6.46 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.05 | 21.00 | 6.27 | 6.27 | 6.75 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.10 | 21.00 | 6.25 | 6.25 | 7.05 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.14 | 21.00 | 6.23 | 6.23 | 7.35 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.19 | 21.00 | 6.22 | 6.22 | 7.65 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.24 | 21.00 | 6.20 | 6.20 | 7.94 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.29 | 21.00 | 6.18 | 6.18 | 8.24 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.33 | 21.00 | 6.17 | 6.17 | 8.53 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.38 | 21.00 | 6.15 | 6.15 | 8.82 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.43 | 21.00 | 6.13 | 6.13 | 9.12 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.46 | 21.00 | 6.12 | 6.12 | 9.41 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.52 | 21.00 | 6.10 | 6.10 | 9.70 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.57 | 21.00 | 6.08 | 6.08 | 9.99 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.62 | 21.00 | 6.07 | 6.07 | 10.28 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.67 | 21.00 | 6.05 | 6.05 | 10.57 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.71 | 21.00 | 6.03 | 6.03 | 10.85 | 0.97 | 26.28 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.76 | 21.00 | 6.02 | 6.02 | 11.14 | 0.95 | 26.22 | Vu < PhiVc/2 | Not Reqd 1 | 26.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.81 | 21.00 | 6.00 | 6.00 | 11.43 | 0.92 | 26.16 | Vu < PhiVc/2 | Not Reqd 1 | 26.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.86 | 21.00 | 5.98 | 5.98 | 11.71 | 0.89 | 26.10 | Vu < PhiVc/2 | Not Reqd 1 | 26.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.90 | 21.00 | 5.97 | 5.97 | 12.00 | 0.87 | 26.05 | Vu < PhiVc/2 | Not Reqd 1 | 26.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 1.95 | 21.00 | 5.95 | 5.95 | 12.28 | 0.85 | 26.00 | Vu < PhiVc/2 | Not Reqd 1 | 26.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.00 | 21.00 | 5.93 | 5.93 | 12.56 | 0.83 | 25.95 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.05 | 21.00 | 5.92 | 5.92 | 12.85 | 0.81 | 25.90 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.10 | 21.00 | 5.90 | 5.90 | 13.13 | 0.79 | 25.86 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |

# Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235
Licensee : EIKON Consultant Group, LLC

Description : grado beam at slug catcher (16k wheel load)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.14 | 21.00 | 5.88 | 5.88 | 13.41 | 0.77 | 25.82 | Vu < PhiVc/2 | Not Reqd 1 | 25.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.19 | 21.00 | 5.87 | 5.87 | 13.69 | 0.75 | 25.78 | Vu < PhiVc/2 | Not Reqd 1 | 25.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.24 | 21.00 | 5.85 | 5.85 | 13.97 | 0.73 | 25.74 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.29 | 21.00 | 5.83 | 5.83 | 14.24 | 0.72 | 25.70 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.33 | 21.00 | 5.82 | 5.82 | 14.52 | 0.70 | 25.67 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.38 | 21.00 | 5.80 | 5.80 | 14.80 | 0.69 | 25.63 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.43 | 21.00 | 5.78 | 5.78 | 15.07 | 0.67 | 25.60 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.48 | 21.00 | 5.77 | 5.77 | 15.35 | 0.66 | 25.57 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.52 | 21.00 | 5.75 | 5.75 | 15.62 | 0.64 | 25.54 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.57 | 21.00 | 5.73 | 5.73 | 15.90 | 0.63 | 25.51 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.62 | 21.00 | 5.72 | 5.72 | 16.17 | 0.62 | 25.48 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.67 | 21.00 | 5.70 | 5.70 | 16.44 | 0.61 | 25.45 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.71 | 21.00 | 5.69 | 5.69 | 16.71 | 0.60 | 25.43 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.78 | 21.00 | 5.67 | 5.67 | 16.98 | 0.58 | 25.40 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.81 | 21.00 | 5.65 | 5.65 | 17.25 | 0.57 | 25.38 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.86 | 21.00 | 5.64 | 5.64 | 17.52 | 0.56 | 25.36 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.90 | 21.00 | 5.62 | 5.62 | 17.79 | 0.55 | 25.33 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 2.95 | 21.00 | 5.60 | 5.60 | 18.06 | 0.54 | 25.31 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.00 | 21.00 | 5.59 | 5.59 | 18.32 | 0.53 | 25.29 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.05 | 21.00 | 5.57 | 5.57 | 18.59 | 0.52 | 25.27 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.10 | 21.00 | 5.55 | 5.55 | 18.85 | 0.52 | 25.26 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.14 | 21.00 | 5.54 | 5.54 | 19.12 | 0.51 | 25.23 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.19 | 21.00 | 5.52 | 5.52 | 19.38 | 0.50 | 25.21 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.24 | 21.00 | 5.50 | 5.50 | 19.64 | 0.49 | 25.19 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.29 | 21.00 | 5.49 | 5.49 | 19.91 | 0.48 | 25.17 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.33 | 21.00 | 5.47 | 5.47 | 20.17 | 0.47 | 25.16 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.38 | 21.00 | 5.45 | 5.45 | 20.43 | 0.47 | 25.14 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.43 | 21.00 | 5.44 | 5.44 | 20.69 | 0.46 | 25.12 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.48 | 21.00 | 5.42 | 5.42 | 20.94 | 0.45 | 25.11 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.52 | 21.00 | 5.40 | 5.40 | 21.20 | 0.45 | 25.09 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.57 | 21.00 | 5.39 | 5.39 | 21.46 | 0.44 | 25.08 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.62 | 21.00 | 5.37 | 5.37 | 21.71 | 0.43 | 25.06 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.67 | 21.00 | 5.35 | 5.35 | 21.97 | 0.43 | 25.05 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.71 | 21.00 | 5.34 | 5.34 | 22.22 | 0.42 | 25.03 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.76 | 21.00 | 5.32 | 5.32 | 22.48 | 0.41 | 25.02 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.81 | 21.00 | 5.30 | 5.30 | 22.73 | 0.41 | 25.01 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.86 | 21.00 | 5.29 | 5.29 | 22.98 | 0.40 | 25.00 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.90 | 21.00 | 5.27 | 5.27 | 23.23 | 0.40 | 24.98 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 3.95 | 21.00 | 5.25 | 5.25 | 23.49 | 0.39 | 24.97 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.00 | 21.00 | 5.24 | 5.24 | 23.74 | 0.39 | 24.96 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.05 | 21.00 | 5.22 | 5.22 | 23.98 | 0.38 | 24.95 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.10 | 21.00 | 5.20 | 5.20 | 24.23 | 0.36 | 24.93 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.14 | 21.00 | 5.19 | 5.19 | 24.48 | 0.37 | 24.92 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.19 | 21.00 | 5.17 | 5.17 | 24.73 | 0.37 | 24.91 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.24 | 21.00 | 5.15 | 5.15 | 24.97 | 0.36 | 24.90 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.29 | 21.00 | 5.14 | 5.14 | 25.22 | 0.36 | 24.89 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.33 | 21.00 | 5.12 | 5.12 | 25.46 | 0.35 | 24.88 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.38 | 21.00 | 5.11 | 5.11 | 25.71 | 0.35 | 24.87 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.43 | 21.00 | 5.09 | 5.09 | 25.95 | 0.34 | 24.86 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.48 | 21.00 | 5.07 | 5.07 | 26.19 | 0.34 | 24.85 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.52 | 21.00 | 5.06 | 5.06 | 26.43 | 0.33 | 24.84 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.57 | 21.00 | 5.04 | 5.04 | 26.67 | 0.33 | 24.83 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.62 | 21.00 | 5.02 | 5.02 | 26.91 | 0.33 | 24.82 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.67 | 21.00 | 5.01 | 5.01 | 27.15 | 0.32 | 24.82 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Constultant Group, LLC
Lic. # : KW-06010235

Description : grade beam at slug catcher (16k wheel load)

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | PhiVc (k) | Comment | PhiVs (k) | PhiVn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.71 | 21.00 | 4.99 | 4.99 | 27.39 | 0.32 | 24.81 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.76 | 21.00 | 4.97 | 4.97 | 27.62 | 0.32 | 24.80 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.81 | 21.00 | 4.96 | 4.96 | 27.86 | 0.31 | 24.79 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.86 | 21.00 | 4.94 | 4.94 | 28.10 | 0.31 | 24.78 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.90 | 21.00 | 4.92 | 4.92 | 28.33 | 0.30 | 24.77 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 4.95 | 21.00 | 4.91 | 4.91 | 28.57 | 0.30 | 24.77 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.00 | 21.00 | 4.89 | 4.89 | 28.80 | 0.30 | 24.76 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.05 | 21.00 | 4.87 | 4.87 | 29.03 | 0.29 | 24.75 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.10 | 21.00 | 4.86 | 4.86 | 20.26 | 0.29 | 24.74 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.14 | 21.00 | 4.84 | 4.84 | 29.49 | 0.29 | 24.74 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.19 | 21.00 | 4.82 | 4.82 | 29.72 | 0.28 | 24.73 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.24 | 21.00 | 4.81 | 4.81 | 29.95 | 0.28 | 24.72 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.29 | 21.00 | 4.79 | 4.79 | 30.18 | 0.28 | 24.71 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.33 | 21.00 | 4.77 | 4.77 | 30.41 | 0.27 | 24.71 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.38 | 21.00 | 4.76 | 4.76 | 30.64 | 0.27 | 24.70 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.43 | 21.00 | 4.74 | 4.74 | 30.86 | 0.27 | 24.69 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.48 | 21.00 | 4.72 | 4.72 | 31.09 | 0.27 | 24.69 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.52 | 21.00 | 4.71 | 4.71 | 31.31 | 0.26 | 24.68 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.57 | 21.00 | 4.69 | 4.69 | 31.54 | 0.26 | 24.67 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.62 | 21.00 | 4.67 | 4.67 | 31.76 | 0.26 | 24.67 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.67 | 21.00 | 4.66 | 4.66 | 31.98 | 0.25 | 24.66 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.71 | 21.00 | 4.64 | 4.64 | 32.20 | 0.25 | 24.66 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.76 | 21.00 | 4.62 | 4.62 | 32.42 | 0.25 | 24.65 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.81 | 21.00 | 4.61 | 4.61 | 32.64 | 0.25 | 24.64 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.86 | 21.00 | 4.59 | 4.59 | 32.86 | 0.24 | 24.64 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.90 | 21.00 | 4.57 | 4.57 | 33.08 | 0.24 | 24.63 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 5.95 | 21.00 | 4.56 | 4.56 | 33.30 | 0.24 | 24.63 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.00 | 21.00 | 4.54 | 4.54 | 33.51 | 0.24 | 24.62 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.05 | 21.00 | -21.07 | 21.07 | 32.51 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.10 | 21.00 | -21.09 | 21.09 | 31.51 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.14 | 21.00 | -21.11 | 21.11 | 30.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.19 | 21.00 | -21.12 | 21.12 | 29.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.24 | 21.00 | -21.14 | 21.14 | 28.49 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.29 | 21.00 | -21.16 | 21.18 | 27.48 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.33 | 21.00 | -21.17 | 21.17 | 26.48 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.38 | 21.00 | -21.19 | 21.19 | 25.47 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.43 | 21.00 | -21.21 | 21.21 | 24.46 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.48 | 21.00 | -21.22 | 21.22 | 23.45 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.52 | 21.00 | -21.24 | 21.24 | 22.44 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.57 | 21.00 | -21.26 | 21.26 | 21.42 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.62 | 21.00 | -21.27 | 21.27 | 20.41 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.67 | 21.00 | -21.29 | 21.29 | 19.40 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.71 | 21.00 | -21.31 | 21.31 | 18.38 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.76 | 21.00 | -21.32 | 21.32 | 17.37 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.81 | 21.00 | -21.34 | 21.34 | 16.35 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.86 | 21.00 | -21.36 | 21.36 | 15.34 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.90 | 21.00 | -21.37 | 21.37 | 14.32 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 6.95 | 21.00 | -21.39 | 21.39 | 13.30 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.00 | 21.00 | -21.41 | 21.41 | 12.28 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.05 | 21.00 | -21.42 | 21.42 | 11.26 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.10 | 21.00 | -21.44 | 21.44 | 10.24 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.14 | 21.00 | -21.46 | 21.46 | 9.22 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.19 | 21.00 | -21.47 | 21.47 | 8.20 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.24 | 21.00 | -21.49 | 21.49 | 7.18 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010235
Licensee : EIKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.29 | 21.00 | -21.51 | 21.51 | 6.15 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.33 | 21.00 | -21.52 | 21.52 | 5.13 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.38 | 21.00 | -21.54 | 21.54 | 4.10 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.43 | 21.00 | -21.56 | 21.56 | 3.08 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.48 | 21.00 | -21.57 | 21.57 | 2.05 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.52 | 21.00 | -21.59 | 21.59 | 1.02 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.57 | 21.00 | -21.61 | 21.61 | 0.01 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.62 | 21.00 | -21.62 | 21.62 | 1.04 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.67 | 21.00 | -21.64 | 21.64 | 2.07 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.71 | 21.00 | -21.65 | 21.65 | 3.10 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.76 | 21.00 | -21.67 | 21.67 | 4.13 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.81 | 21.00 | -21.69 | 21.69 | 5.16 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.86 | 21.00 | -21.70 | 21.70 | 6.19 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.90 | 21.00 | -21.72 | 21.72 | 7.23 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 7.95 | 21.00 | -21.74 | 21.74 | 8.26 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.00 | 21.00 | -21.75 | 21.75 | 9.30 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.05 | 21.00 | -21.77 | 21.77 | 10.33 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.10 | 21.00 | -21.79 | 21.79 | 11.37 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.14 | 21.00 | -21.80 | 21.80 | 12.41 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.19 | 21.00 | -21.82 | 21.82 | 13.45 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.24 | 21.00 | -21.84 | 21.84 | 14.49 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.29 | 21.00 | -21.85 | 21.85 | 15.53 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.33 | 21.00 | -21.87 | 21.87 | 16.57 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.38 | 21.00 | -21.89 | 21.89 | 17.61 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.43 | 21.00 | -21.90 | 21.90 | 18.65 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.48 | 21.00 | -21.92 | 21.92 | 19.70 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.52 | 21.00 | -21.94 | 21.94 | 20.74 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.57 | 21.00 | -21.95 | 21.95 | 21.79 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.62 | 21.00 | -21.97 | 21.97 | 22.83 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.67 | 21.00 | -21.99 | 21.99 | 23.88 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.71 | 21.00 | -22.00 | 22.00 | 24.93 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.76 | 21.00 | -22.02 | 22.02 | 25.97 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.81 | 21.00 | -22.04 | 22.04 | 27.02 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.86 | 21.00 | -22.05 | 22.05 | 28.07 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.90 | 21.00 | -22.07 | 22.07 | 29.12 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 8.95 | 21.00 | -22.09 | 22.09 | 30.17 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.00 | 21.00 | -22.10 | 22.10 | 31.23 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.05 | 21.00 | -22.12 | 22.12 | 32.28 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.10 | 21.00 | -22.14 | 22.14 | 33.33 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.14 | 21.00 | -22.15 | 22.15 | 34.39 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.19 | 21.00 | -22.17 | 22.17 | 35.44 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.24 | 21.00 | -22.19 | 22.19 | 36.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.29 | 21.00 | -22.20 | 22.20 | 37.55 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.33 | 21.00 | -22.22 | 22.22 | 38.61 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.38 | 21.00 | -22.23 | 22.23 | 39.67 | 0.98 | 26.30 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.0 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.43 | 21.00 | -22.25 | 22.25 | 40.73 | 0.96 | 26.24 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.0 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.48 | 21.00 | -22.27 | 22.27 | 41.70 | 0.93 | 26.19 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.0 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.52 | 21.00 | -22.28 | 22.28 | 42.85 | 0.91 | 26.14 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.9 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.57 | 21.00 | -22.30 | 22.30 | 43.91 | 0.89 | 26.09 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.9 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.62 | 21.00 | -22.32 | 22.32 | 44.97 | 0.87 | 26.04 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.8 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.67 | 21.00 | -22.33 | 22.33 | 46.04 | 0.85 | 26.00 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.8 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.71 | 21.00 | -22.35 | 22.35 | 47.10 | 0.83 | 25.96 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.76 | 21.00 | -22.37 | 22.37 | 48.17 | 0.81 | 25.92 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.81 | 21.00 | -22.38 | 22.38 | 49.23 | 0.80 | 25.88 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |

# Concrete Beam

Lic. # : KW-06010235

Description : grade beam at slug catcher (16k wheel load)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | PhiVc (k) | Comment | PhiVs (k) | PhiVn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.86 | 21.00 | -22.40 | 22.40 | 50.30 | 0.78 | 25.84 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.90 | 21.00 | -22.42 | 22.42 | 51.37 | 0.76 | 25.81 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 1 | 9.95 | 21.00 | -22.43 | 22.43 | 52.43 | 0.75 | 25.77 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.00 | 21.00 | 22.45 | 22.46 | 53.50 | 0.73 | 25.74 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.5 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.05 | 21.00 | 22.43 | 22.43 | 52.43 | 0.75 | 25.77 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.10 | 21.00 | 22.42 | 22.42 | 51.37 | 0.78 | 25.81 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.14 | 21.00 | 22.40 | 22.40 | 50.30 | 0.78 | 25.84 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.6 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.19 | 21.00 | 22.38 | 22.38 | 49.23 | 0.80 | 25.88 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.24 | 21.00 | 22.37 | 22.37 | 48.17 | 0.81 | 25.92 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.29 | 21.00 | 22.35 | 22.35 | 47.10 | 0.83 | 25.96 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.7 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.33 | 21.00 | 22.33 | 22.33 | 46.04 | 0.85 | 26.00 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.8 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.38 | 21.00 | 22.32 | 22.32 | 44.97 | 0.87 | 26.04 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.8 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.43 | 21.00 | 22.30 | 22.30 | 43.91 | 0.89 | 26.09 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.9 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.48 | 21.00 | 22.28 | 22.28 | 42.85 | 0.91 | 26.14 | PhiVc/2 < Vu <= | Min 11.4.6 | 46.9 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.52 | 21.00 | 22.27 | 22.27 | 41.79 | 0.93 | 26.19 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.0 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.57 | 21.00 | 22.25 | 22.25 | 40.73 | 0.96 | 26.24 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.0 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.62 | 21.00 | 22.23 | 22.23 | 39.67 | 0.98 | 26.30 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.67 | 21.00 | 22.22 | 22.22 | 38.61 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.71 | 21.00 | 22.20 | 22.20 | 37.55 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.76 | 21.00 | 22.19 | 22.19 | 36.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.81 | 21.00 | 22.17 | 22.17 | 35.44 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.86 | 21.00 | 22.15 | 22.15 | 34.39 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.90 | 21.00 | 22.14 | 22.14 | 33.33 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 10.95 | 21.00 | 22.12 | 22.12 | 32.28 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.00 | 21.00 | 22.10 | 22.10 | 31.23 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.05 | 21.00 | 22.09 | 22.09 | 30.17 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.10 | 21.00 | 22.07 | 22.07 | 29.12 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.14 | 21.00 | 22.05 | 22.05 | 28.07 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.19 | 21.00 | 22.04 | 22.04 | 27.02 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.24 | 21.00 | 22.02 | 22.02 | 25.97 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.29 | 21.00 | 22.00 | 22.00 | 24.93 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.33 | 21.00 | 21.99 | 21.99 | 23.88 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.38 | 21.00 | 21.97 | 21.97 | 22.83 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.43 | 21.00 | 21.95 | 21.95 | 21.79 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.48 | 21.00 | 21.94 | 21.94 | 20.74 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.52 | 21.00 | 21.92 | 21.92 | 19.70 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.57 | 21.00 | 21.90 | 21.90 | 18.65 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.62 | 21.00 | 21.89 | 21.89 | 17.61 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.67 | 21.00 | 21.87 | 21.87 | 16.57 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.71 | 21.00 | 21.85 | 21.85 | 15.53 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.76 | 21.00 | 21.84 | 21.84 | 14.49 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.81 | 21.00 | 21.82 | 21.82 | 13.45 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.86 | 21.00 | 21.80 | 21.80 | 12.41 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.90 | 21.00 | 21.79 | 21.79 | 11.37 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 11.95 | 21.00 | 21.77 | 21.77 | 10.33 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.00 | 21.00 | 21.75 | 21.75 | 9.30 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.05 | 21.00 | 21.74 | 21.74 | 8.26 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.10 | 21.00 | 21.72 | 21.72 | 7.23 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.14 | 21.00 | 21.70 | 21.70 | 6.19 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.19 | 21.00 | 21.69 | 21.69 | 5.16 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.24 | 21.00 | 21.67 | 21.67 | 4.13 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.29 | 21.00 | 21.65 | 21.65 | 3.10 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.33 | 21.00 | 21.64 | 21.64 | 2.07 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.38 | 21.00 | 21.62 | 21.62 | 1.04 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |

# Concrete Beam

File = I:\140901~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Licensee : EIKON Consultant Group, LLC
Lic. # : KW-06010235

Description : grade beam at slug catcher (16k wheel load)

## Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.43 | 21.00 | 21.61 | 21.61 | 0.01 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.48 | 21.00 | 21.59 | 21.59 | 1.02 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.52 | 21.00 | 21.57 | 21.57 | 2.05 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.57 | 21.00 | 21.56 | 21.56 | 3.08 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.62 | 21.00 | 21.54 | 21.54 | 4.10 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.67 | 21.00 | 21.52 | 21.52 | 5.13 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.71 | 21.00 | 21.51 | 21.51 | 6.15 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.76 | 21.00 | 21.49 | 21.49 | 7.18 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.81 | 21.00 | 21.47 | 21.47 | 8.20 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.86 | 21.00 | 21.46 | 21.46 | 9.22 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.90 | 21.00 | 21.44 | 21.44 | 10.24 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 12.95 | 21.00 | 21.42 | 21.42 | 11.26 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.00 | 21.00 | 21.41 | 21.41 | 12.28 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.05 | 21.00 | 21.39 | 21.39 | 13.30 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.10 | 21.00 | 21.37 | 21.37 | 14.32 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.14 | 21.00 | 21.36 | 21.36 | 15.34 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.19 | 21.00 | 21.34 | 21.34 | 16.35 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.24 | 21.00 | 21.32 | 21.32 | 17.37 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.29 | 21.00 | 21.31 | 21.31 | 18.38 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.33 | 21.00 | 21.29 | 21.29 | 19.40 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.38 | 21.00 | 21.27 | 21.27 | 20.41 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.43 | 21.00 | 21.26 | 21.26 | 21.42 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.48 | 21.00 | 21.24 | 21.24 | 22.44 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.52 | 21.00 | 21.22 | 21.22 | 23.45 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.57 | 21.00 | 21.21 | 21.21 | 24.46 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.62 | 21.00 | 21.19 | 21.19 | 25.47 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.67 | 21.00 | 21.17 | 21.17 | 26.48 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.71 | 21.00 | 21.16 | 21.16 | 27.48 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.76 | 21.00 | 21.14 | 21.14 | 28.49 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.81 | 21.00 | 21.12 | 21.12 | 29.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.86 | 21.00 | 21.11 | 21.11 | 30.50 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.90 | 21.00 | 21.09 | 21.09 | 31.51 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 13.95 | 21.00 | 21.07 | 21.07 | 32.51 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.00 | 21.00 | 21.06 | 21.06 | 33.51 | 1.00 | 26.34 | PhiVc/2 < Vu <= | Min 11.4.6 | 47.1 | 10.5 | 10.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.05 | 21.00 | -4.56 | 4.56 | 33.30 | 0.24 | 24.63 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.10 | 21.00 | -4.57 | 4.57 | 33.08 | 0.24 | 24.63 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.14 | 21.00 | -4.59 | 4.59 | 32.86 | 0.24 | 24.64 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.19 | 21.00 | -4.61 | 4.61 | 32.64 | 0.25 | 24.64 | Vu < PhiVc/2 | Not Reqd 1 | 24.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.24 | 21.00 | -4.62 | 4.62 | 32.42 | 0.25 | 24.65 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.29 | 21.00 | -4.64 | 4.64 | 32.20 | 0.25 | 24.66 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.33 | 21.00 | -4.66 | 4.66 | 31.98 | 0.25 | 24.66 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.38 | 21.00 | -4.67 | 4.67 | 31.76 | 0.26 | 24.67 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.43 | 21.00 | -4.69 | 4.69 | 31.54 | 0.26 | 24.67 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.48 | 21.00 | -4.71 | 4.71 | 31.31 | 0.26 | 24.68 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.52 | 21.00 | -4.72 | 4.72 | 31.09 | 0.27 | 24.69 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.57 | 21.00 | -4.74 | 4.74 | 30.86 | 0.27 | 24.69 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.62 | 21.00 | -4.76 | 4.76 | 30.64 | 0.27 | 24.70 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.67 | 21.00 | -4.77 | 4.77 | 30.41 | 0.27 | 24.71 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.71 | 21.00 | -4.79 | 4.79 | 30.18 | 0.28 | 24.71 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.76 | 21.00 | -4.81 | 4.81 | 29.95 | 0.28 | 24.72 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.81 | 21.00 | -4.82 | 4.82 | 29.72 | 0.28 | 24.73 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.86 | 21.00 | -4.84 | 4.84 | 29.49 | 0.29 | 24.74 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.90 | 21.00 | -4.86 | 4.86 | 29.26 | 0.29 | 24.74 | Vu < PhiVc/2 | Not Reqd 1 | 24.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 14.95 | 21.00 | -4.87 | 4.87 | 29.03 | 0.29 | 24.75 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010236 Licensee : EIKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.00 | 21.00 | -4.89 | 4.89 | 28.80 | 0.30 | 24.76 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.05 | 21.00 | -4.91 | 4.91 | 28.57 | 0.30 | 24.77 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.10 | 21.00 | -4.92 | 4.92 | 28.33 | 0.30 | 24.77 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.14 | 21.00 | -4.94 | 4.94 | 28.10 | 0.31 | 24.78 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.19 | 21.00 | -4.96 | 4.96 | 27.86 | 0.31 | 24.79 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.24 | 21.00 | -4.97 | 4.97 | 27.62 | 0.32 | 24.80 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.29 | 21.00 | -4.99 | 4.99 | 27.39 | 0.32 | 24.81 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.33 | 21.00 | -5.01 | 5.01 | 27.15 | 0.32 | 24.82 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.38 | 21.00 | -5.02 | 5.02 | 26.91 | 0.33 | 24.82 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.43 | 21.00 | -5.04 | 5.04 | 26.67 | 0.33 | 24.83 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.48 | 21.00 | -5.06 | 5.06 | 26.43 | 0.33 | 24.84 | Vu < PhiVc/2 | Not Reqd 1 | 24.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.52 | 21.00 | -5.07 | 5.07 | 26.19 | 0.34 | 24.85 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.57 | 21.00 | -5.09 | 5.09 | 25.95 | 0.34 | 24.86 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.62 | 21.00 | -5.11 | 5.11 | 25.71 | 0.35 | 24.87 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.67 | 21.00 | -5.12 | 5.12 | 25.46 | 0.35 | 24.88 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.71 | 21.00 | -5.14 | 5.14 | 25.22 | 0.36 | 24.89 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.76 | 21.00 | -5.15 | 5.15 | 24.97 | 0.36 | 24.90 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.81 | 21.00 | -5.17 | 5.17 | 24.73 | 0.37 | 24.91 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.86 | 21.00 | -5.19 | 5.19 | 24.48 | 0.37 | 24.92 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.90 | 21.00 | -5.20 | 5.20 | 24.23 | 0.38 | 24.93 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 15.95 | 21.00 | -5.22 | 5.22 | 23.98 | 0.38 | 24.95 | Vu < PhiVc/2 | Not Reqd 1 | 24.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.00 | 21.00 | -5.24 | 5.24 | 23.74 | 0.39 | 24.96 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.05 | 21.00 | -5.25 | 5.25 | 23.49 | 0.39 | 24.97 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.10 | 21.00 | -5.27 | 5.27 | 23.23 | 0.40 | 24.98 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.14 | 21.00 | -5.29 | 5.29 | 22.98 | 0.40 | 25.00 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.19 | 21.00 | -5.30 | 5.30 | 22.73 | 0.41 | 25.01 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.24 | 21.00 | -5.32 | 5.32 | 22.48 | 0.41 | 25.02 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.29 | 21.00 | -5.34 | 5.34 | 22.22 | 0.42 | 25.03 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.33 | 21.00 | -5.35 | 5.35 | 21.97 | 0.43 | 25.05 | Vu < PhiVc/2 | Not Reqd 1 | 25.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.38 | 21.00 | -5.37 | 5.37 | 21.71 | 0.43 | 25.06 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.43 | 21.00 | -5.39 | 5.39 | 21.46 | 0.44 | 25.08 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.48 | 21.00 | -5.40 | 5.40 | 21.20 | 0.45 | 25.09 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.52 | 21.00 | -5.42 | 5.42 | 20.94 | 0.45 | 25.11 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.57 | 21.00 | -5.44 | 5.44 | 20.69 | 0.46 | 25.12 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.62 | 21.00 | -5.45 | 5.45 | 20.43 | 0.47 | 25.14 | Vu < PhiVc/2 | Not Reqd 1 | 25.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.67 | 21.00 | -5.47 | 5.47 | 20.17 | 0.47 | 25.16 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.71 | 21.00 | -5.49 | 5.49 | 19.91 | 0.48 | 25.17 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.76 | 21.00 | -5.50 | 5.50 | 19.64 | 0.49 | 25.19 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.81 | 21.00 | -5.52 | 5.52 | 19.38 | 0.50 | 25.21 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.86 | 21.00 | -5.54 | 5.54 | 19.12 | 0.51 | 25.23 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.90 | 21.00 | -5.55 | 5.55 | 18.85 | 0.52 | 25.25 | Vu < PhiVc/2 | Not Reqd 1 | 25.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 16.95 | 21.00 | -5.57 | 5.57 | 18.59 | 0.52 | 25.27 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.00 | 21.00 | -5.59 | 5.59 | 18.32 | 0.53 | 25.29 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.05 | 21.00 | -5.60 | 5.60 | 18.06 | 0.54 | 25.31 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.10 | 21.00 | -5.62 | 5.62 | 17.79 | 0.55 | 25.33 | Vu < PhiVc/2 | Not Reqd 1 | 25.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.14 | 21.00 | -5.64 | 5.64 | 17.52 | 0.56 | 25.36 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.19 | 21.00 | -5.65 | 5.65 | 17.25 | 0.57 | 25.38 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.24 | 21.00 | -5.67 | 5.67 | 16.98 | 0.58 | 25.40 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.29 | 21.00 | -5.69 | 5.69 | 16.71 | 0.60 | 25.43 | Vu < PhiVc/2 | Not Reqd 1 | 25.4 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.33 | 21.00 | -5.70 | 5.70 | 16.44 | 0.61 | 25.45 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.38 | 21.00 | -5.72 | 5.72 | 16.17 | 0.62 | 25.48 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.43 | 21.00 | -5.73 | 5.73 | 15.90 | 0.63 | 25.51 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.48 | 21.00 | -5.75 | 5.75 | 15.62 | 0.64 | 25.54 | Vu < PhiVc/2 | Not Reqd 1 | 25.5 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.52 | 21.00 | -5.77 | 5.77 | 15.35 | 0.66 | 25.57 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |

## Concrete Beam

File = I:\14090T~1\CALCUL~1\FOOTIN~1.EC6
ENERCALC, INC. 1983-2014, Build:6.14.1.28, Ver:6.14.1.28
Lic. # : KW-06010236 Licensee : EIKON Consultant Group, LLC

Description : grade beam at slug catcher (16k wheel load)

### Detailed Shear Information

| Load Combination | Span Number | Distance (ft) | 'd' (in) | Vu (k) Actual | Vu (k) Design | Mu (k-ft) | d*Vu/Mu | Phi*Vc (k) | Comment | Phi*Vs (k) | Phi*Vn (k) | Spacing (in) Req'd | Spacing (in) Suggest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.57 | 21.00 | -5.78 | 5.78 | 15.07 | 0.67 | 25.60 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.62 | 21.00 | -5.80 | 5.80 | 14.80 | 0.69 | 25.63 | Vu < PhiVc/2 | Not Reqd 1 | 25.6 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.67 | 21.00 | -5.82 | 5.82 | 14.52 | 0.70 | 25.67 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.71 | 21.00 | -5.83 | 5.83 | 14.24 | 0.72 | 25.70 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.76 | 21.00 | -5.85 | 5.85 | 13.97 | 0.73 | 25.74 | Vu < PhiVc/2 | Not Reqd 1 | 25.7 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.81 | 21.00 | -5.87 | 5.87 | 13.69 | 0.75 | 25.78 | Vu < PhiVc/2 | Not Reqd 1 | 25.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.86 | 21.00 | -5.88 | 5.88 | 13.41 | 0.77 | 25.82 | Vu < PhiVc/2 | Not Reqd 1 | 25.8 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.90 | 21.00 | -5.90 | 5.90 | 13.13 | 0.79 | 25.86 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 17.95 | 21.00 | -5.92 | 5.92 | 12.85 | 0.81 | 25.90 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.00 | 21.00 | -5.93 | 5.93 | 12.56 | 0.83 | 25.95 | Vu < PhiVc/2 | Not Reqd 1 | 25.9 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.05 | 21.00 | -5.95 | 5.95 | 12.28 | 0.85 | 26.00 | Vu < PhiVc/2 | Not Reqd 1 | 26.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.10 | 21.00 | -5.97 | 5.97 | 12.00 | 0.87 | 26.05 | Vu < PhiVc/2 | Not Reqd 1 | 26.0 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.14 | 21.00 | -5.98 | 5.98 | 11.71 | 0.89 | 26.10 | Vu < PhiVc/2 | Not Reqd 1 | 26.1 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.19 | 21.00 | -6.00 | 6.00 | 11.43 | 0.92 | 26.16 | Vu < PhiVc/2 | Not Reqd 1 | 26.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.24 | 21.00 | -6.02 | 6.02 | 11.14 | 0.95 | 26.22 | Vu < PhiVc/2 | Not Reqd 1 | 26.2 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.29 | 21.00 | -6.03 | 6.03 | 10.85 | 0.97 | 26.28 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.33 | 21.00 | -6.05 | 6.05 | 10.57 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.38 | 21.00 | -6.07 | 6.07 | 10.28 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.43 | 21.00 | -6.08 | 6.08 | 9.99 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.48 | 21.00 | -6.10 | 6.10 | 9.70 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.52 | 21.00 | -6.12 | 6.12 | 9.41 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.57 | 21.00 | -6.13 | 6.13 | 9.12 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.62 | 21.00 | -6.15 | 6.15 | 8.82 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.67 | 21.00 | -6.17 | 6.17 | 8.53 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.71 | 21.00 | -6.18 | 6.18 | 8.24 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.76 | 21.00 | -6.20 | 6.20 | 7.94 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.81 | 21.00 | -6.22 | 6.22 | 7.65 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.86 | 21.00 | -6.23 | 6.23 | 7.35 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.90 | 21.00 | -6.25 | 6.25 | 7.05 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 18.95 | 21.00 | -6.27 | 6.27 | 6.75 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.00 | 21.00 | -6.28 | 6.28 | 6.46 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.05 | 21.00 | -6.30 | 6.30 | 6.16 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.10 | 21.00 | -6.31 | 6.31 | 5.86 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.14 | 21.00 | -6.33 | 6.33 | 5.55 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.19 | 21.00 | -6.35 | 6.35 | 5.25 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.24 | 21.00 | -6.36 | 6.36 | 4.95 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.29 | 21.00 | -6.38 | 6.38 | 4.65 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.33 | 21.00 | -6.40 | 6.40 | 4.34 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.38 | 21.00 | -6.41 | 6.41 | 4.04 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.43 | 21.00 | -6.43 | 6.43 | 3.73 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.48 | 21.00 | -6.45 | 6.45 | 3.43 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.52 | 21.00 | -6.46 | 6.46 | 3.12 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.57 | 21.00 | -6.48 | 6.48 | 2.81 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.62 | 21.00 | -6.50 | 6.50 | 2.50 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.67 | 21.00 | -6.51 | 6.51 | 2.19 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.71 | 21.00 | -6.53 | 6.53 | 1.88 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.76 | 21.00 | -6.55 | 6.55 | 1.57 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.81 | 21.00 | -6.56 | 6.56 | 1.26 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.86 | 21.00 | -6.58 | 6.58 | 0.94 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.90 | 21.00 | -6.60 | 6.60 | 0.63 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 19.95 | 21.00 | -6.61 | 6.61 | 0.32 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |
| +1.20D+1.60L+0.50S+1.60H | 2 | 20.00 | 21.00 | -6.63 | 6.63 | 0.00 | 1.00 | 26.34 | Vu < PhiVc/2 | Not Reqd 1 | 26.3 | 0.0 | 0.0 |

EIKON
Consultant Group

PROJECT TARGA-SLUG CATCHER 14-0135
PROJECT # 14090
NAME RCM
DATE 7/25/14 SHEET ____ OF ____

CONTROLLING LOAD COMBO = 0.9DL + 1.0WIND.VERT

THRUST = 0.9 × 0.1 − 9.1 = 9.01$^{k}$

VERT = 0.9 × 1.1 − 12.5 = −11.51$^{k}$

Slug Catcher Area B-19.lp7o

LPile Plus for Windows, Version 2013-07.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

© 1985-2013 by Ensoft, Inc.
All Rights Reserved

This copy of LPile is licensed to:

EIKON CONSULTANT GROUP
SANGER, TEXAS

Serial Number of Security Device: 225226298
Company Name Stored in Security Device: EIKON Consultant Group

## Files Used for Analysis

Path to file locations: I:\14090 Targa Little Missouri #3\CAD\Outside Information\7-24-2014\
Name of input data file: Slug Catcher Area B-19.lp7d
Name of output report file: Slug Catcher Area B-19.lp7o
Name of plot output file: Slug Catcher Area B-19.lp7p
Name of runtime messeage file: Slug Catcher Area B-19.lp7r

## Date and Time of Analysis

Date: July 24, 2014 Time: 20:05:44

## Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

---

Program Options

---

Engineering Units of Input Data and Computations:
- Engineering units are US Customary Units: pounds, inches, feet

Analysis Control Options:

| | | |
|---|---|---|
| - Maximum number of iterations allowed | = | 500 |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection | = | 100.0000 in |
| - Number of pile increments | = | 100 |

Loading Type and Number of Cycles of Loading:
- Static loading specified

Computational Options:
- Use unfactored loads in computations
- No computation of pile-head foundation stiffness matrix
- Compute pile response under loading and nonlinear bending properties of pile (if nonlinear properties are specified)
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Input Data Options:
- Analysis does not use p-y modification factors (individual pile or shaft only)
- Analysis assumes zero shear resistance at the pile tip
- Analysis assumes no loading by soil movements acting on pile

Output Options:
- No p-y curves to be computed and reported for user-specified depths
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

| | | |
|---|---|---|
| Total number of pile sections | = | 1 |
| Total length of pile | = | 30.00 ft |
| Depth of ground surface below top of pile | = | 6.00 ft |

Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile.

| Point | Depth X ft | Pile Diameter in |
|---|---|---|
| 1 | 0.00000 | 30.0000000 |
| 2 | 30.000000 | 30.0000000 |

Input Structural Properties:

Slug Catcher Area B-19.lp7o

Pile Section No. 1:

| | | |
|---|---|---|
| Section Type | = | Drilled Shaft (Bored Pile) |
| Section Length | = | 30.00000 ft |
| Section Diameter | = | 30.00000 in |

## Ground Slope and Pile Batter Angles

| | | |
|---|---|---|
| Ground Slope Angle | = | 0.000 degrees |
| | = | 0.000 radians |
| Pile Batter Angle | = | 0.000 degrees |
| | = | 0.000 radians |

## Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 6.00000 ft |
| Distance from top of pile to bottom of layer | = | 10.50000 ft |
| Effective unit weight at top of layer | = | 120.00000 pcf |
| Effective unit weight at bottom of layer | = | 120.00000 pcf |
| Undrained cohesion at top of layer | = | 765.00000 psf |
| Undrained cohesion at bottom of layer | = | 765.00000 psf |
| Epsilon-50 at top of layer | = | 0.01000 |
| Epsilon-50 at bottom of layer | = | 0.01000 |
| Subgrade k at top of layer | = | 100.00000 pci |
| Subgrade k at bottom of layer | = | 100.00000 pci |

Layer 2 is soft clay, p-y criteria by Matlock, 1970

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 10.50000 ft |
| Distance from top of pile to bottom of layer | = | 23.00000 ft |
| Effective unit weight at top of layer | = | 115.00000 pcf |
| Effective unit weight at bottom of layer | = | 115.00000 pcf |
| Undrained cohesion at top of layer | = | 300.00000 psf |
| Undrained cohesion at bottom of layer | = | 300.00000 psf |
| Epsilon-50 at top of layer | = | 0.0000 |
| Epsilon-50 at bottom of layer | = | 0.0000 |

NOTE: Internal default values for Epsilon-50 will be computed for the above soil layer.

Layer 3 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 23.00000 ft |
| Distance from top of pile to bottom of layer | = | 27.00000 ft |
| Effective unit weight at top of layer | = | 120.00000 pcf |
| Effective unit weight at bottom of layer | = | 120.00000 pcf |

| | | |
|---|---|---|
| Undrained cohesion at top of layer | = | 875.00000 psf |
| Undrained cohesion at bottom of layer | = | 875.00000 psf |
| Epsilon-50 at top of layer | = | 0.01000 |
| Epsilon-50 at bottom of layer | = | 0.01000 |
| Subgrade k at top of layer | = | 100.00000 pci |
| Subgrade k at bottom of layer | = | 100.00000 pci |

Layer 4 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 27.00000 ft |
| Distance from top of pile to bottom of layer | = | 32.00000 ft |
| Effective unit weight at top of layer | = | 125.00000 pcf |
| Effective unit weight at bottom of layer | = | 125.00000 pcf |
| Undrained cohesion at top of layer | = | 3500.00000 psf |
| Undrained cohesion at bottom of layer | = | 3500.00000 psf |
| Epsilon-50 at top of layer | = | 0.00500 |
| Epsilon-50 at bottom of layer | = | 0.00500 |
| Subgrade k at top of layer | = | 1000.00000 pci |
| Subgrade k at bottom of layer | = | 1000.00000 pci |

Layer 5 is stiff clay with water-induced erosion

| | | |
|---|---|---|
| Distance from top of pile to top of layer | = | 32.00000 ft |
| Distance from top of pile to bottom of layer | = | 35.00000 ft |
| Effective unit weight at top of layer | = | 130.00000 pcf |
| Effective unit weight at bottom of layer | = | 130.00000 pcf |
| Undrained cohesion at top of layer | = | 5400.00000 psf |
| Undrained cohesion at bottom of layer | = | 5400.00000 psf |
| Epsilon-50 at top of layer | = | 0.00400 |
| Epsilon-50 at bottom of layer | = | 0.00400 |
| Subgrade k at top of layer | = | 2000.00000 pci |
| Subgrade k at bottom of layer | = | 2000.00000 pci |

(Depth of lowest soil layer extends 5.00 ft below pile tip)

Summary of Soil Properties

| Layer Num. | Soil Type (p-y Curve Criteria) | Strain Factor Epsilon 50 | kpy pci | Layer Depth ft | Effective Unit Wt. pcf | Undrained Cohesion psf |
|---|---|---|---|---|---|---|
| 1 | Stiff Clay w/o Free Water, using k | 0.01000 | 100.000 | 6.000 | 120.000 | 765.000 |
| | | | | 10.500 | 120.000 | 765.000 |
| 2 | Soft Clay | 0.01000 | 100.000 | 10.500 | 115.000 | 300.000 |
| | | default | -- | 23.000 | 115.000 | 300.000 |
| 3 | Stiff Clay w/o Free Water, using k | default | -- | 23.000 | 120.000 | 875.000 |
| | | 0.01000 | 100.000 | 27.000 | 120.000 | 875.000 |

| | | | | | |
|---|---|---|---|---|---|
| 0.01000 | 100.000 | | | | |
| 4 | Stiff Clay w/o Free Water, using k | | 27.000 | 125.000 | 3500.000 |
| 0.00500 | 1000.000 | | | | |
| | | | 32.000 | 125.000 | 3500.000 |
| 0.00500 | 1000.000 | | | | |
| 5 | Stiff Clay w/o Free Water, using k | | 32.000 | 130.000 | 5400.000 |
| 0.00400 | 2000.000 | | | | |
| | | | 35.000 | 130.000 | 5400.000 |
| 0.00400 | 2000.000 | | | | |

## Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

## Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

| Load No. | Load Compute Type | Condition 1 | Condition 2 | Axial Thrust Force, lbs |
|---|---|---|---|---|
| Top y vs. Pile Length | | | | |
| 1 | 1 No | V = 9000.00000 lbs | M = 0.0000 in-lbs | -11510. |

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

## Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

| | | |
|---|---|---|
| Length of Section | = | 30.00000 ft |
| Shaft Diameter | = | 30.00000 in |
| Concrete Cover Thickness | = | 3.00000 in |
| Number of Reinforcing Bars | = | 10 bars |
| Yield Stress of Reinforcing Bars | = | 60.00000 ksi |
| Modulus of Elasticity of Reinforcing Bars | = | 29000. ksi |

Slug Catcher Area B-19.lp7o

| | | |
|---|---|---|
| Gross Area of Shaft | = | 706.85835 sq. in. |
| Total Area of Reinforcing Steel | = | 7.90000 sq. in. |
| Area Ratio of Steel Reinforcement | = | 1.12 percent |
| Edge-to-Edge Bar Spacing | = | 6.10739 in |
| Maximum Concrete Aggregate Size | = | 0.75000 in |
| Ratio of Bar Spacing to Aggregate Size | = | 8.14 |
| Offset of Center of Rebar Cage from Center of Pile | = | 0.0000 in |

Axial Structural Capacities:

| | | |
|---|---|---|
| Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As | = | 3147.516 kips |
| Tensile Load for Cracking of Concrete | = | -334.148 kips |
| Nominal Axial Tensile Capacity | = | -474.000 kips |

Reinforcing Bar Dimensions and Positions Used in Computations:

| Bar Number | Bar Diam. inches | Bar Area sq. in. | X inches | Y inches |
|---|---|---|---|---|
| 1 | 1.00000 | 0.79000 | 11.50000 | 0.00000 |
| 2 | 1.00000 | 0.79000 | 9.30370 | 6.75953 |
| 3 | 1.00000 | 0.79000 | 3.55370 | 10.93715 |
| 4 | 1.00000 | 0.79000 | -3.55370 | 10.93715 |
| 5 | 1.00000 | 0.79000 | -9.30370 | 6.75953 |
| 6 | 1.00000 | 0.79000 | -11.50000 | 0.00000 |
| 7 | 1.00000 | 0.79000 | -9.30370 | -6.75953 |
| 8 | 1.00000 | 0.79000 | -3.55370 | -10.93715 |
| 9 | 1.00000 | 0.79000 | 3.55370 | -10.93715 |
| 10 | 1.00000 | 0.79000 | 9.30370 | -6.75953 |

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 6.10739 inches between Bars 5 and 6

Spacing to aggregate size ratio = 8.14319

Concrete Properties:

| | | |
|---|---|---|
| Compressive Strength of Concrete | = | 4.50000 ksi |
| Modulus of Elasticity of Concrete | = | 3823.67624 ksi |
| Modulus of Rupture of Concrete | = | -0.50312 ksi |
| Compression Strain at Peak Stress | = | 0.00200 |
| Tensile Strain at Fracture of Concrete | = | -0.0001152 |
| Maximum Coarse Aggregate Size | = | 0.75000 in |

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

| Number | Axial Thrust Force kips |
|---|---|
| 1 | -11.510 |

Oefinitions of Run Messages and Notes:

