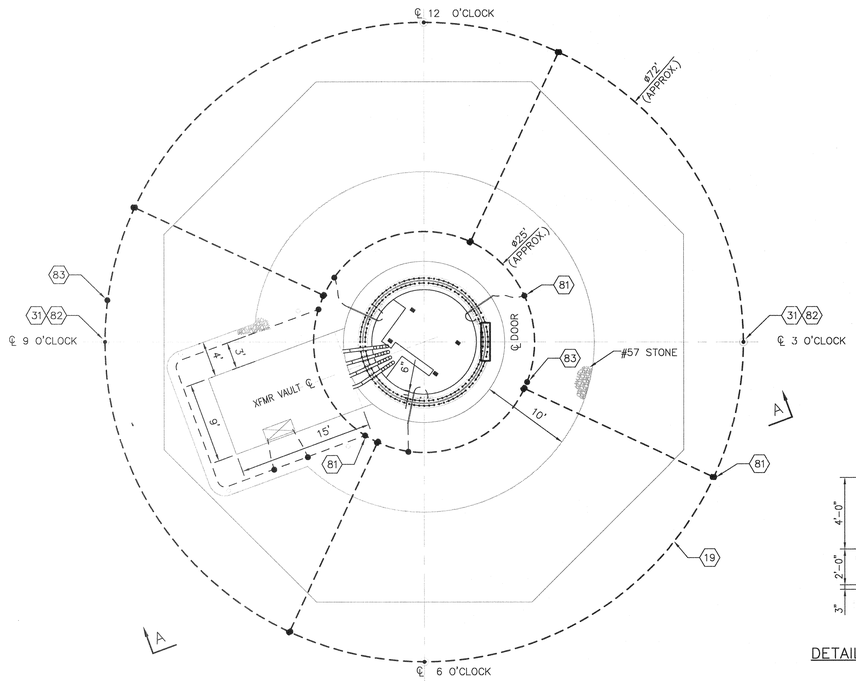
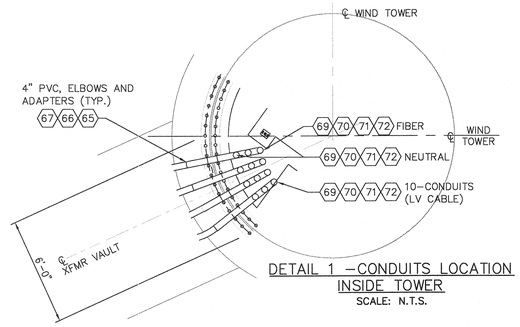
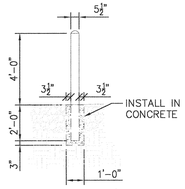



PLAN: TOWER FOUNDATION AND GROUNDING
SCALE: N.T.S.




DETAIL 1 – CONDUITS LOCATION INSIDE TOWER
SCALE: N.T.S.

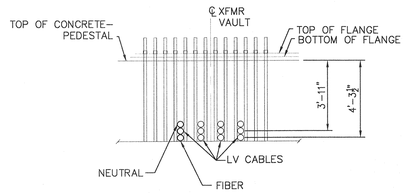



DETAIL 2 – BOLLARD
SCALE: N.T.S.

