

150 E. GAY STREET, 24TH FLOOR COLUMBUS, OH 43215-3192 TELEPHONE: (614) 744-2570 FACSIMILE: (844) 670-6009 http://www.dickinsonwright.com

CHRISTINE M.T. PIRIK
CPirik@dickinsonwright.com
(614) 591-5461

June 17, 2019

Ms. Tanowa Troupe, Secretary Ohio Power Siting Board Docketing Division 180 East Broad Street, 11th Floor Columbus, OH 43215

Re: Case Nos. 09-479-EL-BGN, 11-3446-EL-BGA, 16-469-EL-BGA, and 16-2404-EL-BGA

In the Matter of the Application of Hardin Wind Energy LLC for a Certificate of Environmental Compatibility and Public Need for the Hardin Wind Farm.

Phase 3 – Compliance with Condition 23, Case No. 09-479-EL-BGN – Turbine Foundation Design

Dear Ms. Troupe:

Hardin Wind Energy LLC ("Applicant") is certified to construct a wind-powered electric generation facility in Hardin County, Ohio, in accordance with the orders issued by the Ohio Power Siting Board ("OPSB") in the above-referenced cases.

The Applicant is currently preparing to begin Phase 3 of the project, which will entail construction of the access roads and turbine foundations that were not included in Phases 1 and 2.

At this time, for purposes of complying with the certificate conditions for Phase 3, the Applicant is filing the attached Turbine Foundation Design. This document is being provided in compliance with Condition 23 of OPSB's March 22, 2010 Order in Case No. 09-479-EL-BGN.

We are available, at your convenience, to answer any questions you may have.

Respectfully submitted,

/s/ Christine M.T. Pirik
Christine M.T. Pirik (0029759)
William V. Vorys (0093479)
Dickinson Wright PLLC
150 East Gay Street, Suite 2400
Columbus, Ohio 43215
Attorneys for Hardin Wind Energy LLC

cc: Ed Steele Derek Collins

COLUMBUS 39579-20 117506v2

ARIZONA CALIFORNIA FLORIDA KENTUCKY MICHIGAN
NEVADA OHIO TENNESSEE TEXAS TORONTO WASHINGTON DC

HARDIN WIND FARM SPREAD FOOTING FOUNDATIONS HARDIN COUNTY, OHIO

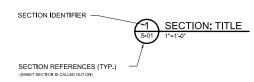
TURBINE	TYPE	X Lon83	Y Lat83
ID	1175	A_L01163	1_Lato3
1	2.7-116	-83.8349148	40.7011553
2	2.7-116	-83.8376900	40.6982499
3	2.7-116	-83.8375013	40.6946427
4	2.7-116	-83.8335157	40.6913495
5	2.7-116	-83.8283259	40.7015332
6	2.7-116	-83.8272815	40.6989468
10	2.7-116	-83.8200031	40.6874428
11	2.7-116	-83.8189712	40.6842975
15	2.7-116	-83.8300300	40.6878368
16	2.7-116	-83.8298243	40.6846533
18	2.7-116	-83.8284913	40.6794349
19	2.7-116	-83.8273508	40.6768057
22	2.7-116	-83.8170591	40.6793543
55	2.7-116	-83.7965170	40.6436184
59	2.7-116	-83.7856078	40.6519797
60	2.7-116	-83.7850118	40.6493100
84	2.7-116	-83.7738059	40.6944985
85	2.7-116	-83.7690425	40.6932079
86	2.7-116	-83.7659439	40.6915348
88	2.7-116	-83.7600711	40.6946028
91	2.7-116	-83.7511557	40.6985177
92	2.7-116	-83.7492800	40.6949235
101	2.7-116	-83.7534005	40.6872232
104	2.7-116	-83.7432906	40.6845097
105	2.7-116	-83.7399274	40.6835718
106	2.7-116	-83.7365856	40.6825793
123	2.7-116	-83.7470458	40.6921035
127	2.7-116	-83.8188936	40.6816153
TOTAL:	28		

TURBINE	TYPE	X_Lon83	Y_Lat83
12	2.8-127	-83.8107891	40.6999083
17	2.8-127	-83.8296276	40.6819650
20	2.8-127	-83.8385768	40.6876448
21	2.8-127	-83.8369058	40.6853531
23	2.8-127	-83.8153281	40.6767395
33	2.8-127	-83.8454104	40.6713898
35	2.8-127	-83.8365280	40.6708700
37	2.8-127	-83.8447464	40.6549413
38	2.8-127	-83.8374532	40.6564269
52	2.8-127	-83.7911984	40.6521869
54	2.8-127	-83.7984893	40.6463898
56	2.8-127	-83.7955262	40.6405620
62	2.8-127	-83.7839380	40.6436794
64	2.8-127	-83.7795128	40.6390573
65	2.8-127	-83.8058432	40.6316827
68	2.8-127	-83.8021929	40.6244035
80	2.8-127	-83.7682307	40.6813199
83	2.8-127	-83.7779391	40.6951467
94	2.8-127	-83.7418742	40.7001708
98	2.8-127	-83.7331991	40.6964045
103	2.8-127	-83.7466200	40.6854843
107	2.8-127	-83.7240834	40.6780293
108	2.8-127	-83.7575261	40.6819636
111	2.8-127	-83.7154346	40.7088936
112	2.8-127	-83.7058394	40.7139650
113	2.8-127	-83.7051527	40.7063610
114	2.8-127	-83.7052978	40.7020522
115	2.8-127	-83.6987556	40.7006562
116	2.8-127	-83.6969264	40.6984381
118	2.8-127	-83.7140955	40.6919556
125	2.8-127	-83.7661943	40.6729921
126	2.8-127	-83.7650734	40.6704880
TOTAL:	32		

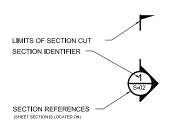
- 1. ANTICIPATED GROUNDWATER DEPTH BASED ON PROJECT GEOTECHNICAL REPORT. SEE DRAWING S-01 AND S-02 REFERENCE 2.
- 2. COORDINATES GEOGRAPHIC NAD83 AS PROVIDE BY INVENERGY LLC
 3. TURBINE ID'S, COORDINATES AND PEDESTAL ELEVATIONS ARE TO BE VERIFIED BY CONTRACTOR WITH THE CIVIL DRAWINGS PRIOR TO CONSTRUCTION.