Slug Catcher Area B-19.lp7o

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = -11.510 kips

| Bending Max Concrete Curvature Stress rad/in. ksi | Bending Max Steel Moment Stress in-kip ksi | | Bending Run Stiffness Msg kip-in2 | Depth to N Axis in | Max Comp Strain in/in | Max Tens Strain in/in |
|---|---|---|---|---|---|---|
| 0.000001250 | 238.8587447 | | 191086996. | 12.2601246 | 0.0000153 | -0.0000222 |
| 0.0678383 | -0.6376330 | | | | | |
| 0.000002500 | 476.3686275 | | 190547451. | 13.6250388 | 0.0000341 | -0.0000409 |
| 0.1502659 | -1.1763097 | | | | | |
| 0.000003750 | 712.4736388 | | 189992970. | 14.0799662 | 0.0000528 | -0.0000597 |
| 0.2319191 | -1.7149912 | | | | | |
| 0.000005000 | 947.1735252 | | 189434705. | 14.3074073 | 0.0000715 | -0.0000785 |
| 0.3127982 | -2.2536759 | | | | | |
| 0.000006250 | 1180.4682544 | | 188874921. | 14.4438554 | 0.0000903 | -0.0000972 |
| 0.3929031 | -2.7923637 | | | | | |
| 0.000007500 | 1180.4682544 | | 157395767. | 5.1024917 | 0.0000383 | -0.0001867 |
| 0.1655377 | -5.3825832 | C | | | | |
| 0.000008750 | 1180.4682544 | | 134910658. | 5.4718571 | 0.0000479 | -0.0002146 |
| 0.2070378 | -6.1859538 | C | | | | |
| 0.0000100 | 1180.4682544 | | 118046825. | 5.7347870 | 0.0000573 | -0.0002427 |
| 0.2477220 | -6.9934118 | C | | | | |
| 0.0000113 | 1180.4682544 | | 104930512. | 5.9330066 | 0.0000667 | -0.0002708 |
| 0.2879049 | -7.8029191 | C | | | | |
| 0.0000125 | 1180.4682544 | | 94437460. | 6.0879164 | 0.0000761 | -0.0002989 |
| 0.3276986 | -8.6137553 | C | | | | |
| 0.0000138 | 1180.4682544 | | 85852237. | 6.2122915 | 0.0000854 | -0.0003271 |
| 0.3671630 | -9.4255362 | C | | | | |
| 0.0000150 | 1180.4682544 | | 78697884. | 6.3141113 | 0.0000947 | -0.0003553 |
| 0.4063224 | -10.2381115 | C | | | | |
| 0.0000163 | 1180.4682544 | | 72644200. | 6.4008129 | 0.0001040 | -0.0003835 |
| 0.4453332 | -11.0504294 | C | | | | |
| 0.0000175 | 1180.4682544 | | 67455329. | 6.4744688 | 0.0001133 | -0.0004117 |
| 0.4841082 | -11.8630821 | C | | | | |
| 0.0000188 | 1180.4682544 | | 62958307. | 6.5368104 | 0.0001226 | -0.0004399 |
| 0.5225785 | -12.6765468 | C | | | | |
| 0.0000200 | 1180.4682544 | | 59023413. | 6.5917820 | 0.0001318 | -0.0004682 |
| 0.5608992 | -13.4897664 | C | | | | |
| 0.0000213 | 1180.4682544 | | 55551447. | 6.6406859 | 0.0001411 | -0.0004964 |
| 0.5990700 | -14.3027397 | C | | | | |
| 0.0000225 | 1180.4682544 | | 52465256. | 6.6845353 | 0.0001504 | -0.0005246 |
| 0.6370905 | -15.1154657 | C | | | | |
| 0.0000238 | 1180.4682544 | | 49703927. | 6.7241298 | 0.0001597 | -0.0005528 |
| 0.6749603 | -15.9279430 | C | | | | |
| 0.0000250 | 1180.4682544 | | 47218730. | 6.7596573 | 0.0001690 | -0.0005810 |

| | | | | | |
|---|---|---|---|---|---|
| 0.7126325 | -16.7404984 C | | | | |
| 0.0000263 | 1180.4682544 | 44970219. | 6.7910671 | 0.0001783 | -0.0006092 |
| 0.7500392 | -17.5536126 C | | | | |
| 0.0000275 | 1180.4682544 | 42926118. | 6.8199198 | 0.0001875 | -0.0006375 |
| 0.7872937 | -18.3664889 C | | | | |
| 0.0000288 | 1180.4682544 | 41059765. | 6.8465500 | 0.0001968 | -0.0006657 |
| 0.8243957 | -19.1791263 C | | | | |
| 0.0000300 | 1180.4682544 | 39348942. | 6.8712370 | 0.0002061 | -0.0006939 |
| 0.8613449 | -19.9915238 C | | | | |
| 0.0000313 | 1180.4682544 | 37774984. | 6.8942150 | 0.0002154 | -0.0007221 |
| 0.8981409 | -20.8036801 C | | | | |
| 0.0000325 | 1180.4682544 | 36322100. | 6.9156825 | 0.0002248 | -0.0007502 |
| 0.9347833 | -21.6155942 C | | | | |
| 0.0000338 | 1180.4682544 | 34976837. | 6.9358084 | 0.0002341 | -0.0007784 |
| 0.9712718 | -22.4272649 C | | | | |
| 0.0000350 | 1180.4682544 | 33727664. | 6.9547376 | 0.0002434 | -0.0008066 |
| 1.0076061 | -23.2386912 C | | | | |
| 0.0000363 | 1214.6715187 | 33508180. | 6.9725950 | 0.0002528 | -0.0008347 |
| 1.0437857 | -24.0498719 C | | | | |
| 0.0000375 | 1259.1498430 | 33577329. | 6.9894887 | 0.0002621 | -0.0008629 |
| 1.0798103 | -24.8608059 C | | | | |
| 0.0000388 | 1303.5960070 | 33641187. | 7.0055132 | 0.0002715 | -0.0008910 |
| 1.1156795 | -25.6714920 C | | | | |
| 0.0000400 | 1348.0098796 | 33700247. | 7.0207508 | 0.0002808 | -0.0009192 |
| 1.1513929 | -26.4819290 C | | | | |
| 0.0000413 | 1392.3913288 | 33754941. | 7.0352741 | 0.0002902 | -0.0009473 |
| 1.1869503 | -27.2921158 C | | | | |
| 0.0000425 | 1436.7402214 | 33805652. | 7.0491471 | 0.0002996 | -0.0009754 |
| 1.2223511 | -28.1020511 C | | | | |
| 0.0000438 | 1481.0647590 | 33852909. | 7.0618747 | 0.0003090 | -0.0010035 |
| 1.2575028 | -28.9124338 C | | | | |
| 0.0000450 | 1525.3574169 | 33896831. | 7.0740439 | 0.0003183 | -0.0010317 |
| 1.2924905 | -29.7226226 C | | | | |
| 0.0000463 | 1569.6175187 | 33937676. | 7.0857353 | 0.0003277 | -0.0010598 |
| 1.3273198 | -30.5325699 C | | | | |
| 0.0000475 | 1613.8449361 | 33975683. | 7.0969876 | 0.0003371 | -0.0010879 |
| 1.3619904 | -31.3422745 C | | | | |
| 0.0000488 | 1658.0395389 | 34011067. | 7.1078353 | 0.0003465 | -0.0011160 |
| 1.3965019 | -32.1517352 C | | | | |
| 0.0000513 | 1746.3297756 | 34074727. | 7.1284383 | 0.0003653 | -0.0011722 |
| 1.4650463 | -33.7699209 C | | | | |
| 0.0000538 | 1834.4871682 | 34129994. | 7.1477592 | 0.0003842 | -0.0012283 |
| 1.5329497 | -35.3871176 C | | | | |
| 0.0000563 | 1922.5106394 | 34177967. | 7.1659746 | 0.0004031 | -0.0012844 |
| 1.6002093 | -37.0033163 C | | | | |
| 0.0000588 | 2010.3990951 | 34219559. | 7.1832311 | 0.0004220 | -0.0013405 |
| 1.6668217 | -38.6185073 C | | | | |
| 0.0000613 | 2098.1514235 | 34255533. | 7.1996516 | 0.0004410 | -0.0013965 |
| 1.7327838 | -40.2326811 C | | | | |
| 0.0000638 | 2185.7664952 | 34286533. | 7.2153397 | 0.0004600 | -0.0014525 |
| 1.7980925 | -41.8458280 C | | | | |
| 0.0000663 | 2273.2431625 | 34313104. | 7.2303836 | 0.0004790 | -0.0015085 |
| 1.8627444 | -43.4579379 C | | | | |
| 0.0000688 | 2360.5802593 | 34335713. | 7.2448584 | 0.0004981 | -0.0015644 |
| 1.9267362 | -45.0690008 C | | | | |
| 0.0000713 | 2447.7766002 | 34354759. | 7.2588292 | 0.0005172 | -0.0016203 |
| 1.9900646 | -46.6790064 C | | | | |
| 0.0000738 | 2534.8309801 | 34370590. | 7.2723521 | 0.0005363 | -0.0016762 |
| 2.0527261 | -48.2879442 C | | | | |
| 0.0000763 | 2621.7421742 | 34383504. | 7.2854760 | 0.0005555 | -0.0017320 |
| 2.1147173 | -49.8958035 C | | | | |
| 0.0000788 | 2708.5089369 | 34393764. | 7.2982435 | 0.0005747 | -0.0017878 |
| 2.1760347 | -51.5025736 C | | | | |

Slug Catcher Area B-19.lp7o

| | | | | | |
|---|---|---|---|---|---|
| 0.0000813 | 2795.1300019 | 34401600. | 7.3106924 | 0.0005940 | -0.0018435 |
| 2.2366747 | -53.1082433 C | | | | |
| 0.0000838 | 2881.6040810 | 34407213. | 7.3228557 | 0.0006133 | -0.0018992 |
| 2.2966338 | -54.7128015 C | | | | |
| 0.0000863 | 2967.9298641 | 34410781. | 7.3347628 | 0.0006326 | -0.0019549 |
| 2.3559082 | -56.3162367 C | | | | |
| 0.0000888 | 3054.1060185 | 34412462. | 7.3464400 | 0.0006520 | -0.0020105 |
| 2.4144941 | -57.9185372 C | | | | |
| 0.0000913 | 3140.1413359 | 34412508. | 7.3575490 | 0.0006714 | -0.0020661 |
| 2.4722883 | -59.5206483 C | | | | |
| 0.0000938 | 3226.0302394 | 34410989. | 7.3683153 | 0.0006908 | -0.0021217 |
| 2.5293401 | -60.0000000 CY | | | | |
| 0.0000963 | 3311.7671329 | 34407970. | 7.3789192 | 0.0007102 | -0.0021773 |
| 2.5856900 | -60.0000000 CY | | | | |
| 0.0000988 | 3397.3506767 | 34403551. | 7.3893772 | 0.0007297 | -0.0022328 |
| 2.6413340 | -60.0000000 CY | | | | |
| 0.0001013 | 3482.7795069 | 34397822. | 7.3997039 | 0.0007492 | -0.0022883 |
| 2.6962684 | -60.0000000 CY | | | | |
| 0.0001038 | 3568.0522356 | 34390865. | 7.4099127 | 0.0007688 | -0.0023437 |
| 2.7504893 | -60.0000000 CY | | | | |
| 0.0001063 | 3653.1674512 | 34382752. | 7.4200158 | 0.0007884 | -0.0023991 |
| 2.8039928 | -60.0000000 CY | | | | |
| 0.0001088 | 3738.0051117 | 34372461. | 7.4299459 | 0.0008080 | -0.0024545 |
| 2.8567515 | -60.0000000 CY | | | | |
| 0.0001113 | 3816.4660594 | 34305313. | 7.4356933 | 0.0008272 | -0.0025103 |
| 2.9075642 | -60.0000000 CY | | | | |
| 0.0001138 | 3876.5049911 | 34079165. | 7.4295267 | 0.0008451 | -0.0025674 |
| 2.9540837 | -60.0000000 CY | | | | |
| 0.0001163 | 3921.9543243 | 33737241. | 7.4143978 | 0.0008619 | -0.0026256 |
| 2.9971265 | -60.0000000 CY | | | | |
| 0.0001188 | 3966.6426518 | 33403307. | 7.3996760 | 0.0008787 | -0.0026838 |
| 3.0394913 | -60.0000000 CY | | | | |
| 0.0001213 | 4011.2512522 | 33082485. | 7.3857725 | 0.0008955 | -0.0027420 |
| 3.0813152 | -60.0000000 CY | | | | |
| 0.0001238 | 4055.7795792 | 32773976. | 7.3726393 | 0.0009124 | -0.0028001 |
| 3.1225957 | -60.0000000 CY | | | | |
| 0.0001263 | 4100.2270798 | 32477046. | 7.3602322 | 0.0009292 | -0.0028583 |
| 3.1633305 | -60.0000000 CY | | | | |
| 0.0001288 | 4144.5890510 | 32190983. | 7.3484305 | 0.0009461 | -0.0029164 |
| 3.2034923 | -60.0000000 CY | | | | |
| 0.0001313 | 4188.8423777 | 31914990. | 7.3367589 | 0.0009629 | -0.0029746 |
| 3.2429418 | -60.0000000 CY | | | | |
| 0.0001338 | 4233.0148371 | 31648709. | 7.3257298 | 0.0009798 | -0.0030327 |
| 3.2818464 | -60.0000000 CY | | | | |
| 0.0001363 | 4277.1058362 | 31391602. | 7.3153094 | 0.0009967 | -0.0030908 |
| 3.3202034 | -60.0000000 CY | | | | |
| 0.0001388 | 4320.7730841 | 31140707. | 7.3052197 | 0.0010136 | -0.0031489 |
| 3.3579328 | -60.0000000 CY | | | | |
| 0.0001413 | 4360.7320584 | 30872439. | 7.2930572 | 0.0010301 | -0.0032074 |
| 3.3942838 | -60.0000000 CY | | | | |
| 0.0001438 | 4392.5708701 | 30557015. | 7.2756987 | 0.0010459 | -0.0032666 |
| 3.4282744 | -60.0000000 CY | | | | |
| 0.0001463 | 4415.5772191 | 30191981. | 7.2527593 | 0.0010607 | -0.0033268 |
| 3.4597823 | -60.0000000 CY | | | | |
| 0.0001488 | 4432.0322919 | 29795175. | 7.2260214 | 0.0010749 | -0.0033876 |
| 3.4893715 | -60.0000000 CY | | | | |
| 0.0001588 | 4496.0771912 | 28321746. | 7.1276081 | 0.0011315 | -0.0036310 |
| 3.6034965 | -60.0000000 CY | | | | |
| 0.0001688 | 4559.4650895 | 27019052. | 7.0420521 | 0.0011883 | -0.0038742 |
| 3.7111653 | -60.0000000 CY | | | | |
| 0.0001788 | 4621.6657712 | 25855473. | 6.9633834 | 0.0012447 | -0.0041178 |
| 3.8111040 | -60.0000000 CY | | | | |
| 0.0001888 | 4683.2799931 | 24812079. | 6.8946003 | 0.0013014 | -0.0043611 |

| | | | | | |
|---|---|---|---|---|---|
| 3.9047548 | -60.0000000 CY | | | | |
| 0.0001988 | 4744.2935535 | 23870659. | 6.8342464 | 0.0013583 | -0.0046042 |
| 3.9920197 | -60.0000000 CY | | | | |
| 0.0002088 | 4804.6916647 | 23016487. | 6.7811462 | 0.0014156 | -0.0048469 |
| 4.0727969 | -60.0000000 CY | | | | |
| 0.0002188 | 4864.3378062 | 22236973. | 6.7332607 | 0.0014729 | -0.0050896 |
| 4.1466830 | -60.0000000 CY | | | | |
| 0.0002288 | 4923.1325702 | 21521891. | 6.6890643 | 0.0015301 | -0.0053324 |
| 4.2134300 | -60.0000000 CY | | | | |
| 0.0002388 | 4979.2107881 | 20855333. | 6.6481142 | 0.0015872 | -0.0055753 |
| 4.2730855 | -60.0000000 CY | | | | |
| 0.0002488 | 5021.4980666 | 20186927. | 6.6000737 | 0.0016418 | -0.0058207 |
| 4.3234934 | -60.0000000 CY | | | | |
| 0.0002588 | 5044.2067683 | 19494519. | 6.5398734 | 0.0016922 | -0.0060703 |
| 4.3643896 | -60.0000000 CY | | | | |
| 0.0002688 | 5058.1067470 | 18820862. | 6.4775409 | 0.0017408 | -0.0063217 |
| 4.3987082 | -60.0000000 CY | | | | |
| 0.0002788 | 5071.2519971 | 18192832. | 6.4180277 | 0.0017890 | -0.0065735 |
| 4.4277665 | -60.0000000 CY | | | | |
| 0.0002888 | 5083.7097268 | 17605921. | 6.3612927 | 0.0018368 | -0.0068257 |
| 4.4517437 | -60.0000000 CY | | | | |
| 0.0002988 | 5095.8910295 | 17057376. | 6.3091667 | 0.0018849 | -0.0070776 |
| 4.4709887 | -60.0000000 CY | | | | |
| 0.0003088 | 5107.7894323 | 16543448. | 6.2612177 | 0.0019332 | -0.0073293 |
| 4.4854270 | -60.0000000 CY | | | | |
| 0.0003188 | 5119.3977554 | 16060856. | 6.2170688 | 0.0019817 | -0.0075808 |
| 4.4949813 | -60.0000000 CY | | | | |
| 0.0003288 | 5130.7085635 | 15606718. | 6.1763897 | 0.0020305 | -0.0078320 |
| 4.4995718 | -60.0000000 CY | | | | |
| 0.0003388 | 5141.4949117 | 15177845. | 6.1379243 | 0.0020792 | -0.0080833 |
| 4.4938590 | -60.0000000 CY | | | | |
| 0.0003488 | 5151.5943236 | 14771597. | 6.1001045 | 0.0021274 | -0.0083351 |
| 4.4989734 | 60.0000000 CY | | | | |
| 0.0003588 | 5161.3826627 | 14387129. | 6.0652014 | 0.0021759 | -0.0085866 |
| 4.4948376 | 60.0000000 CY | | | | |
| 0.0003688 | 5170.8219331 | 14022568. | 6.0330531 | 0.0022247 | -0.0088378 |
| 4.4968935 | 60.0000000 CY | | | | |
| 0.0003788 | 5180.0246066 | 13676633. | 6.0032459 | 0.0022737 | -0.0090888 |
| 4.4998633 | 60.0000000 CY | | | | |
| 0.0003888 | 5188.8611248 | 13347553. | 5.9758465 | 0.0023231 | -0.0093394 |
| 4.4917298 | 60.0000000 CY | | | | |
| 0.0003988 | 5197.4426315 | 13034339. | 5.9504758 | 0.0023728 | -0.0095897 |
| 4.4975558 | 60.0000000 CY | | | | |
| 0.0004088 | 5205.8142164 | 12735937. | 5.9269087 | 0.0024226 | -0.0098399 |
| 4.4999408 | 60.0000000 CY | | | | |
| 0.0004188 | 5213.8263057 | 12450928. | 5.9053021 | 0.0024728 | -0.0100897 |
| 4.4902432 | 60.0000000 CY | | | | |
| 0.0004288 | 5221.6254816 | 12178718. | 5.8852534 | 0.0025233 | -0.0103392 |
| 4.4964489 | 60.0000000 CY | | | | |
| 0.0004388 | 5229.2440336 | 11918505. | 5.8666014 | 0.0025740 | -0.0105885 |
| 4.4995927 | 60.0000000 CY | | | | |
| 0.0004488 | 5236.5796563 | 11669258. | 5.8493743 | 0.0026249 | -0.0108376 |
| 4.4930967 | 60.0000000 CY | | | | |
| 0.0004588 | 5243.4819642 | 11429933. | 5.8317115 | 0.0026753 | -0.0110872 |
| 4.4923794 | 60.0000000 CY | | | | |
| 0.0004688 | 5250.2467356 | 11200526. | 5.8152211 | 0.0027259 | -0.0113366 |
| 4.4973833 | 60.0000000 CY | | | | |
| 0.0004788 | 5256.8707354 | 10980409. | 5.7998398 | 0.0027767 | -0.0115858 |
| 4.4997810 | 60.0000000 CY | | | | |
| 0.0004888 | 5263.2474434 | 10768793. | 5.7857384 | 0.0028278 | -0.0118347 |
| 4.4922534 | 60.0000000 CY | | | | |
| 0.0004988 | 5269.4348332 | 10565283. | 5.7727191 | 0.0028791 | -0.0120834 |
| 4.4900428 | 60.0000000 CY | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 0.0005088 | 5275.5078665 | 10369549. | 5.7605620 | 0.0029307 | -0.0123318 |
| 4.4956689 | 60.0000000 CY | | | | |
| 0.0005188 | 5281.4639763 | 10181135. | 5.7492257 | 0.0029824 | -0.0125801 |
| 4.4989987 | 60.0000000 CY | | | | |
| 0.0005288 | 5287.2866142 | 9999596. | 5.7387035 | 0.0030343 | -0.0128282 |
| 4.4990304 | 60.0000000 CYT | | | | |
| 0.0005388 | 5292.8424874 | 9824302. | 5.7292496 | 0.0030866 | -0.0130759 |
| 4.4867280 | 60.0000000 CYT | | | | |
| 0.0005488 | 5298.3059114 | 9655227. | 5.7204292 | 0.0031391 | -0.0133234 |
| 4.4895755 | 60.0000000 CYT | | | | |
| 0.0006088 | 5328.6733664 | 8753468. | 5.6802069 | 0.0034578 | -0.0148047 |
| 4.4898156 | 60.0000000 CYT | | | | |
| 0.0006688 | 5355.1081886 | 8007638. | 5.6569216 | 0.0037831 | -0.0162794 |
| 4.4828354 | 60.0000000 CYT | | | | |
| 0.0007288 | 5355.1081886 | 7348347. | 5.7281251 | 0.0041744 | -0.0176881 |
| 4.4832990 | 60.0000000 CYT | | | | |

---

## Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

---

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

| Load No. | Axial Thrust kips | Nominal Mom. Cap. in-kip | Max. Comp. Strain |
|---|---|---|---|
| 1 | -11.510 | 5283.436 | 0.00300000 |

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

| Axial Load No. | Resistance Factor for Moment | Bending Stiffness kip-in^2 | Nominal Moment Capacity in-kip | Ultimate (Factored) Axial Thrust kips | Ultimate Moment (Factored) Capacity in-kip |
|---|---|---|---|---|---|
| 1 | 0.65 | 34401077.797 | 5283.436 | -7.481 | 3434.233 |
| 1 | 0.70 | 34377264.665 | 5283.436 | -8.057 | 3698.405 |
| 1 | 0.75 | 33433686.063 | 5283.436 | -8.633 | 3962.577 |

