PPU- RTBT STUB PRELIMINARY AND FINAL DESIGN

SPALLATION NEUTRON SOURCE - OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

Certified For Construction - 7/11/2019

Index of Drawings

Applicable Codes, Standards and Ordinances

- 2010 INTERNATIONAL BUILDING CODE
- 2010 INTERNATIONAL MECHANICAL CODE
- 2010 INTERNATIONAL PLUMBING CODE
- 2010 INTERNATIONAL ELECTRICAL CODE
- 2010 NFPA 101 - LIFE SAFETY CODE

- ACI 318 - SPECIFICATION FOR STRUCTURAL CONCRETE
- AISC 360 - SPECIFICATION FOR STRUCTURAL STEEL
- AWWA C150 - STANDARD FOR STEEL PRESSURE pipe AND pipe FITTINGS

- CAN/CSA-Z669-12 - INDUSTRY STANDARDS FOR AIR HANDLING UNITS
- CAN/CSA-Z621-13 - INDUSTRY STANDARDS FOR AIR HANDLING UNITS

- NFPA 1, FIRE CODE, LATEST EDITION
- NFPA 10, PORTABLE FIRE EXTINGUISHERS
- NFPA 70, THE NATIONAL ELECTRICAL CODE, LATEST EDITION

- 2012 INTERNATIONAL FIRE CODE
- 2012 INTERNATIONAL FUEL GAS CODE
- 2012 INTERNATIONAL MECHANICAL CODE
- 2012 INTERNATIONAL PLUMBING CODE
- 2012 INTERNATIONAL BUILDING CODE

- NFPA 22 - STANDARD FOR WATER TOWERS
- NFPA 86 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- NFPA 1010 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- NFPA 1021 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- NFPA 1023 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷

- FM 2010 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- FM 2011 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- FM 2012 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷
- FM 2013 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷

- NFPA 101 - LIFE SAFETY CODE
- NFPA 1021 - STANDARD FOR THE INSTALLATION OF AIR Cooled液冷

- 2012 INTERNATIONAL BUILDING CODE
- 2012 INTERNATIONAL MECHANICAL CODE
- 2012 INTERNATIONAL PLUMBING CODE
- 2012 INTERNATIONAL ELECTRICAL CODE
- 2012 NFPA 101 - LIFE SAFETY CODE

- AISC 360 - SPECIFICATION FOR STRUCTURAL STEEL
The As-Built and Site Layout for the Proposed Structure

- **Installation** of HDPE SF 48
- **Temporary SLOPE MATTING**
- **Permanent Seeding**
- **Check Dam** (See Sheet C0702, Detail 9)

No representation or warranty, expressed or implied, is made as to others. No liability is assumed with respect to the use of, or for damages resulting from the use of, any information, apparatus, materials or methods described herein or recommended in any application.
1. FOR GENERAL NOTES AND ABBREVIATIONS, SEE DRAWING S0001.

2. TOP OF SLAB ELEVATION 100'-0" UNLESS NOTED OTHERWISE [+ OR -] FROM ELEVATION 100'-0".

3. FIELD VERIFY DIMENSIONS AFFECTED BY EXIST TUNNEL AS-BUILT LOCATION DIFFERING FROM PLAN.

4. LAYOUT OF RTBT STUB TUNNEL IS BASED ON THE FUTURE PROTON BEAM LINE GEOMETRY.

76°

7

S0302

S0302

S0101

WORK POINT A

SEE C0203 FOR COORDINATES (NOTE 4)

EMBEDDED UNISTRUT @ 8' - 0" OC, TYP UNO. SEE 7/S0301 FUTURE CABLE TRAYS BY OTHERS (FOR REFERENCE ONLY)

5'-10" (TYP)

11'-2" (TYP)

76° (TYP)

29'-9 3/8"

11 1/8"

10'-0"

9'-6 1/4"

22'-2 1/2"
1. PROVIDE VERTICAL P3266 (12 FT LONG) GALVANIZED UNISTRUT EMBEDDED IN CONCRETE WALL. LOCATE END OF EMBED 6" FROM UNDERSIDE OF ROOF SLAB. SEE PLAN FOR SPACING.

