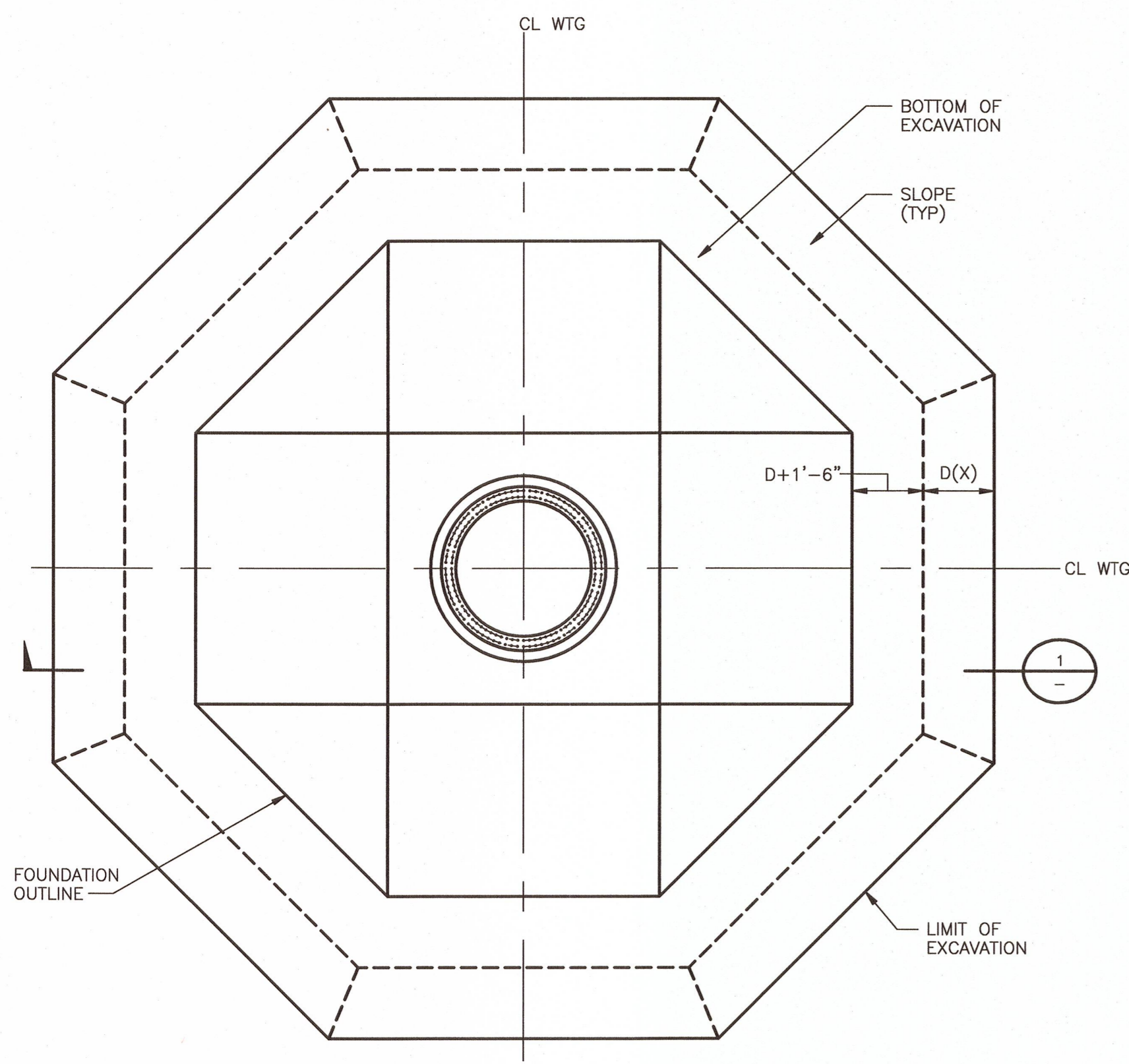
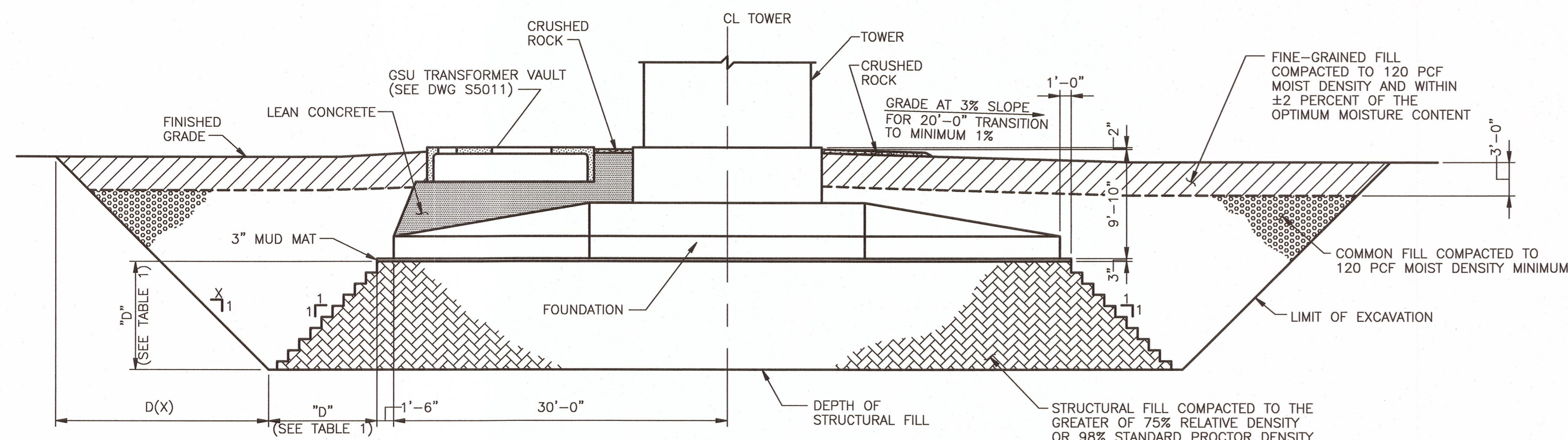