Slug Catcher Area B-19.lp7o

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 9000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = -11510.0 lbs

| Depth X feet | Deflect. y inches | Bending Moment in-lbs | Shear Force lbs | Slope S radians | Total Stress psi* | Bending Stiffness lb-in^2 | Soil Res. Es*h lb/inch | Soil Spr. Lat. Load lb/inch | Distrib. p lb/in |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.1733 | -1.187E-05 | 9000.0000 | -0.001073 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 0.300 | 0.1694 | 32356. | 9000.0000 | -0.001073 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 0.600 | 0.1656 | 64711. | 9000.0000 | -0.001072 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 0.900 | 0.1617 | 97067. | 9000.0000 | -0.001071 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 1.200 | 0.1579 | 129422. | 9000.0000 | -0.001069 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 1.500 | 0.1540 | 161778. | 9000.0000 | -0.001066 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 1.800 | 0.1502 | 194134. | 9000.0000 | -0.001062 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 2.100 | 0.1464 | 226490. | 9000.0000 | -0.001059 | 0.000 | 1.911E+11 | 0.000 | 0.000 | 0.000 |
| 2.400 | 0.1426 | 258846. | 9000.0000 | -0.001054 | 0.000 | 1.910E+11 | 0.000 | 0.000 | 0.000 |
| 2.700 | 0.1388 | 291203. | 9000.0000 | -0.001049 | 0.000 | 1.909E+11 | 0.000 | 0.000 | 0.000 |
| 3.000 | 0.1350 | 323559. | 9000.0000 | -0.001043 | 0.000 | 1.908E+11 | 0.000 | 0.000 | 0.000 |
| 3.300 | 0.1313 | 355916. | 9000.0000 | -0.001037 | 0.000 | 1.907E+11 | 0.000 | 0.000 | 0.000 |
| 3.600 | 0.1276 | 388273. | 9000.0000 | -0.001030 | 0.000 | 1.907E+11 | 0.000 | 0.000 | 0.000 |
| 3.900 | 0.1239 | 420631. | 9000.0000 | -0.001022 | 0.000 | 1.906E+11 | 0.000 | 0.000 | 0.000 |
| 4.200 | 0.1202 | 452989. | 9000.0000 | -0.001014 | 0.000 | 1.906E+11 | 0.000 | 0.000 | 0.000 |
| 4.500 | 0.1166 | 485347. | 9000.0000 | -0.001005 | 0.000 | 1.905E+11 | 0.000 | 0.000 | 0.000 |
| 4.800 | 0.1130 | 517706. | 9000.0000 | -0.000995 | 0.000 | 1.904E+11 | 0.000 | 0.000 | 0.000 |
| 5.100 | 0.1094 | 550064. | 9000.0000 | -0.000985 | 0.000 | 1.903E+11 | 0.000 | 0.000 | 0.000 |
| 5.400 | 0.1059 | 582424. | 9000.0000 | -0.000974 | 0.000 | 1.902E+11 | 0.000 | 0.000 | 0.000 |
| 5.700 | 0.1024 | 614784. | 9000.0000 | -0.000963 | 0.000 | 1.902E+11 | 0.000 | 0.000 | 0.000 |
| 6.000 | 0.0989 | 647144. | 9000.0000 | -0.000951 | 0.000 | 1.901E+11 | 0.000 | 0.000 | 0.000 |
| 6.300 | 0.0955 | 679505. | 8938.0892 | -0.000939 | 0.000 | 1.900E+11 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| -34.3949 | 1296.0000 | 0.000 | | | | |
| 6.600 | 0.0922 | 711421. | 8756.7059 | -0.000925 | 0.000 | 1.900E+11 |
| -66.3736 | 2592.0000 | 0.000 | | | | |
| 6.900 | 0.0889 | 742476. | 8464.4545 | -0.000912 | 0.000 | 1.899E+11 |
| -95.9883 | 3888.0000 | 0.000 | | | | |
| 7.200 | 0.0856 | 772289. | 8069.7449 | -0.000897 | 0.000 | 1.898E+11 |
| -123.2948 | 5184.0000 | 0.000 | | | | |
| 7.500 | 0.0824 | 800504. | 7580.7819 | -0.000882 | 0.000 | 1.897E+11 |
| -148.3513 | 6480.0000 | 0.000 | | | | |
| 7.800 | 0.0793 | 826798. | 7015.8459 | -0.000867 | 0.000 | 1.897E+11 |
| -165.5020 | 7516.3573 | 0.000 | | | | |
| 8.100 | 0.0762 | 850947. | 6414.3182 | -0.000851 | 0.000 | 1.896E+11 |
| -168.6801 | 7971.7262 | 0.000 | | | | |
| 8.400 | 0.0731 | 872910. | 5801.5578 | -0.000835 | 0.000 | 1.896E+11 |
| -171.7423 | 8453.2053 | 0.000 | | | | |
| 8.700 | 0.0702 | 892649. | 5177.9843 | -0.000818 | 0.000 | 1.895E+11 |
| -174.6874 | 8962.7181 | 0.000 | | | | |
| 9.000 | 0.0673 | 910124. | 4544.0224 | -0.000801 | 0.000 | 1.895E+11 |
| -177.5137 | 9502.3592 | 0.000 | | | | |
| 9.300 | 0.0644 | 925299. | 3900.1019 | -0.000783 | 0.000 | 1.895E+11 |
| -180.2199 | 10074. | 0.000 | | | | |
| 9.600 | 0.0616 | 938140. | 3246.6581 | -0.000766 | 0.000 | 1.895E+11 |
| -182.8045 | 10681. | 0.000 | | | | |
| 9.900 | 0.0589 | 948612. | 2584.1314 | -0.000748 | 0.000 | 1.894E+11 |
| -185.2659 | 11326. | 0.000 | | | | |
| 10.200 | 0.0562 | 956683. | 1912.9682 | -0.000730 | 0.000 | 1.894E+11 |
| -187.6026 | 12011. | 0.000 | | | | |
| 10.500 | 0.0536 | 962325. | 1348.6772 | -0.000711 | 0.000 | 1.894E+11 |
| -125.8924 | 8450.0940 | 0.000 | | | | |
| 10.800 | 0.0511 | 966335. | 1000.7162 | -0.000693 | 0.000 | 1.894E+11 |
| -67.4192 | 4749.1336 | 0.000 | | | | |
| 11.100 | 0.0486 | 969472. | 756.8696 | -0.000675 | 0.000 | 1.894E+11 |
| -68.0511 | 5036.2478 | 0.000 | | | | |
| 11.400 | 0.0462 | 971728. | 510.8622 | -0.000656 | 0.000 | 1.894E+11 |
| -68.6198 | 5341.3806 | 0.000 | | | | |
| 11.700 | 0.0439 | 973096. | 262.9223 | -0.000638 | 0.000 | 1.894E+11 |
| -69.1246 | 5666.0163 | 0.000 | | | | |
| 12.000 | 0.0417 | 973569. | 13.2810 | -0.000619 | 0.000 | 1.894E+11 |
| -69.5649 | 6011.7974 | 0.000 | | | | |
| 12.300 | 0.0395 | 973140. | -237.8280 | -0.000601 | 0.000 | 1.894E+11 |
| -69.9401 | 6380.5449 | 0.000 | | | | |
| 12.600 | 0.0373 | 971807. | -490.1690 | -0.000582 | 0.000 | 1.894E+11 |
| -70.2494 | 6774.2812 | 0.000 | | | | |
| 12.900 | 0.0353 | 969563. | -743.5038 | -0.000564 | 0.000 | 1.894E+11 |
| -70.4922 | 7195.2572 | 0.000 | | | | |
| 13.200 | 0.0333 | 966407. | -997.5921 | -0.000545 | 0.000 | 1.894E+11 |
| -70.6680 | 7645.9840 | 0.000 | | | | |
| 13.500 | 0.0313 | 962335. | -1252.1914 | -0.000527 | 0.000 | 1.894E+11 |
| -70.7761 | 8129.2705 | 0.000 | | | | |
| 13.800 | 0.0295 | 957347. | -1507.0570 | -0.000509 | 0.000 | 1.894E+11 |
| -70.8159 | 8648.2668 | 0.000 | | | | |
| 14.100 | 0.0277 | 951442. | -1761.9417 | -0.000491 | 0.000 | 1.894E+11 |
| -70.7868 | 9206.5169 | 0.000 | | | | |
| 14.400 | 0.0259 | 944620. | -2016.5964 | -0.000473 | 0.000 | 1.894E+11 |
| -70.6881 | 9808.0202 | 0.000 | | | | |
| 14.700 | 0.0243 | 936883. | -2270.7693 | -0.000455 | 0.000 | 1.895E+11 |
| -70.5191 | 10457. | 0.000 | | | | |
| 15.000 | 0.0227 | 928233. | -2522.8845 | -0.000437 | 0.000 | 1.895E+11 |
| -69.5449 | 11043. | 0.000 | | | | |
| 15.300 | 0.0211 | 918682. | -2770.3428 | -0.000419 | 0.000 | 1.895E+11 |
| -67.9319 | 11574. | 0.000 | | | | |
| 15.600 | 0.0197 | 908252. | -3011.9766 | -0.000402 | 0.000 | 1.895E+11 |
| -66.3091 | 12147. | 0.000 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15.900 | 0.0182 | 896963. | -3247.7500 | -0.000385 | 0.000 | 1.895E+11 |
| -64.6762 | 12769. | 0.000 | | | | |
| 16.200 | 0.0169 | 884836. | -3477.6262 | -0.000368 | 0.000 | 1.896E+11 |
| -63.0328 | 13443. | 0.000 | | | | |
| 16.500 | 0.0156 | 871894. | -3701.5665 | -0.000351 | 0.000 | 1.896E+11 |
| -61.3785 | 14178. | 0.000 | | | | |
| 16.800 | 0.0143 | 858156. | -3919.5303 | -0.000335 | 0.000 | 1.896E+11 |
| -59.7125 | 14981. | 0.000 | | | | |
| 17.100 | 0.0132 | 843645. | -4131.4746 | -0.000319 | 0.000 | 1.896E+11 |
| -58.0343 | 15860. | 0.000 | | | | |
| 17.400 | 0.0121 | 828383. | -4337.3534 | -0.000303 | 0.000 | 1.897E+11 |
| -56.3428 | 16827. | 0.000 | | | | |
| 17.700 | 0.0110 | 812391. | -4537.1174 | -0.000287 | 0.000 | 1.897E+11 |
| -54.6372 | 17894. | 0.000 | | | | |
| 18.000 | 0.009985 | 795692. | -4730.7130 | -0.000272 | 0.000 | 1.898E+11 |
| -52.9159 | 19078. | 0.000 | | | | |
| 18.300 | 0.009033 | 778307. | -4918.0813 | -0.000257 | 0.000 | 1.898E+11 |
| -51.1776 | 20397. | 0.000 | | | | |
| 18.600 | 0.008133 | 760260. | -5099.1572 | -0.000243 | 0.000 | 1.899E+11 |
| -49.4202 | 21874. | 0.000 | | | | |
| 18.900 | 0.007286 | 741573. | -5273.8678 | -0.000228 | 0.000 | 1.899E+11 |
| -47.6413 | 23539. | 0.000 | | | | |
| 19.200 | 0.006489 | 722270. | -5442.1306 | -0.000214 | 0.000 | 1.900E+11 |
| -45.8380 | 25429. | 0.000 | | | | |
| 19.500 | 0.005742 | 702372. | -5603.8510 | -0.000201 | 0.000 | 1.900E+11 |
| -44.0066 | 27591. | 0.000 | | | | |
| 19.800 | 0.005042 | 681905. | -5758.9193 | -0.000188 | 0.000 | 1.900E+11 |
| -42.1424 | 30088. | 0.000 | | | | |
| 20.100 | 0.004389 | 660892. | -5907.2065 | -0.000175 | 0.000 | 1.901E+11 |
| -40.2393 | 33004. | 0.000 | | | | |
| 20.400 | 0.003781 | 639359. | -6048.5583 | -0.000163 | 0.000 | 1.901E+11 |
| -38.2894 | 36455. | 0.000 | | | | |
| 20.700 | 0.003217 | 617329. | -6182.7872 | -0.000151 | 0.000 | 1.902E+11 |
| -36.2822 | 40605. | 0.000 | | | | |
| 21.000 | 0.002694 | 594830. | -6309.6602 | -0.000139 | 0.000 | 1.902E+11 |
| -34.2029 | 45699. | 0.000 | | | | |
| 21.300 | 0.002213 | 571888. | -6428.8811 | -0.000128 | 0.000 | 1.903E+11 |
| -32.0309 | 52117. | 0.000 | | | | |
| 21.600 | 0.001770 | 548532. | -6540.0607 | -0.000118 | 0.000 | 1.903E+11 |
| -29.7355 | 60490. | 0.000 | | | | |
| 21.900 | 0.001364 | 524790. | -6642.6672 | -0.000108 | 0.000 | 1.904E+11 |
| -27.2681 | 71961. | 0.000 | | | | |
| 22.200 | 0.000994 | 500695. | -6735.9316 | -9.799E-05 | 0.000 | 1.905E+11 |
| -24.5454 | 88868. | 0.000 | | | | |
| 22.500 | 0.000659 | 476283. | -6818.6412 | -8.876E-05 | 0.000 | 1.905E+11 |
| -21.4044 | 117001. | 0.000 | | | | |
| 22.800 | 0.000355 | 451594. | -6888.5624 | -8.000E-05 | 0.000 | 1.906E+11 |
| -17.4407 | 176741. | 0.000 | | | | |
| 23.100 | 8.261E-05 | 426679. | -6921.9087 | -7.170E-05 | 0.000 | 1.906E+11 |
| -1.0850 | 47283. | 0.000 | | | | |
| 23.400 | -0.000161 | 401750. | -6919.9509 | -6.388E-05 | 0.000 | 1.906E+11 |
| 2.1727 | 48579. | 0.000 | | | | |
| 23.700 | -0.000377 | 376850. | -6906.6305 | -5.653E-05 | 0.000 | 1.907E+11 |
| 5.2275 | 49875. | 0.000 | | | | |
| 24.000 | -0.000568 | 352018. | -6882.6878 | -4.965E-05 | 0.000 | 1.907E+11 |
| 8.0740 | 51171. | 0.000 | | | | |
| 24.300 | -0.000735 | 327291. | -6848.8779 | -4.324E-05 | 0.000 | 1.908E+11 |
| 10.7092 | 52467. | 0.000 | | | | |
| 24.600 | -0.000879 | 302702. | -6805.9628 | -3.730E-05 | 0.000 | 1.909E+11 |
| 13.1325 | 53763. | 0.000 | | | | |
| 24.900 | -0.001003 | 278285. | -6754.7025 | -3.182E-05 | 0.000 | 1.909E+11 |
| 15.3455 | 55059. | 0.000 | | | | |
| 25.200 | -0.001108 | 254066. | -6695.8469 | -2.680E-05 | 0.000 | 1.910E+11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 17.3521 | 56355. | 0.000 | | | | |
| 25.500 | -0.001196 | 230072. | -6630.1283 | -2.224E-05 | 0.000 | 1.911E+11 |
| 19.1583 | 57651. | 0.000 | | | | |
| 25.800 | -0.001269 | 206327. | -6558.2533 | -1.813E-05 | 0.000 | 1.911E+11 |
| 20.7722 | 58947. | 0.000 | | | | |
| 26.100 | -0.001327 | 182851. | -6480.8960 | -1.446E-05 | 0.000 | 1.911E+11 |
| 22.2041 | 60243. | 0.000 | | | | |
| 26.400 | -0.001373 | 159663. | -6398.6901 | -1.124E-05 | 0.000 | 1.911E+11 |
| 23.4659 | 61539. | 0.000 | | | | |
| 26.700 | -0.001408 | 136780. | -6312.2225 | -8.445E-06 | 0.000 | 1.911E+11 |
| 24.5717 | 62835. | 0.000 | | | | |
| 27.000 | -0.001434 | 114215. | -6019.5652 | -6.081E-06 | 0.000 | 1.911E+11 |
| 138.0157 | 346593. | 0.000 | | | | |
| 27.300 | -0.001452 | 93438. | -5510.1800 | -4.125E-06 | 0.000 | 1.911E+11 |
| 144.9761 | 359553. | 0.000 | | | | |
| 27.600 | -0.001463 | 74541. | -4976.6841 | -2.543E-06 | 0.000 | 1.911E+11 |
| 151.4105 | 372513. | 0.000 | | | | |
| 27.900 | -0.001470 | 57606. | -4420.8475 | -1.298E-06 | 0.000 | 1.911E+11 |
| 157.3877 | 385473. | 0.000 | | | | |
| 28.200 | -0.001473 | 42711. | -3844.1854 | -3.530E-07 | 0.000 | 1.911E+11 |
| 162.9801 | 398433. | 0.000 | | | | |
| 28.500 | -0.001472 | 29928. | -3247.9511 | 3.313E-07 | 0.000 | 1.911E+11 |
| 168.2611 | 411393. | 0.000 | | | | |
| 28.800 | -0.001470 | 19326. | -2633.1381 | 7.952E-07 | 0.000 | 1.911E+11 |
| 173.3016 | 424353. | 0.000 | | | | |
| 29.100 | -0.001467 | 10969. | -2000.4946 | 1.081E-06 | 0.000 | 1.911E+11 |
| 178.1670 | 437313. | 0.000 | | | | |
| 29.400 | -0.001462 | 4922.1488 | -1350.5489 | 1.230E-06 | 0.000 | 1.911E+11 |
| 182.9140 | 450273. | 0.000 | | | | |
| 29.700 | -0.001458 | 1245.5082 | -683.6466 | 1.288E-06 | 0.000 | 1.911E+11 |
| 187.5873 | 463233. | 0.000 | | | | |
| 30.000 | -0.001453 | 0.000 | 0.000 | 1.300E-06 | 0.000 | 1.911E+11 |
| 192.2164 | 238096. | 0.000 | | | | |

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

| | | | |
|---|---|---|---|
| Pile-head deflection | = | 0.1733083 | inches |
| Computed slope at pile head | = | -0.0010734 | radians |
| Maximum bending moment | = | 973569. | inch-lbs |
| Maximum shear force | = | 9000.0000005 | lbs |
| Depth of maximum bending moment | = | 12.0000000 | feet below pile head |
| Depth of maximum shear force | = | 0.3000000 | feet below pile head |
| Number of iterations | = | 19 | |
| Number of zero deflection points | = | 1 | |

---

Summary of Pile Response(s)

---

Slug Catcher Area B-19.lp7o

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

| Load Case No. | Maximum Load Shear Type in Pile No. | Pile-head Condition 1 V(lbs) or y(inches) lbs | Pile-head Condition 2 in-lb, rad., or in-lb/rad. radians | Axial Loading lbs | Pile-head Deflection inches | Maximum Moment in Pile in-lbs |
|---|---|---|---|---|---|---|
| 1 | 1 | V = 9000.0000 | M = 0.000 | -11510. | 0.17330833 | 973569. |
| | | 9000.0000 | -0.00107344 | | | |

The analysis ended normally.

EIKON Consultant Group

PROJECT Tolga - Slug Catcher

PROJECT # 14090

NAME RCM

DATE 7/24/14 SHEET ____ OF ____

Check Pier / Pier Cap Connx:

$M_u = 226{,}490^{\#\cdot in} / 12{,}000 = 18.87^{k'}$

$\phi M_n = 395^{k'}$

$l_d$ #8 $= 3/40 \times 60{,}000/\sqrt{4{,}500} \times 0.875 = 59$ in

$l_{dprov} / l_{dreq'd} = (20.8) / 59 = 0.35$ $(A_{s\,req'd}/A_{s\,prov'd})$

$\therefore \phi M_n = 0.35 \times 395 = 138^{k'} > M_u$ OK

www.hilti.us

**Profis Anchor 2.4.7**

| | | | |
|---|---|---|---|
| Company: | | Page: | 1 |
| Specifier: | | Project: | Targa - Little Mo Slug C |
| Address: | | Sub-Project I Pos. No.: | Slug Catcher Anchor Bl |
| Phone I Fax: | | Date: | 7/25/2014 |
| E-Mail: | | | |

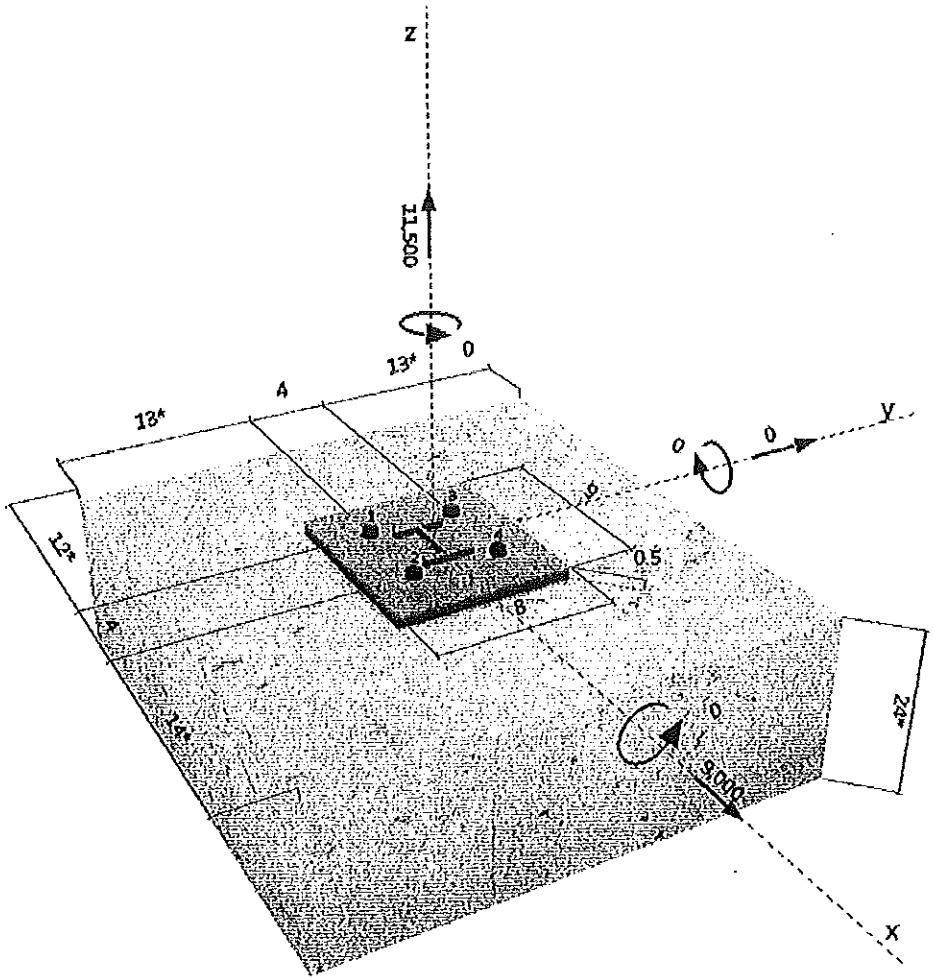
**Specifier's comments:** Slug Catcher Anchor Bolts

## 1 Input data



| | |
|---|---|
| **Anchor type and diameter:** | **Hex Head ASTM F 1554 GR. 36 3/4** |
| Effective embedment depth: | $h_{ef}$ = 12.000 in. |
| Material: | ASTM F 1554 |
| Proof: | design method ACI 318-08 / CIP |
| Stand-off installation: | $e_b$ = 0.000 in. (no stand-off); t = 0.500 in. |
| Anchor plate: | $l_x$ x $l_y$ x t = 9.000 in. x 8.000 in. x 0.500 in.; (Recommended plate thickness: not calculated) |
| Profile: | S shape (AISC); (L x W x T x FT) = 3.000 in. x 2.330 in. x 0.170 in. x 0.260 in. |
| Base material: | uncracked concrete, 4000, $f_c'$ = 4000 psi; h = 24.000 in. |
| Reinforcement: | tension: condition B, shear: condition B;<br>edge reinforcement: none or < No. 4 bar |
| Seismic loads (cat. C, D, E, or F) | no |

**Geometry [in.] & Loading [lb, in.lb]**



| | | | |
|---|---|---|---|
| Company: | | Page: | 2 |
| Specifier: | | Project: | Targa - Little Mo Slug C |
| Address: | | Sub-Project I Pos. No.: | Slug Catcher Anchor Bl |
| Phone I Fax: | | Date: | 7/25/2014 |
| E-Mail: | | | |

## 2 Proof I Utilization (Governing Cases)

| | | Design values [lb] | | Utilization | |
|---|---|---|---|---|---|
| Loading | Proof | Load | Capacity | $\beta_N$ / $\beta_V$ [%] | Status |
| Tension | Concrete Breakout Strength | 11500 | 41611 | 28 / - | OK |
| Shear | Concrete edge failure in direction x+ | 9000 | 18874 | - / 48 | OK |

| Loading | $\beta_N$ | $\beta_V$ | $\zeta$ | Utilization $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|---|
| Combined tension and shear loads | 0.276 | 0.477 | 5/3 | 41 | OK |

## 3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

**Fastening meets the design criteria!**

## 4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.


PROFIS Anchor ( c ) 2003-2009 Hilti AG, FL-9494 Schaan Hilti is a registered Trademark of Hilti AG, Schaan

www.hilti.us

Profis Anchor 2.4.7

| | | | |
|---|---|---|---|
| Company: | | Page: | 1 |
| Specifier: | | Project: | Targa - Little Mo Slug C |
| Address: | | Sub-Project I Pos. No.: | Slug Catcher Anchor Bl |
| Phone I Fax: | | Date: | 7/25/2014 |
| E-Mail: | | | |

