

1.0 EXCAVATION, SUBGRADE PREPARATION, BACKFILL, & COMPACTION

- A. GENERAL**
- ENSURE FOUNDATION SITE IS EXCAVATED AND GRADED IN ACCORDANCE WITH THE DRAWINGS.
 - ENSURE UNIFORM BEARING CONDITIONS ARE PROVIDED FOR THE FOUNDATION. DO NOT PLACE THE FOUNDATION ON VARIABLE OR DISTURBED SOIL CONDITIONS.
 - ALLOW OWNER'S GEOTECHNICAL ENGINEER ACCESS TO INSPECT THE SUBGRADE AT EACH FOUNDATION. DO NOT PLACE LEAN CONCRETE UNTIL GEOTECHNICAL ENGINEER HAS GIVEN APPROVAL FOR CONSTRUCTION TO CONTINUE. IF ADDITIONAL GROUND IMPROVEMENT IS REQUIRED GEOTECHNICAL ENGINEER OR FOUNDATION ENGINEER WILL PROVIDE DIRECTION.
 - OWNER WILL PERFORM SOIL TESTING STIPULATED IN SECTION 7.0. DO NOT PLACE LEAN CONCRETE UNTIL GEOTECHNICAL ENGINEER HAS WITNESSED PROOF ROLL TEST AND HAS GIVEN APPROVAL.
- B. SUBMITTALS**
- SUBMIT GROUNDWATER CONTROL PLAN IF NECESSARY.
- C. PRODUCTS**
- LEAN CONCRETE: CONTAINING ASTM C150, TYPE V OR ASTM C1157, TYPE HS CEMENT; OR CONTAINING ASTM C150 TYPE II OR ASTM C1157, TYPE MS IN CONJUNCTION WITH 25% TYPE F FLYASH. COMPRESSIVE STRENGTH AND THICKNESS SHALL BE SUFFICIENT TO SUPPORT REINFORCING STEEL AND ANCHOR BOLT CAGE DURING CONSTRUCTION.
 - COMMON FILL: SHALL CONSIST OF SUITABLE MATERIALS EXCAVATED FROM THE FOUNDATION SITE OR IMPORTED AS NECESSARY. ADDITIONAL CRUSHING AND SCREENING MAY BE REQUIRED TO PROCESS THE MATERIAL TO THE SPECIFICATION REQUIREMENTS.
 - MATERIALS BACKFILLED WITHIN 1 FOOT OF THE PEDESTAL SHALL BE FINE, WELL GRADED MATERIAL WITH A PARTICLE SIZE NO GREATER THAN 3".
 - MATERIALS BACKFILLED OUTSIDE THIS AREA SHALL CONFORM TO UNIFORM SOIL CLASSIFICATION SYSTEM SOIL TYPES SM, SC, OR CL. THESE MATERIALS SHALL HAVE A MAXIMUM PERMEABILITY OF 1.0E-6 CM/SECOND, HAVE A MAXIMUM FINES CONTENT OF 25%, AND MEET THE DENSITY REQUIREMENTS. MATERIALS SHALL BE PLACED USING METHODS THAT WILL PREVENT VOIDS FROM OCCURRING.
 - ALL EXCAVATED AREAS AROUND THE FOUNDATION MUST BE BACKFILLED AND COMPACTED TO THE REQUIREMENTS LISTED BELOW.
 - ENGINEERED FILL: REFER TO SHEET S-03 FOR ENGINEERED FILL SPECIFICATIONS (IF REQUIRED).
- D. EXECUTION**
- REMOVE TOPSOIL FROM THE PLAN AREA AND STORE IN AN OWNER DESIGNATED AREA. THE TOPSOIL SHALL BE USED FOR SITE RESTORATION.