SECTION VIEW TITLE



SECTION VIEW CALL OUT

DRAWING INDEX

SHEET	REV.	TITLE
S-00	0	TITLE SHEET, DRAWING INDEX, AND SITE LOCATION MAP
S-01	0	GE 2.7-116 SPREAD FOOTING FOUNDATION PLAN, ELEVATION, SECTION, & DETAILS
S-02	0	GE 2.8-127 SPREAD FOOTING FOUNDATION PLAN, ELEVATION, SECTION, & DETAILS
S-03	0	SPREAD FOOTING FOUNDATION TECHNICAL SPECIFICATIONS AND SUBMITTALS
S-04	0	SPREAD FOOTING FOUNDATION SOIL CORRECTION SECTIONS AND SPECIFICATIONS



ISSUED FOR CONSTRUCTION CONFIDENTIAL

0	JWM	AST	MBJ	06/11/2019	ISSUED FOR CONSTRUCTION		CLIENT				06/11/19				
							BID								
							CONSTRUCTION				06/11/19				5
							PERMITTING								16
							RELEASED	Α	В	C	0	1	2	3	Corporat
10.	BY	снк.	APP.	DATE	REVISION DESCRIPTION		TO/FOR			DATE I	RELEA	SED			Minneap Ph: 1-80

BARR ENGINEERING CO. 4300 MARKETPOINTE DRIVE MINNEAPOLIS, MN 55435

ite	06/10/2019
awn	swo
necked	AST
esIgned	JWM
proved	MBI

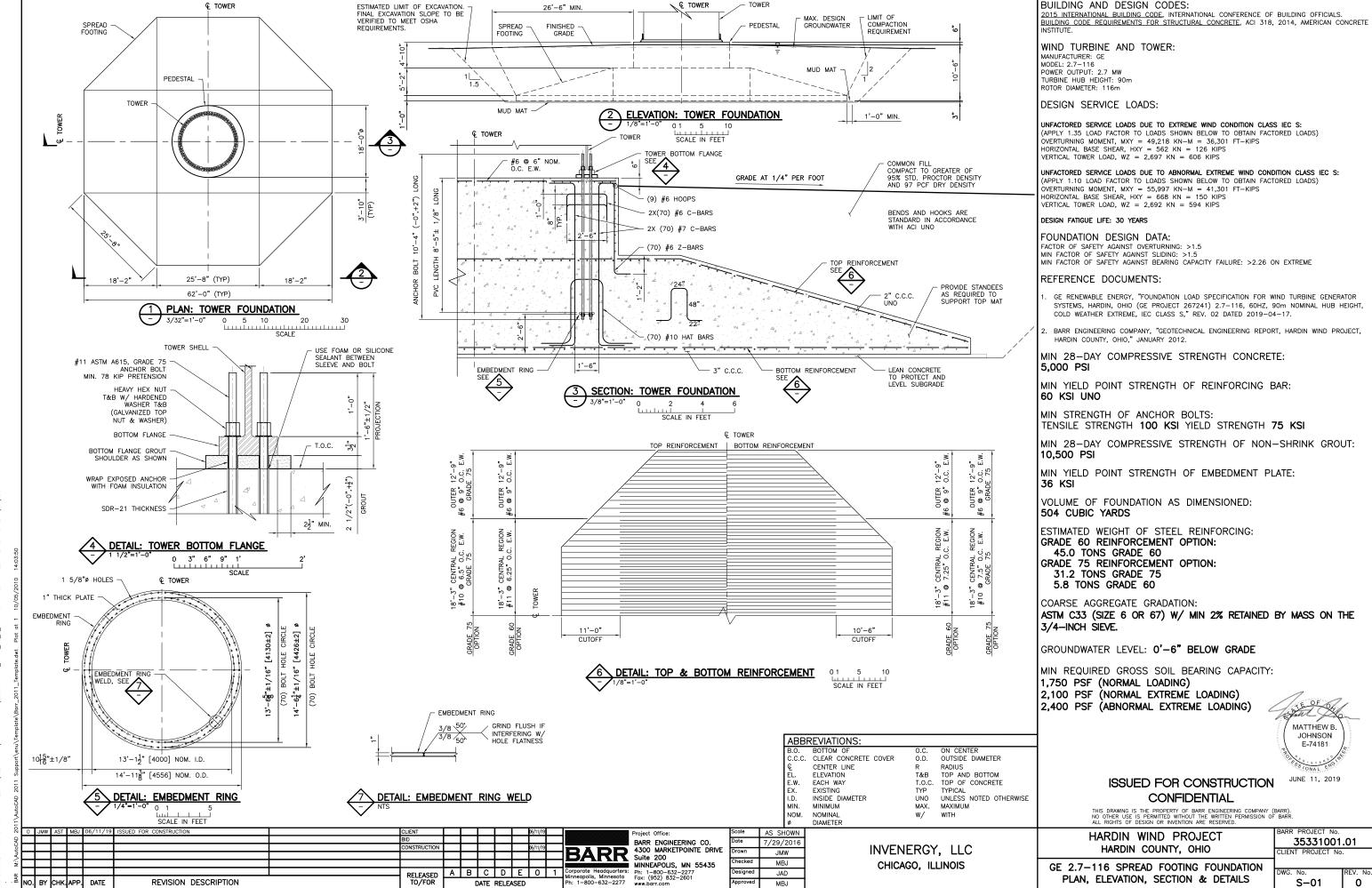
INVENERGY, LLC CHICAGO, ILLINOIS

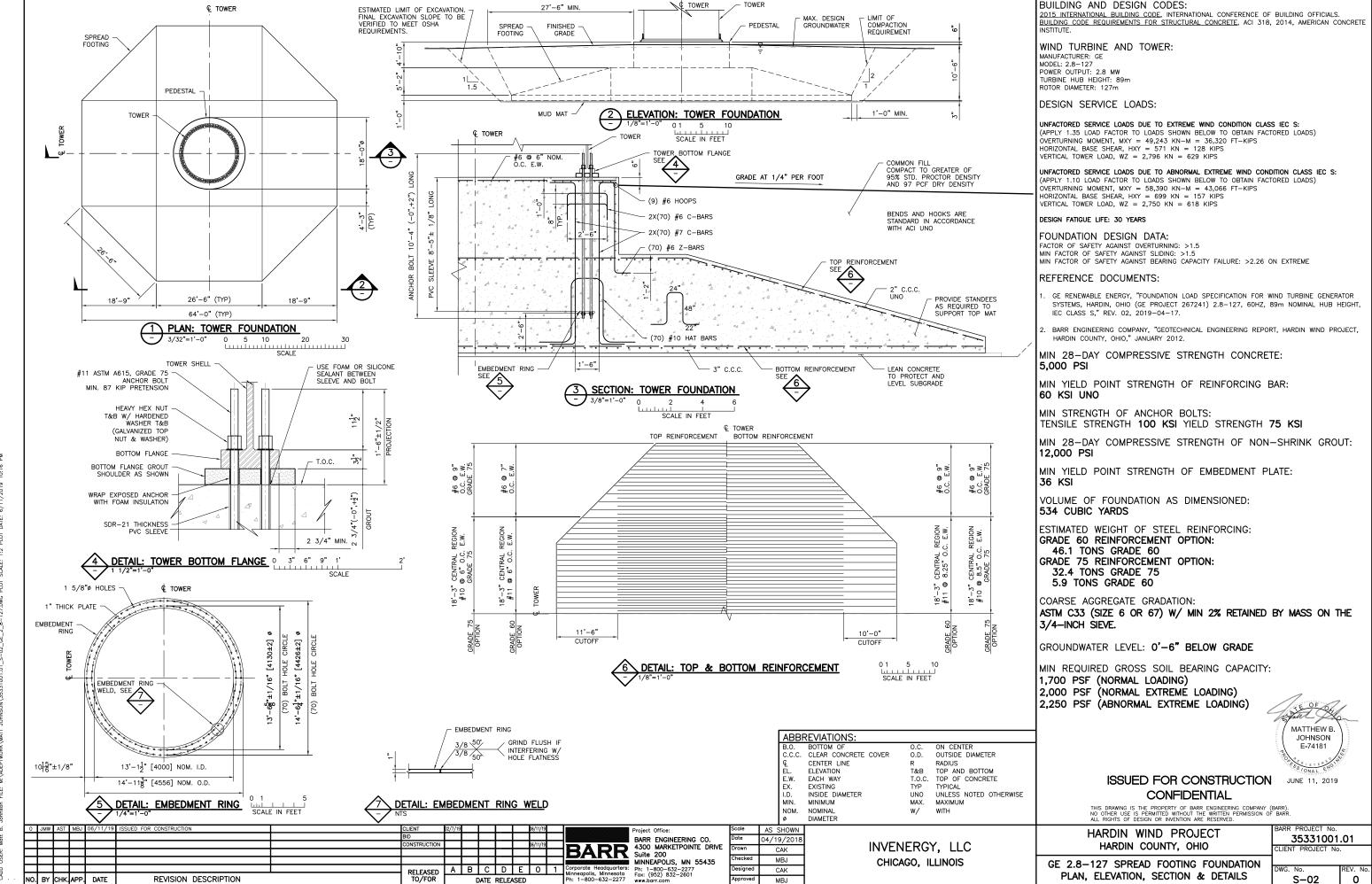
HARDIN WIND FARM HARDIN COUNTY, OHIO

TITLE SHEET, DRAWING INDEX, AND

BARR PROJECT No.
35331001.01
CLIENT PROJECT No.

SITE LOCATION MAP





DD USER: Matt B. Johnson FILE: M:\ADEPTWORK\MATT JOHNSON\35331001.01 S-02 GE 2. 8-127.DWG PLOT SCALE: 1:2 PLOT DATE: 6/11/2019 10:

1.0 GENERAL REQUIREMENTS AND SUBMITTALS

GENERAL

- THE REQUIREMENTS SPECIFIED HEREIN APPLY TO THE FOLLOWING DRAWINGS
- HARDIN WIND PROJECT, DRAWING S-01 & S-02, SPREAD FOOTING FOUNDATION

- SUBMITTALS SHALL BE MADE A MINIMUM OF ONE WEEK PRIOR TO INCORPORATION INTO THE WORK. THE FOUNDATION ENGINEER (BARR) WILL REVIEW SUBMITTALS. INCLUDING THE TESTING AND INSPECTION RECORDS TO CHECK CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS. THE REVIEW DOES NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN CONSTRUCTION OF THE WORK DUE TO ERRORS CONTAINED IN THOSE DOCUMENTS. SUBMIT ONE ELECTRONIC COPY OF THE SUBMITTALS SPECIFIED TO THE FOUNDATION ENGINEER AT
- THE FOLLOWING: BARR ENGINEERING COMPANY ATTN: MR. CHUCK BEAUZAY [CBEAUZAY@BARR.COM]
