

**2 FLUSH HANDHOLE/SPLICE BOX**  
SCALE: NTS

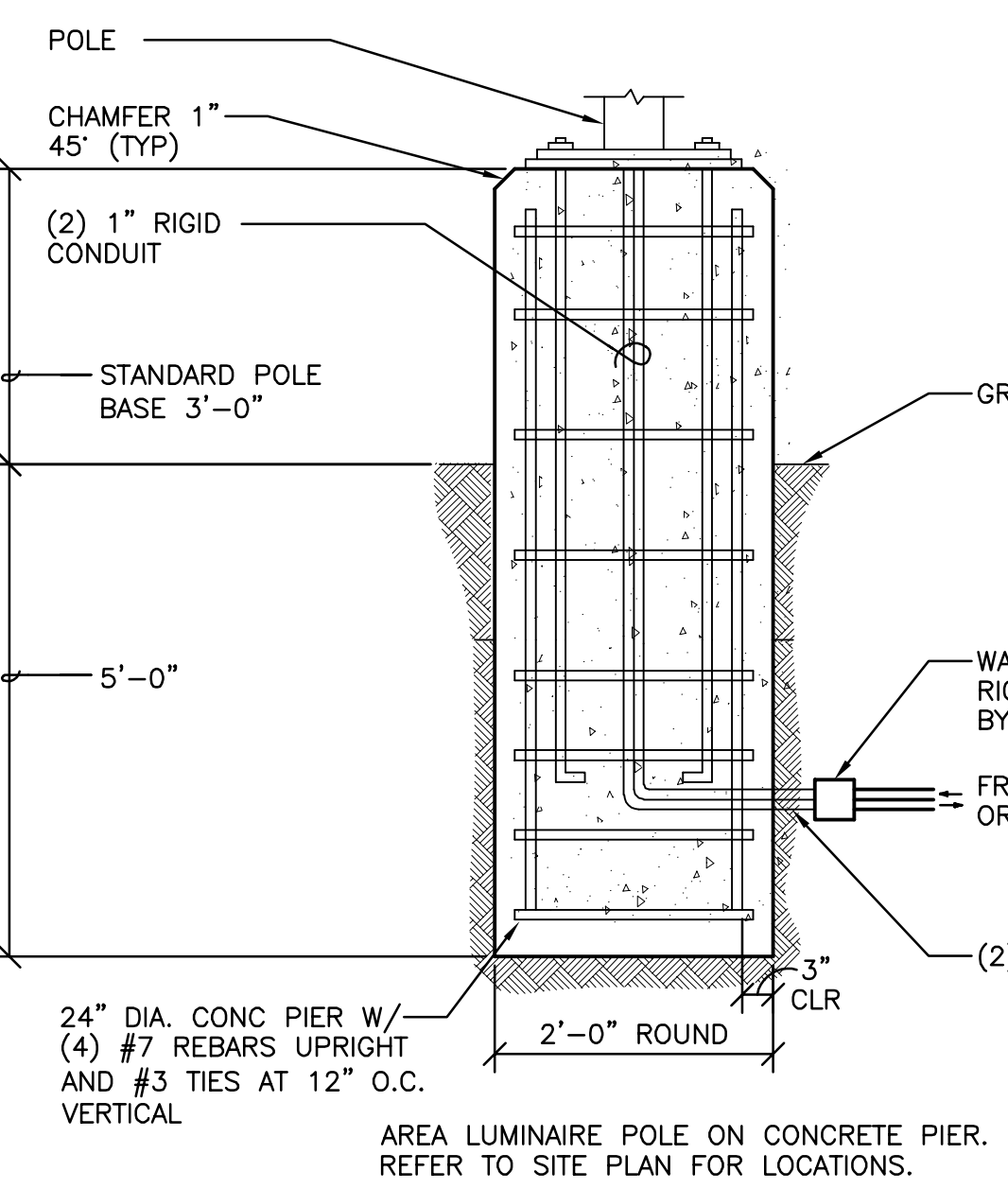
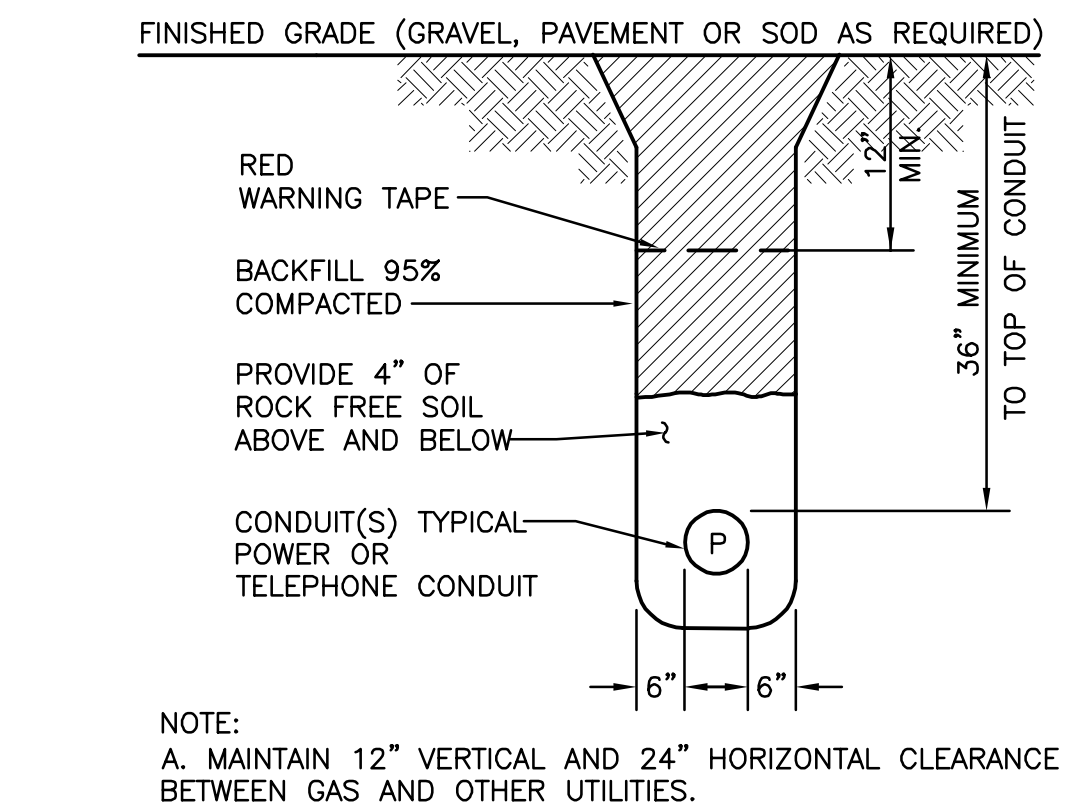
LUMINAIRE SCHEDULE					
TYPE	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	LAMP	WATTAGE
A	LINEAR 48" HANGING LED AREA LUMINAIRE, MOUNT 9" HIGH, 4000 LM, STANDARD EFFICIENCY, ROUND DIFFUSE, MVOLT (120-277V), 3000K CCT, 80 CRI, 0-10V DRIVER DIMS TO 1%, EMERGENCY BATTERY, WHITE FINISH, 36" HANGER CHAIN (1 PAIR)	LITHONIA LIGHTING	CLX L48 4000LM SEF RDL MVOLT EZ1 30K 80CRI E10WLCP WH HC36 M12 OR APPROVED EQUIVALENT	LED	160 W
B	WALL MOUNT LED, 3000K, 80CRI, VISUAL COMFORT WIDE OPTIC, MVOLT, 750LM, DARK BRONZE FINISH	LITHONIA LIGHTING	WDGE1 LED P0 30K 80CRI VW MVOLT SRM DDBXD OR APPROVED EQUIVALENT	LED	4 W
C	CEILING DOWNLIGHT LED, 3000K, 80CRI, WIDE 33 DEGREE BEAM, 120/277V, 1975LM, BLACK FINISH, 4.5"x4.5" FIXTURE, IP65	LIGMAN LIGHTING	ULD-80021-22W-W-W30-01-120/277V OR APPROVED EQUIVALENT	LED	22 W