NOTE:

7 / S0302

SECTION AND DETAIL KEY

5'-0" 5'-0" 5'-0" 5'-0"

MATCHING DOWELS SHOWED OR TAKEN OR DETAIL IS WHICH SECTION DRAWING ON

PROTON BEAM WATERSTOP, TYP.

#8@12" IF #9@12" OF EXIST CONC ROOF

500 V3 EPOXY ADHESIVE.

HOW TO ALONG LENGTH OF WALL.

HILTI HIT RE 500 V3 EPOXY - 500 V3 (STAINLESS), TYP

ADHESIVE. SPACE @ 12" OC ALONG LENGTH OF WALL.

#8 HOOKED DOWEL W/ 20" MIN. OF ALL POST INSTALLED REINFORCING DOWEL LOCATIONS.

ADD 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 ADDL 2 Addl...
1. LAYOUT OF RTBT TUNNEL IS BASED ON THE FUTURE PROTON BEAM LINE GEOMETRY, TO BE PROVIDED BY THE COMPANY.

2. AIR BARRIER PENETRATION SECTION DETAIL

3. AS TEMPORARY WALL ENCLOSURE PLAN DETAIL

4. WA-L25 END WALL PLAN DETAIL

RTBT STUB FLOOR PLAN
EXISTING RTBT SERVICE BUILDING

RTBT TUNNEL

ROOF PLAN

RTBT STUB ROOF.
EPDM ROOFING MEMBRANE ON TAPERED INSULATION

CONCRETE CURB REFER TO STRUCTURAL DRAWINGS

42" HIGH. GALVANIZED GUARDRAIL

SLOPE 1/4" / FT

6 8 7 6 5 4 3 2 1

HGFEDCB

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DRAWING APPROVALS

REQ  PJ  PE  CHK  DRW  DSN

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managed for the DEPARTMENT OF ENERGY under PROJECT NAME:

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PPU - RTBT PRELIMINARY AND FINAL DESIGN

A/E DRAWING NUMBER

CERTIFIED FOR CONSTRUCTION JULY 11, 2019

DEPT UTB

PE DATE PJ DATE DATE DATE

U.S. GOVERNMENT contract DE-AC05-000R22725

1 48 49 50 PLANT BLDG 8 8200 3 X X

WBS NC NA 1.8.3.2

MARK CONNELL TBD

M. MICHILINI J. HOWARD A. BELTRAN M. BUCHANAN

A P

3 8

1/8" = 1'-0" A0331

RTBT STUB ROOF PLAN 1
1. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF FACILITY EXPANSION JOINTS, FIRE FEEDER DESIGNATION, RATED WALLS AND SMOKE WALLS.

2. SYMBOL WITH DASHED OUTLINE INDICATES INSTALLATION AT CEILING.

3. VERIFY EXACT LOCATION OF CONNECTION POINTS PRIOR TO CONNECTION.

5. PROVIDE RACEWAY, WIRE AND CABLE, ASSOCIATED FITTINGS AND CONNECTORS, AND COMPLETE CONNECTIONS REQUIRED FOR DESIGNATED BRANCH CIRCUITS FROM DEVICE(S) TO FINAL OVERCURRENT DEVICE AND TO LOCAL CONTROL DEVICE(S) PER SPECIFICATIONS.

7. PULL A SEPERATE NUETRAL AND GROUND CONDUCTOR FROM PANELBOARD FOR EACH BRANCH APPLICABLE.

8. CIRCUIT NUMBERS SHOWN FOR EQUIPMENT WIRED TO EXISTING PANELBOARD(S) IS SHOWN FOR NUMBERS INDICATES SOURCE PANELBOARD AND CIRCUIT(S) DESIGN INTENT ONLY AND MAY NOT CORRESPOND TO ACTUAL CIRCUIT BREAKER MOUNTING POSITION IN THE PANEL. UPDATE THE AS-BUILT DRAWINGS WITH THE ACTUAL CIRCUIT NUMBERS.