SUBGRADE EXCAVATION & BACKFILL

- 1.0 GENERAL
- 1.1 ENSURE FOUNDATION SITE IS EXCAVATED, BACKFILLED AND GRADED IN ACCORDANCE WITH THIS DRAWING.
- 1.2 OVEREXCAVATE AND REPLACE WITH STRUCTURAL FILL AT TURBINE SITE NOTED IN TABLE 1.
- 1.3 THE MAXIMUM AND MINIMUM INDEX DENSITIES OF SOILS TO BE USED AS STRUCTURAL FILLS SHALL BE MEASURED ACCORDING TO ASTM D4253 AND D4254 PRIOR TO THE MATERIALS BEING PLACED.
- 1.4 THE STANDARD PROCTOR DENSITY OF SOILS TO BE USED AS STRUCTURAL, COMMON, AND FINE-GRAINED FILLS SHALL BE MEASURED ACCORDING TO ASTM D698 PRIOR TO THE MATERIALS BEING PLACED.
- 2.0 SUBMITTALS
- 2.1 SUBMIT GRAIN SIZE ANALYSIS, NATURAL CONTENT, MAXIMUM AND MINIMUM INDEX DENSITY, AND STANDARD PROCTOR DENSITY TEST RESULTS FOR SOILS TO BE USED AS STRUCTURAL, COMMON, AND FINE-GRAINED FILLS.
- 2.2 SUBMIT COMPACTION TEST RESULTS FOR STRUCTURAL FILL PLACED BENEATH THE FOUNDATION INDICATING LOCATION OF TEST, DRY DENSITY, AND MOISTURE CONTENT OF PLACED STRUCTURAL FILL.
- 2.3 SUBMIT COMPACTION TEST RESULTS FOR COMMON FILL AND FINE-GRAINED BACKFILL PLACED OVER FOUNDATION, INDICATING LOCATION OF TEST, DRY DENSITY, AND MOISTURE CONTENT OF PLACED FILLS.
- 2.4 SUBMIT SUBGRADE INSPECTION REPORT FOR EACH FOUNDATION COMPLETED BY A GEOTECHNICAL ENGINEER.
- 3.0 PRODUCTS
- 3.1 STRUCTURAL FILL: ACCEPTABLE STRUCTURAL FILL MATERIALS ARE SOILS WITH CLASSIFICATION SYMBOLS OF GW, SW AND CL BASED ON ASTM D2487.
- 3.2 MUD MAT CONCRETE: CONTAINING ASTM C150, TYPE V CEMENT, SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH GREATER THAN 1,000 PSI.
- 3.3 COMMON FILL: ONSITE SOILS WITH PARTICLE SIZE NO GREATER THAN 4 INCHES EXCEPT FOR ORGANICS OR FAT CLAYS.
- 3.4 FINE-GRAINED FILL: LEAN CLAY WITH PARTICLE SIZE NO GREATER THAN NO. 4 SIEVE AND GREATER THAN 70% PASSING NO. 200 SIEVE.
- 4.0 EXECUTION
- 4.1 SCRAPE TOPSOIL FROM THE PLAN AREA AND STORE IN A PURCHASER DESIGNATED AREA. THE TOPSOIL WILL BE REUSED FOR SITE RESTORATION.