D1	POLE MOUNT AREA LUMINAIRE, 3000K CCT, 80 CRI, 11601LM, MVOLT, TYPE 3 DISTRIBUTION, 3" MIN. ROUND POLE MOUNTING, DARK BRONZE FINISH, MOUNT FIXTURE 16' ABOVE GROUND	LITHONIA LIGHTING	DSX0 LED P5 30K 80CRI T3M MVOLT RPA DDBXD OR APPROVED EQUIVALENT	LED	90 W
D2	SAME AS 'D1' EXCEPT WITH A HOUSESIDE SHIELD	LITHONIA LIGHTING	DSX0 LED P5 30K 80CRI T3M MVOLT RPA HS DDBXD OR APPROVED EQUIVALENT	LED	90 W
E	PGE STREET LIGHT, 8' MAST ARM, WOOD POLE MOUNTING, 18700LM, MOUNT 25' ABOVE GROUND, MVOLT, 3000K CCT, TYPE 3 DISTRIBUTION, GRAY FINISH, PHOTOCONTROL RECEPTACLE, FIXED DRIVE CURRENT, 70 CRI, 610 DRIVE CURRENT CODE, UTILITY WATTAGE LABEL, WILDLIFE GUARD, HOUSESIDE SHIELD	LEOTEK	GCL1-806-MV-WW-3R-GY-610-FDC-PCR7-WL-RWG-HSSGCL OR PGE APPROVED EQUIVALENT	LED	160 W
--	13' ROUND STRAIGHT STEEL POLE, 3" NOMINAL SHAFT BASE SIZE, 0.120" WALL THICKNESS, DARK BRONZE FINISH, OPEN TOP W/ TOP CAP	LITHONIA LIGHTING	RSS 13 3B PT DDBXD	--	--