 - EXCAVATE SOILS TO THE LIMITS INDICATED ON S-01 USING TECHNIQUES (E.G. A SMOOTH EDGED EXCAVATOR BUCKET) THAT WILL MINIMIZE DISTURBANCE TO THE SUBGRADE. CONTRACTOR IS RESPONSIBLE FOR CONTROL OF SURFACE WATER AND/OR GROUNDWATER FLOWS INTO THE EXCAVATION.
 - ALLOW OWNER'S GEOTECHNICAL ENGINEER TO INSPECT FOUNDATION SUBGRADE. DO NOT CONTINUE UNTIL OWNER'S GEOTECHNICAL ENGINEER HAS PERFORMED SUBGRADE INSPECTION AND GIVEN APPROVAL FOR WORK TO CONTINUE OR PROVIDED DIRECTION AS TO GROUND IMPROVEMENT REQUIRED. OWNER'S GEOTECHNICAL ENGINEER WILL PERFORM THE FOLLOWING TASKS:
 - OBSERVE THE SOIL TYPE ENCOUNTERED.
 - OBSERVE GROUNDWATER AND OTHER SUBSURFACE CONDITIONS.
 - CHECK THAT OBSERVATIONS TAKEN ARE CONSISTENT WITH THE OBSERVATIONS CONTAINED IN THE GEOTECHNICAL REPORT.
 - EVALUATE SUBGRADE STRENGTH AND UNIFORMITY.
 - IF SOIL CONDITIONS ARE ENCOUNTERED THAT ARE NOT CONSISTENT WITH THE REFERENCED GEOTECHNICAL DOCUMENTS (E.G. HALF SOILS AND HALF ROCK) OR IF SUBGRADE UNIFORMITY OR STRENGTH IS INSUFFICIENT, OBTAIN WRITTEN INSTRUCTIONS FROM THE FOUNDATION ENGINEER AS TO THE MEANS OF CORRECTION TO BE UNDERTAKEN. OBTAIN WRITTEN CONFIRMATION FROM THE GEOTECHNICAL ENGINEER THAT THE SPECIFIED CORRECTIVE ACTIONS WERE COMPLETED.
 - FOR SOILS ENCOUNTERED ACROSS THE ENTIRE FOOTPRINT OF THE FOUNDATION, SURFACE COMPACT THE TOP OF THE SUBGRADE TO CONSOLIDATE LOOSE SOILS CREATED DURING EXCAVATION. REFER TO GEOTECHNICAL REPORT FOR PROPER SUBGRADE PREPARATION TECHNIQUES.
 - FOR PROTECTION OF THE SUBGRADE AND ESTABLISHMENT OF A WORKING SURFACE, PLACE LEAN CONCRETE FILL AS INDICATED ON S-01. IT IS RECOMMENDED THAT THE LEAN CONCRETE FILL BE PLACED AS LEVEL AS PRACTICAL TO FACILITATE PLACEMENT OF THE REINFORCING STEEL AND EMBEDMENT RING. THE LEAN CONCRETE FILL MUST BE THICK ENOUGH TO SUPPORT THE REINFORCING STEEL AND THE ANCHOR BOLT CAGE.
 - BACKFILL AND COMPACTION: PLACE AND COMPACT COMMON FILL MATERIALS TO THE LIMITS, DEPTH AND DRY DENSITY INDICATED ON S-01. IN ADDITION TO THE DRY DENSITY REQUIREMENT, BACKFILL MUST BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR. PLACE FILL IN MAXIMUM 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 3000 PSI.
 - GRADE THE SITE IN ACCORDANCE WITH S-01 TO PREVENT WATER FROM PONDING OVER THE FOUNDATION WHILE MAINTAINING AT LEAST THE MINIMUM DEPTH OF FILL SPECIFIED ON S-01. RESTORE THE SITE IN ACCORDANCE WITH OWNER REQUIREMENTS.