- SUBMIT A LIST OF THE TESTING COMPANIES THAT WILL BE UTILIZED ON THE PROJECT FOR PERFORMANCE OF TESTS SPECIFIED.
- SUBMIT NAME AND QUALIFICATIONS OF THE CONSTRUCTION PHASE GEOTECHNICAL ENGINEER. SUBMIT INFORMATION (TESTING RESULTS, PRODUCT DATA, CONSTRUCTION DETAILS, ETC.) AS LISTED
- IN THE FOLLOWING SECTIONS: 2.B, 3.B, 4.B, 5.B, AND 6.B

2.0 EXCAVATION, SUBGRADE PREPARATION, BACKFILL, & COMPACTION

. GENERAL

COORDINATE THE EXCAVATION, SUBGRADE PREPARATION, BACKFILL, COMPACTION, AND GRADING ACTIVITIES WITH THE GEOTECHNICAL DOCUMENT REFERENCED ON DRAWING S-01.

- SUBMIT GROUNDWATER AND SURFACE WATER CONTROL PLAN.
- SUBMIT SUBGRADE STRENGTH AND UNIFORMITY VERIFICATION METHOD.
- SUBMIT SUBGRADE INSPECTION REPORT FOR EACH FOUNDATION COMPLETED BY THE CONSTRUCTION PHASE GEOTECHNICAL ENGINEER
- SUBMIT GRAIN SIZE ANALYSIS PER ASTM D422, NATURAL MOISTURE CONTENT PER ASTM D2216, AND STANDARD PROCTOR MAXIMUM DRY DENSITY PER ASTM D698 FOR COMMON FILL SOIL MATERIALS.
- SUBMIT COMPACTION TEST RESULTS FOR FILL PLACED OVER THE FOUNDATION INDICATING LOCATION OF TEST, DRY DENSITY, AND MOISTURE CONTENT OF PLACED FILL,

PRODUCTS

- LEAN CONCRETE: SEE SECTION 3.C.2 OF THESE SPECIFICATIONS FOR CEMENT TYPE. COMPRESSIVE STRENGTH AND THICKNESS SHALL BE SUFFICIENT TO SUPPORT REINFORCING STEEL AND ANCHOR BOLT CAGE DURING CONSTRUCTION.
- COMMON FILL: SHALL CONSIST OF SUITABLE UNFROZEN MATERIALS EXCAVATED FROM TH FOUNDATION SITE OR IMPORTED AS NECESSARY. ADDITIONAL CRUSHING AND SCREENING MAY BE REQUIRED TO PROCESS THE MATERIAL TO THE SPECIFIED REQUIREMENTS BELOW
 - MATERIALS BACKFILLED WITHIN 1 FOOT OF ANY CONCRETE SHALL BE FINE, WELL GRADED MATERIAL WITH PARTICLE SIZE NO GREATER THAN 3 INCHES.
- MATERIALS BACKFILLED BEYOND 1 FOOT OF ANY CONCRETE MAY CONSIST OF ALL OTHER EXCAVATED MATERIALS PROVIDED THEY MEET THE DENSITY REQUIREMENTS AND CAN BE PLACED USING METHODS THAT WILL PREVENT VOIDS FROM OCCURRING.
- ENGINEERED FILL: REFER TO ENGINEERED FILL SPECIFICATIONS IN GEOTECHNICAL DOCUMENT REFERENCED ON DRAWING S-01 (IF REQUIRED).