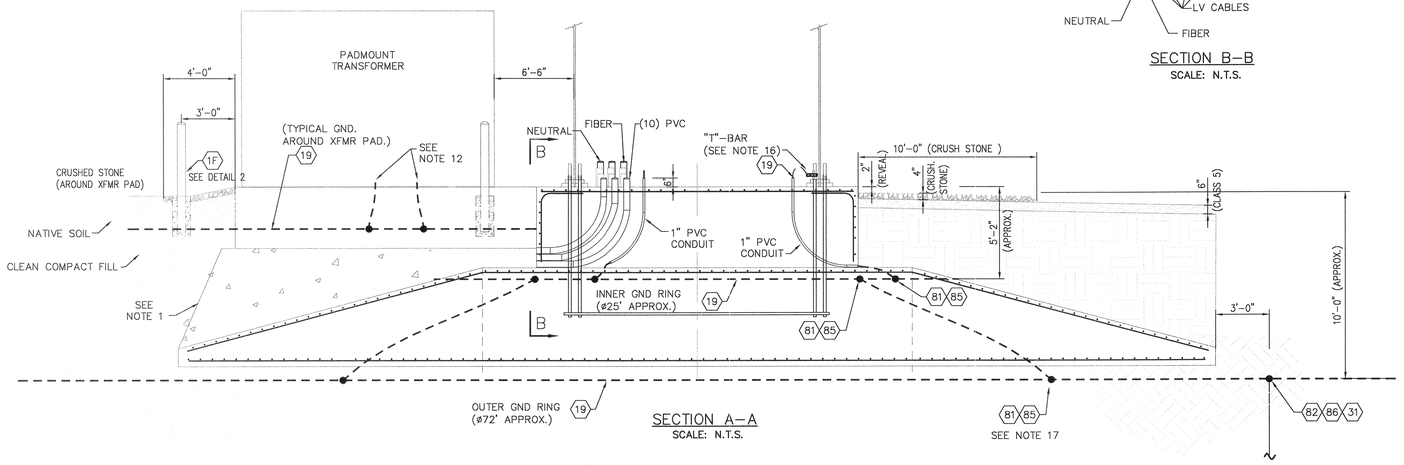
**LEGEND:**

- ● CADWELD
- ◉ GROUND ROD
- – – 2/0 COPPER GROUND WIRE
- ⦶ FUTURE CONNECTION
- ⬡ REFERS TO BILL OF MATERIALS THIS SHEET

DETAIL 3 – "T"–BAR
SCALE: N.T.S.




SECTION B–B
SCALE: N.T.S.




SECTION A–A
SCALE: N.T.S.

BILL OF MATERIALS – CONDUIT & GROUNDING

| ITEM | QUANTITY | UNIT | DESCRIPTION | MANUFACTURER | CATALOG |
|---|---|---|---|---|---|
| 1F | 4 | EA | BOLLARD 5 1/2" O.D. X 6'–0", CONCRETE FILLED, PAINTED YELLOW OR PROVIDE YELLOW COVERS | | |
| 19 | 545 | FT | WIRE, 2/0 COPPER BARE, STR | | |
| 31 | 4 | EA | GROUND ROD, 5/8" X 8' | BLACKBURN – OE | 6258 |
| 50 | 0 | EA | LUG, COMPRESSION, COPPER, 2 HOLE, 4/0 AWG | BURNDY | YGHA28–2N |
| 65 | 6 | EA | 4" PVC CONDUIT, 10' SCHEDULE 40 RIGID NONMETALLIC CONDUIT (RNC) | CARLON | 49015–010 |
| 66 | 12 | EA | 4" PVC END BELLS | CARLON | E997N |
| 67 | 6 | EA | 4" PVC CONDUIT, 45° ELBOW, 36" RADIUS | CARLON | UB9FN |
| 69 | 12 | EA | 4" PVC CONDUIT 90° ELBOW, 36" RADIUS, ID–TYPE | CARLON | |
| 70 | 40 | FT | 4" PVC CONDUIT, ID–TYPE | CARLON | |
| 71 | 12 | EA | 4" PVC END BELLS | CARLON | |
| 72 | 12 | EA | 4" PVC COUPLING | CARLON | |
| 74 | 2 | EA | 1" PVC CONDUIT, 10' SCHEDULE 40 RIGID NONMETALLIC CONDUIT (RNC) | CARLON | 49008–020 |
| 75 | 6 | EA | 1" PVC END BELLS | CARLON | E997F |
| 76 | 3 | EA | 1" PVC CONDUIT, 90° ELBOW, 36" RADIUS | CARLON | UB9FF |
| 77 | 6 | EA | 1" PVC COUPLING | CARLON | |
| 81 | 17 | EA | 2/0 COPPER RUN TO 2/0 COPPER TAP, TYPE TA CONNECTION, DARK BLUE CONTAINER | CADWELD | TA |
| 82 | 4 | EA | 2/0 COPPER RUN TO GROUND ROD, TYPE GY CONNECTION, GRAY CONTAINER | CADWELD | GY |
| 83 | 2 | EA | 2/0 COPPER TO 2/0 COPPER, TYPE SS CONNECTION, ORANGE CONTAINER | CADWELD | SS |
| 85 | ** | EA | MOLD WITH BAFFLE FOR 2/0 COPPER RUN TO 2/0 COPPER TAP, TYPE TA CONNECTION | CADWELD | TAC–2G2G |
| 86 | ** | EA | MOLD WITH BAFFLE FOR 2/0 COPPER TO GROUND ROD, TYPE GY | CADWELD | GYE–182G |
| 87 | ** | EA | MOLD WITH BAFFLE FOR 2/0 COPPER TO 2/0 COPPER, TYPE SS CONNECTION | CADWELD | SSC–2G |
| 94 | 8 | EA | POWER UNIT ANCHOR BOLT – SEE SIEMENS SPECIFICATION | | |
| 95 | ** | EA | HANDLE CLAMP (AS NEEDED) | CADWELD PLUS | L160 |
| 96 | 9 | CU | CRUSHED STONE #57 | | |