**SYMBOL LEGEND AND ABBREVIATIONS**

- CKT CIRCUIT
- CRI COLOR RENDERING INDEX
- LM LUMENS
- GND GROUND
- K KELVIN
- TYP. TYPICAL
- V VOLT
- W WATT
- WP WEATHERPROOF
- EMERGENCY LUMINAIRE, SIZE AND TYPE AS SHOWN
- EXISTING LUMINAIRE, SIZE AND TYPE AS SHOWN
- STRIP LUMINAIRE, LENGTH AND TYPE AS SHOWN
- UTILITY POLE-MOUNTED LUMINAIRE
- POLE-MOUNTED LUMINAIRE
- SURFACE-MOUNTED LUMINAIRE
- CEILING-MOUNTED LUMINAIRE
- JUNCTION BOX
- LIGHT SWITCH
- LIGHT SWITCH WITH DIMMER
- METERED SERVICE CABINET
- 
- 
- 
- 
- 
- 

**EXHIBIT E**

**1 POWER CONDUIT TRENCH DETAIL**  
SCALE: NTS



**3 LIGHT POLE BASE DETAIL**  
SCALE: NTS

INCOMING ELECTRICAL SERVICE DIVISION OF RESPONSIBILITY				
	ELEC. CONTR.	UTILITY CO.	ELEC. CONTR.	UTILITY CO.
PRIMARY CONDUIT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SECONDARY CONDUIT	<input type="checkbox"/>
PRIMARY CONDUCTORS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	SECONDARY CONDUCTORS	<input type="checkbox"/>
PRIMARY GROUNDING	<input type="checkbox"/>	<input checked="" type="checkbox"/>	C/T ENCLOSURE	<input type="checkbox"/>
POST TOP LIGHTING	<input checked="" type="checkbox"/>	<input type="checkbox"/>	C/T'S	<input checked="" type="checkbox"/>
TRANSFORMER CONNECTIONS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	METER BASE	<input type="checkbox"/>
ELECTRIC EQUIPMENT DOOR	<input checked="" type="checkbox"/>	<input type="checkbox"/>	METER	<input checked="" type="checkbox"/>
LOCK BOX (OBTAIN FROM POWER COMPANY)	<input type="checkbox"/>	<input type="checkbox"/>	METER GROUNDING	<input type="checkbox"/>

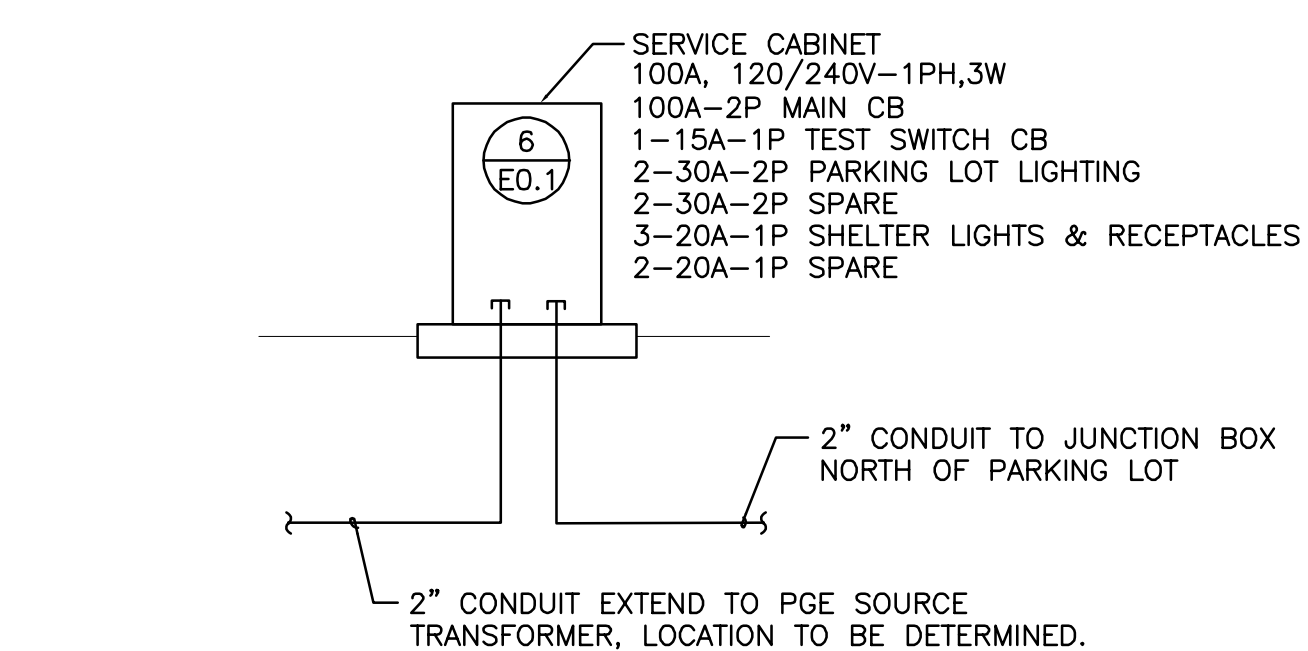
**NOTES:**  
1. CONTACT AND COORDINATE ALL REQUIREMENTS AND RESPONSIBILITIES WITH SERVING UTILITY COMPANIES PRIOR TO SUBMITTING BID.  
2. ALL SERVICE INSTALLATION WORK SHALL BE IN STRICT COMPLIANCE WITH THE REQUIREMENTS OF THE SERVING UTILITIES.