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2.0 CAST-IN-PLACE CONCRETE AND STEEL REINFORCING

- A. GENERAL**
- CONCRETE WORK SHALL BE IN COMPLIANCE WITH THE FOLLOWING CODES AND SPECIFICATIONS:
 - ACI 318 (CURRENT EDITION), BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.
 - ACI 301, STANDARD SPECIFICATIONS FOR STRUCTURAL CONCRETE.
 - ACI 308, STANDARD SPECIFICATION FOR CURING CONCRETE.
 - ACI 309, GUIDE FOR CONSOLIDATION OF CONCRETE.
 - ASTM C94, STANDARD SPECIFICATION FOR READY-MIX CONCRETE.
 - ASTM C172, STANDARD PRACTICE FOR SAMPLING FRESHLY MIXED CONCRETE.
 - CONCRETE SHALL MEET THE REQUIREMENTS OF ACI 318, TABLES 4.2.1 AND 4.3.1 FOR EXPOSURE CLASSES F2 (SEVERE FREEZING AND THAWING), S2 (SEVERE SULFATE), P0 (NO PERMEABILITY REQUIREMENT), AND C1 (MODERATE CORROSION).
- B. SUBMITTALS**
- FOR EACH CONCRETE TYPE USED, SUBMIT FOR APPROVAL A MIX DESIGN CERTIFIED BY A PROFESSIONAL ENGINEER LICENSED IN NORTH DAKOTA AND MEETING THE MINIMUM SPECIFIED REQUIREMENTS.
 - SUBMIT PRODUCT DATA FOR ADMIXTURES, POZZOLAN, AND CURING MEMBRANE USED ON THE PROJECT. INCLUDE GRADATION OF COARSE AGGREGATE IF MAX. AGGREGATE SIZE SPECIFIED.
 - SUBMIT REINFORCING FABRICATION AND PLACEMENT SHOP DRAWINGS.
 - SUBMIT MILL REPORTS OF REINFORCING STEEL, CONFIRMING THE GRADE AND STRENGTH OF REINFORCING STEEL PROVIDED ON THE PROJECT.
 - SUBMIT QUALITY CONTROL FIELD TESTS OF AIR CONTENT, SLUMP, AIR TEMPERATURE, AND CONCRETE TEMPERATURE.
 - SUBMIT CONCRETE CYLINDER STRENGTH TEST RESULTS.
 - SUBMIT A PLAN FOR HOT AND COLD WEATHER PROTECTION OF CONCRETE IN ACCORDANCE WITH ACI 305-306.
- C. PRODUCTS**
- REINFORCING BARS: TO ASTM A615, GRADE 60, DEFORMED, UNCOATED.
 - CEMENT: TO ASTM C150, TYPE V OR ASTM C1157, TYPE HS; OR TO ASTM C150, TYPE II OR ASTM C1157, TYPE MS IN CONJUNCTION WITH 25% TYPE F FLYASH MEETING THE REQUIREMENTS OF TYPE V CEMENT IN ACCORDANCE WITH ASTM C1012.
 - FLY ASH: TO ASTM C618, CLASS C OR F; 25% CLASS F IF ASTM C150, TYPE II OR ASTM C1157, TYPE MS CEMENT USED.
 - MINIMUM CEMENTITIOUS CONTENT: IN ACCORDANCE WITH APPROVED MIX DESIGN.
 - COARSE AGGREGATES: TO ASTM C33, GRADATION IN ACCORDANCE WITH SPECIFICATIONS AND APPROVED MIX DESIGN. NOMINAL MAXIMUM AGGREGATE SIZE SHALL BE 0.75 INCHES.
 - FINE AGGREGATES: TO ASTM C33, GRADATION IN ACCORDANCE WITH APPROVED MIX DESIGN.
 - AIR ADMIXTURE AND CONTENT: TO ASTM C260, RANGING FROM 4.5% ± 1.5% FOR PEDESTAL AND FOOTING.
 - OTHER ADMIXTURES: WATER REDUCING MIXTURE AND SUPERPLASTICIZER AS REQUIRED. CALCIUM CHLORIDE ADMIXTURE NOT PERMITTED.
 - MAXIMUM WATER CEMENT RATIO: 0.45.
 - 28 DAY COMPRESSIVE STRENGTH: 5,000 PSI.
