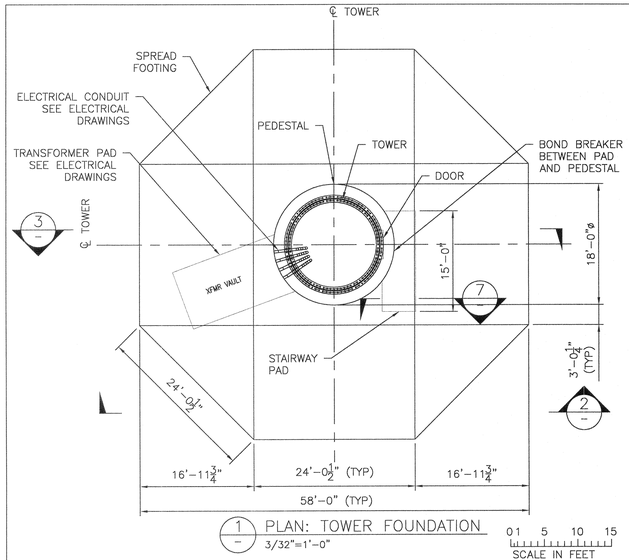
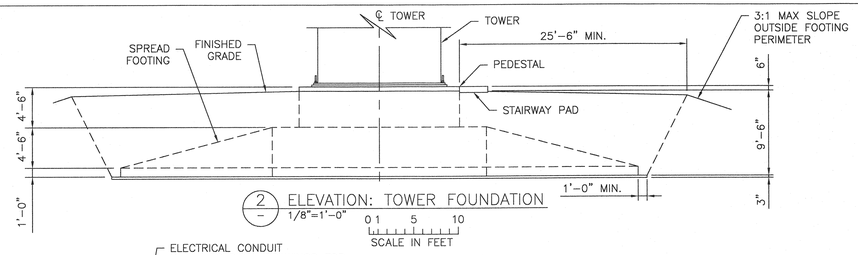
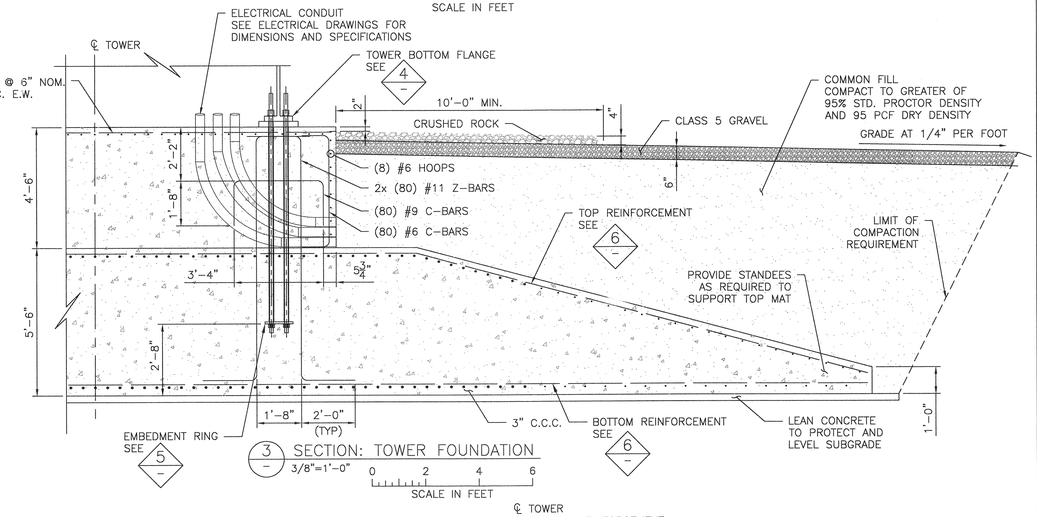