**POWER UTILITY:**  
PORTLAND GENERAL ELECTRIC (PGE)

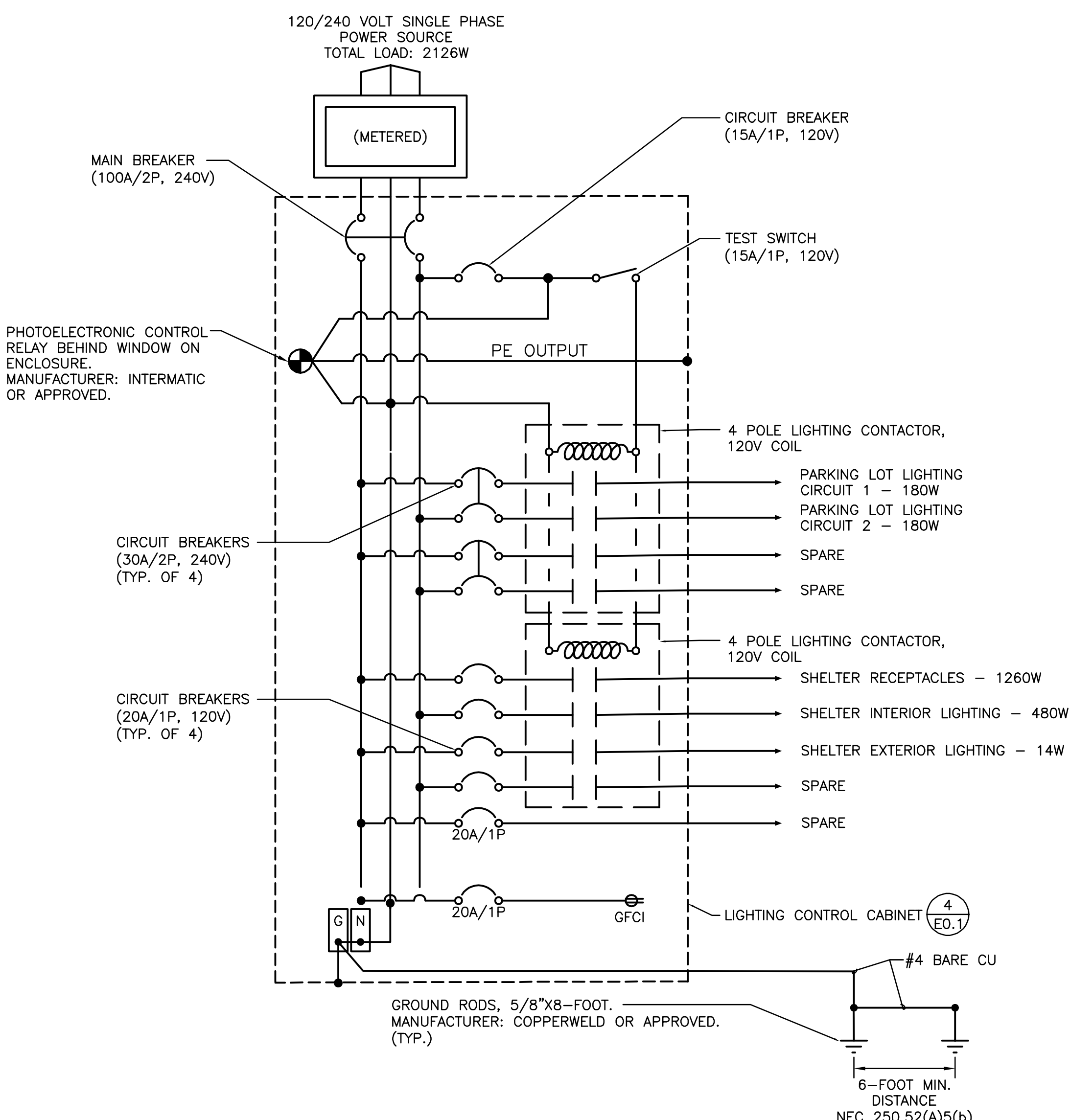
**METERED SERVICE PEDESTAL**

- A1. COORDINATE LIGHTING INSTALLATION WITH OTHER RELATED WORK AND PHASES OF PROJECT AS NECESSARY FOR COMPLETE AND FULLY FUNCTIONAL SYSTEM.
  - A2. CABINET: 14 GA. 304 STAINLESS STEEL, #4 FINISH VANDAL-PROOF.
  - A3. DEAD-FRONT PLATE: 14 GA. STAINLESS STEEL.
  - A4. DOOR TO BE FULLY GASKETED.
  - A5. CABINET HANDLES: 3-POINT, VAULT TYPE WITH PADLOCK PROVISIONS.
  - A6. RAISE THE PANEL A MINIMUM OF ONE INCH, INSTALL DOUBLE NUT BENEATH, AND GROUT IN SPACE.
  - A7. FINISH : UNPAINTED BRUSHED STAINLESS STEEL.
- \*\*MANUFACTURER SHALL BE COOPER B-LINE CMP SERIES OR APPROVED EQUIVALENT COMPLIANT WITH PGE REQUIREMENTS FOR SERVICE EQUIPMENT\*\***