 - SLUMP: IN ACCORDANCE WITH APPROVED MIX DESIGN AT THE POINT OF DEPOSITION WITH THE ADDITION OF ADMIXTURES.
 - CURING MEMBRANE: TO ASTM C309, TYPE 2 (WHITE), CLASS A OR B.
 - CONCRETE UNIT WEIGHT: 145 PCF (MINIMUM) TO ASTM C138.
- D. EXECUTION**
- PLACE CONCRETE AND REINFORCING AS SHOWN AND IN ACCORDANCE WITH THE FOLLOWING DIMENSIONAL TOLERANCES:
 - REINFORCING PLAN SPACING: PLUS OR MINUS 2 INCHES.
 - REINFORCING VERTICAL SPACING: PLUS OR MINUS 1 INCH.
 - FOOTING CLEAR CONCRETE COVER: MINUS 0 INCHES, PLUS 3 INCHES.
 - PEDESTAL CLEAR CONCRETE COVER: MINUS 0 INCHES, PLUS 2 INCHES.
 - FOOTING PLAN DIMENSIONS: MINUS 0 INCHES, PLUS 3 INCHES.
 - FOOTING THICKNESS: MINUS 0 INCHES, PLUS 3 INCHES.
 - PEDESTAL PLAN DIMENSIONS: MINUS 0 INCHES, PLUS 2 INCHES.
 - PEDESTAL HEIGHT: MINUS 1 INCH, PLUS 0 INCHES.
 - PEDESTAL CENTERED TO WITHIN 2 INCHES RELATIVE TO FOOTING.
 - PROVIDE NECESSARY TIES, CHAIRS, AND STANDEES TO SECURE AND SUPPORT REBAR AND PREVENT MOVEMENT OR DISPLACEMENT OF THE BARS DURING PLACEMENT OF CONCRETE.
 - REINFORCEMENT SHALL BE FREE OF LOOSE RUST, MILL SCALE, EARTH, ICE, CONCRETE, OR OTHER MATERIALS WHICH COULD PREVENT BONDING TO NEW CONCRETE.
 - SET FORMWORK PER ACI 347 IN ACCORDANCE WITH SPECIFIED DIMENSIONS AND TOLERANCES. PREVENT FORMWORK FROM DEFLECTING GREATER THAN 1 INCH DURING PLACEMENT OF CONCRETE. FORMWORK MUST BE REMOVED AFTER CONCRETE WORK IS COMPLETED.
 - PLACE CONCRETE IN ACCORDANCE WITH ACI 318. PLACE SUCCESSIVE LIFTS OF CONCRETE AS QUICKLY AS POSSIBLE TO ENSURE PROPER AMALGAMATION OF CONCRETE BETWEEN SUCCESSIVE LIFTS.
 - CONSOLIDATE CONCRETE IN ACCORDANCE WITH ACI 318 AND 309 PREVENTING THE FORMATION OF JOINTS, VOIDS, HONEYCOMBING OR SEGREGATION OF AGGREGATE.
 - ROUGH FINISH TOP OF CONCRETE FOOTING USING A ROLLER SCREED.
 - PRIOR TO PLACING PEDESTAL CONCRETE, CLEAN CONCRETE SURFACE WITH AIR OR WATER TO REMOVE DEBRIS AND OTHER LOOSE MATERIAL FROM TOP OF FOOTING.
 - TROWEL AND BROOM FINISH TOP OF PEDESTAL.
 - CURE CONCRETE FOOTING AND PEDESTAL IN ACCORDANCE WITH ACI 318 AND 308. IF A CURING MEMBRANE IS USED, APPLY CURING MEMBRANE AS SOON AS BLEEDING HAS STOPPED AND FREE WATER HAS DISAPPEARED FROM THE SURFACE.
 - ALL METAL DEVICES USED TO SUPPORT FORMWORK OR TEMPORARY BRACING THAT ARE EMBEDDED IN THE FOOTING OR PEDESTAL SHALL BE REMOVED TO A DEPTH OF ONE INCH FROM THE SURFACE OF THE CONCRETE AND FILLED WITH GROUT.
- E. TESTING AND INSPECTION**
- OWNER WILL PERFORM CONCRETE TESTING STIPULATED IN SECTION 7.0.
 - CONTRACTOR MAY CAST ADDITIONAL CYLINDERS AS DESIRED TO DETERMINE CONCRETE STRENGTH AT OTHER TIMES.