**GENERAL NOTES:**

1. LEAN CONCRETE SHALL BE INSTALLED UNDER VOLTAGE TRANSFORMER AND SURROUND THE LOW VOLTAGE CONDUITS EXITING THE TURBINE PEDESTAL AS SHOW IN SECTION A–A. LEAN CONCRETE MIX SHALL HAVE A MAXIMUM THERMAL RESISTIVITY OF 60 RHO.
2. FOR LOW VOLTAGE CABLES, INSTALL ONE A, B, AND C PHASE IN EACH CONDUIT TO ENSURE REQUIRED AMPACITY IS REACHED.
3. TRANSFORMER PAD SHOULD BE SUPPLIED BY CONTRACTOR AND INSTALLED PER MANUFACTURER SPECIFICATIONS.
4. SEE SIEMENS DOCUMENTATION FOR PROVIDED MATERIAL, FOUNDATION GROUNDING, EARTHING, CONDUIT PROCEDURES, AND LOCATIONS.
5. NOT USED
6. PADMOUNT TRANSFORMER SHOULD BE AWAY FROM THE DOOR AS SHOWN ON PLAN VIEW.
7. BOLLARDS SHALL BE LOCATED 3'–0" FROM THE CORNER OF THE TRANSFORMER.
8. ALIGN WIND TURBINE GENERATOR TOWER DOOR FACING THE CRANE PAD.
9. ANCHOR BOLT LOCATIONS HAVE A TOLERANCE OF +/– 3/16" – PLEASE REFER TO SIEMENS DRAWINGS 1006928 , 1006932 AND 1006931 FOR INSTALLATION AND MOUNTING DETAILS FOR POWER UNIT ANCHOR BOLTS.