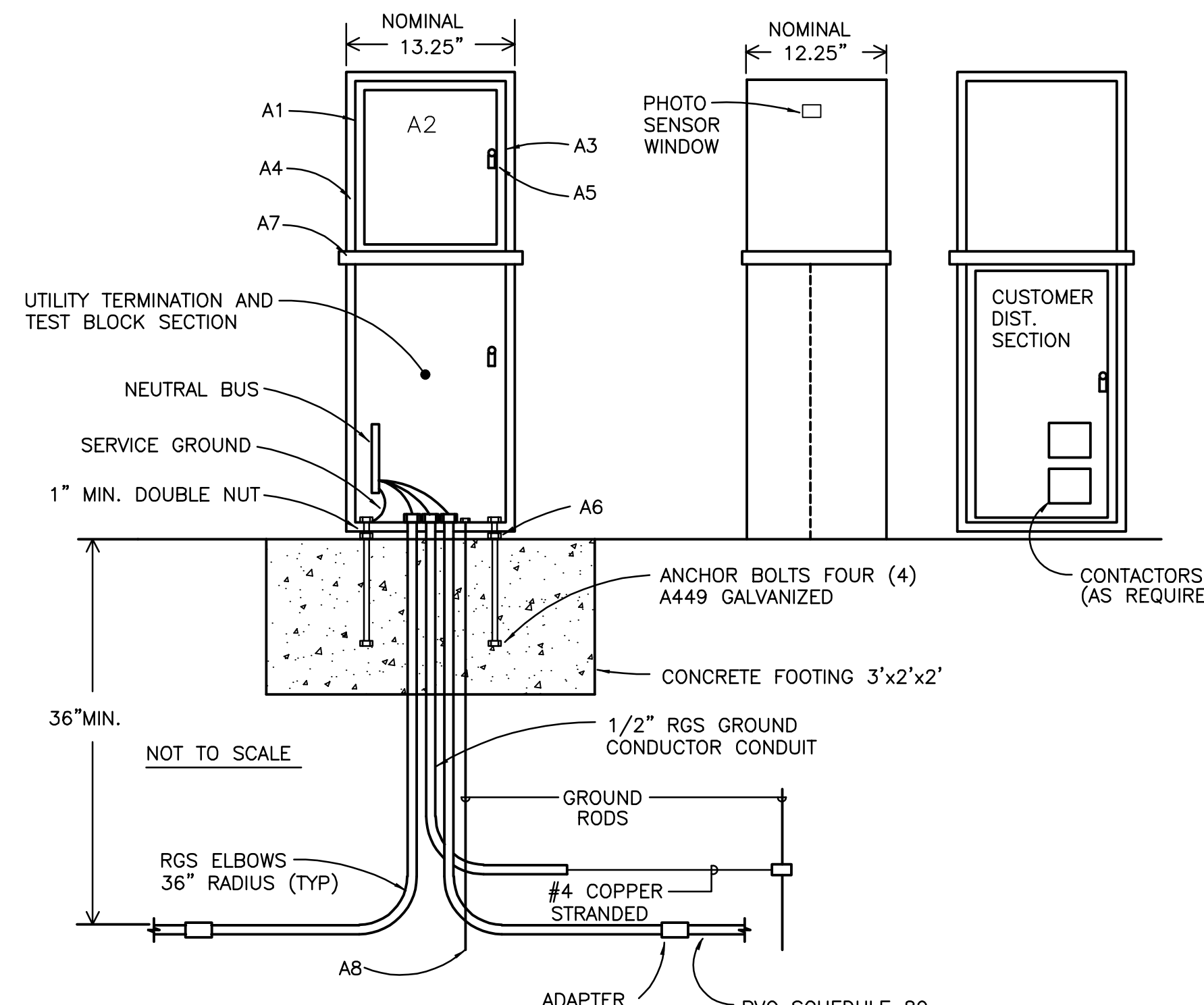
- NOTES:**
1. LOCATE FACE OF PANELS 30" BACK FROM FACE OF CURB OR IN LINE WITH POLES, WHICHEVER IS GREATER. PANEL DOOR SHALL BE ON PRIVATE PROPERTY SIDE OF CABINET, UNLESS OTHERWISE SPECIFIED. CABINETS SHALL BE FABRICATED FROM 14 GAUGE, 304 STAINLESS STEEL, SPOT-WELDED CONSTRUCTION, #4 FINISH. ALL WELDS SHALL BE THOROUGHLY CLEANED. CABINET SHALL BE DEAD-FRONT CONSTRUCTION DEAD-FRONT SHALL BE FABRICATED FROM 14 GAUGE, STAINLESS STEEL. NO ELECTRICAL EQUIPMENT SHALL BE ATTACHED TO THE DEAD-FRONT PANEL.
  2. 100A, 240V CABINET SHALL BE U.L. LISTED FOR USE AS SERVICE EQUIPMENT. SEE DETAIL 2/E2 AND 3/E2 FOR CIRCUIT BREAKER TYPE AND QUANTITY. ALL INTERNAL WIRING, EXCEPT FIELD WIRING, SHALL BE DONE BY A U.L. LISTED FACILITY. ALL SCREWS SHALL BE STAINLESS STEEL.
  3. TERMINALS SHALL BE SIZED FOR CONDUCTOR SIZES SHOWN ON PLANS. CONTRACTOR SHALL VERIFY AVAILABLE GROUND FAULT CURRENT FOR MAIN BREAKER INTERRUPT CAPACITY.