- 4.2 WHERE NOTED IN TABLE 1, PERFORM SUBGRADE OVEREXCAVATION BY SUBCUTTING DEFICIENT SOILS AND REPLACING WITH COMPACTED STRUCTURAL FILL.
- 4.3 FOR THE TURBINE SITE IDENTIFIED, OVEREXCAVATE TO THE DEPTH NOTED IN TABLE 1, AND LIMITS SHOWN IN SECTION 1. HAVE PURCHASER'S REPRESENTATIVE VERIFY THE DEPTH OF OVEREXCAVATION AT THE TIME OF EXCAVATION AND PREPARE A LETTER REPORT INDICATING THE APPROVED DEPTH OF OVEREXCAVATION. GEOPIER FOUNDATION COMPANY HAS PREPARED A PROPRIETARY GROUND IMPROVEMENT DESIGN USING RAMMED AGGREGATE PIERS. THE GEOPIER FOUNDATION COMPANY PROJECT NUMBER FOR THE DESIGN OF THE PIERS IS P09-PMM-00547 DATED SEPTEMBER 25, 2009. THE RAMMED AGGREGATE PIER DESIGN MAY BE USED INSTEAD OF OVEREXCAVATION AND STRUCTURAL FILL. CONTRACTOR MAY ALSO SUBMIT ALTERNATE GROUND IMPROVEMENT DESIGNS FOR THE TURBINE LOCATION. ALTERNATE GROUND IMPROVEMENT DESIGNS ARE SUBJECT TO THE PURCHASER'S APPROVAL.
- 4.4 CONTROL SURFACE WATER OR GROUNDWATER FLOWS INTO THE EXCAVATION USING MEANS DETERMINED BY THE CONTRACTOR. FOR GRANULAR SOILS (GW, GP, GM, GC, SW, SP, SM, SC) BY ASTM D2488, VACUUM WELL POINTS SHALL BE USED TO LOWER GROUNDWATER AT LEAST 1'-0" BELOW THE PREVAILING EXCAVATION LEVEL. IF SUCH MEANS ARE EMPLOYED, RECORD THE MEANS UNDERTAKEN, SOURCE OF WATER (GROUND OR SURFACE), AND VOLUME OF WATER CONTROLLED. SUBMIT A DEWATERING RECORD TO THE PURCHASER'S REPRESENTATIVE.
- 4.5 STRUCTURAL FILL PLACEMENT AND COMPACTION. PLACE AND COMPACT STRUCTURAL FILL TO THE LIMITS, DEPTH, AND DENSITY INDICATED IN SECTION 1. PLACE AN INITIAL LIFT OF STRUCTURAL FILL IMMEDIATELY AFTER COMPLETION OF THE EXCAVATION AND APPROVAL BY THE PURCHASER'S REPRESENTATIVE. PLACE STRUCTURAL FILL IN LOOSE LIFTS OF 8 INCHES OR LESS TO ACHIEVE THE SPECIFIED DENSITY.
- 4.6 FOR BOTH PROTECTION OF THE SOIL SUBGRADE AND ESTABLISHMENT OF A WORKING SURFACE. PLACE MUD MAT FILL TO THE LINES AND LEVELS INDICATED ON THE DRAWING. IT IS RECOMMENDED THAT THE CONCRETE SURFACE BE PLACED AS LEVEL AS PRACTICAL TO FACILITATE PLACEMENT OF THE REINFORCING STEEL AND EMBEDMENT RING.