**GROUNDING NOTES:**

10. AFTER INSTALLATION, CONTRACTOR SHALL TEST EACH WIND TURBINE GROUNDING SYSTEM USING THE FALL–OF–POTENTIAL METHOD BEFORE CONNECTING CABLE NEUTRALS AND EARTH INTERCONNECTION WIRES. RESISTANCE TO EARTH OF 10 OHMS OR LESS SHALL BE CONFIRMED AND RECORDED PER SIEMENS REQUIREMENTS. ADD ADDITIONAL 2/0 KCMIL GROUND WIRE AND GROUND RODS AS NECESSARY. ENGINEER SHALL BE CONSULTED PRIOR TO INSTALLATION OF CHEMICAL GROUND WELLS.
11. CONTRACTOR SHALL LOCATE GROUNDING EXIT POINTS ON TOWER PEDESTAL.
12. TWO LEADS FROM TRANSFORMER GROUND FOR BONDING CONCENTRIC NEUTRALS OF 34.5KV CABLES. SEE DRAWING E–PM–01 FOR DETAILS.
13. "T"–BAR FOR EARTHING (SUPPLIED BY VENDOR)– SEE SIEMENS DRAWING 1008731 FOR DETAIL.
14. GROUNDING CONDUCTOR SHALL BE TURNED UP ABOVE GRADE FOR FUTURE CONNECTION TO CHEMICAL GROUND WELLS IF REQUIRED. ENGINEER SHALL BE CONSULTED PRIOR TO INSTALLATION OF CHEMICAL GROUND WELLS.
15. NOT USED
16. GROUND WIRE FROM "T"–BAR (BOLTED), THROUGH 1 " CONDUIT, TO THE INNER GROUND RING. 3 PLACES 120° APART. "T"–BAR LOCATED ABOVE STRUCTURAL NUT BELOW ADDITIONAL LOCK NUT OF SAME TYPE.
17. GROUND WIRE FROM INNER RING TO OUTER RING. (CADWELD). 4 PLACES, 90° APART.
18. GROUNDING FOR GSU TO BE LOCATED OUTSIDE THE PERIMETER OF CONCRETE OF GSU.
19. 9 GSU NEUTRAL CONDUCTORS SHALL BE RUN IN SEPARATE CONDUIT.
20. CONDUCTOR NEUTRALS FROM THE GSU NEUTRAL BUSHING SHALL BE EQUALLY CONNECTED TO THE "T"–BARS IN THE TOWER. CONDUCTORS SHALL BE ROUTED ALONG THE TOWER WALL, OUTSIDE OF THE ANCHOR BOLTS.

**CONDUITS NOTES:**

21. FIELD CONTRACTOR SHALL POSITION CONDUIT FOUNDATION PENETRATION TURN–UPS.
22. NOT ALL CONDUITS ARE SHOW FOR CLARITY.

PIKE ENERGY SOLUTIONS
PIKE ENERGY SOLUTIONS, LLC.
10101 Claude Freeman Drive, Suite 100W
Charlotte, NC 28262
ND License No. 954PE

**REFERENCE DRAWINGS:**

BARR PROJECT NO. 34/33–1007 DRAWING S–01 – SPREAD FOOTING FOUNDATION PLAN, ELEVATION, SECTION & DETAILS

SIEMENS WIND TURBINES–EARTH TERMINATION SYSTEM, DOCUMENT PG–R3–30–0000–0182–05
SIEMENS DRAWINGS – 1008731, 1006928 , 1006932 & 1006931

| NO. | BY | CHK | APP. | DATE | REVISION DESCRIPTION |
|---|---|---|---|---|---|
| B | MME | CEG | CSF | 7/1/11 | ISSUED FOR 90% REVIEW |
| C | MME | CEG | CSF | 7/8/11 | REVISED PER CLIENT COMMENT |
| D | MME | CEG | CSF | 7/15/11 | REVISED PER CLIENT COMMENT |
| E | BNK | CEG | CSF | 7/21/11 | REVISED PER CLIENTS COMMENTS |
| 0 | BNK | RJG | CSF | 8/4/11 | ISSUED FOR CONSTRUCTION |
| 1 | NJG | KJB | CSF | 11/16/12 | CONSTRUCTION REVISIONS |

Kenneth J. Benoit – Registered Professional Engineer – State of North Dakota – 6506 – Date 2-21-13 – Rev.

| | 7/8/11 | 7/15/11 | 7/21/11 | 8/4/11 | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | | | | | | | |
| BID | | | | | | | |
| CONSTRUCTION | | | | | | | |
| PERMITTING | | | | | | | |
| RELEASED TO/FOR | C | D | E | 0 | 1 | 2 | 3 |
| 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 | N.T.S |
| Date | 05/27/11 |
| Drawn | MME |
| Checked | CEG |
| Designed | MME |
| Approved | JLM |

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

COLLECTOR SYSTEM
CONDUIT & GROUNDING DETAIL

BARR PROJECT No. 34/33–1007
CLIENT PROJECT No.
DWG. No. E–TD–01
REV. No. 1

images in Drawing