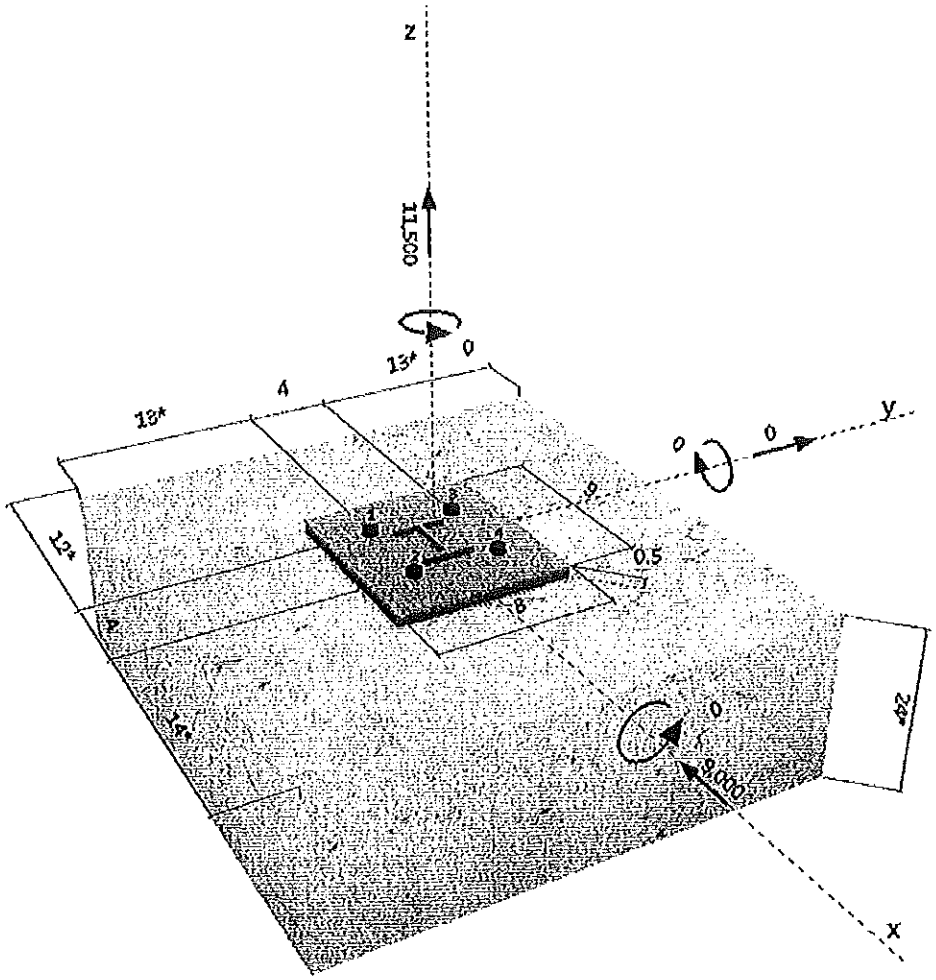
**Specifier's comments:** Slug Catcher Anchor Bolts

## 1 Input data



| | |
|---|---|
| **Anchor type and diameter:** | **Hex Head ASTM F 1554 GR. 36 3/4** |
| Effective embedment depth: | $h_{ef}$ = 12.000 in. |
| Material: | ASTM F 1554 |
| Proof: | design method ACI 318-08 / CIP |
| Stand-off installation: | $e_b$ = 0.000 in. (no stand-off); t = 0.500 in. |
| Anchor plate: | $l_x$ x $l_y$ x t = 9.000 in. x 8.000 in. x 0.500 in.; (Recommended plate thickness: not calculated) |
| Profile: | S shape (AISC); (L x W x T x FT) = 3.000 in. x 2.330 in. x 0.170 in. x 0.260 in. |
| Base material: | uncracked concrete, 4000, $f_c'$ = 4000 psi; h = 24.000 in. |
| Reinforcement: | tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar |
| Seismic loads (cat. C, D, E, or F) | no |

**Geometry [in.] & Loading [lb, in.lb]**



www.hilti.us

Profis Anchor 2.4.7

| | | | |
|---|---|---|---|
| Company: | | Page: | 2 |
| Specifier: | | Project: | Targa - Little Mo Slug C |
| Address: | | Sub-Project I Pos. No.: | Slug Catcher Anchor Bl |
| Phone I Fax: | | Date: | 7/25/2014 |
| E-Mail: | | | |

## 2 Proof I Utilization (Governing Cases)

| | | Design values [lb] | | Utilization | |
|---|---|---|---|---|---|
| Loading | Proof | Load | Capacity | $\beta_N$ / $\beta_V$ [%] | Status |
| Tension | Concrete Breakout Strength | 11500 | 41611 | 28 / - | OK |
| Shear | Concrete edge failure in direction x- | 9000 | 18084 | - / 50 | OK |

| Loading | $\beta_N$ | $\beta_V$ | $\zeta$ | Utilization $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|---|
| Combined tension and shear loads | 0.276 | 0.498 | 5/3 | 43 | OK |

## 3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

# Fastening meets the design criteria!

## 4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.


PROFIS Anchor ( c ) 2003-2009 Hilti AG, FL-9494 Schaan Hilti is a registered Trademark of Hilti AG, Schaan

# McKENZIE COUNTY, ND

# BUILDING PERMIT

*Permit #*

14437

*Description of Work:*

Targa No. 3 Ware-house Bldg

1939 125th Ave

Watford City, ND

*Required Inspections*

*(Inspector initial and date)*

____ Footing

____ Foundation

____ Footing

____ Final

*Date Issued:* 8/25/2014

Call 701.444.6494 ext. 2 for Inspections, no later than 24 hours in advance

**This Permit Expires 6 Months from Issue Date.**

ORIGINAL

**MCKENZIE COUNTY**
**BUILDING INSPECTION**
201 5th Street NW, Watford City, ND 58854
Phone: 701-444-6494 Fax: 701-444-4113
**For Inspections Call: 701-444-3616 x1045**

**Property Address** 1131 125th Ave **Permit No.** 11137
Subdivision Twin Townhouse Lot No. Date 9/16/14
Name Ivan Phone Time 11:30

☐Complaint ☒Initial Inspection ☐Reinspection ☐Consultation

| INSPECTIONS TYPE | RESULT: APPROVED | RESULT: CORRECTION REQUESTED | RESULT: RE-INSPECTION REQUESTED | SPECIAL COMMENTS | UNABLE TO MAKE INSPECTION BECAUSE: |
|---|---|---|---|---|---|
| | | | | ☐Prior Violation Not Corrected<br>☐Engineering required<br>Item # ____<br>☐Work Incomplete<br>☐OK to proceed without reinspection<br>☐Other ____ | ☐Approved plan/permit not available<br>☐Building not identified<br>☐Building locked or work inaccessible<br>☐Cannot locate structure<br>☐Party missed appointment<br>Time ____ |
| **Clearances** | | | | | |
| 1. Gas Meter | ☐ | ☐ | ☐ | | |
| 2. Bond Release | ☐ | ☐ | ☐ | | |
| 3. Other ____ | ☐ | ☐ | ☐ | Comments: 6 pier holes | |
| **Land Use** | | | | | |
| 4. Side Setback | ☐ | ☐ | ☐ | 30' deep per hole. | |
| 5. Front Setback | ☐ | ☐ | ☐ | 30" wide. | |
| 6. Rear Setback | ☐ | ☐ | ☐ | | |
| 7. Right of Way | ☐ | ☐ | ☐ | #6 Vert. x2. | |
| 8. Building Height/FFE | ☐ | ☐ | ☐ | #4 Horizontal @ ~12" center. | |
| 9. Other ____ | ☐ | ☐ | ☐ | | |
| **Inspections** | | | | | |
| Sub-rough: | | | | | |
| 10. Excavation | ☐ | ☐ | ☐ | Suspended above bot by 24"± | |
| 11. Footings | ☒ | ☐ | ☐ | over top of hole. | |
| 12. Foundation | ☐ | ☐ | ☐ | | |
| 13. Mechanical | ☐ | ☐ | ☐ | | |
| 14. Other ____ | ☐ | ☐ | ☐ | | |
| Rough: | | | | | |
| 15. Building | ☐ | ☐ | ☐ | | |
| 16. Shear Walls | ☐ | ☐ | ☐ | | |
| 17. Mechanical | ☐ | ☐ | ☐ | | |
| 18. Insulation | ☐ | ☐ | ☐ | | |
| 19. Drywall | ☐ | ☐ | ☐ | | |
| 20. Lath | ☐ | ☐ | ☐ | | |
| 21. Bond Beam | ☐ | ☐ | ☐ | | |
| 22. Ceiling Grid | ☐ | ☐ | ☐ | | |
| 23. Above Grid | ☐ | ☐ | ☐ | | |
| 24. Gas Line | ☐ | ☐ | ☐ | | |
| 25. Other ____ | ☐ | ☐ | ☐ | | |
| **Final** | | | | | |
| 26. Building | ☐ | ☐ | ☐ | | |
| 27. Mechanical | ☐ | ☐ | ☐ | | |
| 28. Water Meter Box | ☐ | ☐ | ☐ | | |
| 29. Final Grading/Excavation | ☐ | ☐ | ☐ | | |
| 30. Landscaping | ☐ | ☐ | ☐ | | |
| 31. Bonds/Escrow Required | ☐ | ☐ | ☐ | | |
| 32. Other ____ | ☐ | ☐ | ☐ | | |

Signed [signature] Inspector

# McKenzie County Building Permit Fee Worksheet

**Permit #:** 14437
**Name:** Targa Little Missouri No.3 Warehouse Bldg
**Address:** 1939 125th Ave, Watford City
**Subdivision:**

## SQUARE FOOTAGE COMPUTATION *(If totals are not provided on plans)*

**MAIN BUILDING:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| 5 | | x | | = 0 |
| 6 | | x | | = 0 |
| | TOTAL AREA | | | 0 |

**BASEMENT:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| 3 | | x | | = 0 |
| 4 | | x | | = 0 |
| | TOTAL AREA | | | 0 |

**GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | TOTAL AREA | | | 0 |

**DECK OR COVERED PATIO:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | TOTAL AREA | | | 0 |

**STAND ALONE GARAGE:**

| | | | | |
|---|---|---|---|---|
| 1 | | x | | = 0 |
| 2 | | x | | = 0 |
| | TOTAL AREA | | | 0 |

## VALUATION COMPUTATION *(To be completed and authorized by Plan Reviewer and/or Building Official)*

(Valuation computed using average construction cost per square foot, per ICC BVD chart including NCE modifier)

| | Group | Type | | | | |
|---|---|---|---|---|---|---|
| Valuation of main floor | S-2 Storage, low hazard | VB | $83.57 (Cost/Sqft) | x | 4200.0 (Square Footage) | = $350,991.90 (Valuation-Sq. Ft) |
| Valuation of unfinished basement | N/A | N/A | $15.00 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of finished basement | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation of garage | U-Utility | VB | $48.85 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| * Private Garages use Utility, miscellaneous | | | | | | |
| Valuation of deck/covered patio | N/A | N/A | $0.00 (Cost/Sqft) | x | (Square Footage) | = $0.00 (Valuation-Sq. Ft) |
| Valuation and inspection of signs and other similar structures | | | | | | = $0.00 (Valuation-Sq. Ft) |
| | | | Hours req'd for inspection | | Value of Structure | |

* For shell only buildings deduct 20 percent ☐ Shell Building
* Authorized Adjustment ☐ Authorized Adjustment

Adjustment % (+/-) 0%

Adjustments to building valuations will only be assessed on non-typical structures. Adjustments are not to be used unless approved by the Building Official

| Reasoning for Adjustment *Required | |
|---|---|

**TOTAL BUILDING VALUATION** $350,991.90

## BUILDING PERMIT FEES

| | | | |
|---|---|---|---|
| Building Permit Base Fee | | | $2,370.46 |
| Modular Construction (50% of Building Permit Fee, No Plan Check Fee) | | ☐ Modular | $0.00 |
| Plan Review Fee (65% of Permit Fee Commercial) | | ☑ Commercial | $1,540.80 |
| Plan Review Fee (40% of Permit Fee Residential) | | ☐ Residential | $0.00 |
| Emergency Services ($TBD per unit) | | | - |
| Water Impact Fee | | | - |
| Residential | ($TBD per unit) | | - |
| Commercial | ($TBD per connection) | | - |
| Institutional | ($TBD per connection) | | - |

## PERMIT FEE

| | |
|---|---|
| TOTAL FEE | $3,911.25 |
| PREPAID DEPOSIT | $0.00 |
| **AMOUNT DUE** | $3,911.25 |

Calculated By: Kendall Phillips Date: 8/25/2014

Signature:

*McKenzie County Building& Planning Department*
*201 5th Street NW*
*Watford City, ND 58854* *mckenziecounty.net*
*Phone: 701-444-6494*

Permit No: #14437

# COMMERCIAL BUILDING APPLICATION

(Incomplete information will delay approval of the application)

RECEIVED
AUG 05 2014

Submit Application Along with Submittal Requirements

## 1. PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Title: | Targa - Little Missouri #3 Warehouse Bldg. | | |
| Property Address: | 1939 125th Ave NW | City/Zip: | Watford City, ND 58854 |
| Subdivision: | NW ¼ of SW ¼ | Lot#: | N/A |
| Township: | T149 | Section: 29 | Range: 98W |
| Name of Applicant: | Mike Pratt | Address/City/Zip: | 25610 Clay Rd./Katy, TX 77493 |
| Phone Numbers: | 281-371-7500 | Email: | mike.pratt@opdepc.com |

## 2. OWNER INFORMATION

| | | | |
|---|---|---|---|
| Owner Name: | Targa | | |
| Owner Address: | 25610 Clay Rd. | Address/City/Zip: | Katy, TX 77493 |
| Owner Phone Number: | 281-371-7500 | | |

## 3. PROJECT DESCRIPTION

| Type of Work: check box that applies | New Construction | Alteration | Addition | Demolition |
|---|---|---|---|---|
| | (New Construction) | | | |

Location of Work: (ie: Floor, Level) GROUND LEVEL

Square Footage of Work Being Done: 4200 SF

Describe in detail work being done:

Metal Bldg for warehouse use

Foundation Type: Footing/stem walls

## 4. FEE INFORMATION

| | | | |
|---|---|---|---|
| General Contractor Name: | OPD | Phone #: | 281-371-7500 |
| ND License #: | 50680 | | |

## 5. ZONING/ASSESING INFORMATION (for office use only)

| New ☐ | Addition | Alteration ☐ | Demolition ☐ | Miscellaneous |
|---|---|---|---|---|
| Occupancy Group: | Division: | Census Code: | Ownership: | # of Units: |
| Building Height: | Construction Type: | Front Width: | Rear Width: | Building Width: |
| Zoning: per approval | Average Depth of Lot: | | Lot Area (sq ft): | |
| Easement: | | | | |
| Front Yard Setback | Side Yard Setbacks | | Rear Yard Setback | |
| See site plan | | | | |
| Area of Main: | Finished Area: | | Finished Area Alt / Add: | |
| # Required Parking Spaces | Area Required Parking: | | Total Area: | |
| Zoning Approval Signature: Walter J. Hadley | | | Date: 8/25/19 | |

## 6. BUILDING CODE INFORMATION (for office use only)

| | |
|---|---|
| Occupancy Classification: | Change of Occupancy: |
| Type of Construction: | Allowable Area: |
| Building Stories / Height: | Mixed Occupancy: |
| Building Area: | Occupant Load: |
| Fire Protection Systems | Area Increase |
| Alarm: | Frontage |
| Sprinkler: | Sprinkler |
| Fire Resistance Rating Requirements: | |
| | |

## 7. PROJECT REVIEW

| |
|---|
| Reviewed By: T. Tavon |
| Project Title: |
| Address: |
| $1500 Application Submittal Fee is required. ☐ Check Rec'd No. _____ OR ☐ Payment Receipt from Treasurer |
| ☐ Payment scanned to electronic files. Date: _____ |
| Total Permit Fee Amount $911.25 |

A member of the Building Department will inform you when the permit has been created. Your signature is required when you pick up the permit. The property must be clearly identified with an address prior to inspection. Any information the applicant has set forth in this application that if false or misleading may result in the rejection of the application or revocation of the permit. A condition for the issuance of this permit is that the proposed construction will comply at all times with the plans as approved by all applicable government agencies.

I hereby declare and affirm that all matters and facts set forth in this application are true and correct to the best of my knowledge, information and beliefs.

Signature

8/7/2014
Date

This permit application and associated plans have been reviewed for compliance with the Code. All work associated with this permit is subject to field inspection by certified individuals during the course of construction. Issuance of this permit is in no way granting any portion of the proposed work to be completed in a manner contrary to the Code. Construction must commence within (six) months.

## Forsgren Inspector

**From:** Forsgren Inspector
**Sent:** Tuesday, August 19, 2014 11:00 AM
**To:** 'mike.pratt@opdepc.com'
**Cc:** John (john@atarchitecture.com); Walter Hadley (whadley@co.mckenzie.nd.us); 'jwoodbury@co.mckenzie.nd.us'
**Subject:** Permits 14437, 14438 and 14439 Warehouse, Compressor and Slug Catcher Buildings

Mike,

I have started review on these and everything looks in order; however these are not approved by the Zoning Department. Once they are I can proceed with issuing the building permits.

Kendall Phillips, P.E.
McKenzie County Building Official

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Warehouse Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 4200 SF
2. Height of Building: +/- 28'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group S-2 Low Hazard Storage
5. Table 503: Allowable height: 40'/1 story. OK; Allowable area: 13,500 sf. OK
6. Table 1004.1.2: Occupant load: Warehouse: 1/500 sf. 4200 sf @ 1/500: 8 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 2 exits provided. OK
8. Doors/Windows: Refer to Legend, Targa Drawing number 902 for door/window information.
9. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
10. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
11. Gratings at exterior doors: Refer to detail 2/S2.1. Top of grating to be flush with finish floor.
12. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

13. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
14. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
15. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.
John Biggs
Date 8-5-2014 Lic. No. 2163

Lightowler Johnson Associates
architects engineers
incorporated

August 5, 2014

Mr. Jerry Divin
OPD, LLC
25610 Clay Road
Katy, TX 77493

RE: Architectural review of drawings for building permit application

Dear Mr. Divin,

This letter is to confirm that LJA Architects and Engineers has reviewed your drawings and found that the design for the Warehouse Building appears to conform with the 2012 IBC and McKenzie County Building Department criteria with the following exceptions or clarifications to drawings:

1. Area of Building: 4200 SF
2. Height of Building: +/- 28'-0"
3. Construction Type: V-B, Non-sprinklered
4. Occupancy Group: Occupancy Group S-2 Low Hazard Storage
5. Table 503: Allowable height: 40'/1 story. OK; Allowable area: 13,500 sf. OK
6. Table 1004.1.2: Occupant load: Warehouse: 1/500 sf. 4200 sf @ 1/500: 8 occs.
7. Table 1015.1: One exit required, less than 49 occupants. 2 exits provided. OK
8. Doors/Windows: Refer to Legend, Targa Drawing number 902 for door/window information.
9. Door closers at exterior doors shall be designed for cold-climate applications, provided with hydraulic fluid for cold climates.
10. Hardware at exterior doors shall include: exterior threshold, door sweep, and weather-strip gasket. Door shall be adjusted for seal between door and gasket when in closed position.
11. Gratings at exterior doors: Refer to detail 2/S2.1. Top of grating to be flush with finish floor.
12. Other buildings shown on site plan to be submitted separately for building permits.

700 Main Avenue
Fargo, ND 58103
Phone (701) 293-1350
Fax (701) 293-1353
www.lja-1.com

919 7th St. S. Kirkwood Tower Ste. 205
Bismarck, ND 58504
Phone (701) 224-5006
Fax (701) 224-5008

1135 2nd Ave. West, Ste. 207
Williston, ND 58801
Phone (701) 577-0033
Fax (701) 577-0035

13. Details, Eikon sheet S2.1 to be modified to include 3" rigid insulation from top of footing to top of stem wall.
14. Underground piping to be buried to a depth acceptable to the building official (+/- 8' below finish grade) and provided with protection against freezing along the length of the pipes above that level. Sewer pipes to be installed in accordance with industry and State standards for maximum slopes of sewer and drain pipes.
15. Septic systems and leach fields to be installed by a licensed contractor listed with Upper Missouri District Health Unit on the UMDHU list of approved contractors, and shall be designed and installed according to approved criteria by Upper Missouri District Health Unit, including but not limited to criteria for depth of system, setbacks from wells and buildings and water lines, and treatment area.

Best regards,

John Biggs
LJA Architects and Engineers

I hereby certify that this plan specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.

John Biggs

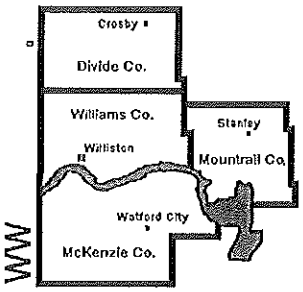
Date 8-5-2014 Lic. No. 2163

# Upper Missouri District Health Unit

*"Your Public Health Professionals"*

Date: 8/8/2013

Check #: 575661





WILLIAMS COUNTY
110 W. Bdwy, Ste 101
Williston, ND 58801-6056
Phone 701-774-6400
Fax 701-577- 8536
Toll Free 1-877-572-3763


X $100.00 Individual Permit Fee
____ $200.00 Multi -dwelling up to 20 bedrooms
____ $500.00 Multi-dwelling more than 20bedrooms
____ $50.00 Holding Tank
____ $50.00 Rebuilding Fee

AUG 15 2013 MEG

## SEWAGE TREATMENT SYSTEM PLANS PERMIT

OWNER Targa Badlands LLC phone 701-842-3315

INSTALL ADDRESS 1939 125th Ave NW Watford City, ND 58854

MAILING ADDRESS 1939 125th Ave NW Watford City, ND 58854

DIRECTIONS TO PROPERTY From Watford City take US 85 S approx 4.1 miles take a left onto Co. 37. After approx .5 miles take a right and travel approx 1.7 miles to site on left.

PURCHASER N/A LENDING INSTITUTION N/A

COUNTY McKenzie TWP T149 RNG 98W SEC 29

SUBD NW 1/4 of SW 1/4 LOT N/A BLOCK N/A

LOT SIZE 40 acres # OF BEDROOMS N/A or # OF EMPLOYEES 15 WELL DEPTH N/A

If you do not include township, range and section and number of bedrooms there will be a delay in processing your permit while we have to contact you. **The building owner, contractor, plumbing contractor, and/or installer are jointly responsible for compliance with U.M.D.H.U.'s Regulations for Individual Sewage Treatment Systems. In addition, it is your responsibility to follow all city, township and county regulations.**

Owner: [signature] Date: 8/8/13

DEPTH TO RESTRICTING LAYER ____ SOIL TYPE Clay loam

SEPTIC TANK (WORKING CAPACITY) 1,000 GAL.

TREATMENT AREA:

TRENCH IN SQUARE FEET

6" GRAVEL 660 12"GRAVEL 530 18"GRAVEL 440 24"GRAVEL 380

GRAVELLESS PIPE IN LINEAR FEET:

8" 330 10" 220

CHAMBER SYSTEM IN LINEAR FEET:

12" TALL 180 15"TALL 160

MOUND IN SQUARE FEET 240

ISTS PERMIT GOOD FOR 12 MONTHS FROM DATE OF ISSUE.

APPROVED BY: ____ DATE: ____

NOTIFY THIS OFFICE AT LEAST 2 BUSINESS DAYS PRIOR TO INSTALLATION FOR INSPECTION.