- CONFIRM LOCATION OF TURBINE COORDINATES IN THE GEOTECHNICAL DOCUMENT REFERENCED OF DRAWING S-01 IF TURBINE COORDINATES ARE OFFSET BY MORE THAN 50 FEET. OBTAIN WRITTEN INSTRUCTIONS FROM THE FOUNDATION ENGINEER AS TO THE MEANS OF ADDITIONAL INVESTIGATION TO BE UNDERTAKEN. OBTAIN WRITTEN CONFIRMATION FROM THE GEOTECHNICAL ENGINEER THAT THE SPECIFIED INVESTIGATION WAS COMPLETED.
- REMOVE TOPSOIL FROM THE PLAN AREA AND STORE IN AN OWNER DESIGNATED AREA, THE TOPSOIL SHALL BE USED FOR SITE RESTORATION.
- EXCAVATE SOILS OR ROCK TO THE LIMITS INDICATED ON DRAWING S-01 USING TECHNIQUES WILL MINIMIZE DISTURBANCE TO THE SUBGRADE. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROL OF SURFACE WATER AND/OR GROUNDWATER FLOWS INTO THE EXCAVATION.
- IF GRANULAR SOILS ARE ENCOUNTERED ACROSS THE ENTIRE FOOTPRINT OF THE FOUNDATION SURFACE COMPACT THE TOP OF THE SUBGRADE TO CONSOLIDATE LOOSE SOILS CREATED DURING EXCAVATION. REFER TO THE GEOTECHNICAL DOCUMENT REFERENCED ON DRAWING S-01 FOR RECOMMENDED SUBGRADE PREPARATION TECHNIQUES
- IF ROCKY CONDITIONS ARE ENCOUNTERED ACROSS THE ENTIRE FOOTPRINT OF THE FOUNDATION, PERFORM THE FOLLOWING TASKS:
 - SUBSTANTIALLY REMOVE ALL LOOSE ROCK GREATER THAN 3 INCHES DIAMETER FROM THE BOTTOM OF THE EXCAVATION. AS PRACTICALLY AS POSSIBLE, REMOVE MATERIAL LESS THAN 3 INCHES DIAMETER TO EXPOSE UNDISTURBED ROCK
- IF THE BOTTOM OF THE EXCAVATION IS OF VARIABLE ELEVATION, ESTABLISH A LEVEL BENCH BY USE OF LEAN CONCRETE FILL.
- PRIOR TO PLACING PROTECTIVE LEAN CONCRETE SURFACE, HAVE THE CONSTRUCTION PHASE GEOTECHNICAL ENGINEER (OR A PERSON UNDER THE GEOTECHNICAL ENGINEER'S DIRECT SUPERVISION) INSPECT THE SUBGRADE CONDITIONS AND RECORD THE SOIL TYPE ENCOUNTERED. GROUNDWATER CONDITIONS, OR OTHER SUBSURFACE CONDITIONS. A SUBGRADE INSPECTION REPORT SHALL BE PREPARED AND SUBMITTED FOR EACH FOUNDATION THAT INCLUDES THE FOLLOWING:
- VERIFICATION THAT OBSERVATIONS TAKEN ARE CONSISTENT WITH THE OBSERVATION CONTAINED IN THE GEOTECHNICAL DOCUMENT REFERENCED ON DRAWING S-01.
- VERIFICATION THAT SUBGRADE STRENGTH AND UNIFORMITY ARE ADEQUATE (SUBMIT FOR REVIEW THE METHODS TO BE USED TO VERIFY THE SUBGRADE STRENGTH AND UNIFORMITY). PHOTOS OF PREPARED SUBGRADE
- IF SOIL CONDITIONS ARE ENCOUNTERED THAT ARE NOT CONSISTENT WITH THE REFERENCED GEOTECHNICAL DOCUMENT (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 PROTECTION OF THE SUBGRADE AND ESTABLISHMENT OF A WORKING SURFACE, PLACE LEAN CONCRETE FILL AS INDICATED ON DRAWING S-01. IT IS RECOMMENDED THAT THE LEAN CONCRETE FILL BE PLACED AS LEVEL AS PRACTICAL TO FACILITATE PLACEMENT OF THE REINFORCING STEEL AND
- BACKFILL AND COMPACTION: PLACE AND COMPACT COMMON FILL MATERIALS TO THE LIMITS, DEPTI AND DRY DENSITY INDICATED ON DRAWING S-01. IN ADDITION TO THE DRY DENSITY REQUIREMENT, BACKFILL MUST BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR MAXIMUM DRY DENSITY. PLACE FILL IN MAXIMUM LOOSE LIFTS OF 12 INCHES OR LESS TO ACHIEVE THE SPECIFIED DENSITY ADDITIONAL DRYING OF BACKFILL MATERIAL MAY BE NECESSARY TO ACHIEVE THESE SPECIFICATIONS BACKFILL MAY BE PLACED WHEN THE FOOTING AND PEDESTAL HAVE REACHED 2,000 PSI.
- GRADE THE SITE IN ACCORDANCE WITH DRAWING S-01 TO PREVENT WATER FROM PONDING OVER THE FOUNDATION WHILE MAINTAINING AT LEAST THE MINIMUM DEPTH OF FILL SPECIFIED ON THE

E. TESTING AND INSPECTION

- O CUBIC YARDS OF PLACED COMMON FILL, OBTAIN SAMPLES OF COMMON FILE MATERIALS AND PERFORM AND SUBMIT 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 PERFORM AND SUBMIT ONE DENSITY TEST PER LIFT (INDICATING TEST LOCATION, DRY DENSITY AND MOISTURE CONTENT) PER ASTM D6938
- PROVIDE A SUBGRADE INSPECTION REPORT TO BE COMPLETED BY THE CONSTRUCTION PHASE GEOTECHNICAL ENGINEER FOR EACH FOUNDATION

3.0 CAST-IN-PLACE CONCRETE AND STEEL REINFORCING

DRAWINGS. RESTORE THE SITE IN ACCORDANCE WITH OWNER REQUIREMENTS

A. GENERAL

- CONCRETE WORK SHALL BE IN COMPLIANCE WITH THE FOLLOWING CODES AND SPECIFICATIONS (CURRENT EDITIONS):
- ACI 301, SPECIFICATIONS FOR STRUCTURAL CONCRETE
- ACI 318, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.
- ACI 305.1, SPECIFICATION FOR HOT WEATHER CONCRETIN
- ACI 306.1. SPECIFICATION FOR COLD WEATHER CONCRETING. ACI 308.1, SPECIFICATION FOR CURING 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 19.3.1.1 AND 19.3.2.1 FOR EXPOSURE CLASSES F2, S2, W0, AND C1,

- FOR EACH CONCRETE MIX USED, SUBMIT FOR APPROVAL A MIX DESIGN CERTIFIED BY A PROFESSIONAL ENGINEER (LICENSED IN OHIO) MEETING THE MINIMUM SPECIFIED REQUIREMENTS. CONCRETE MIX SHALL BE PROPORTIONED ACCORDING TO THE REQUIREMENTS OF ACI 301 AND 318. CHAPTER 26.4.3 ON THE BASIS OF FIELD DATA OR TRIAL MIXTURES. THE CONCRETE MIX DESIGN SUBMITTAL SHALL INCLUDE THE FOLLOWING ITEMS:
- GRADATION, SOURCE, AND TYPE OF COARSE AND FINE AGGREGATES MEETING THE REQUIREMENTS OF ASTM C33.
- HISTORICAL OR TRIAL BATCH STRENGTH DATA
- MILL REPORTS FOR CEMENT AND FLY ASH (OR OTHER CEMENTITIOUS MATERIALS)
- PRODUCT DATA FOR ADMIXTURES
- ASR TEST RESULTS: IF AGGREGATES CONTAIN POTENTIALLY REACTIVE MATERIALS (AS DETERMINED BY ONE OF THE TEST METHODS OUTLINED IN ASTM C33, APPENDIX X1), SUBMIT TEST RESULTS INDICATING THE POTENTIAL REACTIVITY, SUCH AS THE RESULTS OF TESTING TO ASTM C295, C289, C1293, OR C1260. IF THESE TEST RESULTS INDICATE THE AGGREGATES ARE REACTIVE, SUBMIT AN ASR MITIGATION PLAN, INCLUDING VERIFICATION THAT THE PROPOSED MEASURES WILL SUFFICIENTLY LIMIT ASR TO PREVENT EXCESSIVE EXPANSION. THIS VERIFICATION SHALL CONSIST OF THE RESULTS OF TESTS PERFORMED ACCORDING TO ASTM C1567, AASHTO T303, OR ASTM C1293.
- 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 305.1 AND 306.1
- SUBMIT A PLAN FOR CONCRETE CURING IN ACCORDANCE WITH ACL 308 1
- SUBMIT FOR APPROVAL A MASS CONCRETE PLACEMENT AND TEMPERATURE CONTROL PLAN MEETING THE REQUIREMENTS OF ACI 301 CHAPTER 8.