9. CONFIRM ALL LABELS AND ROOM NUMBERS WITH OWNER PRIOR TO FINALIZING LABELING.

D 4 LC 1 - GROUND/ELECTRODE CONDUCTOR
GROUND CONNECTION (MOLDED FUSION WELD OR IRREVERSIBLE)
EQUIP ROOM GROUND TERMINAL BAR OF LENGTH INDICATED, 1'-6" AFF

GROUNDING AND BONDING

TERMINATIONS

CONDUCTOR  AWG #12 #10 #8
MAXIMUM CONDUCTOR LENGTH AT 120V  95 160 245
MAXIMUM CONDUCTOR LENGTH AT 277V 225 375 565
MAXIMUM CONDUCTOR LENGTH AT 208V 1 PH. 170 280 425
MAXIMUM CONDUCTOR LENGTH AT 480V 1 PH. 390 650 985
GROUND CONDUCTOR AWG #12 #10 #8

TRANSFORMERS

MOTOR CONTROLLERS
FRACTIONAL HORSEPOWER MOTOR CONTROLLER, RECESSED 3'-8" AFF OR ABOVE CEILING

NEW EQUIPMENT

EXISTING WORK

DEVICE TO BE REMOVED (DEMO PLANS) UNDERFLOOR CONDUIT (NEW PLANS)

WIRE AND/OR CONDUIT RUN CONTINUED ON REFERENCED DETAIL

MATCH LINE REFERENCING CONTINUATION ON OTHER DRAWINGS

EQUIPMENT DESIGNATIONS

POWER BRANCH CIRCUITS

WIRING TERMINATIONS

GROUNDINGS AND BONDING

RACEWAY AND PATHWAY

PANELBOARDS DESIGNATIONS

UNDERGROUND CONSTRUCTION

DISTRICT PANELBOARDS

EQUIPMENT IDENTIFICATION TAG.

SCHEDULE REPRESENTS MINIMUM CONDUCTOR SIZE BASED ON LENGTH OF OUTLET DEVICE. PROVIDE JUNCTION BOX WITHIN 10' OF OUTLET. EXTEND #12 DUCT BANK L LOCATOR STYLE SWITCH OPERATING HANDLE WP WEATHERPROOF

TRANSFORMER (PLAN DENOTATION)
TRANSFORMER (PLAN DENOTATION)
TRANSFORMER (PLAN DENOTATION)
TRANSFORMER (PLAN DENOTATION)

COMPLETE DRAWINGS.

NOT FOR CONSTRUCTION

CERTIFIED FOR CONSTRUCTION E0001 JUL 11, 2016

E0001 ELECTRICAL ELECTRICAL NOT FOR CONSTRUCTION

 THIS DOCUMENT AVAILABLE FOR INFORMATION TO BIDDER ARE NOT TO BE USED FOR OTHER PURPOSES.

SYSTEM NUMBER

REV

DESCRIPTION

NUMBER

TYPE

1 48 49 50 PLANT BLDG
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TYPE CLASS
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DRAWN BY: MICHAEL BRINKMAN

CHECKED BY: ALEX GIBERSON

PREPARED BY: PE EASON

SCHEDULE OF WORK:

3 48 49 50 PLANT BLDG
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1. REMOVE AND RELOCATE EXISTING LIGHT SWITCH TO ACCOMMODATE OPENINGS IN TUNNEL WALLS.

KEYED NOTES:

1. WIRE LUMINAIRES AND LIGHT SWITCHES TO EXISTING LIGHTING CIRCUITS SERVING RTBT TUNNEL. WIRE LIGHT FIXTURES TAGGED WITH SINGLE LOWER CASE LETTER (EXAMPLE 'b') THROUGH ASSOCIATED LOCAL LIGHT SWITCH. WIRE EMERGENCY LIGHT FIXTURES AND EXIT SIGNS (INDICATED WITH AN "E" PREFIX), AHEAD OF LIGHTING CONTROLS, TO EXISTING LIGHTING CIRCUITS SERVING RTBT TUNNEL.

BRANCH CIRCUIT NOTES:

1/8" = 1'-0"

RS-1L1; CCT #1 - NORMAL LIGHTING (LOCATED WITHIN RTBT SERVICE BUILDING) RS-1EL1; CCT #1 - EMERGENCY LIGHTING (E) (LOCATED WITHIN RTBT SERVICE BUILDING)

LIGHTING PLAN
1. Wire motors, equipment, and other branch circuits as indicated to panel indicated in equipment wiring schedule; unless noted otherwise. Wire electrical receptacles, and other branch circuits as indicated to existing receptacle circuit serving RTBT tunnel.