- 4.7 COMMON FILL PLACEMENT AND COMPACTION. PLACE AND COMPACT COMMON FILL TO THE LIMITS, DEPTH, AND MOIST DENSITY INDICATED IN SECTION 1. PLACE FILL IN LOOSE LIFTS OF 12 INCHES OR LESS TO ACHIEVE THE SPECIFIED DENSITY. BACKFILL MAY BE PLACED WHEN THE FOOTING AND PEDESTAL HAVE REACHED A COMPRESSIVE STRENGTH OF 2000 PSI. PLACE AT A MOIST DENSITY EXCEEDING 120 POUNDS PER CUBIC FOOT.
- 4.8 FINE-GRAINED FILL PLACEMENT AND COMPACTION. PLACE AND COMPACT FINE-GRAINED TO THE DEPTH AND MOIST DENSITY INDICATED IN SECTION 1. PLACE FILL IN LOOSE LIFTS OF 8 INCHES OR LESS TO ACHIEVE THE SPECIFIED DENSITY.
- 4.9 GRADE THE SITE IN ACCORDANCE WITH DRAWINGS TO PREVENT WATER FROM PONDING OVER THE FOUNDATION WHILE MAINTAINING AT LEAST THE MINIMUM DEPTH OF FILL SPECIFIED ON THE DRAWINGS.
- 4.10 RESTORE THE SITE IN ACCORDANCE WITH PURCHASER'S REQUIREMENTS.
- 5.0 TESTING AND INSPECTION SHALL BE PERFORMED BY AN INDEPENDENT TESTING & INSPECTION FIRM. COPIES OF THE FOLLOWING TESTING AND INSPECTION REPORTS WILL BE PROVIDED TO THE CONTRACTOR.
- 5.1 EVERY 1,000 CUBIC YARDS OF PLACED STRUCTURAL FILL, SAMPLES OF STRUCTURAL FILL MATERIALS WILL BE OBTAINED AND GRAIN SIZE ANALYSIS, MOISTURE CONTENT, ATTERBERG LIMITS, AND PROCTOR DENSITY TEST WILL BE PERFORMED.
- 5.2 EVERY 1,000 CUBIC YARDS OF PLACED COMMON AND FINE-GRAINED FILL, SAMPLES OF MATERIALS WILL BE OBTAINED AND GRAIN SIZE ANALYSIS, MOISTURE CONTENT, ATTERBERG LIMITS, AND PROCTOR DENSITY TESTS WILL BE PERFORMED.
- 5.3 STRUCTURAL FILL WILL HAVE FOUR NUCLEAR DENSITY TESTS (ASTM 693B) PERFORMED PER LIFT INDICATING TEST LOCATION, DENSITY, AND MOISTURE CONTENT. IN THE EVENT THAT THE DENSITY REQUIREMENT IS NOT ACHIEVED, CONTRACTOR SHALL RECOMPACT AND TESTING FIRM SHALL RETEST THE STRUCTURAL FILL.
- 5.4 FOR COMMON AND FINE-GRAINED FILLS, TWO NUCLEAR DENSITY TESTS (ASTM 693B) PER LIFT SHALL BE PERFORMED INDICATING TEST LOCATION, DRY DENSITY, AND MOISTURE CONTENT.
- 5.5 A SUBGRADE INSPECTION REPORT COMPLETED BY A GEOTECHNICAL ENGINEER SHALL BE PROVIDED.