- REINFORCING BARS: TO ASTM A615, GRADE 60 AND 75 DEFORMED, UNCOATED.
- CEMENT: TO ASTM C150, TYPE V OR EQUIVALENT OR ASTM C595 TYPE HS.
- FLY ASH: TO ASTM C618, CLASS F (IF SPECIFIED).
- COARSE AND FINE AGGREGATES: TO ASTM C33, GRADATION IN ACCORDANCE WITH SPECIFICATIONS AND APPROVED MIX DESIGN, NOMINAL MAXIMUM AGGREGATE SIZE SHALL BE AS SHOWN ON DRAWING S-01. ALL AGGREGATES MUST BE NON-REACTIVE WITH CEMENT TO PREVENT ASR. AIR ADMIXTURE AND CONTENT: TO ASTM C260, 6% FOR PEDESTAL ONLY, NO AIR CONTENT
- REQUIREMENT FOR FOOTING OTHER ADMIXTURES: CHLORIDE FREE WATER REDUCING ADMIXTURE AND SUPERPLASTICIZER AS
- RECUIRED
- 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
- CONCRETE UNIT WEIGHT: 145 PCF (MINIMUM) TO ASTM C138.

- PLACE CONCRETE AND REINFORCING AS SHOWN AND IN ACCORDANCE WITH THE FOLLOWING
 - 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 O INCHES.
- PEDESTAL CENTERED TO WITHIN 2 INCHES RELATIVE TO FOOTING. CONCRETE AIR CONTENT: +/- 1.5% PROVIDE NECESSARY TIES, CHAIRS, AND STANDERS TO SECURE AND SUPPORT REBAR AND PREVENT
- PERMANENT DISPLACEMENT OR MOVEMENT OF THE BARS GREATER THAN 1 INCH DURING PLACEMENT OF CONCRETE, REBAR THAT DEFLECTS BUT RETURNS TO ITS ORIGINAL POSITION IS ACCEPTABLE. 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 301 AND 318 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 301 AND 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 301 AND 318 PREVENTING THE FORMATION OF JOINTS VOIDS HONEYCOMBING OR SEGREGATION OF AGGREGATE
- BARR ENGINEERING CO. 4300 MARKETPOINTE DRIVE MINNEAPOLIS, MN 55435 Ph: 1-800-632-2277 Fax: (952) 832-2601

04/18/2019 SWO AST JMW

E. TESTING AND INSPECTION

INVENERGY, LLC CHICAGO, ILLINOIS

COMPLETE WITH THREADS, PERFORMED BY AN INDEPENDENT TESTING LABORATORY. PERFORM TES 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 THE SPECIFIED 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 RE-TENSIONED AND THE TENSION TEST MUST BE REPEATED. REPEAT THE PROCEDURE UNTIL ALL THE TENSION TESTS

5.0 TOWER BASE GROUT

A. GENERAL

PRIOR TO PLACING PEDESTAL CONCRETE, CLEAN CONCRETE SURFACE WITH AIR OR WATER TO

CURE CONCRETE FOOTING AND PEDESTAL IN ACCORDANCE WITH ACI 301, 318 AND 308.1. IF A CURING

MEMBRANE IS USED, APPLY CURING MEMBRANE AS SOON AS BLEEDING HAS STOPPED AND FREE

ALL METAL DEVICES USED TO SUPPORT FORMWORK OR TEMPORARY BRACING THAT ARE EMBEDDED

ANY SHRINKAGE CRACKS IN EXCESS OF 0.012 INCHES (0.3mm) IN WIDTH SHALL BE SEALED WITH AN

FOR EACH FOOTING PLACED, CAST A MINIMUM OF (2) 6-INCH OR (3) 4-INCH DIAMETER CONCRETE

CYLINDERS PER ASTM C31 FOR EVERY 150 CUBIC YARDS, OR FRACTION THEREOF, OF CONCRETE

DAYS FOR EVERY 150 CUBIC YARDS, OR FRACTION THEREOF, OF CONCRETE PLACED ("STRENGTH

(2) 6-INCH OR (3) 4-INCH ADDITIONAL CONCRETE CYLINDERS PER ASTM C31, AND IF NECESSARY

PERFORM ONE "STRENGTH TEST" PER ASTM C39 AT 56 DAYS. CAST ADDITIONAL CYLINDERS AS

PLACED FOR LABORATORY STRENGTH TESTING PER ASTM C39, PERFORM ONE "STRENGTH TEST" AT 2

TEST" = AVERAGE OF (2) 6-INCH OR (3) 4-INCH CYLINDER BREAKS). FOR EACH FOOTING PLACED, CAST

FOR EACH PEDESTAL, CAST A MINIMUM OF (4) 6-INCH OR (6) 4-INCH DIAMETER CONCRETE CYLINDERS

PER ASTM C31 FOR LABORATORY STRENGTH TESTING PER ASTM C39. PERFORM ONE "STRENGTH TEST" AT 28 DAYS ("STRENGTH TEST" = AVERAGE OF (2) 6-INCH OR (3) 4-INCH CYLINDER BREAKS) AND IF

NECESSARY ONE AT 56 DAYS. CAST ADDITIONAL CYLINDERS AS REQUIRED TO DETERMINE CONCRETE

PERFORM A MINIMUM OF ONE AIR TEST PER ASTM C231 AND A MINIMUM OF ONE SLUMP TEST PER

ASTM C143 PER SET OF CYLINDERS CAST. RECORD AMBIENT AIR TEMPERATURE AND CONCRETE

PERFORM TESTING AND INSPECTION REQUIRED BY THE MASS CONCRETE TEMPERATURE CONTROL

PRODUCTS, SUBMITTALS, EXECUTION, AND TESTING ARE SPECIFIED TO PROVIDE DURABLE ANCHOR

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

SUBMIT A TENSIONING CALIBRATION PROCEDURE FOR REVIEW, INCLUDING VERIFICATION THAT THE

EQUIPMENT PROVIDED AND TENSIONING METHODS USED ARE DELIVERING THE NECESSARY LOCK OFF

SUBMIT TENSION TEST DATA FOR ANCHOR BOLTS THAT ARE TESTED INDICATING BOLT LOCATION AND

ANCHOR BOLTS: #11 SIZE WITH MATERIAL TO ASTM A615 GRADE 75, WITH COLD ROLLED THREADS,

MINIMUM YIELD STRENGTH OF 75 KSL A MINIMUM TENSILE STRENGTH OF 100 KSL A MAXIMUM THREAD

HEAVY HEX NUTS: TO ANCHOR BOLT MANUFACTURER'S SPECIFICATIONS, HOT-DIP GALVANIZE TO ASTM

HARDENED STEEL WASHERS: TO ASTM F436, PLAIN FINISH, HOT-DIP GALVANIZE TO ASTM A153 ABOVE

GREASE; FUCHS LUBRITECH, CHEMPLEX 825, WITH WATER WASHOUT TO ASTM D1264 (<3% AT 175 DEG.

SUBMIT PRODUCT DATA AND SHOP DRAWING FOR ANCHORS AND HARDWARE

SUBMIT LABORATORY TENSION TESTS OF ANCHOR COMPLETE WITH THREADS.

