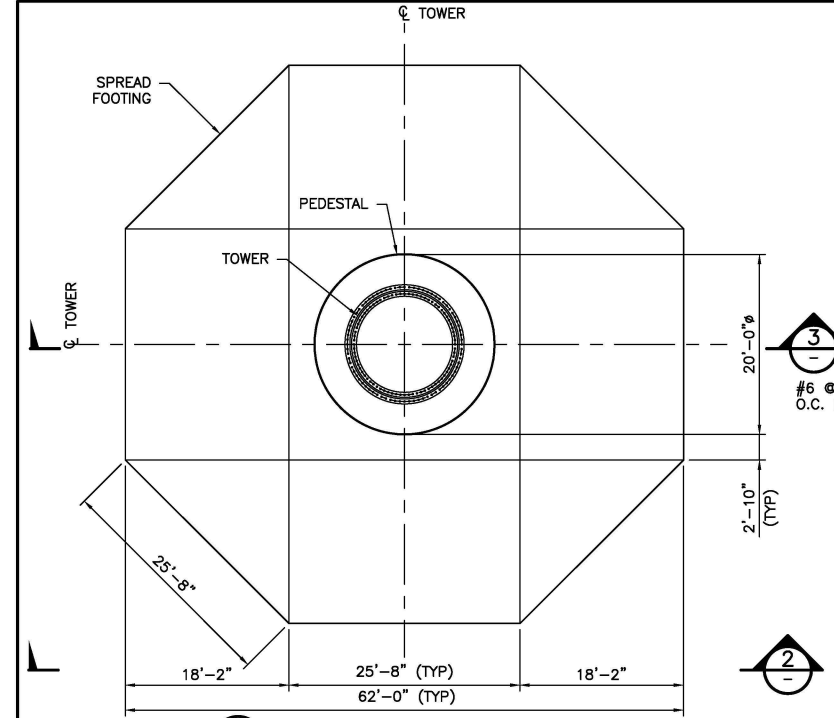


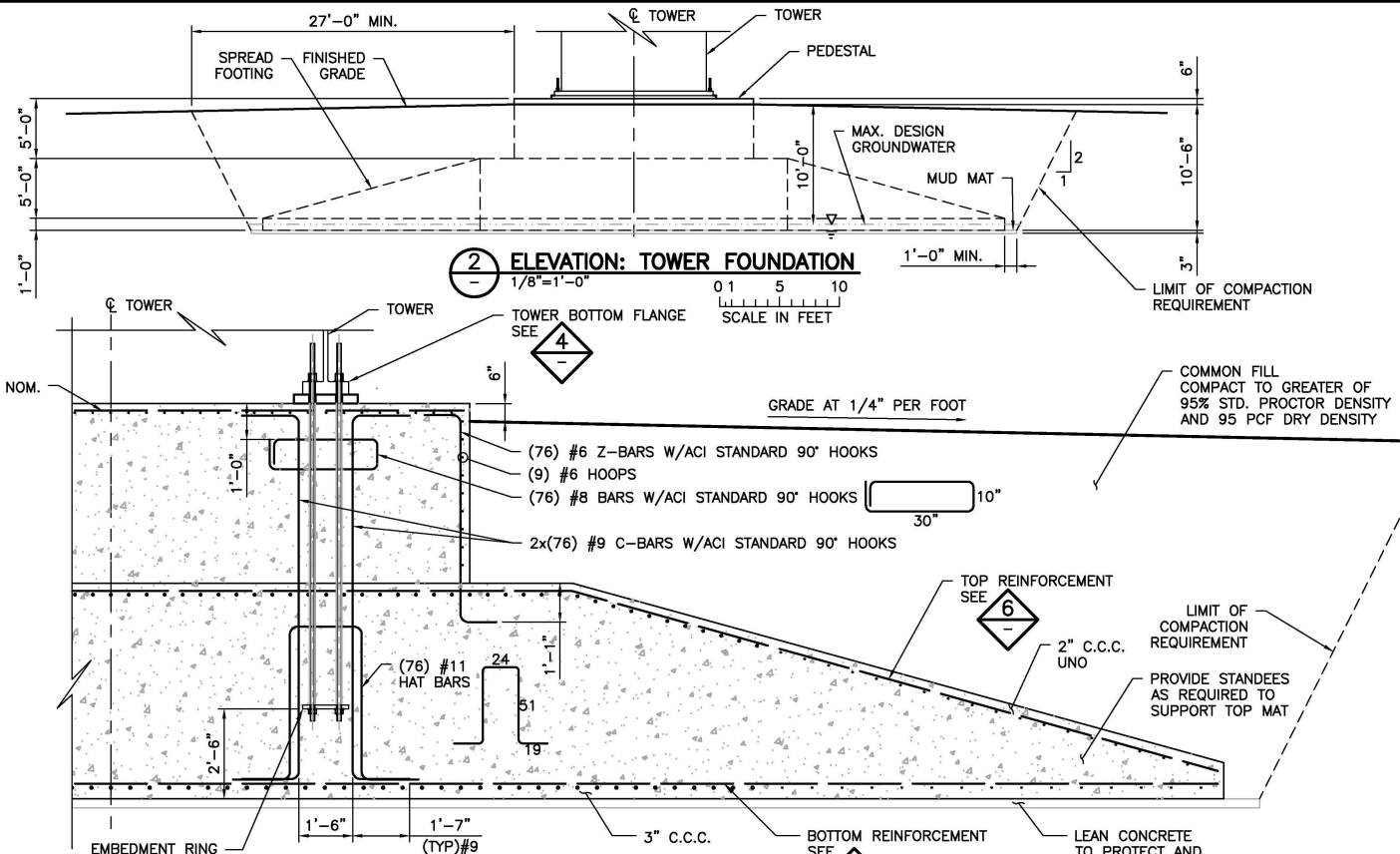
Appendix A – Typical Turbine Foundation

CADD USER: Matt B. Johnson FILE: M:\ADPTWORK\WATT_JOHNSON\1121001_CROCKER_S-01_REV A.DWG PLOT SCALE: 1:2 PLOT DATE: 10/16/2017 9:50 AM