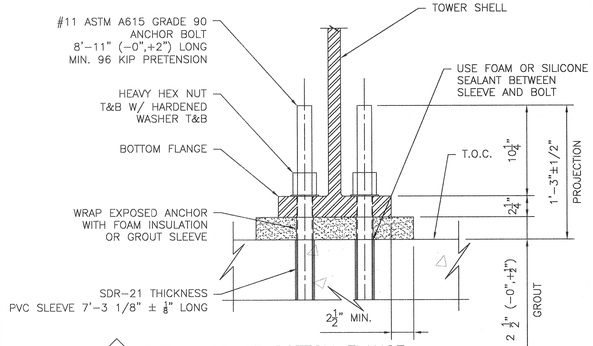
1 PLAN: TOWER FOUNDATION
3/32"=1'-0"



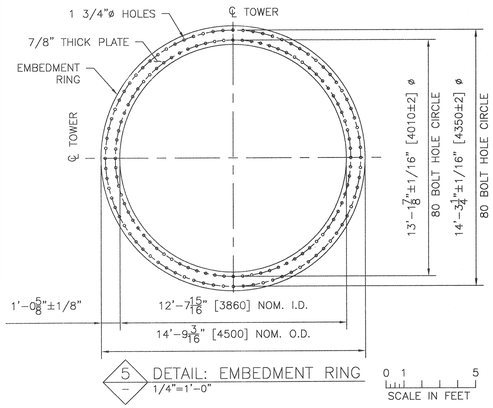
2 ELEVATION: TOWER FOUNDATION
1/8"=1'-0"



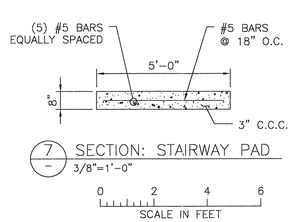
3 SECTION: TOWER FOUNDATION
3/8"=1'-0"



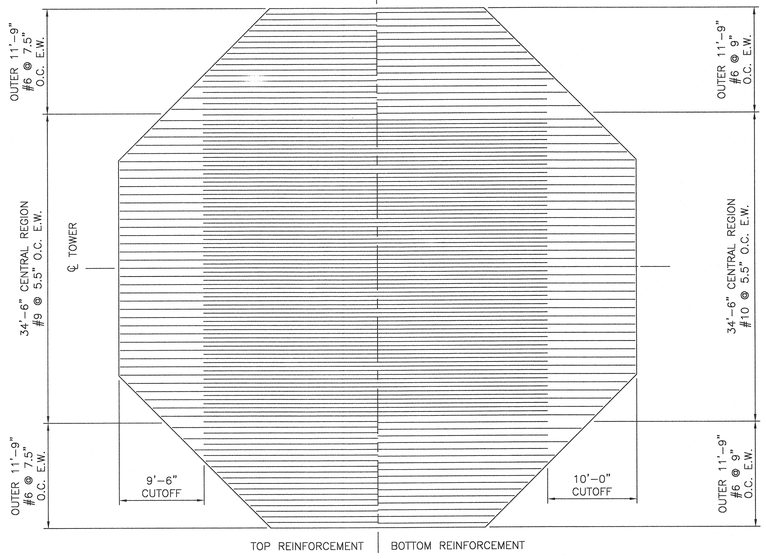
4 DETAIL: TOWER BOTTOM FLANGE
1 1/2"=1'-0"
0 3" 6" 9" 1' 2'
SCALE



5 DETAIL: EMBEDMENT RING
1/4"=1'-0"
0 1 5
SCALE IN FEET



7 SECTION: STAIRWAY PAD
3/8"=1'-0"
0 2 4 6
SCALE IN FEET



6 DETAIL: TOP & BOTTOM REINFORCEMENT
1/8"=1'-0"
0 1 5 10
SCALE IN FEET

BUILDING AND DESIGN CODES:

INTERNATIONAL BUILDING CODE 2009, INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS.

BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318, 2008, AMERICAN CONCRETE INSTITUTE.