# ISTS Plans

List any plan issues: _____

_____

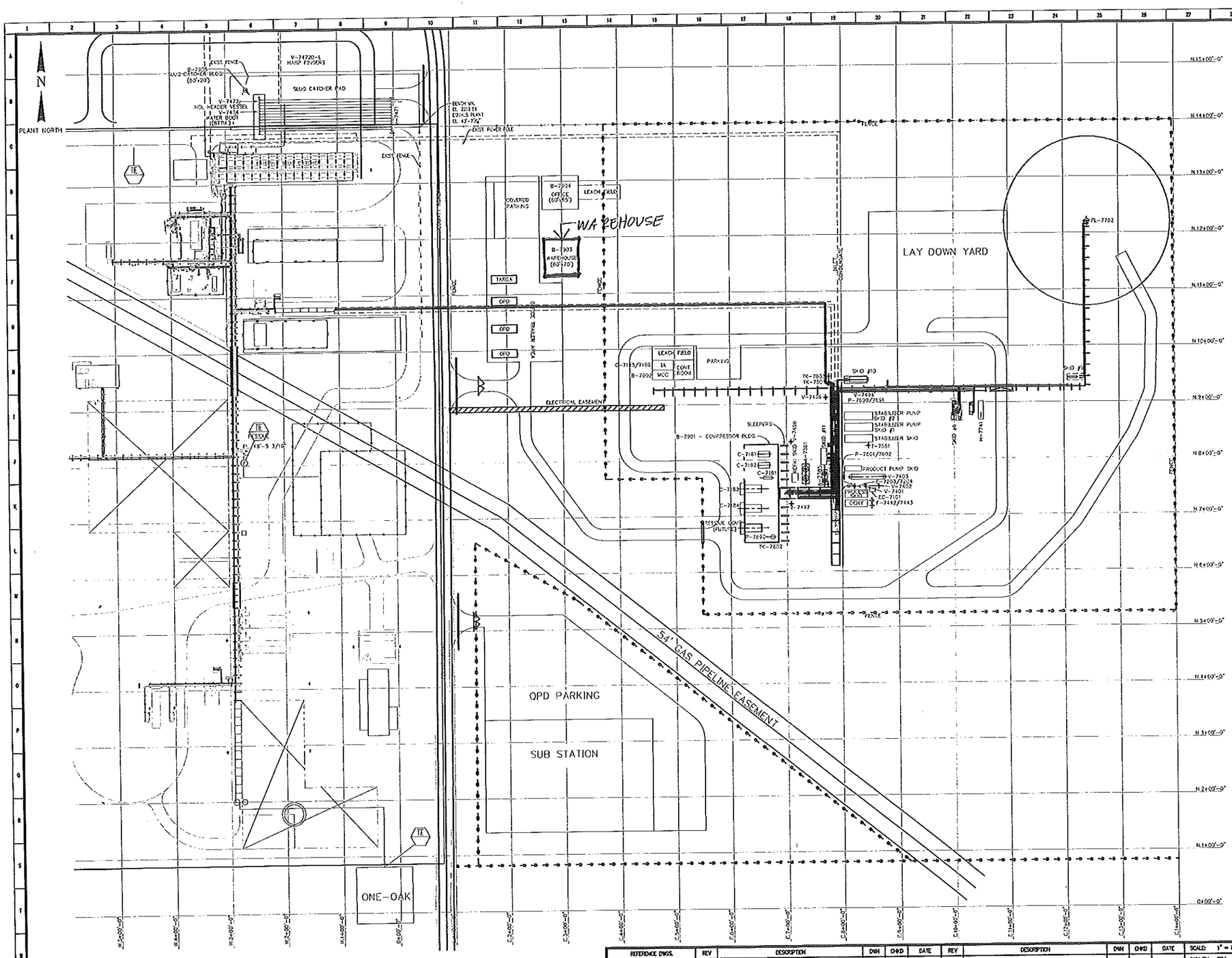
## Setbacks

| | Well <100' | Well >100' | Distribution Device | Treatment Area | Property Lines | Building |
|---|---|---|---|---|---|---|
| Bldg. Sewer | 100 | 50 | —— | —— | —— | —— |
| Septic tank | 100 | 50 | 5 | 10 | 10 | 10 |
| Distribution Device | 100 | 50 | —— | —— | 10 | 20 |
| Treatment area | 100 | 50 | 5 | —— | 10 | 10 |
| Well <100' | -- | -- | 100 | 100 | n/a | n/a |
| Well >100' | -- | -- | 50 | 50 | n/a | n/a |
| water line (pressure) | -- | -- | 10 | 10 | n/a | n/a |
| (suction) | -- | -- | 50 | 50 | n/a | n/a |
| Surface Water bodies | n/a | n/a | 100 | 100 | n/a | n/a |

## Reminders:

Rock Size: 1 to 3 inches

Cover Material: Straw or Fabric




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7441 | P&KT GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7445 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TEAL REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7101 | EXPANDER COMPRESSOR |
| P-7696/7697 | EXPANDER LUBE OIL PUMPS |
| P-7698 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7461 | REFRIGERANT SUCTION SCRUBBER |
| V-7462 | REFRIGERANT ECONOMIZER |
| V-7463 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7487 | HEAT MEDIUM FILTER |
| P-7656/7657 | HEAT MEDIUM PUMPS |
| V-7422 | HEAT MEDIUM EXPANSION TANK |
| H-7721 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7653/7654/7655 | CONDENSATE PIPELINE PUMPS |
| V-7475 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7251 | STABILIZER FEED/COMP. DISCH. EXCHANGER |
| E-7252 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7253 | STABILIZER REBOILER |
| F-7481/7482 | STABILIZER FEED FILTERS |
| F-7453/7456 | STABILIZER FEED COALESCERS |
| F-7455 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7493 | FLARE KNOCK OUT DRUM |
| P-7658/7659 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7434 | CLOSED DRAIN TANK |
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7455 | RESIDUE GAS FILTER COALESCER |
| V-7425 | FUEL GAS SCRUBBER |
| E-7284 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7901 | COMPRESSOR BUILDING |
| B-7902 | CONTROL ROOM/MCC/T.A. BUILDING |
| B-7903 | WAREHOUSE BUILDING |
| B-7904 | OFFICE BUILDING |
| B-7905 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7383/7384 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7358 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7161 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7185/7186 | RESIDUE COMPRESSORS |
| C-7185/7188 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7206 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7201/7204 | SIDE REBOILER - REBOILER |
| E-7205 | SEAL GAS HEATER |
| F-7442/7443 | MOL SIEVE DEHYDRATORS |
| F-7464 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7651/7652 | PRODUCT BOOSTER PUMPS |
| P-7659 | METHANOL INJECTION PUMP |
| P-7632 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEMETHANIZER |
| T-7551 | STABILIZER |
| TK-7801 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | SLOP OIL TANK |
| V-7401 | COLD SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7471 | HEADER VESSEL |
| V-7472-L | HARP FINGERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7476 | INSTRUMENT AIR RECEIVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7498 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | B | ISSUED FOR APPROVAL | RBJ | | |
| | A | ISSUED FOR BID - QPD JOB #14025 | RBJ | - | - |

SCALE: 1" = 80' — DATE: 3/7/14
DWN BY: RBJ
CHKD BY:
FINAL OK:
ENGR.: MP
APPR.:
APPR.:
PLANT NAME: LITTLE MISSOURI #3

DRAWING NUMBER: LM-3000
CAD FILE NAME: LM-3000
REVISION: 8

TARGA

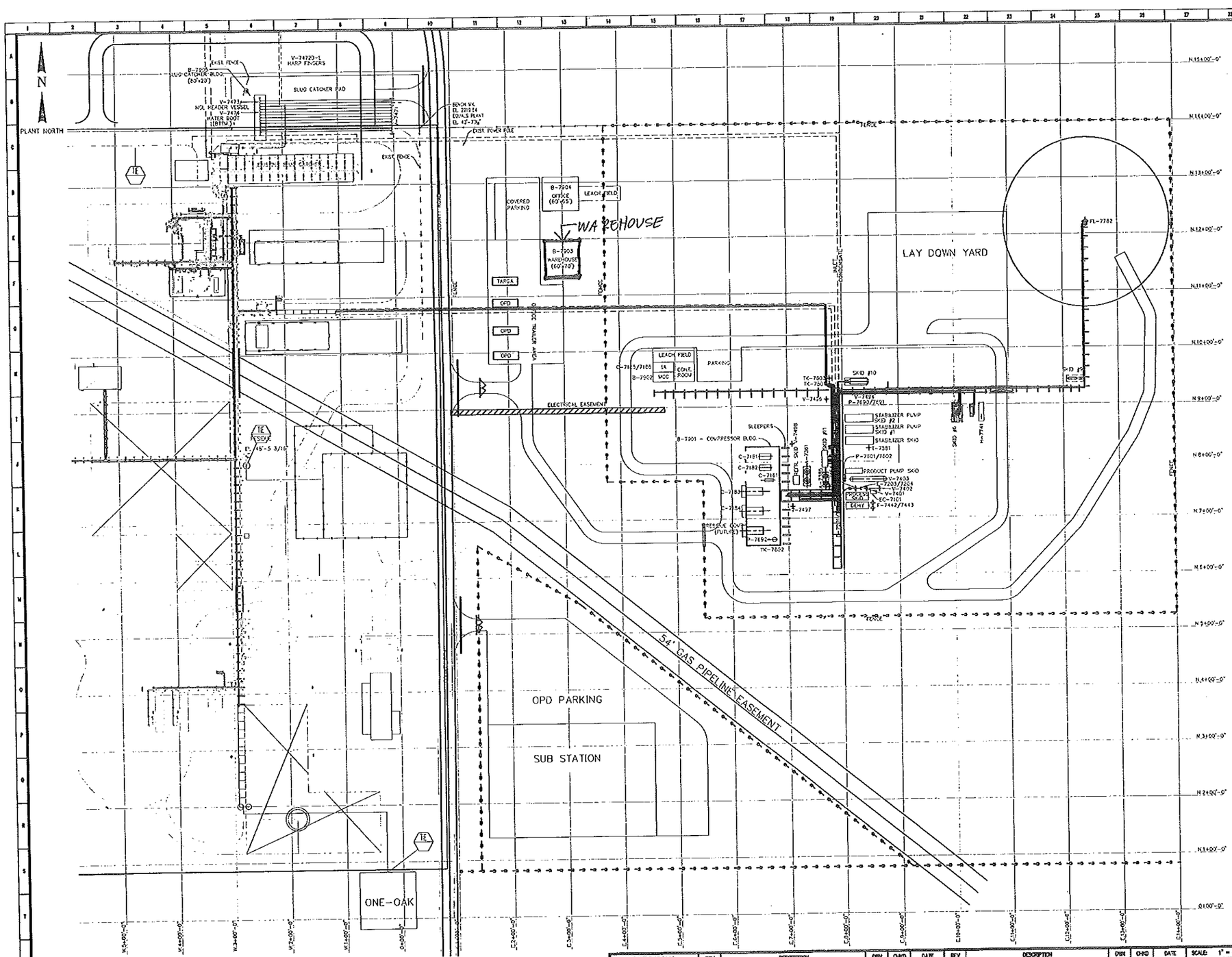
PLOT PLAN
LITTLE MISSOURI #3 GAS PLANT

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

PLOT DATE: -




## EQUIPMENT LIST

**DEHYDRATION SKID #1**

| | |
|---|---|
| A-7141 | REGENERATION GAS COMPRESSOR AFTERCOOLER |
| A-7341 | MOL SIEVE COOLER |
| C-7141 | REGENERATION GAS COMPRESSOR |
| F-7443 | INLET GAS COALESCING FILTER SEPARATOR |
| F-7444/7445 | DRY GAS FILTERS |
| V-7445 | REGENERATION GAS SCRUBBER |

**PROCESS SKID #2**

| | |
|---|---|
| E-7202 | GAS/PRODUCT EXCHANGER |
| E-7205 | CHILLER |
| E-7207 | TEA REBOILER |

**PRODUCT PUMP SKID #3**

P-7603/7604/7605 PRODUCT PIPELINE PUMPS

**EXPANDER/COMPRESSOR SKID #4**

| | |
|---|---|
| EC-7151 | EXPANDER COMPRESSOR |
| P-7606/7607 | EXPANDER LUBE OIL PUMPS |
| P-7608 | EXPANDER LUBE OIL MAKEUP PUMP |

**REFRIGERATION SKID #5**

| | |
|---|---|
| A-7362 | REFRIGERATION COMPRESSOR LUBE OIL COOLER |
| V-7451 | REFRIGERANT SUCTION SCRUBBER |
| V-7452 | REFRIGERANT ECONOMIZER |
| V-7453 | REFRIGERANT ACCUMULATOR |

**HEAT MEDIUM SKID #6**

| | |
|---|---|
| F-7497 | HEAT MEDIUM FILTER |
| P-7655/7657 | HEAT MEDIUM PUMPS |
| V-7452 | HEAT MEDIUM EXPANSION TANK |
| H-7751 | HEAT MEDIUM EXPANSION HEATER |

**STABILIZER PUMP SKID #7**

| | |
|---|---|
| P-7653/7654/7655 | CONDENSATE PIPELINE PUMPS |
| V-7475 | CONDENSATE SURGE TANK |

**STABILIZER SKID #8**

| | |
|---|---|
| E-7251 | STABILIZER FEED/COND. OVHD EXCHANGER |
| E-7252 | STABILIZER FEED/BOTTOMS EXCHANGER |
| E-7253 | STABILIZER REBOILER |
| F-7451/7452 | STABILIZER FEED FILTERS |
| F-7453/7454 | STABILIZER FEED COALESCERS |
| F-7455 | INLET SEPARATOR |

**FLARE KNOCK OUT SKID #9**

| | |
|---|---|
| V-7493 | FLARE KNOCK OUT DRUM |
| P-7655/7883 | FLARE KNOCK OUT PUMPS |

**CLOSED DRAIN SKID #10**

| | |
|---|---|
| V-7494 | CLOSED DRAIN TANK |
| P-7690/7691 | CLOSED DRAIN TANK PUMPS |

**FUEL GAS SKID #11**

| | |
|---|---|
| F-7455 | RESIDUE GAS FILTER COALESCER |
| V-7455 | FUEL GAS SCRUBBER |
| E-7281 | FUEL GAS HEATER |

**BUILDINGS**

| | |
|---|---|
| B-7901 | COMPRESSOR BUILDING |
| B-7902 | CONTROL ROOM/MCC/T.A. BUILDING |
| B-7903 | WAREHOUSE BUILDING |
| B-7904 | OFFICE BUILDING |
| B-7905 | SLUG CATCHER BUILDING |

**OFF SKID**

| | |
|---|---|
| A-7351 | REFRIGERANT CONDENSER |
| A-7353/7354 | RESIDUE COMPRESSOR INTERSTAGE COOLERS |
| A-7355 | RESIDUE COMPRESSOR DISCHARGE COOLER |
| C-7161 | REFRIGERANT COMPRESSOR |
| C-7181/7182 | STABILIZER OVERHEAD COMPRESSORS |
| C-7183/7184 | RESIDUE COMPRESSORS |
| C-7185/7186 | INSTRUMENT AIR COMPRESSORS |
| E-7201/7205 | GAS/GAS EXCHANGER - REFLUX CONDENSER |
| E-7203/7204 | SIDE REBOILER - REBOILER |
| E-7205 | SEAL GAS HEATER |
| F-7442/7443 | MOL SIEVE DEHYDRATORS |
| F-7484 | REFRIGERANT COMPRESSOR LUBE OIL FILTER |
| FL-7782 | FLARE STACK |
| H-7741 | REGENERATION GAS HEATER |
| P-7601/7602 | PRODUCT BOOSTER PUMPS |
| P-7628 | METHANOL INJECTION PUMP |
| P-7632 | COMPRESSOR BUILDING SUMP PUMP |
| T-7501 | DEHEXANITER |
| T-7581 | STABILIZER |
| TK-7831 | WATER TANK |
| TK-7802 | COMPRESSOR BUILDING SUMP |
| TK-7803 | SLOP OIL TANK |
| V-7401 | COND SEPARATOR |
| V-7402 | WARM GAS SEPARATOR |
| V-7403 | PRODUCT SURGE TANK |
| V-7431 | HEADER VESSEL |
| V-7472D-L | HARP FINGERS |
| V-7473 | NGL HEADER VESSEL |
| V-7474 | WATER BOOT |
| V-7495 | INSTRUMENT AIR RECIEVER |
| V-7497 | STARTING AIR VOLUME TANK |
| V-7455 | STARTING AIR VOLUME TANK |

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|
| | B | ISSUED FOR APPROVAL | RBJ | | |
| | A | ISSUED FOR BID - OPD JOB #14025 | RBJ | - | - |

SCALE: 1" = 80'
DRN BY: RBJ — DATE: 3/7/14
CHKD BY:
FINAL OK:
ENGR: MP
APPR:
APPR:
PLANT NAME: LITTLE MISSOURI #3

DRAWING NUMBER: LM-3000
CAD FILE NAME: LM-3000
REVISION: B

TARGA

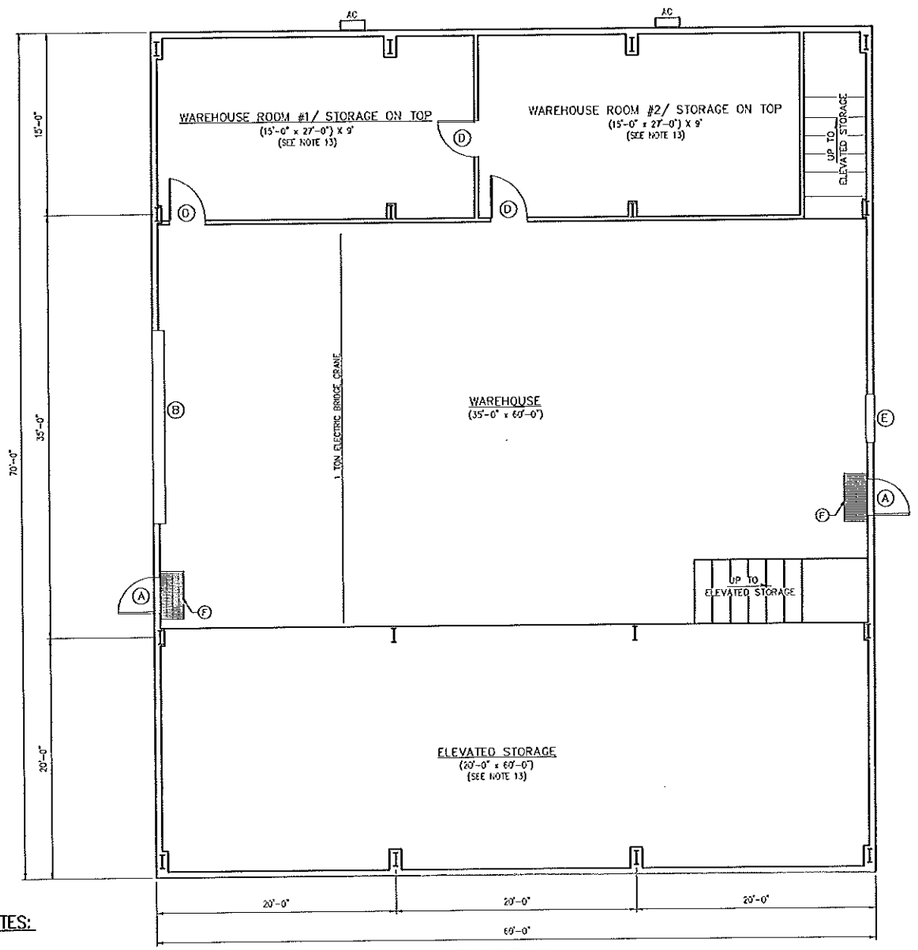
PLOT PLAN
LITTLE MISSOURI #3 GAS PLANT

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

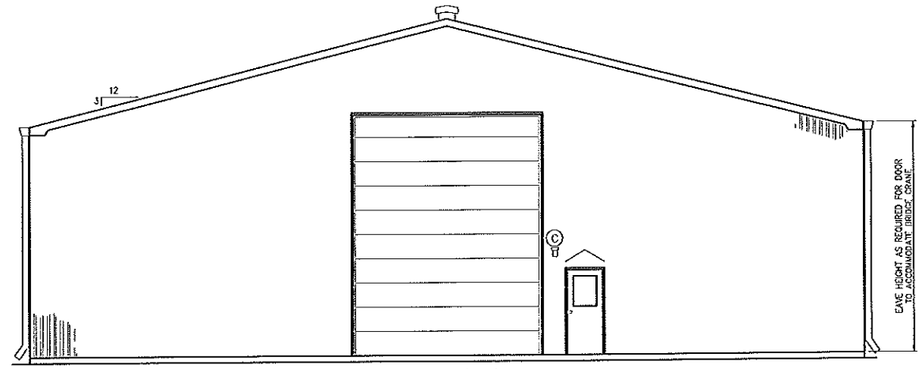
PROJECT NUMBER: 14025

PLOT DATE: -



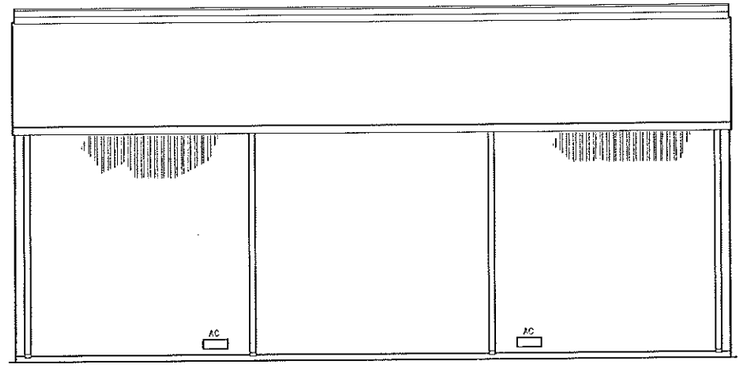

FLOOR PLAN

SCALE: 3/16"=1'-0"




EAST ELEVATION

SCALE: 3/16"=1'-0"




NORTH ELEVATION

SCALE: 3/16"=1'-0"

## NOTES:

1. DESIGN LOADS: PER IBC 2012.
   WIND = 120 MPH, EXPOSURE C, RISK CAT. III
   SDS/SD1: Ss=7% S1=2.6%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. RIGID FRAME TYPE BUILDING (PRIMED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. 6" INSULATION IN THE WALLS AND ROOF.
8. FURN. BY OPD
9. 8'-0" HIGH WALL LINER PANEL.
10. ELECTRICAL BY OPD.
11. CONTINUOUS RIDGE VENT W/ BIRD SCREEN & CHAIN OPERATED DAMPER.
12. 4~ 36" TRANSLUCENT SKYLIGHT PANELS OVER SHOP.
13. ALL ELEVATED STORAGE TO BE DESIGNED FOR 100# PER SQ. FT. LIVE LOAD
14. (1)~ ONE TON, BRIDGE CRANE ~ MANUAL (CHAIN DRIVEN) W/ ELECTRIC HOIST & TROLLEY. (CRANE TO BE ABLE TO ACCESS SHOP FLOOR AREA ONLY)
15. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.