3.0 ANCHOR BOLTS AND EMBEDMENT RING

- A. GENERAL**
- PRODUCTS, SUBMITTALS, EXECUTION, AND TESTING ARE SPECIFIED TO PROVIDE DURABLE ANCHOR BOLTS AND EMBEDMENT PLATES.
- B. SUBMITTALS**
- SUBMIT PRODUCT DATA FOR ANCHORS AND HARDWARE.
 - SUBMIT A 12-INCH LONG PRODUCT SAMPLE OF THE ANCHOR COMPLETE WITH WASHER AND NUT.
 - SUBMIT MILL CERTIFICATES FOR ANCHORS INDICATING YIELD AND TENSILE STRENGTH OF ANCHORS.
 - SUBMIT MILL CERTIFICATES FOR THE EMBEDMENT RING INDICATING THAT THE MATERIAL MEETS THE MINIMUM STRENGTH REQUIREMENTS.
 - SUBMIT 5 LABORATORY TENSION TESTS OF ANCHOR COMPLETE WITH THREADS.
 - SUBMIT A TENSIONING CALIBRATION PROCEDURE FOR REVIEW, INCLUDING VERIFICATION THAT THE EQUIPMENT PROVIDED AND TENSIONING METHODS USED ARE DELIVERING THE NECESSARY LOCK OFF LOAD.
 - SUBMIT A TENSIONING PROCEDURE FOR REVIEW.
 - SUBMIT A TENSION TESTING PROCEDURE FOR REVIEW.
 - SUBMIT TENSION TEST DATA FOR ANCHOR BOLTS THAT ARE TESTED INDICATING BOLT LOCATION AND TENSION VALUE.
 - SUBMIT EMBEDMENT RING SHOP DRAWING.
- C. PRODUCTS**
- ANCHOR BOLTS: #11 BAR SIZE WITH MATERIAL TO ASTM A615 GRADE 90, FABRICATED WITH COLD ROLLED THREADS, A MINIMUM YIELD STRENGTH OF 90 KSI, A MINIMUM TENSILE STRENGTH OF 120 KSI, A MAXIMUM THREAD DIAMETER OF 1.5625 INCHES, AND A MINIMUM NET AREA OF 1.56 SQUARE INCHES.
 - ANCHOR BOLT SLEEVES: PVC TO ASTM D1784, MANUFACTURED TO ASTM D2241, SDR21 THICKNESS.
 - EMBEDMENT RING: TO ASTM A36, PLAIN FINISH.
 - HEAVY HEX NUTS: TO ASTM A194, GRADE 2H, EXCEPT FOR THE DIMENSIONAL REQUIREMENTS. OR TO AISI-1045 HT TO HRC 24/36. NUTS SHALL BE CAPABLE OF DEVELOPING THE MINIMUM TENSILE STRENGTH OF THE ANCHOR.
 - HARDENED STEEL WASHERS: TO ASTM F436, PLAIN FINISH.
- D. EXECUTION**
- THE FOLLOWING DIMENSIONAL TOLERANCES SHALL BE ADHERED TO FOR PLACEMENT OF ANCHOR BOLTS:
 - ANCHOR BOLT PLAN LOCATION - PLUS OR MINUS 1/16 INCH.
 - ANCHOR BOLT PLUMBNESS - LESS THAN 1/4 DEGREE.
 - TEMPLATE AND EMBEDMENT RING PLAN DIMENSION - PLUS OR MINUS 1/16 INCH.
 - EMBEDMENT RING LEVEL - PLUS OR MINUS 1/4 INCH.
 - EMBEDMENT RING ELEVATION - PLUS OR MINUS 1/2 INCH.
 - USE A TEMPLATE RING TO SET ANCHOR BOLT PLUMBNESS AND POSITION. ENSURE THE TEMPLATE RING IS SET IN ACCORDANCE WITH THE SPECIFIED CONSTRUCTION TOLERANCES.
 - PLACE AND LEVEL THE EMBEDMENT RING IN ACCORDANCE WITH THE SPECIFIED TOLERANCES. ENSURE THE EMBEDMENT RING IS PROPERLY ANCHORED TO PREVENT MOVEMENT. IT IS ACCEPTABLE TO WELD SUPPLEMENTAL STEEL BRACING TO THE EMBEDMENT RING OR TEMPLATE RING TO PREVENT MOVEMENT.
 - AFTER PLACEMENT OF CONCRETE PEDESTAL, PREVENT WATER FROM ENTERING THE SLEEVE ANNULUS FROM THE TOP SURFACE PRIOR TO SETTING OF TOWER AND GROUTING OF BASEPLATE.
 - AFTER SETTING OF THE LOWER TOWER SECTION(S) AND GROUTING OF THE BASEPLATE, USING AN APPROVED TENSIONING PROCEDURE, APPLY A LOCK-OFF FORCE TO EACH ANCHOR BOLT WHICH IS GREATER THAN 96 KIPS AND LESS THAN 106 KIPS IN ORDER TO ACHIEVE A MINIMUM TENSION FORCE OF 96 KIPS IN THE ANCHOR. THE LOCK-OFF FORCE SELECTED BY THE CONTRACTOR SHOULD ACCOUNT FOR TENSION LOSSES DUE TO THE TENSIONING PROCEDURE TO ENSURE THE SPECIFIED TENSION TEST VALUE IS ACHIEVED. THE TENSIONING EQUIPMENT FOR THE ANCHOR BOLTS SHOULD BE CALIBRATED IN ACCORDANCE WITH THE APPROVED PROCEDURE ON A REGULAR BASIS TO ENSURE REQUIRED TENSIONS ARE ACHIEVED.
- E. TESTING AND INSPECTION**
- SUBMIT 5 LABORATORY TENSION TESTS FOR ANCHOR BOLTS FOR EACH HEAT NUMBER FURNISHED, COMPLETE WITH THREADS, PERFORMED BY AN INDEPENDENT TESTING LABORATORY. PERFORM TEST IN ACCORDANCE WITH ASTM A370, AND REPORT YIELD STRESS AND TENSILE STRESS.
 - AFTER ALL BOLTS HAVE BEEN TENSIONED, A MINIMUM OF 10% OF THE TOTAL BOLTS INSTALLED PER FOUNDATION SHALL BE RANDOMLY TESTED TO VERIFY THAT A 96 KIP TENSION LOAD HAS BEEN ACHIEVED BY USE OF AN APPROVED TENSION TESTING PROCEDURE. IF ANY OF THE BOLTS DO NOT MEET THE REQUIRED TENSION TEST VALUE, THEN ALL BOLTS OF THE TOWER MUST BE RETENSIONED AND THE TENSION TEST MUST BE REPEATED. REPEAT THE PROCEDURE UNTIL ALL THE TENSION TESTS PASS.