**4 METERED DISTRIBUTION PEDESTAL - PARKING LOT**  
NOT TO SCALE



**5 CIRCUIT DIAGRAM - SERVICE CABINET (SC) - PARKING LOT PANEL 'P'**  
NOT TO SCALE



**6 SERVICE METERED POWER PEDESTAL DETAIL**  
SCALE: NOT TO SCALE

**GENERAL NOTES**

- A. THIS INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NFPA-70, 2010 EDITION) AS AMENDED BY OESC 918-305. ALL WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER WITHIN STANDARD OF CARE FOR PROFESSION PER NEC 110.12 AND NECA-1. PLANS MAY INDICATE WORK OR STANDARDS WHICH EXCEEDS CODE MINIMUMS. SPECIFICATIONS AND PLAN DRAWINGS ARE TO BE TAKEN TOGETHER AND UNDERSTOOD AS ONE.

**GENERAL REQUIREMENTS**

1. CONFORM TO CURRENT CODE INCLUDING OSSC, NEC, BUILDING CODE, AND LOCAL REQUIREMENTS.
2. PROVIDE COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEMS AS SPECIFIED, AS SHOWN ON DRAWINGS, AS REQUIRED, AND AS INTENDED.
3. EQUIPMENT SHALL BE NEW AND OF LIKE MATERIALS THROUGH AUTHORIZED DISTRIBUTORS. PROVIDE EQUIPMENT OF SAME SYSTEM AND TYPE BY SAME MANUFACTURER. EQUIPMENT SHALL BE LISTED FOR ITS USE AND SHALL MEET OREGON LISTING REQUIREMENTS. REFER TO OAR 918-306-00 FOR MORE INFORMATION ON OREGON LISTING REQUIREMENTS.
4. WARRANT WORK, MATERIALS, AND EQUIPMENT FOR NOT LESS THAN ONE-YEAR. THIS REQUIREMENT SHALL NOT LIMIT, RESTRICT, OR OTHERWISE LESSEN ANY WARRANTY PROVIDED BY EQUIPMENT MANUFACTURER'S STANDARD WARRANTY IF GREATER THAN ONE-YEAR.
5. PROVIDE SUBMITTALS FOR ELECTRICAL EQUIPMENT. PROVIDE STANDARD CUT-SHEETS CLEARLY INDICATING MODELS TO BE INSTALLED.
6. GROUND SYSTEMS PER NEC ARTICLE 250, AS INDICATED, AND AS SHOWN.
7. ALL ELECTRICAL WORK TO COMPLY WITH NFPA 70E ARC FLASH RULES, WHICH WILL INCLUDE AN ARC FLASH ANALYSIS AND ARC FLASH LABEL FOR THE CONTROLLER CABINET.
8. UNLESS THE COUNTY DETERMINES IN ITS SOLE DISCRETION THAT A CONTRACTOR'S ATTENDANCE IS NOT NECESSARY, CONTRACTORS WILL BE REQUIRED TO ATTEND A PRE-TASK MEETING WITH THE PROJECT MANAGER AND ELECTRICAL SUPERVISOR OR DESIGNEE TO DISCUSS THE HAZARDS AND SAFE WORK PROCEDURES FOR ALL ELECTRICAL WORK TO BE PERFORMED ON THE PROJECT.
9. ELECTRICAL WORK SHALL BE PERFORMED UNDER ELECTRICALLY SAFE WORK CONDITIONS WITH LOCK-OUT TAG-OUT PER NFPA 70E. KEEP POWER DISRUPTIONS TO A MINIMUM AND NOTIFY OWNER IN ADVANCE OF POWER DISRUPTIONS.
10. CALL U-DIG 811 AT LEAST 2-BUSINESS DAYS BEFORE DIG OR TRENCH PER OAR 952-001-0010 THROUGH -0090. SCAN & MARK SUGGESTED ROUTING FOR UTILITIES & IRRIGATION PRIOR TO TRENCHING ACTIVITIES; DO NOT DISTURB UTILITIES OR PIPING, AVOID CONFLICTS. WHERE FEASIBLE, MARK THE ANTICIPATED ROUTE(S) WITH WHITE PAINT; THIS HELPS LOCATING PERSONNEL FIND THE RIGHT AREA AND LOCATE NEARBY FACILITIES AS ACCURATELY AS POSSIBLE.