OVER EXCAVATION PLAN
SCALE: 3/32"=1'-0"

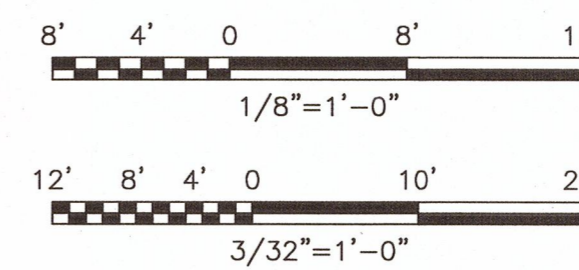


SECTION 1
SCALE: 1/8"=1'-0"

FOR EXCAVATION IN GRANULAR SOILS, X = 1.5 SHOULD BE USED
FOR EXCAVATION IN COHESIVE SOIL, X = 0.75 OR GREATER MAY BE USED

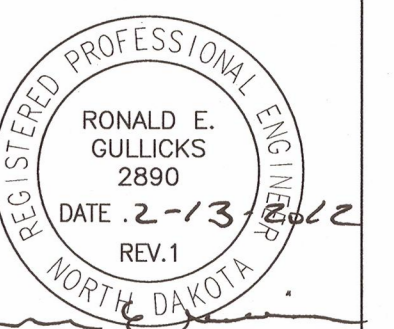
STRUCTURAL FILL COMPACTED TO THE GREATER OF 75% RELATIVE DENSITY OR 98% STANDARD PROCTOR DENSITY AND WITHIN ±2% OF THE OPTIMUM MOISTURE CONTENT OR A RAMMED AGGREGATE PIER SYSTEM DESIGNED BY GEOPIER FOUNDATION COMPANY OR ALTERNATE GROUND IMPROVEMENT TECHNIQUES SUBJECT TO THE PURCHASER'S APPROVAL.

WTG NO.	OVER EXCAVATION DEPTH "D" (FT)
20	8.5



NOTES

1. SEE DRAWING 1TGU-S5008 FOR SPECIFICATIONS AND GENERAL NOTES.
2. SEE DRAWING 1TGU-S5009 FOR DESIGN DATA.



NO.	DATE	REVISION DESCRIPTION	BY	APPROVED	NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
1	2-9-12	CONSTRUCTION REVISIONS, W.O.#17480 NO CHANGES	NJG	[Signature]	0	03-09-11	ISSUED APPROVED FOR CONSTRUCTION	SJU	[Signature]

BLACK & VEATCH
CORPORATION
REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NORTH DAKOTA
I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NORTH DAKOTA.
DESIGNED BY: [Signature] DATE: 03-15-11
DRAWN BY: [Signature] DATE: 03-15-11
CHECKED BY: [Signature] DATE: 03-15-11
PROJECT NUMBER: 16233-1TGU-S5012



BISON WIND GENERATING FACILITY
NEW SALEM, ND

BISON WIND ENERGY PROJECT PHASE 1B
WIND TURBINE FOUNDATION
OVEREXCAVATION AND BACKFILL PLAN

SHEET REV. 1
16233-1TGU-S5012