4.0 TOWER BASE GROUT

- A. GENERAL**
- NO ITEMS.
- B. SUBMITTALS**
- SUBMIT MANUFACTURER'S GROUT PRODUCT DATA AND MANUFACTURER'S APPROVED MIXING, PLACING AND CURING INSTRUCTIONS FOR GROUT TO BE PLACED.
 - SUBMIT GROUT CUBE STRENGTH TEST RESULTS.
 - SUBMIT CONTRACTOR'S TOWER BASE SETTING/GROUTING PLAN.

— CONTINUED FROM SECTION 4.0

- C. PRODUCTS**
- CEMENTITIOUS NON-SHRINK GROUT: PREPACKAGED GROUT CONFORMING TO ASTM C1107, WITH A MINIMUM COMPRESSIVE STRENGTH OF 10,000 PSI AFTER 28 DAYS ACCORDING TO ASTM C109.
 - EPOXY NON-SHRINK GROUT: PREPACKAGED EPOXY GROUT WITH A MINIMUM COMPRESSIVE STRENGTH OF 10,000 PSI AFTER 28 DAYS ACCORDING TO ASTM C579 AND A MAXIMUM COEFFICIENT OF THERMAL EXPANSION OF 30 X 10-6 IN/IN/°F IN ACCORDANCE WITH ASTM C531.
- D. EXECUTION**
- MIX, PLACE, AND CURE GROUT IN ACCORDANCE WITH APPROVED MANUFACTURER'S INSTRUCTIONS.
 - FOR CEMENT GROUTS, POUR GROUT ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE GROUT SHOULDERS IN ACCORDANCE WITH DRAWING DETAILS. DO NOT ALLOW GROUT TO BE PLACED AGAINST THE SIDE OF THE TOWER FLANGE.
 - FOR EPOXY GROUTS, POUR GROUT ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE GROUT SHOULDERS IN ACCORDANCE WITH DRAWING DETAILS. IF GROUT IS PLACED UP THE SIDE OF THE TOWER FLANGE, PROVIDE A 1/4" EXPANSION JOINT BETWEEN THE TOWER FLANGE AND THE GROUT.
 - COORDINATE GROUTING PROCEDURES WITH THE REQUIREMENTS OF THE TOWER MANUFACTURER.
- E. TESTING**
- CAST A MINIMUM OF 9 GROUT CUBES FOR EACH FOUNDATION, AND PERFORM TWO LABORATORY STRENGTH TESTS PER ASTM C109 AT 28 DAYS (AVERAGE OF THREE CUBE BREAKS FOR EACH STRENGTH TEST) AND IF NECESSARY ONE STRENGTH TEST AT 56 DAYS. CAST ADDITIONAL GROUT CUBES AS REQUIRED TO DETERMINE STRENGTH AT OTHER TIMES.