## LEGEND

- (A)~ 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.
- (B)~ 16'-0"W x 20'-0"H ROLL-UP DOOR
- (C)~ EXTERIOR LIGHTING AT EA. EXT. DOOR ~ (BY OPD)
- (D)~ 3'-0" x 7'-0" INTERIOR DOOR ~ METAL, INSULATED CORE W/ HARDWARE.
- (E)~ 5' X 5' EXHAUST FAN
- (F)~ SUMP WITH GRATING

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|
| | 2 | GENERAL REVISION | JWH | JMD | 8/5/14 |
| | 1 | REVISED AS SHOWN | JWH | TT | 6/25/14 |
| | 0 | ISSUE FOR CONSTRUCTION | JWH | JMD | 6/20/14 |

| SCALES: NOTED | DATE |
|---|---|
| DRN BY: TT | 3/27/14 |
| CHKD BY: JMD | 4/2/14 |
| FINAL OK: -- | -- |
| ENGR.: -- | -- |
| APPR.: | |
| APPR.: -- | -- |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

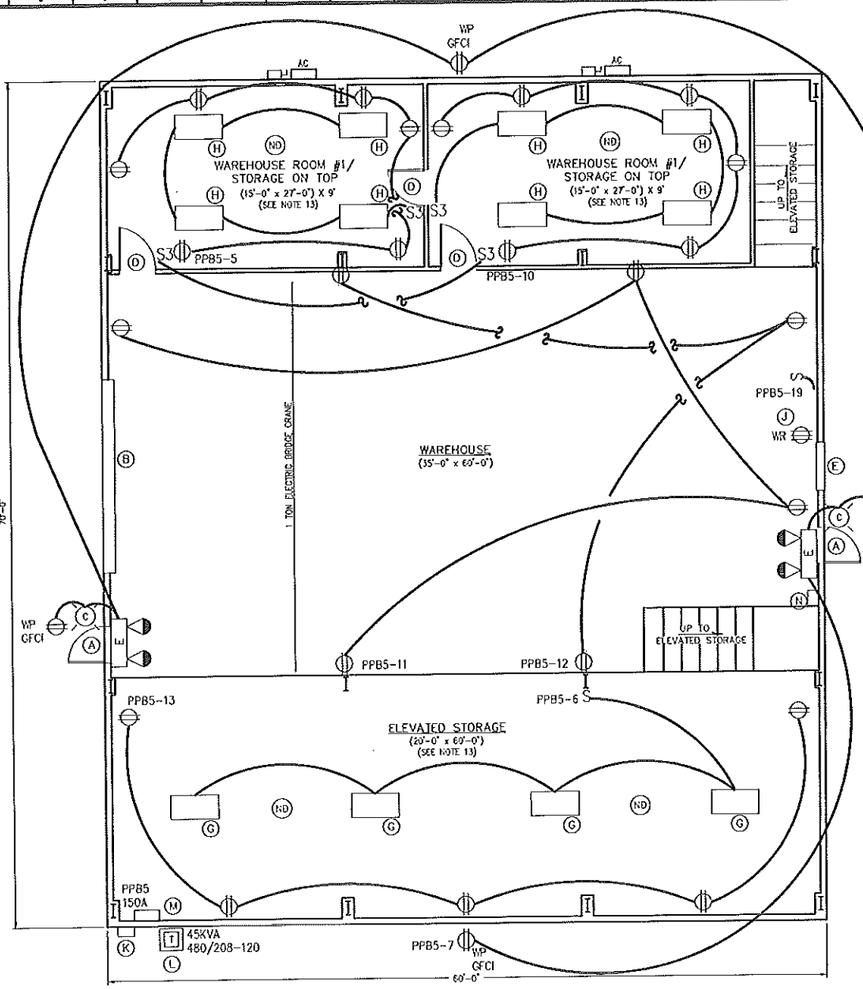
DRAWING NUMBER: 14025-A-902

CAD FILE NAME: 14025-A-902

REVISION: 2

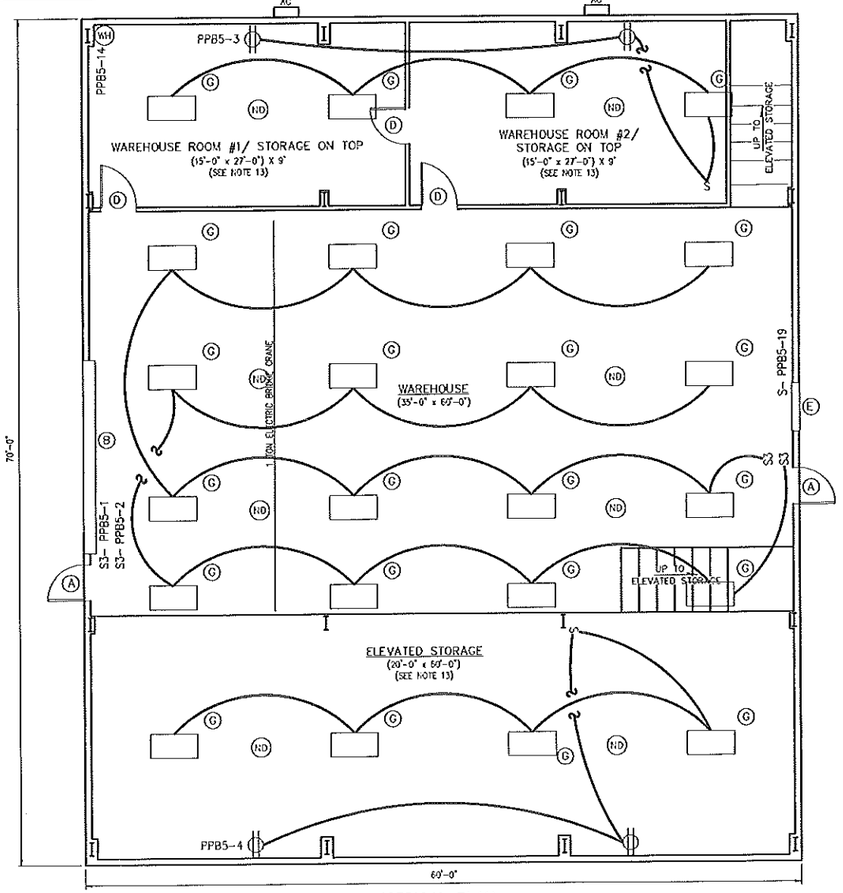
# WAREHOUSE BUILDING
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: -




FIRST FLOOR ELECTRICAL PLAN

SCALE: 3/16"=1'-0"




HIGH BAY & STORAGE ELECTRICAL PLAN

SCALE: 3/16"=1'-0"

## LEGEND

- (A) — 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.
- (B) — 16'-0"W x 20'-0"H ROLL-UP DOOR
- (C) — EXTERIOR LIGHTING AT EA. EXT. DOOR - (BY OPO)
- (D) — 3'-0" x 7'-0" INTERIOR DOOR - METAL, INSULATED CORE W/ HARDWARE
- (E) — 5' X 5' EXHAUST FAN
- (F) — SUMP WITH GRADING
- (G) — HIGH BAY LIGHT FIXTURE
- (H) — METALUX LAY-IN FIXTURE
- (J) — CROUSE HINDS DISCONNECT/WELDING RECEPTACLE
- (K) — EATON - SERVICE DISCONNECT
- (L) — HAMMOND - TRANSFORMER
- (M) — EATON PANELBOARD BREAKER/ENCLOSURE
- (N) — EATON CRANE DISCONNECT

METALUX OR = 2GR8-232A-UNV-L8735-EB81-U 2' X 4' LAYIN FIXTURE W/2 T-8 LAMPS (BY BLDG VENDOR)

A/C DISCONNECT (BY BLDG. VENDOR)

(ND) SMOKE DETECTOR (BY BLDG. VENDOR)

E — EXIT LIGHT WHITE W/RED LETTER & DUAL EMERGENCY LIGHT W/BATTERY BACKUP SURE-LITE UNH-1-R 120-0H (BY BLDG. VENDOR)

$ LIGHT SWITCH (BY BLDG. VENDOR)

120 RECEPTACLE DUPLEX (BY BLDG. VENDOR)

WR 480 WELDING RECEPTACLE. CROUSE HINDS P/N: WSRD6352 (BY OPO)

LITHONIA P/N: TWA-100M-120-LPI 100WATT, METAL HALIDE, 120VAC WALL PACK W/PHOTO CELL (BY BLDG VENDOR)

## BILL OF MATERIAL

| ITEM # | QUANTITY | DESCRIPTION | MANUFACTURER | PART NUMBER |
|---|---|---|---|---|
| C | 2 | MINI WALL PACK, 100W MH, 120V, EXT. LIGHTING | LITHONIA | TWA-100M-120-LPI |
| G | 28 | HIGH BAY LIGHT FIXTURE-4 LAMP, T-5 LAMP,120V | ULTRALUX | ULHBT5-446 |
| G | 28 | HIGH BAY LIGHT FIXTURE-WIRE GUARD FOR 4 LAMP FIXTURE, 120V | ULTRALUX | ULHBT5-WG4 |
| H | 8 | LAY-IN FIXTURE, 2' X 4', 4 LAMP | METALUX | 2GR8-432-UNV-L8735-EB81-U |
| J | 1 | DISCONNECT/WELDING RECEPTACLE, 600V, 60 AMP, 3 PHASE | CROUSE-HINDS | WSR06352 |
| K | 1 | SERVICE DISCONNECT, 600V, 60 AMP, 3 PHASE NEMA 4X | EATON | DH362UWK |
| L | 1 | TRANSFORMER, 45KVA, 460Δ/208-120Y, 3 PHASE, COPPER, WINDING, NEMA 3R | HAMMOND | NMK045KBC |
| M | 1 | PRL1A PANELBOARD, 225 A RATED, 3 PHASE/4 WIRE, 150A MAIN BREAKER | EATON | P1AT4C2-42ED-150 |
| M | 1 | PRL1A PANELBOARD ENCLOSURE, GALVANIZED | EATON | EZB2042RC |
| M | 1 | PRL1A PANELBOARD ENCLOSURE, TRIM & SURFACE MOUNT | EATON | EZT2042 S |
| N | 1 | CRANE DISCONNECT, 600V, 30 AMP, 3 PHASE NEMA 12 | EATON | DH361UDK |
| | | | | |

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | 1 | GENERAL REVISION | JNH | JND | 8/3/16 |
| | 0 | ISSUE FOR CONSTRUCTION | JNH | TT | 7/27/16 |

| SCALES: NOTED | DATE |
|---|---|
| DWN BY: JNH | 8/13/16 |
| CHKD BY: JND | 8/16/16 |
| FINAL CK: - | - |
| ENGR: - | - |
| APPRV: | |
| APPRV: - | - |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

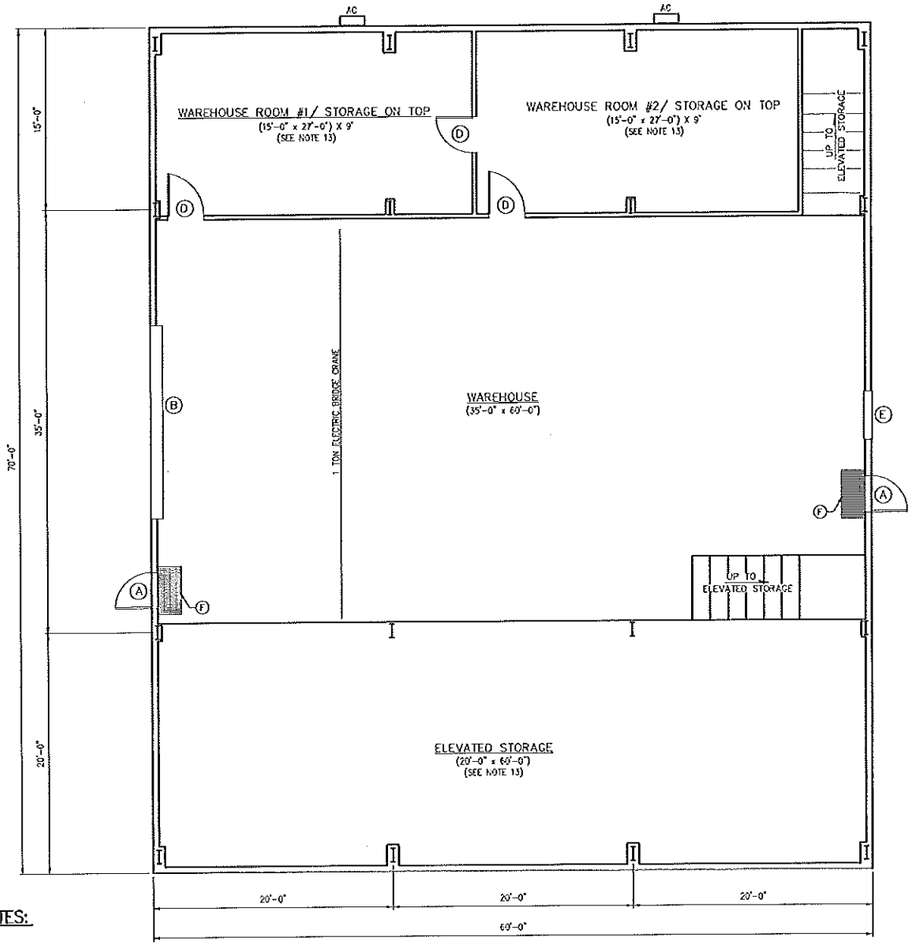
DRAWING NUMBER: 14025-A-902A

CAD FILE NAME: 14025-A-902

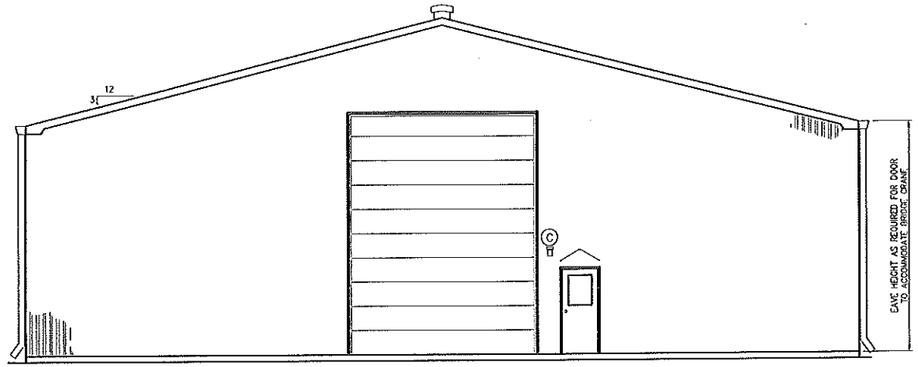
REVISION: 1

WAREHOUSE LIGHTING
LITTLE MISSOURI #3 GAS PLANT

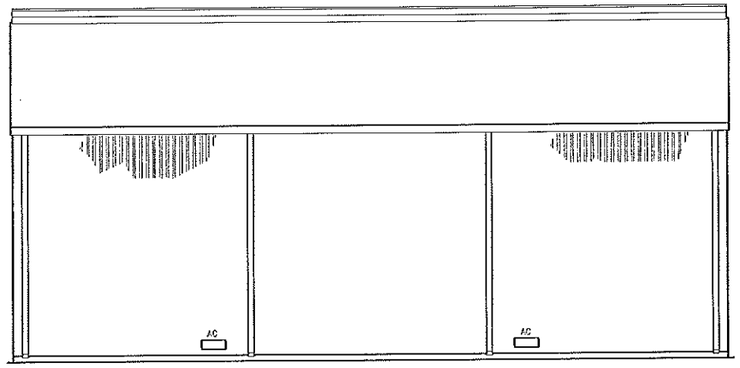
PLOT DATED 1




FLOOR PLAN
SCALE: 1/8"=1'-0"




EAST ELEVATION
SCALE: 1/8"=1'-0"




NORTH ELEVATION
SCALE: 1/8"=1'-0"

## NOTES:

1. DESIGN LOADS: PER IBC 2012;
   WIND = 120 MPH, EXPOSURE C, RISK CAT. III
   SEISMIC: Ss=.7% S1=.26%
   SOIL SITE CLASS D
   1.25 IMPORTANCE FACTOR
   GROUND SNOW LOAD 30 PSF
   1.1 IMPORTANCE FACTOR
2. RIGID FRAME TYPE BUILDING (PINNED BASE)
3. WALL AND ROOF PANELS TO BE 26 GA. MIN., RIBBED, COLOR SHALL BE CARLSBAD CANYON.
4. STRUCTURAL MEMBERS TO BE PRIMED.
5. STANDARD TRIM AND FLASHING 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
6. GUTTERS AND DOWNSPOUTS 26 GA. MIN., COLOR SHALL BE CARLSBAD CANYON.
7. 6" INSULATION IN THE WALLS AND ROOF.
8. FDN. BY OPD
9. 8'-0" HIGH WALL LINER PANEL
10. ELECTRICAL BY OPD.
11. CONTINUOUS RIDGE VENT W/ BIRD SCREEN & CHAIN OPERATED DAMPER.
12. 4~ 36" TRANSLUCENT SKYLIGHT PANELS OVER SHOP.
13. ALL ELEVATED STORAGE TO BE DESIGNED FOR 100# PER SQ. FT. LIVE LOAD
14. (1)~ ONE TON, BRIDGE CRANE ~ MANUAL (CHAIN DRIVEN) W/ ELECTRIC HOIST & TROLLEY. (CRANE TO BE ABLE TO ACCESS SHOP FLOOR AREA ONLY)
15. EACH PERSONNEL DOOR SHALL HAVE A SEPARATE ROOF GABLE DESIGNED TO PROTECT PERSONNEL FROM ICE OR SNOW THAT FALLS FROM THE ROOF.

## LEGEND

- (A)~ 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.
- (B)~ 16'-0"W x 20'-0"H ROLL-UP DOOR
- (C)~ EXTERIOR LIGHTING AT EA. EXT. DOOR ~ (BY OPD)
- (D)~ 3'-0" x 7'-0" INTERIOR DOOR ~ METAL, INSULATED CORE W/ HARDWARE.
- (E)~ 5' X 5' EXHAUST FAN
- (F)~ SUMP WITH GRATING

PLOT DATE: ~

| REFERENCE DWGS. | REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |

| REV | DESCRIPTION | DWN | CHKD | DATE |
|---|---|---|---|---|
| | | | | |
| 2 | GENERAL REVISION | JWH | JWD | 8/5/14 |
| 1 | REVISED AS SHOWN | JWH | TT | 6/25/14 |
| 0 | ISSUE FOR CONSTRUCTION | JWH | JWD | 4/29/14 |

| SCALE: NOTED | DATE |
|---|---|
| DWN BY: TT | 3/27/14 |
| CHKD BY: JWD | 4/1/14 |
| FINAL OK: ~ | ~ |
| ENGR: ~ | ~ |
| APPR'd: | |
| APPR: ~ | ~ |

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent.
NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

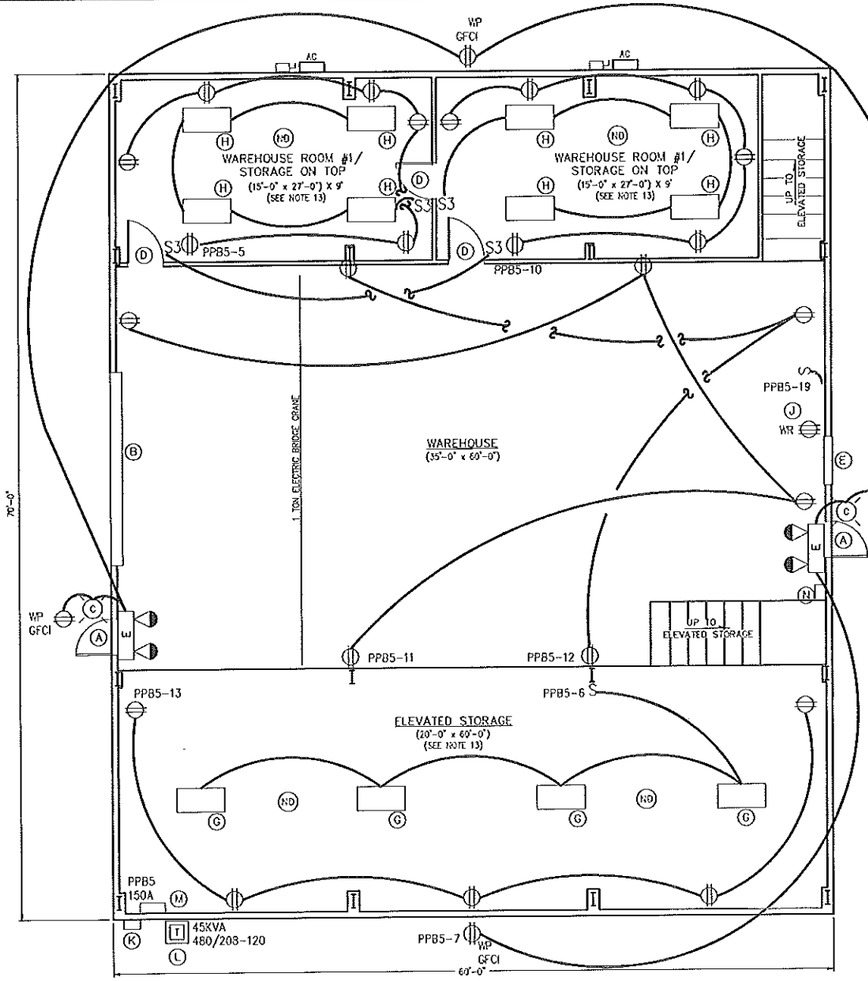
PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

TARGA

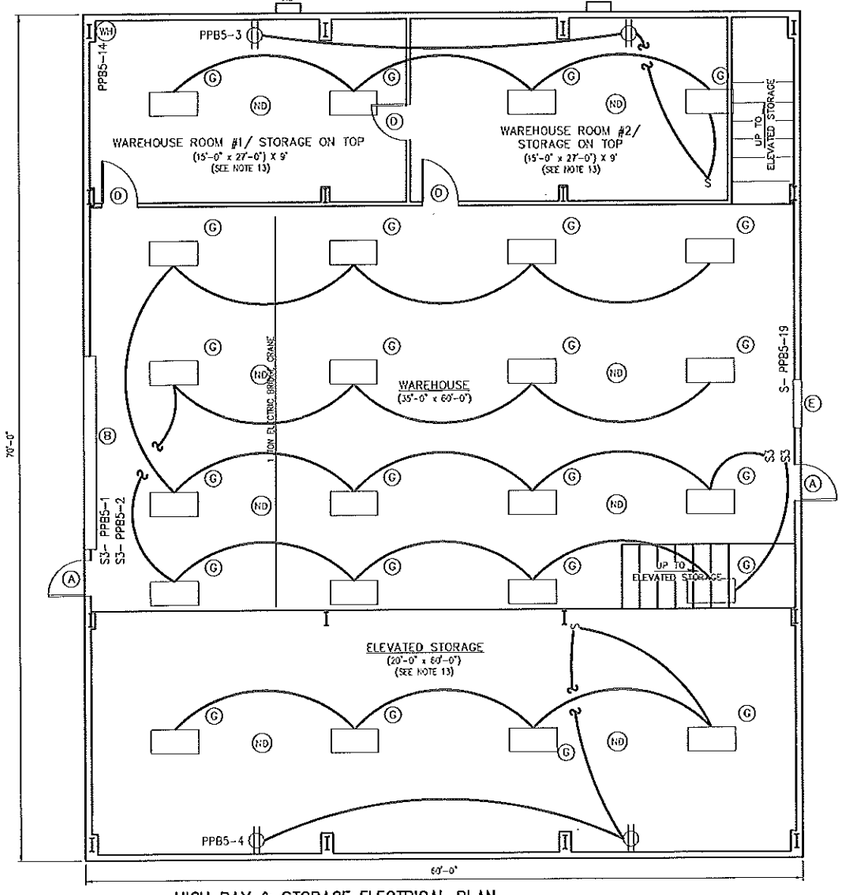
DRAWING NUMBER: 14025-A-902
CAD FILE NAME: 14025-A-902
REVISION: 2

WAREHOUSE BUILDING
LITTLE MISSOURI #3 GAS PLANT




## FIRST FLOOR ELECTRICAL PLAN

SCALE: 3/32"=1'-0"




## HIGH BAY & STORAGE ELECTRICAL PLAN

SCALE: 3/32"=1'-0"

### LEGEND

- (A) — 3'-0" x 7'-0" INSULATED PERSONNEL DOORS COMPLETE WITH HALF GLAZED LAMINATED SAFETY GLASS, PANIC HARDWARE, CLOSURE, & AWNING.
- (B) — 16'-0"W x 20'-0"H ROLL-UP DOOR
- (C) — EXTERIOR LIGHTING AT EA. EXT. DOOR – (BY OPD)
- (D) — 3'-0" x 7'-0" INTERIOR DOOR – METAL, INSULATED CORE W/ HARDWARE.
- (E) — 5' X 5' EXHAUST FAN
- (F) — SUMP WITH GRADING
- (G) — HIGH BAY LIGHT FIXTURE
- (H) — METALUX LAY-IN FIXTURE
- (J) — CROUSE HINDS DISCONNECT/WELDING RECEPTACLE
- (K) — EATON – SERVICE DISCONNECT
- (L) — HAMMOND – TRANSFORMER
- (M) — EATON PANELBOARD BREAKER/ENCLOSURE
- (N) — EATON CRANE DISCONNECT

- METALUX OR = 2GR8-232A-UNV-L8735-EB81-U 2' X 4' LAYIN FIXTURE W/2 T-8 LAMPS (BY BLDG VENDOR)
- A/C DISCONNECT (BY BLDG. VENDOR)
- (ND) SMOKE DETECTOR (BY BLDG. VENDOR)
- EXIT LIGHT WHITE W/RED LETTER & DUAL EMERGENCY LIGHT W/BATTERY BACKUP SURE-LITE UNH-1-R 120-DH (BY BLDG. VENDOR)
- $ LIGHT SWITCH (BY BLDG. VENDOR)
- 120 RECEPTACLE DUPLEX (BY BLDG. VENDOR)
- WR 480 WELDING RECEPTACLE. CROUSE HINDS P/N: WSR06352 (BY OPD)
- LITHONIA P/N: TWA-100M-120-LPI 100WATT, METAL HALIDE, 120VAC WALL PACK W/PHOTO CELL (BY BLDG VENDOR)

### BILL OF MATERIAL

| ITEM # | QUANTITY | DESCRIPTION | MANUFACTURER | PART NUMBER |
|---|---|---|---|---|
| C | 2 | MINI WALL PACK, 100W MH, 120V, EXT. LIGHTING | LITHONIA | TWA-100M-120-LPI |
| G | 28 | HIGH BAY LIGHT FIXTURE-4 LAMP, T-5 LAMP,120V | ULTRALUX | ULHBT5-446 |
| G | 28 | HIGH BAY LIGHT FIXTURE-WIRE GUARD FOR 4 LAMP FIXTURE, 120V | ULTRALUX | ULHBT5-WG4 |
| H | 8 | LAY-IN FIXTURE, 2' X 4', 4 LAMP | METALUX | 2GR8-432-UNV-L8735-EB81-U |
| J | 1 | DISCONNECT/WELDING RECEPTACLE, 600V, 60 AMP, 3 PHASE | CROUSE-HINDS | WSR06352 |
| K | 1 | SERVICE DISCONNECT, 600V, 60 AMP, 3 PHASE NEMA 4X | EATON | DH362UWK |
| L | 1 | TRANSFORMER, 45KVA, 460Δ/208-120Y, 3 PHASE, COPPER, WINDING, NEMA 3R | HAMMOND | NMK045KBC |
| M | 1 | PRL1A PANELBOARD, 225 A RATED, 3 PHASE/4 WIRE, 150A MAIN BREAKER | EATON | P1AT4C2-42ED-150 |
| | 1 | PRL1A PANELBOARD ENCLOSURE, GALVANIZED | EATON | EZB2042RC |
| | 1 | PRL1A PANELBOARD ENCLOSURE, TRIM & SURFACE MOUNT | EATON | EZT2042 S |
| N | 1 | CRANE DISCONNECT, 600V, 30 AMP, 3 PHASE NEMA 12 | EATON | DH361UDK |
| | | | | |

| REFERENCE DWGS. | REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|---|
| | | | | | |

| REV | DESCRIPTION | DRN | CHKD | DATE |
|---|---|---|---|---|
| 1 | GENERAL REVISION | JMH | JMD | 8/5/14 |
| 0 | ISSUE FOR CONSTRUCTION | JMH | TT | 7/17/14 |

| | |
|---|---|
| SCALE: NOTED | DATE |
| DRN BY: JMH | 6/13/14 |
| CHKD BY: JMD | 8/14/14 |
| FINAL OK: – | – |
| ENGR.: – | – |
| APPRV: | |
| APPRV: – | – |

This drawing is owned by a TARGA Resources, Inc. operating subsidiary and is loaned solely for confidential use. Recipient promises and agrees to return this drawing upon request and agrees that it shall not be reproduced, copied, loaned or otherwise disposed of, nor used for any purpose other than that for which it is furnished without express written consent. NO REPRESENTATION OR WARRANTY IS MADE REGARDING THE ACCURACY OF THIS DRAWING IN ANY PARTICULAR.