208Y/120V Panelboards (Service Building)

3. Remove and reinstall 1" duct bank from RTBT service ice building to truck loading dock. Chip out concrete around existing duct and concrete encasement and interface with existing concrete encasement. Equipment, terminations, and conduit labeling are by company. Sequence and schedule duct bank replacement with site excavation phasing. Remove after phase 1 outage, reinstall after complete backfill.

4. Assign heat detectors to separate zone from the rest of the RTBT tunnel.

5. Extend existing fire alarm circuits from existing junction box.
A. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

Keyed Notes:

1. Route all conduits through top of door entry cut out.

3/4" - Mechanical Equipment (FCU-1, CU-1, RHC-1)

1. Route all conduits along inside curve of tunnel, along ceiling of 7'-0".

3/4" - Alarm

1. Route all conduits within a single duct in existing RTBT service building ductbank.

3/4" - Lighting

1. Route all conduits within a single duct in existing RTBT service building ductbank. Route BMS alarm cable within a single duct in existing RTBT service building ductbank.

3/4" - Emergency Lighting

6. Utilize existing cable tray for routing associated circuits and cable to existing panelboards and system cabinets.

3/4" - Fire Alarm

7. Provide type C conduit bodies for future reroute of conduit through temporary shielding.

3/4" - PPS

8. Provide type LR conduit bodies to route conduit tight to wall and top of concrete opening.

3/4" - Receptacles

1. Route all mechanical equipment circuits within a single duct in temporary shielding.

1. Provide type LR conduit bodies to route conduit tight to wall and top of concrete opening.

1. Extend existing lighting circuit from existing junction box.

1. Extend existing fire alarm circuits from existing junction box.

1. Extend existing PPS circuit from existing junction box.

1. Extend existing BMS alarm circuit from existing junction box.

1. Extend existing electrical lighting circuit from existing junction box.

1. Extend existing emergency lighting circuit from existing junction box.

1. Extend existing mechanical equipment (FCU-1, CU-1, RHC-1) circuit from existing junction box.

1. Extend existing mechanical equipment (FCU-1, CU-1) circuit from existing junction box.
### Equipment Connection / Motor Controller Schedule

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Size</th>
<th>Panel</th>
<th>Location</th>
<th>Volts</th>
<th>Mains Rating (A)</th>
<th>Supply From</th>
<th>Demand Load (VA)</th>
<th>Mains Type</th>
<th>Panel Options</th>
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### Luminare Schedule

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### Notes

1. Extend existing circuit to feed emergency lighting and exit signs.
2. Provide integral photocell.
3. Supply panel options from RTBT service building.

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**Calculations**

- Total Connected Load (VA)
- Total Demand Load (VA)
- A.I.C. Rating (A)
- Mains Type

**Recommendations**

- Use 3-Phase 4-Wire wiring for supply.
- Ensure compliance with National Electrical Code, Articles 220, 430, and 440.

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**General Notes**

- Certain equipment configurations may require custom modifications to meet design criteria.
- Inclusion of manufacturer's series &/or model numbers does not imply unconditional product approval.
- Manufacturer's standard products may require custom modifications.
1. CONCRETE REBAR GROUNDING

2. 1/4" x 4" x 10" ELECTROLYTIC COPPER BAR

3. 9/16" HOLES ON 2" CENTERS

4. GROUND BAR ASSEMBLY

5. GROUND ROOD DETAIL

6. SPLICE CONNECTION DETAIL

7. GROUND CABLE CONNECTION DETAIL

GROUNDED DETAILS

1. EXOTHERMIC WELD TYPE CONNECTION

2. #4/0 SBC CONNECTOR MIN. 30" COVER EXTERNAL

3. 1/2" WIRE GROUND ROOD

4. 1/2" STEEL WIRE GROUND ROD CABLE CONNECTION DETAIL

5. SBC CABLE, SIZE AS INDICATED ON GROUNDING WIRING