**SANDY COMMUNITY CAMPUS PARK**

CITY OF SANDY  
17225 SMITH AVE  
SANDY, OR 97055

**LAND USE SUBMITTAL**

**REVISIONS**

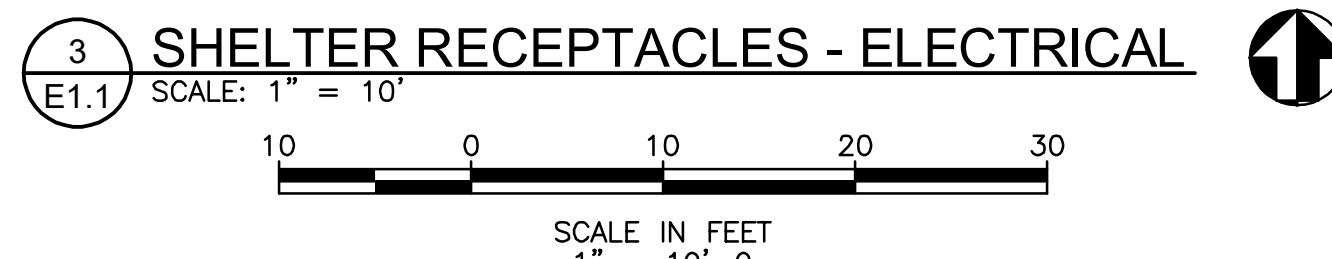
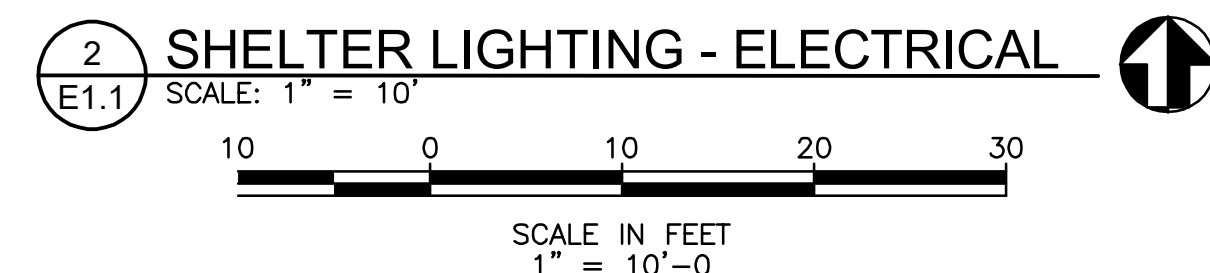
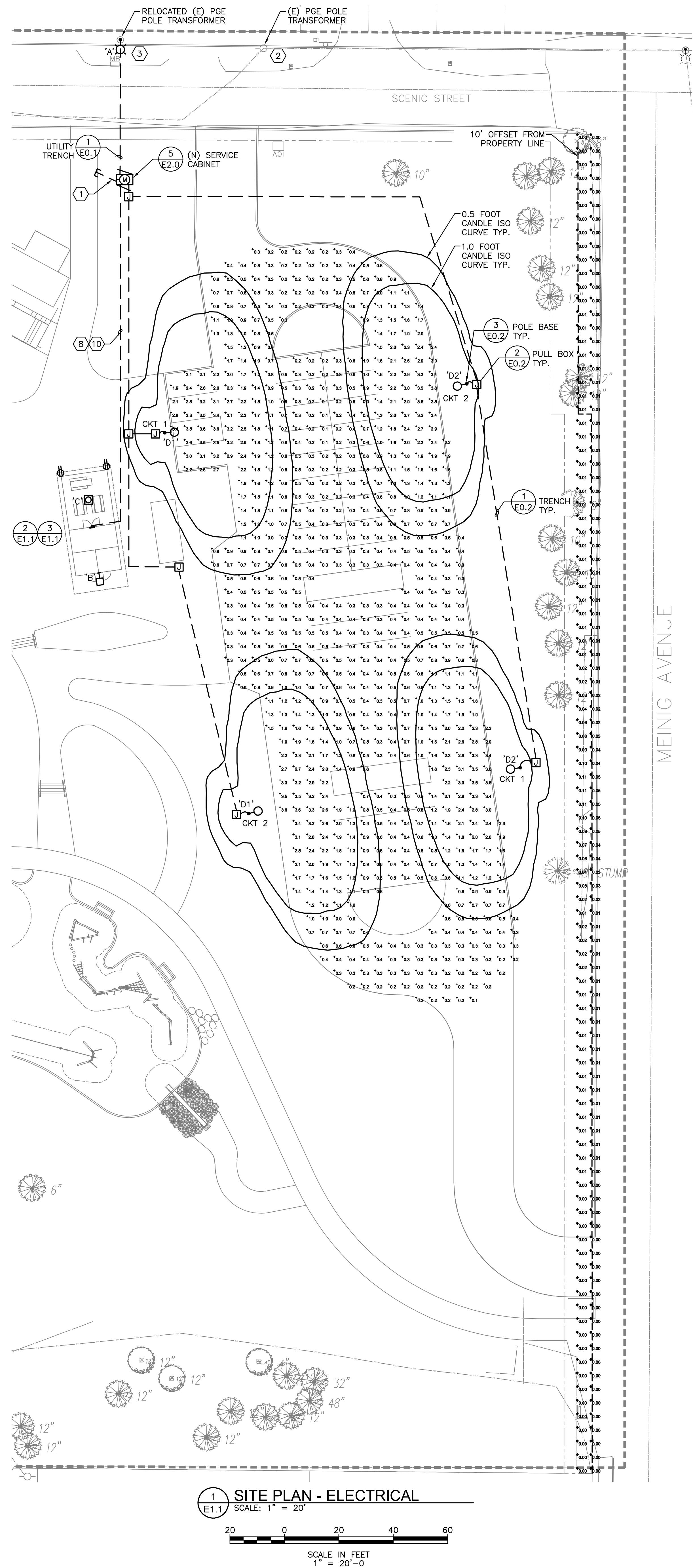
SCALE AS NOTED  
DRAWN BY R&W  
DATE 06.20.23  
PROJECT NO. 2239