PREPARED BY: OPTIMIZED PROCESS DESIGN

PROJECT NUMBER: 14025

PLANT NAME: LITTLE MISSOURI #3 GAS PLANT

TARGA

DRAWING NUMBER: 14025-A-902A

CAD FILE NAME: 14025-A-902

REVISION: 1

# WAREHOUSE LIGHTING
# LITTLE MISSOURI #3 GAS PLANT

PLOT DATE: 8

Permit #: TA061413P2

# McKENZIE COUNTY CONSENT FOR UTILITY COMPANY TO CROSS A PUBLIC ROAD OR SECTION ROAD

Targa Assets — Utility Company Name

of

1000 Louisiana, Suite 4300 Houston, TX 77002 — Address, City, State & Zip

| Route* | Section # From | Section # To | Township (N) From | Township (N) To | Range (W) From | Range (W) To | For Official Use Only: Type of Crossing | For Official Use Only: Fee |
|---|---|---|---|---|---|---|---|---|
| 125th Ave NW | 30 | 29 | T-149-N | T-149-N | R-98-W | R-98-W | RB 6" | 250 |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | --- | --- | ----- | ----- | ----- | ----- | | |
| | | | | | | | Total Fee: | 250 |

*Enter the County Route # or Street Name. If it is simply a section line crossing, enter "Section Line"

**AUTHORIZED AGENT OF THE UTILITY COMPANY**

I, the undersigned, being an authorized agent of the Utility Company described in the above, do hereby agree on behalf of the Utility Company that all **terms and conditions listed on the reverse** will be complied with, and any assignment of this buried transmission facility described above shall include and assignment of this liability to comply with the terms and conditions as stated herein.

Signature of Authorized Agent of Utility Company — Date: 6-14-2013

Paul Zaharia — Printed Name of Authorized Agent of Utility Company — Telephone Number: 701-839-3383

If you require additional pages for your request, idicate your total number of pages.

Page of Total # Pages

**WHERE SHOULD THE APPROVED PERMIT BE SENT TO:**

KLJ c/o Paul Zaharia — Company Name or Agent Name — Telephone Number: 701-839-3383

2900 10th Street SW, Suite A — Address

Address

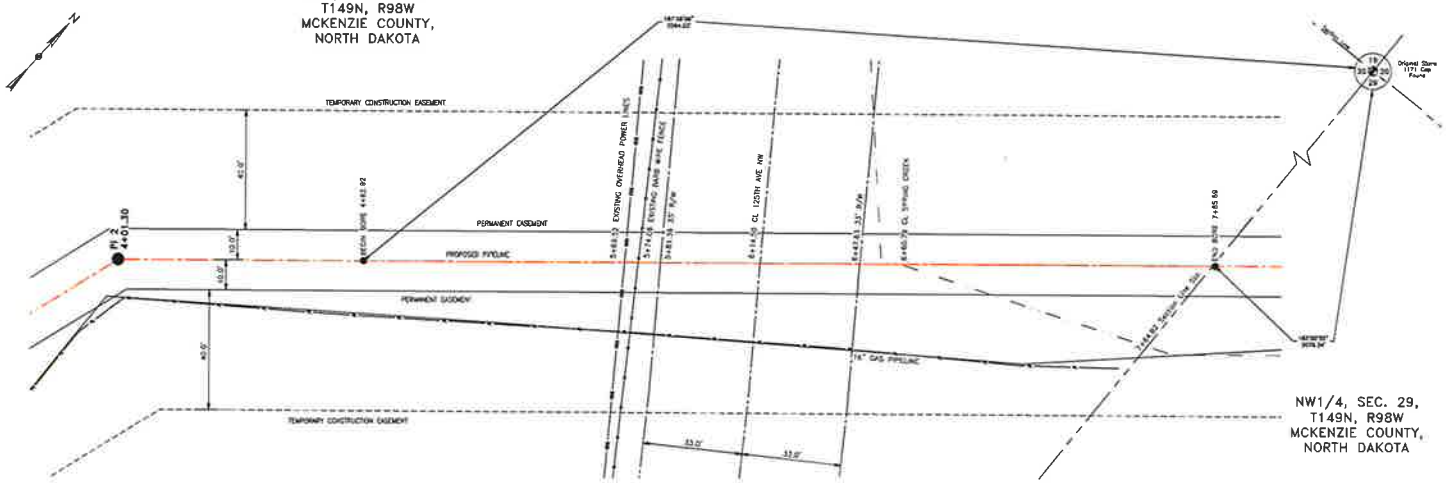
Minot, ND 58701 — City, State & Zip Code

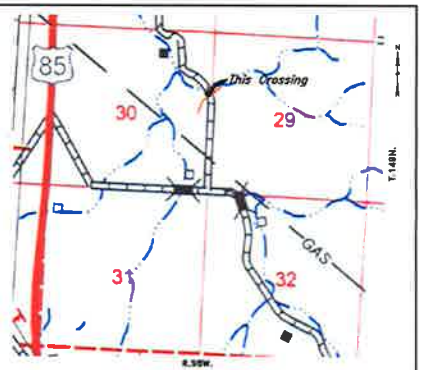
Approval Stamp: OFFICIAL SEAL MCKENZIE COUNTY ORGANIZED APRIL 1905 STATE OF NORTH DAKOTA

PERMIT APPROVED

JUN 14 2013

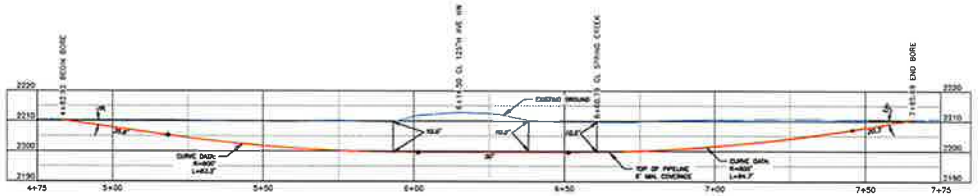
# SMOKEY SLUG LINE TO GAS PLANT
## 125TH AVE NW CROSSING BORE
## DETAIL "A"




*Location Map*

PIPE SPECIFICATION
Crossing designed using PRCI Report PR-327-9424
Contents: Gas
Carrier Pipe: 8.625" OD x 0.280" wt, API 5L X52




TOTAL HORIZONTAL DISTANCE = 282.77 FT
TOTAL PIPELINE LENGTH = 284.0 FT.

LEGEND
PROPOSED PIPE

| | | | |
|---|---|---|---|
| SMOKEY SLUG LINE TO GAS PLANT<br>125TH AVE NW CROSSING BORE<br>MCKENZIE COUNTY | | | SHEET NO.<br>1 of 1 |
| KLJ | TARGA | 1000 Louisiana, Suite 420<br>Houston, TX 77002 | |
| | | | REV # |
| | | PROJECT NO.<br>3713595 | DATE<br>6/13/2013 |

Jun 12, 2013 - 4:04pm - J:\oilfield\Targa\3713595 - Smokey 6in Slug to Gas Plant\Cad\Bore\8 inch Slug Line - Bore.dwg

| Project | |
|---|---|
| SBP - Smokey Slug Line to Gas Plant - 125th Ave NW Crossing | |
| Location: T149N R98W Sec29 & 30 | Date: 6/13/2013 |

# HDD - Pull Force and Installation Stress Analysis

| PIPE AND PROFILE DATA: | |
|---|---|
| Pipe Outside Diameter [in.] | 6.63 |
| Pipe Wall Thickness [in.] | 0.280 |
| Specified Minimum Yield Strength [psi] | 52,000 |
| Young's Modulus for Steel [ksi] | 30,000 |
| Poisson's Ratio for Steel | 0.30 |
| Mud Weight [lbs/ft³] | 89.8 |
| Soil Friction Coefficient | 0.30 |
| Fluid Drag Coefficient [psi] | 0.05 |
| Water Density [lbs/ft³] | 62.40 |
| Pipe Filled with Water: | No |
| **Straight Section "A - B" Downslope:** | |
| Measured Length [ft] | 20.3 |
| Angle of Inclination [°] | 10 |
| **Curved Section "B - C" Downslope:** | |
| Measured Length [ft] | 94.7 |
| Half of the Angle of Inclination [°] | 5 |
| Radius of Curvature [ft] | 600 |
| **Straight Section "C - D":** | |
| Measured Length [ft] | 50 |
| **Curved Section "D - E" Upslope:** | |
| Measured Length [ft] | 83.2 |
| Half of the Angle of Inclination [°] | 4 |
| Radius of Curvature [ft] | 600 |
| **Straight Section "E - F" Upslope:** | |
| Measured Length [ft] | 35.8 |
| Angle of Inclination [°] | 8 |

| RESULTS OF CALCULATION: | |
|---|---|
| Pipe Weight in Air [lbs/ft] | 18.99 |
| Pipe Exterior Volume [ft³/ft] | 0.24 |
| Pipe Interior Volume [ft³/ft] | 0.20 |
| Weight of Water [lbs/ft] | 0.00 |
| Displaced Mud Weight [lbs/ft] | 21.53 |
| Effective Weight of Pipe [lbs/ft] | -2.540 |
| **Total Pull Force [lbs]** | **4,945** |

Notes:

Reference: "Installation of Pipelines by Horizontal Directional Drilling", PRCI Report PR-227-9424

| Prepared By | Approved By | Revision: 10.0.0 |
|---|---|---|

| Project | |
|---|---|
| SBP - Smokey Slug Line to Gas Plant - 125th Ave NW Crossing | |
| Location | Date |
| T149N R98W Sec29 & 30 | 6/13/2013 |

# HDD - Installation Stress Analysis

| Point: "B" | This Project | Allowable | PASS/FAIL |
|---|---|---|---|
| Tensile Stress [psi] | 50 | 46,800 | Pass |
| Bending Stress [psi] | 0 | 39,000 | Pass |
| External Hoop Stress [psi] | 26 | 21,250 | Pass |
| Unity Check: Tensile & Bending Stress | 0.00 | 1.00 | Pass |
| Unity Check: Tensile,Bending & Hoop Stress | 0.00 | 1.00 | Pass |

| Point: "C" | This Project | Allowable | PASS/FAIL |
|---|---|---|---|
| Tensile Stress [psi] | 377 | 46,800 | Pass |
| Bending Stress [psi] | 13,813 | 39,000 | Pass |
| External Hoop Stress [psi] | 93 | 21,250 | Pass |
| Unity Check: Tensile & Bending Stress | 0.36 | 1.00 | Pass |
| Unity Check: Tensile,Bending & Hoop Stress | 0.12 | 1.00 | Pass |

| Point: "D" | This Project | Allowable | PASS/FAIL |
|---|---|---|---|
| Tensile Stress [psi] | 496 | 46,800 | Pass |
| Bending Stress [psi] | 0 | 39,000 | Pass |
| External Hoop Stress [psi] | 93 | 21,250 | Pass |
| Unity Check: Tensile & Bending Stress | 0.01 | 1.00 | Pass |
| Unity Check: Tensile,Bending & Hoop Stress | 0.00 | 1.00 | Pass |

| Point: "E" | This Project | Allowable | PASS/FAIL |
|---|---|---|---|
| Tensile Stress [psi] | 803 | 46,800 | Pass |
| Bending Stress [psi] | 13,813 | 39,000 | Pass |
| External Hoop Stress [psi] | 50 | 21,250 | Pass |
| Unity Check: Tensile & Bending Stress | 0.37 | 1.00 | Pass |
| Unity Check: Tensile,Bending & Hoop Stress | 0.12 | 1.00 | Pass |

| Point: "F" | This Project | Allowable | PASS/FAIL |
|---|---|---|---|
| Tensile Stress [psi] | 885 | 46,800 | Pass |
| Bending Stress [psi] | 0 | 39,000 | Pass |
| External Hoop Stress [psi] [psi] | 0 | 21,250 | Pass |
| Unity Check: Tensile & Bending Stress | 0.02 | 1.00 | Pass |
| Unity Check: Tensile,Bending & Hoop Stress | 0.00 | 1.00 | Pass |

Notes:

Reference: "Installation of Pipelines by Horizontal Directional Drilling", PRCI Report PR-227-9424

| Prepared By | Approved By | Revision: 10.0.0 |
|---|---|---|

MIDLAND ATLAS CO. WATFORD CITY, NORTH DAKOTA

# MAP OF T 149 N R 98 W

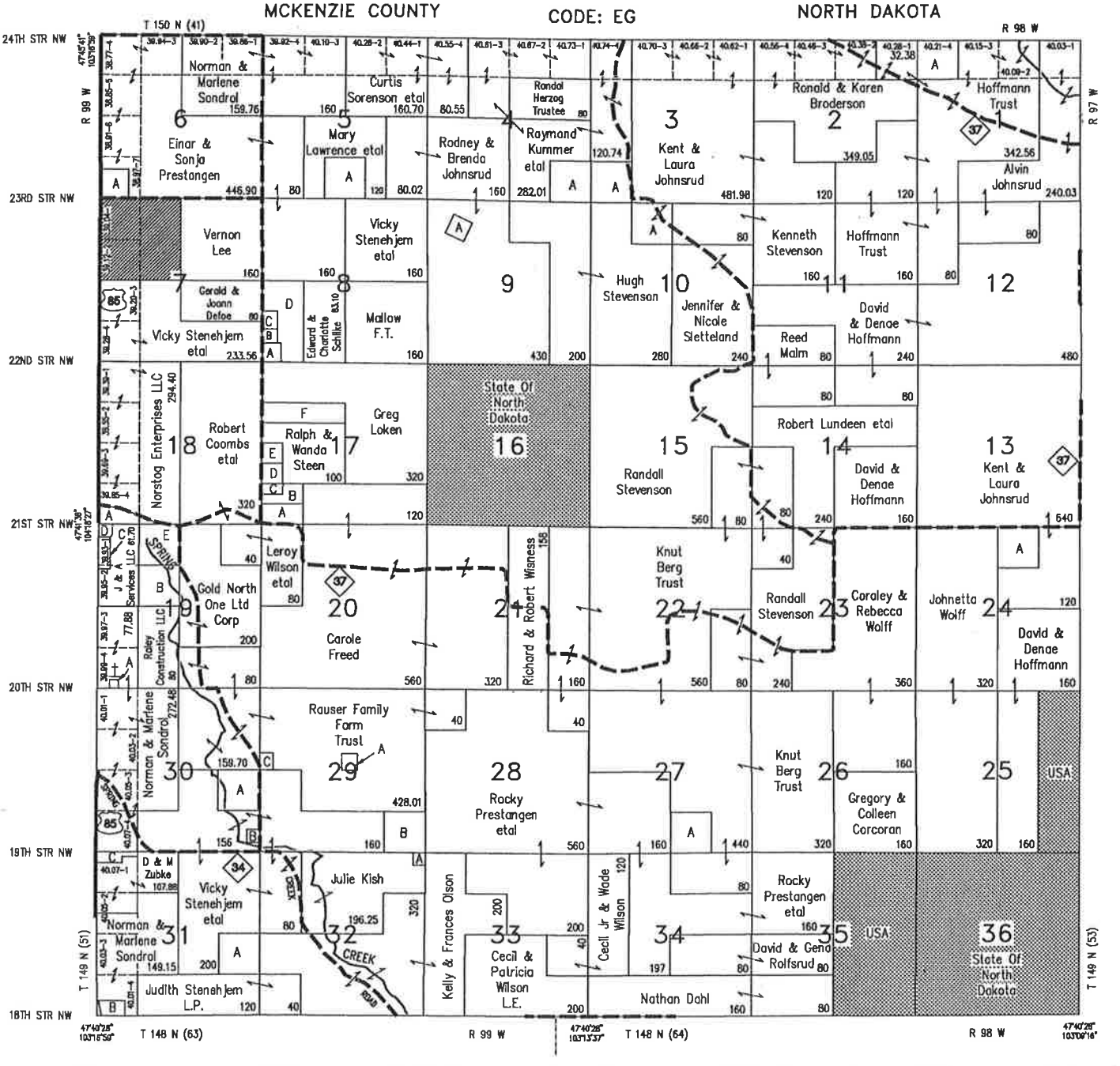
MIDLAND ATLAS COMPANY COPYRIGHT 2012

MIDLAND ATLAS CO. WATFORD CITY, NORTH DAKOTA

TOWNSHIP: 149 N
MCKENZIE COUNTY

CODE: EG

RANGE: 98 W
NORTH DAKOTA




SEE LETTERED SMALL TRACTS DIRECTORY FOLLOWING TOWNSHIP MAPS

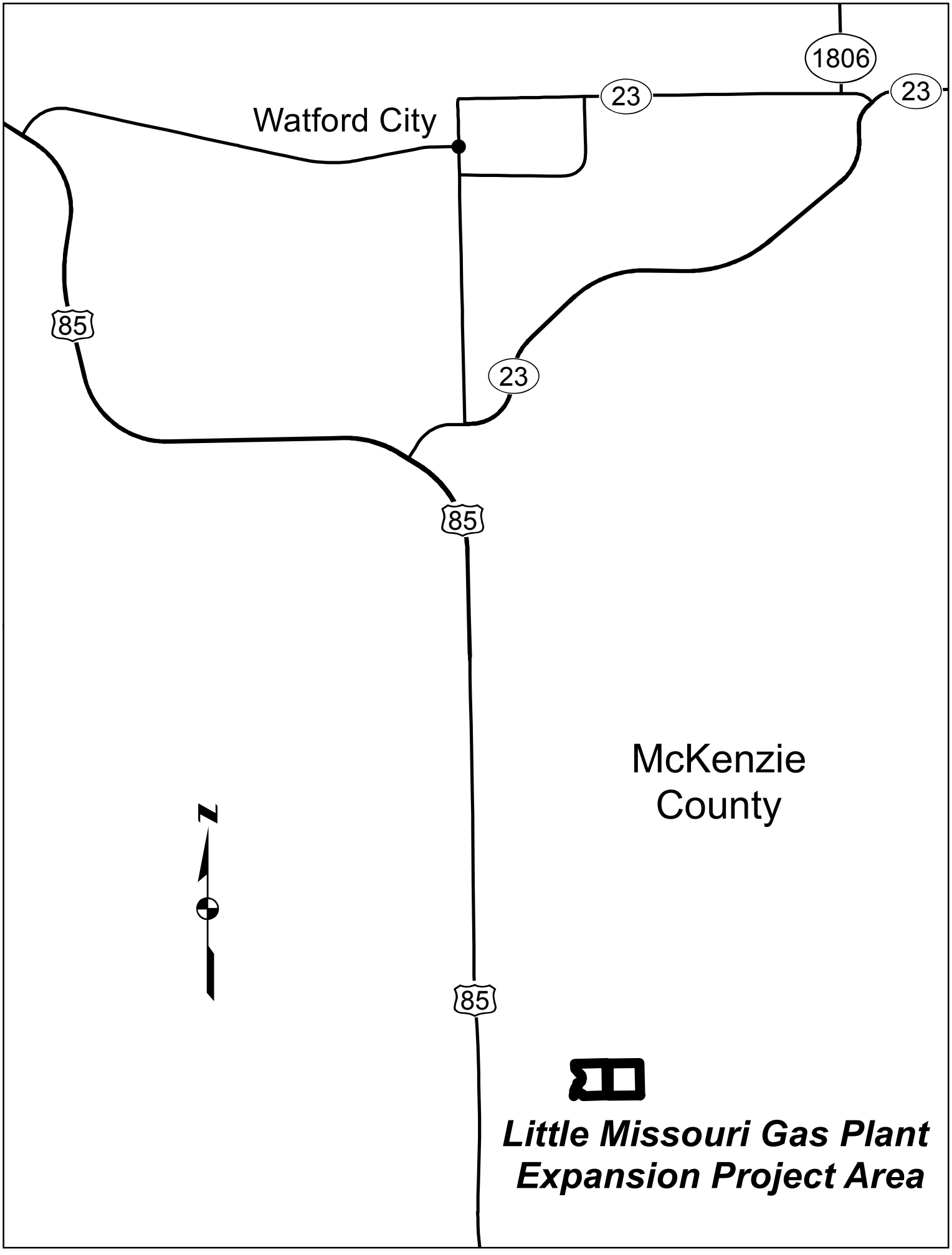

BASIN BROKERS INC.
REAL ESTATE SALES & APPRAISALS
Roger M. Cymbaluk • Tate Cymbaluk
(701) 572-5560
1-800-572-5560
106 Main Street
Williston, ND
www.basinbrokers.com

ACKERMAN SURVEYING & ASSOCIATES, INC.
Lot Surveys · Subdivisions · Land Boundaries · Land Planning
Topographic & Construction Surveys · GPS Services
Rolly B. Ackerman, Robby L. Berard & Aaron J. Anderson
Registered Surveyors
6060 Highway 2 East Minot, ND 58701
(701) 838-0786 Fax: (701) 837-1990
www.ackermansurvey.com email: landsurvey@srt.com

AGRI INDUSTRIES
VALLEY
Water Professionals Underground Contractors
Irrigation System Sales, Service, Parts & Insurance
Water Well Drilling, Service, Parts & Pumps
Pipeline Installation • Directional Drilling
Electrical • Communications • Plumbing
Miles City, MT 406-234-2309
Sidney, MT 406-488-8066
Williston, ND 701-572-0767


© 2013 Google

# Appendix K:
# Black & White Map


1806
23
23
Watford City
85
23
85
85
McKenzie
County
N
Little Missouri Gas Plant
Expansion Project Area