5.0 MISCELLANEOUS CONCRETE EMBEDMENTS

- A. GENERAL**
- COORDINATE THE LOCATION AND PLACEMENT OF GROUNDING GRIDS, CONTROL CONDUIT AND ELECTRICAL CONDUIT.
- B. SUBMITTALS**
- SUBMIT CONDUIT PLACEMENT DETAILS TO THE FOUNDATION ENGINEER FOR APPROVAL SHOWING DISTANCE FROM TOP OF PEDESTAL TO TOP CONDUIT PENETRATION (THROUGH SIDE OF PEDESTAL).
- C. PRODUCTS**
- NO ITEMS.
- D. EXECUTION**
- VERIFY THE LOCATION OF MISCELLANEOUS CONCRETE EMBEDMENTS AND CONDUIT SO AS NOT TO INTERFERE WITH THE FOUNDATION'S STRUCTURAL REINFORCING STEEL.
 - ENSURE THAT MISCELLANEOUS EMBEDMENTS ARE PROPERLY SECURED TO PREVENT MOVEMENT DURING CONCRETE PLACEMENT.
 - TOP OF CONDUIT MUST BE A MINIMUM OF 24 INCHES BELOW TOP OF PEDESTAL.

6.0 SUBMITTALS

- A. ALL SUBMITTALS SHALL BE MADE TO THE OWNER. SUBMITTALS WILL BE FORWARDED BY THE OWNER TO THE ENGINEER OF RECORD.**
- B. SUBMIT ONE ELECTRONIC COPY OF THE SUBMITTALS SPECIFIED TO OWNER. SUBMITTALS SHALL BE MADE A MINIMUM OF ONE WEEK PRIOR TO ITS INCORPORATION INTO THE WORK.**
- C. THE FOUNDATION ENGINEER OF RECORD WILL REVIEW THE SUBMITTAL FOR CONFORMANCE AND COMPLIANCE WITH THE DRAWINGS AND SPECIFICATIONS.**
- D. THE REVIEW DOES NOT RELIEVE THE CONSTRUCTION CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN CONSTRUCTION OF THE WORK DUE TO ERRORS CONTAINED IN THOSE DOCUMENTS.**

7.0 TESTING AND INSPECTION REQUIREMENTS

- A. OWNER WILL PERFORM CONCRETE AND SOIL TESTING AND INSPECTION STIPULATED BELOW. CONTRACTOR TO NOTIFY OWNER'S REPRESENTATIVE WHEN WORK IS READY FOR TESTING AND/OR INSPECTION AND ALLOW OWNER'S REPRESENTATIVE ACCESS TO WORK. DO NOT PROCEED WITH WORK UNTIL OWNER'S REPRESENTATIVE HAS PERFORMED REQUIRED TESTING AND INSPECTION AND APPROVED WORK TO CONTINUE, IF APPLICABLE.**
- B. GEOTECHNICAL TESTING AND INSPECTION**
- FOR EVERY 2500 CUBIC YARDS OF PLACED COMMON FILL, OWNER'S REPRESENTATIVE WILL OBTAIN SAMPLES OF COMMON FILL MATERIALS AND PERFORM GRAIN SIZE ANALYSIS PER ASTM D422, MOISTURE CONTENT PER ASTM D2216, AND STANDARD PROCTOR MAXIMUM DRY DENSITY PER ASTM D698.
 - FOR ALL PLACED AND COMPACTED COMMON FILLS AROUND THE FOUNDATION, OWNER'S REPRESENTATIVE WILL PERFORM ONE DENSITY TEST PER LIFT INDICATING TEST LOCATION, DRY DENSITY AND MOISTURE CONTENT PER ASTM D6938.
 - OWNER'S GEOTECHNICAL ENGINEER WILL PERFORM A SUBGRADE INSPECTION AT EACH FOUNDATION AND PROVIDE A SUBGRADE INSPECTION REPORT.
- C. CONCRETE TESTING AND INSPECTION**
- FOR EACH FOOTING PLACED, OWNER'S REPRESENTATIVE WILL CAST A MINIMUM OF (8) 6 INCH DIAMETER CONCRETE CYLINDERS PER ASTM C31 FOR LABORATORY STRENGTH TESTING PER ASTM C39 WITH 3 STRENGTH TESTS AT 28 DAYS (AVERAGE OF TWO CYLINDER BREAKS FOR EACH STRENGTH TEST) AND IF NECESSARY ONE STRENGTH TEST AT 56 DAYS.
 - FOR EACH PEDESTAL, OWNER'S REPRESENTATIVE WILL CAST A MINIMUM OF (4), 6 INCH DIAMETER CONCRETE CYLINDERS PER ASTM C31 FOR LABORATORY STRENGTH TESTING PER ASTM C39 WITH ONE STRENGTH TEST AT 28 DAYS (AVERAGE OF TWO CYLINDER BREAKS FOR EACH STRENGTH TEST) AND IF NECESSARY ONE STRENGTH TEST AT 56 DAYS.
 - OWNER'S REPRESENTATIVE WILL PERFORM AIR TESTING PER ASTM C231, SLUMP TESTING PER ASTM C143 PER SET OF CYLINDERS CAST, AND RECORD AMBIENT AIR TEMPERATURE AND CONCRETE TEMPERATURE PER ASTM C1064.
- D. FOR TESTING PERFORMED BY CONTRACTOR**
- SUBMIT A LIST OF THE TESTING COMPANIES THAT WILL BE UTILIZED ON THE PROJECT FOR PERFORMANCE OF TESTS SPECIFIED.
 - SUBMIT ONE ELECTRONIC COPY OF TESTING AND INSPECTION RECORDS SPECIFIED TO THE OWNER. SUBMITTALS WILL BE FORWARDED BY THE OWNER TO THE FOUNDATION ENGINEER OF RECORD.
 - THE FOUNDATION ENGINEER WILL REVIEW THE TESTING AND INSPECTION RECORDS TO CHECK CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS.