DIAMETER OF 1.1 INCHES, AND A MINIMUM NET AREA OF 1.56 SQUARE INCHES

ANCHOR BOLT PLAN LOCATION - PLUS OR MINUS 1/16 INCH.

ANCHOR BOLT PLUMBNESS - LESS THAN 1/4 DEGREE.

EMBEDMENT RING LEVEL - PLUS OR MINUS 1/4 INCH.

EMBEDMENT RING ELEVATION - PLUS OR MINUS 1/2 INCH

REGULAR BASIS TO ENSURE REQUIRED TENSIONS ARE ACHIEVED.

RING IS SET IN ACCORDANCE WITH THE SPECIFIED CONSTRUCTION TOLERANCES.

ANCHOR BOLT SLEEVES: TO ANCHOR BOLT MANUFACTURER'S REQUIREMENTS

EMBEDMENT RING: TO ASTM A36, PLAIN FINISH, NEW MATERIAL (NO REUSED TEMPLATES)

A153 ABOVE TOWER FLANGE. NUTS SHALL BE CAPABLE OF DEVELOPING THE MINIMUM TENSILE

ANCHOR BOLT CAP: WILLIAMS-R79T BOLT CAP, OR APPROVED EQUAL, UTILIZING RIGID PLASTIC

TEMPLATE AND EMBEDMENT RING PLAN DIMENSION - PLUS OR MINUS 1/16 INCH.

THE FOLLOWING DIMENSIONAL TOLERANCES SHALL BE ADHERED TO FOR PLACEMENT OF ANCHOR

THE BOTTOM OF THE ANCHOR BOLT SHALL EXTEND BEYOND THE BOTTOM NUT BY A MINIMUM OF 1/2

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

USE A TEMPLATE RING TO SET ANCHOR BOLT PLUMBNESS AND POSITION. ENSURE THE TEMPLATE

PLACE AND LEVEL THE EMBEDMENT RING IN ACCORDANCE WITH THE SPECIFIED TOLERANCES

AFTER PLACEMENT OF CONCRETE PEDESTAL, PREVENT WATER FROM ENTERING THE SLEEVE

GROUT HAS ACHIEVED THE REQUIRED STRENGTH GIVEN IN SECTION 7.0, USE AN APPROVED

TENSIONING PROCEDURE TO APPLY A LOCK-OFF FORCE TO EACH ANCHOR BOLT WHICH IS NO

ANNULUS FROM THE TOP SURFACE PRIOR TO SETTING OF TOWER AND GROUTING OF BASEPLATE

AFTER SETTING AND GROUTING OF THE LOWER TOWER SECTION(S) AND AFTER THE CONCRETE AND

GREATER THAN 10 KIPS MORE THAN THE SPECIFIED TENSION FORCE. 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

SUBMIT 3 LABORATORY TENSION TESTS FOR ANCHOR BOLTS FOR EACH HEAT NUMBER FURNISHED

SUBMIT EMBEDMENT RING AND TEMPLATE RING SHOP DRAWINGS

14. MONITOR MASS CONCRETE TEMPERATURES IN ACCORDANCE WITH THE MASS CONCRETE

IN THE FOOTING OR PEDESTAL SHALL BE REMOVED TO A DEPTH OF ONE INCH FROM THE SURFACE OF

REMOVE DEBRIS AND OTHER LOOSE MATERIAL FROM TOP OF FOOTING.

TROWEL AND BROOM FINISH TOP OF PEDESTAL

THE CONCRETE AND FILLED WITH GROUT.

ENGINEER APPROVED PRODUCT

TEMPERATURE CONTROL PLAN.

STRENGTH AT OTHER TIMES.

A. GENERA

TEMPERATURE PER ASTM C1064.

BOLTS AND EMBEDMENT PLATES.

MINIMUM STRENGTH REQUIREMENTS

TENSION VALUE.

TOWER FLANGE

BOLTS:

INCH

MOVEMENT

OWNER SPECIFIED REQUIREMENTS:

STRENGTH OF THE ANCHOR

F) OR WATER SPRAY TO ASTM D4049 (<10%)

CONSTRUCTION WITH AN 0-RING SEAL.

C. PRODUCTS

SUBMIT A TENSIONING PROCEDURE FOR REVIEW SUBMIT A TENSION TESTING PROCEDURE FOR REVIEW.

4.0 ANCHOR BOLTS AND EMBEDMENT RING

12. ALL HOOKS SHOWN ON REBAR SHALL BE STANDARD HOOKS (UNO).

REQUIRED TO DETERMINE CONCRETE STRENGTH AT OTHER TIMES.

- GROUT WORK FOR CEMENTITIOUS GROUTS SHALL BE IN COMPLIANCE WITH ACI 351.4.
- COORDINATE GROUTING PROCEDURES WITH THE REQUIREMENTS OF THE TOWER MANUFACTURER. 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.

. PRODUCTS

- EPOXY NON-SHRINK GROUT: PREPACKAGED EPOXY GROUT WITH A MINIMUM COMPRESSIVE STRENGT AS SHOWN ON SHEETS AFTER 28 DAYS AND A MAXIMUM COEFFICIENT OF THERMAL EXPANSION OF 30 X 10-6 IN/IN/°E IN ACCORDANCE WITH ASTM C531
- CEMENTITIOUS NON-SHRINK GROUT: PREPACKAGED GROUT CONFORMING TO ASTM C1107, WITH A MINIMUM COMPRESSIVE STRENGTH OF S-01 & S-02 AFTER 28 DAYS.

D. EXECUTION

- MIX, PLACE, AND CURE GROUT IN ACCORDANCE WITH APPROVED MANUFACTURER'S INSTRUCTIONS FOR CEMENT GROUTS, 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. IF GROUT IS PLACED UP THE SIDE OF THE TOWER FLANGE, PROVIDE A 1/4 INCH EXPANSION JOINT BETWEEN THE TOWER FLANGE AND THE GROUT, AND SEAL EXPANSION JOINT WITH AN APPROVED SEALANT.
- ONCE GROUT CUBES ARE MOLDED IN THE FIELD THEY SHALL REMAIN UNDISTURBED AND PROTECTED FROM EXTREMES IN TEMPERATURE AND VIBRATION AT THE PROJECT SITE FOR AT LEAST 18 HOURS.

E. TESTING CAST A MINIMUM OF 9 GROUT CUBES FOR EACH FOUNDATION IN ACCORDANCE WITH ASTM C1107 FOR CEMENTITIOUS GROUTS AND ASTM C579 METHOD B OR C FOR EPOXY GROUTS

PERFORM TWO LABORATORY "GROUT STRENGTH TESTS" AT 28 DAYS PER ASTM C109 FOR CEMENTITIOUS GROUTS AND ASTM C579 FOR EPOXY GROUTS. A "GROUT STRENGTH TEST" = AVERAGE OF THREE CUBE BREAKS. IF NECESSARY, PERFORM ONE TEST AT A LATER DATE. CAST ADDITIONAL GROUT CUBES AS REQUIRED FOR STRENGTH TESTS AT OTHER TIMES.