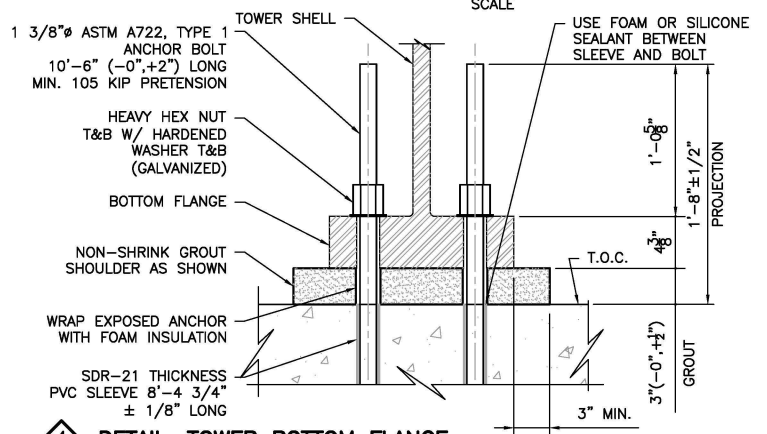
1 PLAN: TOWER FOUNDATION

3/32"=1'-0" SCALE



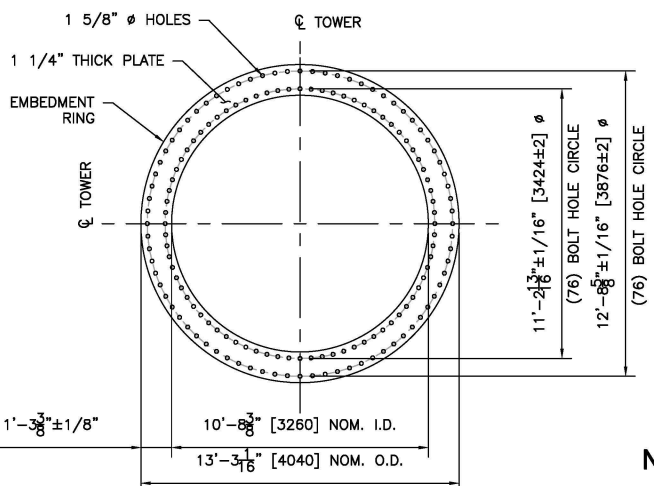
2 ELEVATION: TOWER FOUNDATION

1/8"=1'-0" SCALE IN FEET



4 DETAIL: TOWER BOTTOM FLANGE

1 1/2"=1'-0" SCALE



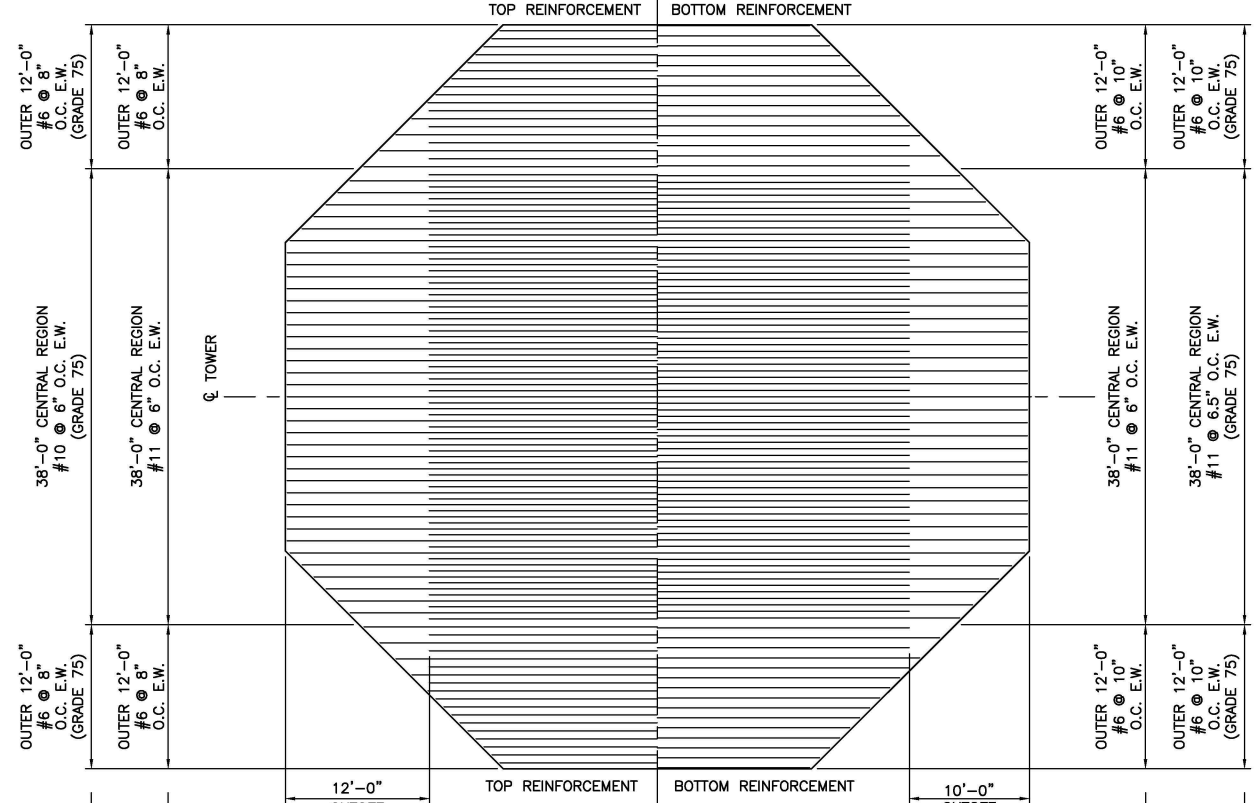
5 DETAIL: EMBEDMENT RING

1/4"=1'-0" SCALE IN FEET

**FOR PERMITTING ONLY
NOT FOR CONSTRUCTION**

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6 DETAIL: TOP & BOTTOM REINFORCEMENT

1/8"=1'-0" SCALE IN FEET

BUILDING AND DESIGN CODES:
INTERNATIONAL BUILDING CODE 2012, INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS.
BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318, 2011, AMERICAN CONCRETE INSTITUTE.

WIND TURBINE AND TOWER:
MANUFACTURER: VESTAS
MODEL: V136-3.45
POWER OUTPUT: 3.45 MW
TURBINE HUB HEIGHT: 82m
ROTOR DIAMETER: 136m

DESIGN SERVICE LOADS:
UNFACTORED SERVICE LOADS DUE TO NORMAL EXTREME WIND CONDITION IEC CLASS IIIB/S (APPLY 1.35 LOAD FACTOR TO LOADS SHOWN BELOW TO OBTAIN FACTORED LOADS)
OVERTURNING MOMENT, MSY = 76,590 KN-M
HORIZONTAL BASE SHEAR, HXY = 916.0 KN
VERTICAL TOWER LOAD, WZ = 4,221 KN

UNFACTORED SERVICE LOADS DUE TO ABNORMAL EXTREME WIND CONDITION IEC CLASS IIIB/S (APPLY 1.10 LOAD FACTOR TO LOADS SHOWN BELOW TO OBTAIN FACTORED LOADS)
OVERTURNING MOMENT, MXY = 92,220 KN-M
HORIZONTAL BASE SHEAR, HXY = 1,111 KN
VERTICAL TOWER LOAD, WZ = 4,301 KN