8.0 TOWER ERECTION AND ANCHOR TENSIONING REQUIREMENTS

- A. UP TO THREE TOWER SECTIONS MAY BE ERECTED, LEVELED AND GROUTED WHEN CONCRETE STRENGTH OF THE FOOTING AND PEDESTAL HAS REACHED 4,000 PSI.**
- B. ANCHORS MAY BE TENSIONED WHEN:**
- THE CONCRETE STRENGTH OF THE FOOTING AND PEDESTAL HAS REACHED THE SPECIFIED 28 DAY STRENGTH.
 - THE GROUT STRENGTH HAS REACHED 6,000 PSI.
 - THE NACELLE AND BLADES MAY BE ERECTED WHEN:
 - THE CONCRETE STRENGTH OF THE FOOTING AND PEDESTAL HAS REACHED THE SPECIFIED 28 DAY STRENGTH.
 - THE GROUT STRENGTH HAS REACHED THE SPECIFIED 28 DAY STRENGTH.
 - UPON COMPLETION OF THE ANCHOR BOLT TENSIONING AND TESTING AS FOUND IN SECTION 3.E.2 VERIFYING THAT THE REQUIRED TENSION VALUE HAS BEEN ACHIEVED.

| NO. | BY | CHK. | APP. | DATE | REVISION DESCRIPTION |
|-----|------|------|------|----------|--|
| A | JAD2 | JXB | JXB | 7/18/11 | 60% DESIGN SUBMITTAL |
| B | JAD2 | JXB | JXB | 8/19/11 | 90% DESIGN SUBMITTAL |
| 0 | DMH2 | JXB | JXB | 9/15/11 | ISSUED FOR CONSTRUCTION |
| 1 | DMH2 | JAD2 | JXB | 9/30/11 | ADDED REQUIREMENT TO SPECIFICATION 1.A.4 |
| 2 | NGJ | | | 11/15/12 | CONSTRUCTION REVISIONS, NO CHANGES |

Professional Engineer Seal for Matthew T. Rudenrich, State of North Dakota, License No. 8225. Date: 12/6/12.

| CLIENT | 7/18/8/19 | | | | | | |
|-----------------|---------------|---|------|------|---|---|---|
| BID | | | | | | | |
| CONSTRUCTION | | | 9/15 | 9/30 | | | |
| RELEASED TO/FOR | A | B | 0 | 1 | 2 | 3 | 4 |
| | DATE RELEASED | | | | | | |

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| Scale | AS SHOWN |
|----------|----------|
| Date | 7/14/11 |
| Drawn | JAD2 |
| Checked | JXB |
| Designed | JAD2 |
| Approved | JXB |

MINNESOTA POWER AN ALLETE COMPANY
BISON
A WIND ENERGY INITIATIVE OF MINNESOTA POWER IN NORTH DAKOTA

| | | |
|---|------|--------------------|
| BISON 3 WIND PROJECT | | BARR PROJECT No. |
| MORTON & OLIVER COUNTIES, NORTH DAKOTA | | 34/30-1006 |
| SPREAD FOOTING FOUNDATION | | CLIENT PROJECT No. |
| TECHNICAL SPECIFICATIONS AND SUBMITTALS | | |
| DWG. No. | S-02 | REV. No. |
| | | 2 |