6.0 MISCELLANEOUS CONCRETE EMBEDMENTS

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

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

7.0 TOWER ERECTION AND ANCHOR TENSIONING REQUIREMENTS

A. GENERAL 1. TOWER SECTIONS MAY BE ERECTED, LEVELED AND GROUTED IN ACCORDANCE WITH SUBMITTAL 5.B.3

- AROVE. ANCHORS MAY BE TENSIONED WHEN
- THE CONCRETE STRENGTH OF THE FOOTING AND PEDESTAL HAS REACHED 5,000 PSI. THE GROUT STRENGTH HAS REACHED 5,000 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 4.E.2 VERIFYING THAT THE REQUIRED TENSION VALUE HAS BEEN ACHIEVED.

MATTHEW B. JOHNSON E-74181

ISSUED FOR CONSTRUCTION JUNE 11, 2019 CONFIDENTIAL

THIS DRAWING IS THE PROPERTY OF BARR ENGINEERING COMPANY (BARR). NO OTHER USE IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF BARR. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.

HARDIN WIND PROJECT HARDIN COUNTY, OHIO

35331001.01 IENT PROJECT No.

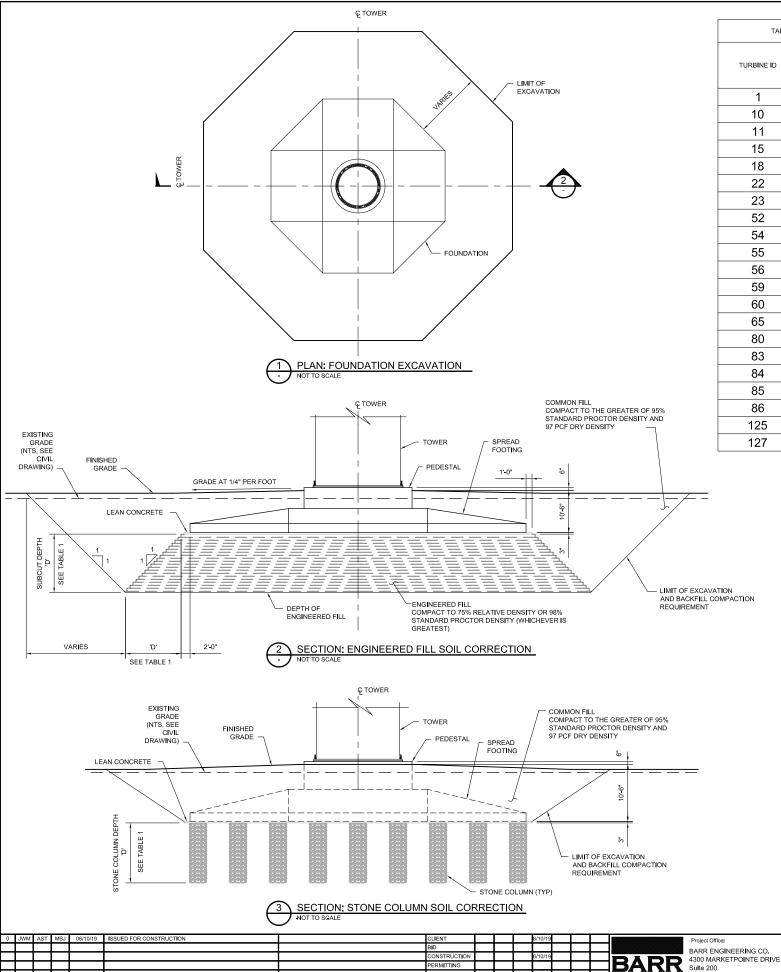
EMBEDMENT RING.

A B C 0 1 2 3 RELEASED REVISION DESCRIPTION

BARR

AS SHOW

SPREAD FOOTING FOUNDATION TECHNICAL SPECIFICATIONS AND SUBMITTALS



RELEASED

REVISION DESCRIPTION

TABLE 1: ANTICIPATED SOIL CORRECTION DEPTH 'D' BELOW BOTTOM OF FOUNDATION CORRECTION DEPTH ANTICIPATED SOIL TURBINE ID CORRECTION DEPTH BELOW BELOW ORIGINAL FOUNDATION 'D' (FT) GROUND SURFACE (FT 15 4.25 stone column 10 22 11.25 stone column 12.5 1.75 11 0verexcavation 15 16.5 5.75 stone column 18 12 1.25 0verexcavation 22 16 5.25 stone column 23 25 14.25 stone column 52 28.5 17.75 stone column 54 23.5 12.75 stone column 55 22.5 11.75 stone column 56 14.5 3.75 **Overexcavation** 59 15 4.25 stone column 60 16 5.25 stone column 65 20 9.25 stone column 80 15 4.25 stone column 83 12.5 1.75 0verexcavation 84 19.5 8.75 stone column 85 11.5 0.75 0verexcavation 86 9.5 0 none 125 27.5 16.75 stone column 127 11.5 0.75 0verexcavation

TABLE 1 NOTES

MINNEAPOLIS, MN 55435

- PROJECT CONTRACTOR/SPECIALTY DESIGN-BUILD CONTRACTOR TO DETERMINE FINAL SOIL CORRECTION METHOD(S). SUGGESTED GROUND REMEDIATION OPTIONS INCLUDE: <4 FT - ENGINEERED FILL
- 2. APPROXIMATE SOIL CORRECTION DEPTHS PER GEOTECHNICAL ENGINEERING REPORT.
- SEE REFERENCE ON DRAWING S-01 AND S-02.

 'D' VALUE ASSUMES A DISTANCE BELOW EXISTING GRADE TO BOTTOM OF MUDMAT AS SHOWN IN TABLE 1. ACTUAL DISTANCE BELOW EXISTING GRADE TO BOTTOM OF MUDMAT MAY VARY TO ACCOUNT FOR SITE SPECIFIC CONDITIONS. TO ALLOW FOR PROPER GRADING AWAY FROM THE FOUNDATION PEDESTAL, OR FOR CONFORMANCE TO THE CIVIL DRAWINGS. ADJUST 'D' VALUES ACCORDINGLY IF DISTANCE BELOW EXISTING GRADE TO BOTTOM OF MUDMAT VARIES FROM WHAT IS SHOWN IN TABLE 1.
- TURBINE ID'S COORDINATES AND FINISHED GRADE ELEVATIONS ARE TO BE VERIFIED BY CONTRACTOR WITH THE CIVIL DRAWINGS PRIOR TO CONSTRUCTION

1.0 SOIL CORRECTION

- A. <u>GENERAL</u>

 1. ENSURE FOUNDATION SITE IS EXCAVATED, BACKFILLED AND GRADED IN ACCORDANCE WITH THIS DRAWING AND DRAWINGS S-01 AND S-02
- PROJECT CONTRACTOR/SPECIALTY DESIGN-BUILD CONTRACTOR TO DETERMINE FINAL SOIL CORRECTION METHOD(S). SUGGESTED GROUND REMEDIATION OPTIONS INCLUDE ENGINEERED FILL, SURFACE COMPACTION, AND STONE COLUMNS.
- THE MAXIMUM AND MINIMUM INDEX DENSITIES OF SOILS TO BE USED AS ENGINEERED FILL SHALL BE MEASURED ACCORDING TO ASTM D4253 AND D4254 OR A STANDARD PROCTOR DENSITY TO ASTM D698 PRIOR TO THE MATERIALS BEING PLACED.
 ANTICIPATED CORRECTION DEPTHS AND SITE COORDINATES ARE REPRODUCED FROM THE PROJECT
- GEOTECHNICAL REPORT REFERENCED ON DRAWING S-01 AND S-02, BARR TAKES NO RESPONSIBILITY FOR THE SITE COORDINATES, DETERMINATION THAT SOIL CORRECTION IS REQUIRED, OR FOR THE METHOD OR DEPTH OF SOIL CORRECTION.