FOUNDATION DESIGN DATA:
MIN. FACTOR OF SAFETY AGAINST OVERTURNING: >1.5
MIN. FACTOR OF SAFETY AGAINST SLIDING: >1.5
MIN. FACTOR OF SAFETY AGAINST BEARING CAPACITY FAILURE: >2.26 ON EXTREME

FATIGUE LIFE: 30 YEARS BASED ON FATIGUE LOADING PROVIDED IN REFERENCE 1

REFERENCE DOCUMENTS:
1. VESTAS, "FOUNDATION LOADS, V136-3.45 MW, MK3, IEC3A, 82 M (TOWER T3II520)," DOCUMENT NO. 0068-6938 VER 00, ISSUED NOT FOR CONSTRUCTION, DATED AUGUST 14, 2017, PRELIMINARY LOADING.
2. BARR ENGINEERING CO., "PRELIMINARY GEOTECHNICAL ENGINEERING REPORT, CROCKER WIND PROJECT, CLARK COUNTY, SOUTH DAKOTA," DATED TBD.

MIN. 28-DAY COMPRESSIVE STRENGTH CONCRETE:
5,000 PSI (FOOTING)
5,500 PSI (PEDESTAL)

MIN. YIELD POINT STRENGTH OF REINFORCING BAR:
60 KSI UNO

MIN. STRENGTH OF ANCHOR BOLTS:
TENSILE STRENGTH 150 KSI YIELD STRENGTH 120 KSI

MIN. 28-DAY COMPRESSIVE STRENGTH OF NON-SHRINK GROUT:
13,000 PSI

MIN. YIELD POINT STRENGTH OF EMBEDMENT PLATE:
36 KSI

VOLUME OF CONCRETE IN FOUNDATION:
505 CUBIC YARDS

ESTIMATED WEIGHT OF STEEL REINFORCING:
GRADE 60 OPTION: 54 TONS
GRADE 75 OPTION: 39.0 TONS GRADE 75
9.0 TONS GRADE 60

COARSE AGGREGATE GRADATION:
ASTM C33 (SIZE NUMBER 5, 56, OR 57) WITH A MINIMUM OF 2% RETAINED ON THE 1-INCH SIEVE.

MIN. REQUIRED ALLOWABLE NET BEARING CAPACITY:
2000 PSF

ABBREVIATIONS:
B.O. BOTTOM OF
C.C.C. CLEAR CONCRETE COVER
C.L. CENTER LINE
E.L. ELEVATION
E.W. EACH WAY
EX. EXISTING
I.D. INSIDE DIAMETER
MIN. MINIMUM
NOM. NOMINAL
Ø DIAMETER
O.C. ON CENTER
O.D. OUTSIDE DIAMETER
R RADIUS
T&B TOP AND BOTTOM
T.O.C. TOP OF CONCRETE
TYP TYPICAL
U.N.O. UNLESS NOTED OTHERWISE
MAX. MAXIMUM
W/ WITH

A	JMW	ARC2	MBJ	10/6/2017	PRELIMINARY												
<table border="1"> <tr> <td>CLIENT</td> <td>10/06</td> </tr> <tr> <td>BID</td> <td></td> </tr> <tr> <td>CONSTRUCTION</td> <td></td> </tr> <tr> <td>RELEASED TO/FOR</td> <td>A B C 0 1 2 3</td> </tr> <tr> <td>DATE RELEASED</td> <td></td> </tr> </table>						CLIENT	10/06	BID		CONSTRUCTION		RELEASED TO/FOR	A B C 0 1 2 3	DATE RELEASED			
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Project Office:
BARR ENGINEERING CO.
3005 BOARDWALK STREET
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ANN ARBOR, MI 48108
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-270-5017
Fax: (732) 922-4401
www.barr.com

Scale	AS SHOWN
Date	9/14/2017
Drawn	JMW
Checked	CMM3
Designed	ARC2
Approved	MBJ

GERONIMO ENERGY
MINNEAPOLIS, MINNESOTA

CROCKER WIND PROJECT		BARR PROJECT No.
CLARK COUNTY, SOUTH DAKOTA		41/12-1001.01
CLIENT PROJECT No.		
SPREAD FOOTING FOUNDATION		
PLAN, ELEVATION, SECTION & DETAILS		
DWG. No.	REV. No.	
S-01	A	