WIND TURBINE AND TOWER:

MANUFACTURER: SIEMENS
MODEL: SWT-3.0-101-DD
POWER OUTPUT: 3.0 MW
TURBINE HUB HEIGHT: 79.5m

DESIGN SERVICE LOADS:

UNFACTORED SERVICE LOADS DUE TO ABNORMAL EXTREME LOAD:
DLC 6.2 LOAD FACTOR = 1.1

OVERTURNING MOMENT, Mxy = 62,500 kN-m = 46,098 ft-kips
HORIZONTAL BASE SHEAR, Hxy = 860 kN = 193 kips
VERTICAL TOWER LOAD, Wz = 2,900 kN = 652 kips

UNFACTORED SURVICE LOADS DUE TO EXTREME WIND LOADS:
DLC 6.1 LOAD FACTOR = 1.35

OVERTURNING MOMENT, Mxy = 49,800 kN-m = 36,731 ft-kips
HORIZONTAL BASE SHEAR, Hxy = 720 kN = 162 kips
VERTICAL TOWER LOAD, Wz = 2,900 kN = 652 kips

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

REFERENCE DOCUMENTS:

1. SIEMENS WIND POWER A/S, "SWT-30-101, 79.5M FOUNDATION LOADS FOR BISON WIND II, USA", REV: 00, DATED 20110224, DOCUMENT ID: PG-R3-40-EUS00255-4386-00.

2. BARR ENGINEERING COMPANY, "GEOTECHNICAL ENGINEERING REPORT, BISON II WIND PROJECT, MINNESOTA POWER", DATED JULY 2011.

MIN. 28-DAY COMPRESSIVE STRENGTH OF CONCRETE:
5000 PSI

MIN. YIELD POINT STRENGTH OF REINFORCING BAR:
60 KSI

MIN. STRENGTH OF ANCHOR BOLTS:
TENSILE STRENGTH 120 KSI YIELD STRENGTH 90 KSI

MIN. GROUT 28-DAY COMPRESSIVE STRENGTH:
10,000 PSI

MIN. YIELD POINT STRENGTH OF EMBEDMENT PLATE:
36 KSI

VOLUME OF FOUNDATION AS DIMENSIONED:
410 CUBIC YARDS

ESTIMATED WEIGHT OF STEEL REINFORCING:
39.0 TONS

ABBREVIATIONS:

B.O.	BOTTOM OF	O.C.	ON CENTER
C.C.C.	CLEAR CONCRETE COVER	O.D.	OUTSIDE DIAMETER
℄	CENTER LINE	R	RADIUS
EL.	ELEVATION	T&B	TOP AND BOTTOM
E.W.	EACH WAY	T.O.C.	TOP OF CONCRETE
EX.	EXISTING	TYP	TYPICAL
I.D.	INSIDE DIAMETER	UNO	UNLESS NOTED OTHERWISE
MIN.	MINIMUM	W/	WITH
NOM.	NOMINAL	ø	DIAMETER

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
A	DMH2	JXB	JXB	4/29/2011	30% SUBMITTAL DESIGN
B	JAD2	JXB	JXB	5/31/11	60% DESIGN SUBMITTAL
C	DMH2	JAD2	JXB	7/1/11	90% DESIGN SUBMITTAL
0	DMH2	JAD2	JXB	8/5/11	ISSUED FOR CONSTRUCTION
1	NJG	.	.	11/15/12	CONSTRUCTION REVISIONS

Images in Drawing

MATTHEW T. BRUGGEMAN — 6225 — REGISTERED PROFESSIONAL ENGINEER — NORTH DAKOTA — DATE REV.1 — 12/6/12

	A	B	C	0	1	2	3
CLIENT	4/29	5/31	7/1				
BID							
CONSTRUCTION				8/5			
RELEASED TO/FOR	DATE RELEASED						

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
55435-4803
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/29/11
Drawn	DMH2
Checked	JXB
Designed	DMH2
Approved	JXB

minnesota power — AN ALLETE COMPANY — Bison

A WIND ENERGY INITIATIVE OF MINNESOTA POWER IN NORTH DAKOTA

BISON 2 WIND PROJECT
MORTON & OLIVER COUNTIES, NORTH DAKOTA

SPREAD FOOTING FOUNDATION
PLAN, ELEVATION, SECTION & DETAILS

BARR PROJECT No. 34/33-1007
CLIENT PROJECT No. —
DWG. No. S-01
REV. No. 1