- PRIOR TO THE MATERIALS BEING PLACED SUBMIT GRAIN SIZE ANALYSIS (ASTM D422), NATURAL MOISTURE CONTENT (ASTM D2216), AND EITHER STANDARD PROCTOR (ASTM D698) OR MAXIMUM (ASTM D4253) AND MINIMUM (ASTM D4254) INDEX DENSITY TEST RESULTS FOR SOILS TO BE USED AS ENGINEERED FILL.
- SUBMIT COMPACTION TEST RESULTS FOR ENGINEERED FILL PLACED BENEATH THE FOUNDATION INDICATING LOCATION OF TEST, DRY DENSITY, AND MOISTURE CONTENT OF PLACED ENGINEERED
- 3. SUBMIT A STONE COLUMN DESIGN REPORT, DRAWINGS, AND SPECIFICATIONS STAMPED BY AN OHIO PROFESSIONAL ENGINEER.
- SUBMIT STONE COLUMN TESTING AND INSPECTION REPORTS
- THE SUBGRADE FOR EACH FOUNDATION SHALL BE INSPECTED BY A GEOTECHNICAL ENGINEER WITHIN 24 HOURS PRIOR TO PLACEMENT OF ENGINEERED FILL OR LEAN CONCRETE, AND WITHIN 24 HOURS AFTER SURFACE COMPACTION. SUBMIT SUBGRADE INSPECTION REPORT IN ACCORDANCE WITH DRAWING S-03 FOR EACH FOUNDATION COMPLETED BY A GEOTECHNICAL ENGINEER.

C. PRODUCTS

- ENGINEERED FILL: PER OHIO DOT (ODOT) 703.17. A WELL GRADED GRANULAR SOIL CONSISTING OF GRAVEL, SAND OR CRUSHED STONE WITH A MAXIMUM SIZE OF 1 1/2", A MINIMUM OF 70% PASSING THE 3/4" SIEVE AND A MAXIMUM OF 10% PASSING THE NO. 200 SIEVE. STONE COLUMNS: TO STONE COLUMN CONTRACTOR REQUIREMENTS.
- LEAN CONCRETE AND COMMON FILL: SEE DRAWING S-03.

- WHERE NOTED IN TABLE 1, PERFORM SUBGRADE SOIL CORRECTION EITHER BY SURFACE COMPACTION, SUBCUTTING DEFICIENT SOILS AND REPLACING WITH COMPACTED ENGINEERED FILL OR LEAN CONCRETE, OR INSTALLING STONE COLUMNS TO THE DEPTHS INDICATED IN ACCORDANCE WITH THE APPLICABLE SOIL CORRECTION METHOD REQUIREMENTS.
- HAVE THE PROJECT GEOTECHNICAL ENGINEER VERIFY THE SURFACE COMPACTION, DEPTH OF SUITABLE BEARING CONDITIONS AND REQUIRED SUBCUT AT THE TIME OF EXCAVATION, OR THE STONE COLUMN DEPTH AT THE TIME OF INSTALLATION AND INCLUDE THAT INFORMATION WITH THE SUBGRADE INSPECTION REPORT.
- CONTROL SURFACE WATER OR GROUNDWATER FLOWS INTO THE EXCAVATION USING MEANS DETERMINED BY THE CONTRACTOR, 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 FOUNDATION ENGINEER.
- SURFACE COMPACTION: SURFACE COMPACT BY USING A SMOOTH DRUM VIBRATORY COMPACTOR OR OTHER EQUIPMENT TO A MINIMUM OF 98% OF STANDARD PROCTOR MAXIMUM DRY DENSITY. ENGINEERED FILL PLACEMENT AND COMPACTION: PLACE AND COMPACT ENGINEERED FILL TO THE
- LIMITS, DEPTH AND RELATIVE DENSITY OR STANDARD PROCTOR DENSITY INDICATED IN SECTION 1. PLACE AN INITIAL LIFT OF ENGINEERED FILL IMMEDIATELY AFTER COMPLETION OF THE EXCAVATION AND APPROVAL BY THE GEOTECHNICAL ENGINEER, MOISTURE CONDITION THE MATERIAL TO WITHIN 3% OF OPTIMUM (PER ASTM D698), PLACE ENGINEERED FILL IN LOOSE LIFTS OF 9 INCHES OR LESS TO ACHIEVE THE SPECIFIED DENSITY.
- PLACE LEAN CONCRETE IN ACCORDANCE WITH DRAWING S-03.
- PLACE COMMON FILL AND GRADE THE SITE IN ACCORDANCE WITH DRAWING S-03.

E. TESTING AND INSPECTION

- FOR EVERY 1000 CUBIC YARDS OF PLACED ENGINEERED FILL: OBTAIN SAMPLES OF ENGINEERED FILL MATERIALS AND PERFORM GRAIN SIZE ANALYSIS, MOISTURE CONTENT, AND RELATIVE DENSITY OR
- FOR PLACED AND COMPACTED ENGINEERED FILL PROVIDE TWO DENSITY TESTS PER LIFT INDICATING TEST LOCATION, DRY DENSITY, MOISTURE CONTENT AND RELATIVE COMPACTION. IN THE EVENT THAT THE SPECIFIED COMPACTION REQUIREMENT IS NOT ACHIEVED, RECOMPACT AND RETEST THE
- FOR SURFACE COMPACTION PROVIDE FIVE DENSITY TESTS INDICATING TEST LOCATION (CENTER AND FOUR QUADRANTS), DRY DENSITY, MOISTURE CONTENT, AND RELATIVE COMPACTION. IN THE EVENT THAT THE SPECIFIED COMPACTION REQUIREMENT IS NOT ACHIEVED, RECOMPACT AND RETEST.
- PERFORM STONE COLUMN TESTING AND INSPECTION IN ACCORDANCE WITH STONE COLUMN
- REQUIREMENTS. MINIMUM ONE TEST PER SOIL TYPE ENCOUNTERED.
 PROVIDE A SUBGRADE INSPECTION REPORT TO BE COMPLETED BY A GEOTECHNICAL ENGINEER.



ISSUED FOR CONSTRUCTION JUNE 11, 2019 CONFIDENTIAL

THIS DRAWING IS THE PROPERTY OF BARR ENGINEERING COMPANY (BARR). NO OTHER USE IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF BARR. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.

SWO	INVENERGY, LLC	HARDIN COUN
AST	CHICAGO. ILLINOIS	SPREAD FOOTING
JMW	,	SOIL CORRECTION SECTION
		LOOH CORRECTION SECTION

HARDIN WIND PROJECT 35331001.01 NTY, OHIO

G FOUNDATION SOIL CORRECTION SECTIONS AND SPECIFICATIONS This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

6/17/2019 4:25:38 PM

in

Case No(s). 09-0479-EL-BGN, 11-3446-EL-BGA, 16-0469-EL-BGA, 16-2404-EL-BGA

Summary: Notification of Phase 3 – Compliance with Condition 23, Turbine Foundation Design electronically filed by Christine M.T. Pirik on behalf of Hardin Wind Energy LLC