**DETAILS**

**E0.1**

LANDSCAPE ARCHITECTS PC  
**lango . hansen**  
1100 NW Gilman #3B Portland OR 97209 T 503.295.2437





**GENERAL NOTES**

- A. CABINETS, POLES, JUNCTION BOXES & CONDUIT NEED TO STAY WITHIN CITY'S RIGHT-OF-WAY. BRING ANY CONFLICTS TO THE IMMEDIATE ATTENTION OF THE PROJECT MANAGER SO A MAINTENANCE EASEMENT CAN BE ACQUIRED, OR THE DESIGN CAN BE MODIFIED.
- B. ALL SPLICES IN UNDERGROUND BOXES OR DIRECT BURIED SHALL BE INSULATED AND WATERPROOFED, USING SCOTCHCAST EPOXY SPlicing COMPOUNDS SUITED FOR THE PURPOSE.
- C. ALL ROUTING FOR POLE-MOUNT SITE LIGHTING TO BE DONE WITH (2) #10 AWG CU AND (1) #10 AWG GND.

**NOTES THIS SHEET**

- 1 2" STUB-OUT FOR COMMUNICATION CABLING. CONTRACTOR TO EXTEND PER UTILITY REQUIREMENTS. VERIFY SIZE AND REQUIREMENTS PRIOR TO START OF WORK.
- 2 EXISTING WOOD POLE WITH EXISTING ATTACHMENTS TO BE RELOCATED WEST AS SHOWN ON SITE PLAN.
- 3 NEW LOCATION FOR RELOCATED WOOD POLE.
- 4 DIMMABLE LIGHT SWITCH TO CONTROL THE (2) SHELTER EXTERIOR LIGHTS. SWITCH TO BE MOUNTED INSIDE SHELTER BY ROOM DOOR.
- 5 PANEL PROVIDED BY SHELTER MANUFACTURER. FIELD VERIFY LOCATION OF PANEL AND AVAILABLE CIRCUIT BREAKERS FOR SHELTER EXTERIOR LIGHTING AND RECEPTACLES. COORDINATE ROUTING TO SHELTER PANEL WITH OWNER. SEE SHEET E0.1 FOR PANEL SCHEDULE.
- 6 RUN OF 3/4" EMT CONDUIT.
- 7 WEATHERPROOF, GFCI RECEPTACLE IN A LOCKABLE ENCLOSURE. MOUNT ON SHELTER CANOPY COLUMN IN LOCATION SHOWN.
- 8 RUN OF 2" SCHEDULE 40 PVC CONDUIT FROM SERVICE CABINET TO SHELTER PANEL.
- 9 RUN OF 1" SCHEDULE 40 PVC CONDUIT.
- 10 CONDUIT TO HOLD (3) #1 AWG AND (1) #8 AWG GROUND CONDUCTORS.
- 11 CONDUIT TO HOLD (2) #12 AWG AND (1) #12 AWG GROUND CONDUCTORS.

**RACEWAY / CONDUCTORS FOR POLE-MOUNT LIGHTING**

- 1. PROVIDE NO SMALLER THAN 1" RACEWAY.
- 2. PROVIDE SCHEDULE 40 PVC FOR UNDERGROUND RACEWAY.
- 3. PROVIDE NO SMALLER THAN #10 AWG STRANDED COPPER XHHW 600V CONDUCTORS.
- 4. EVERY UTILIZED RACEWAY SHALL INCLUDE A SEPARATE EQUIPMENT GROUNDING CONDUCTOR.
- 5. A MINIMUM OF (1) 2-INCH CONDUIT SHALL RUN BETWEEN JUNCTION BOXES AND A MINIMUM OF (2) 1-INCH CONDUIT SHALL RUN FROM THE JUNCTION BOX TO THE LIGHT POLE. THE CONDUIT SHALL BE SCHEDULE 40 PVC EXCEPT ALL ELBOWS SHALL BE FIBERGLASS; NO SPlicing ALLOWED WITHIN THE CONDUIT. CONDUIT SHALL BE USED TO MAKE THE CONNECTION BETWEEN THE JUNCTION BOX AND THE POLE. A LOCATE TRACE WIRE SHALL BE INSTALLED IN EACH SPARE CONDUIT PER ODOT/APWA STANDARDS SECTION 950.42A. ALL CONDUIT ENDS SHALL HAVE A BUSHING INSTALLED AND AN APPROVED CONDUIT PLUG.

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**SANDY COMMUNITY CAMPUS PARK**  
 CITY OF SANDY  
 17225 SMITH AVE  
 SANDY, OR 97055

LAND USE SUBMITTAL

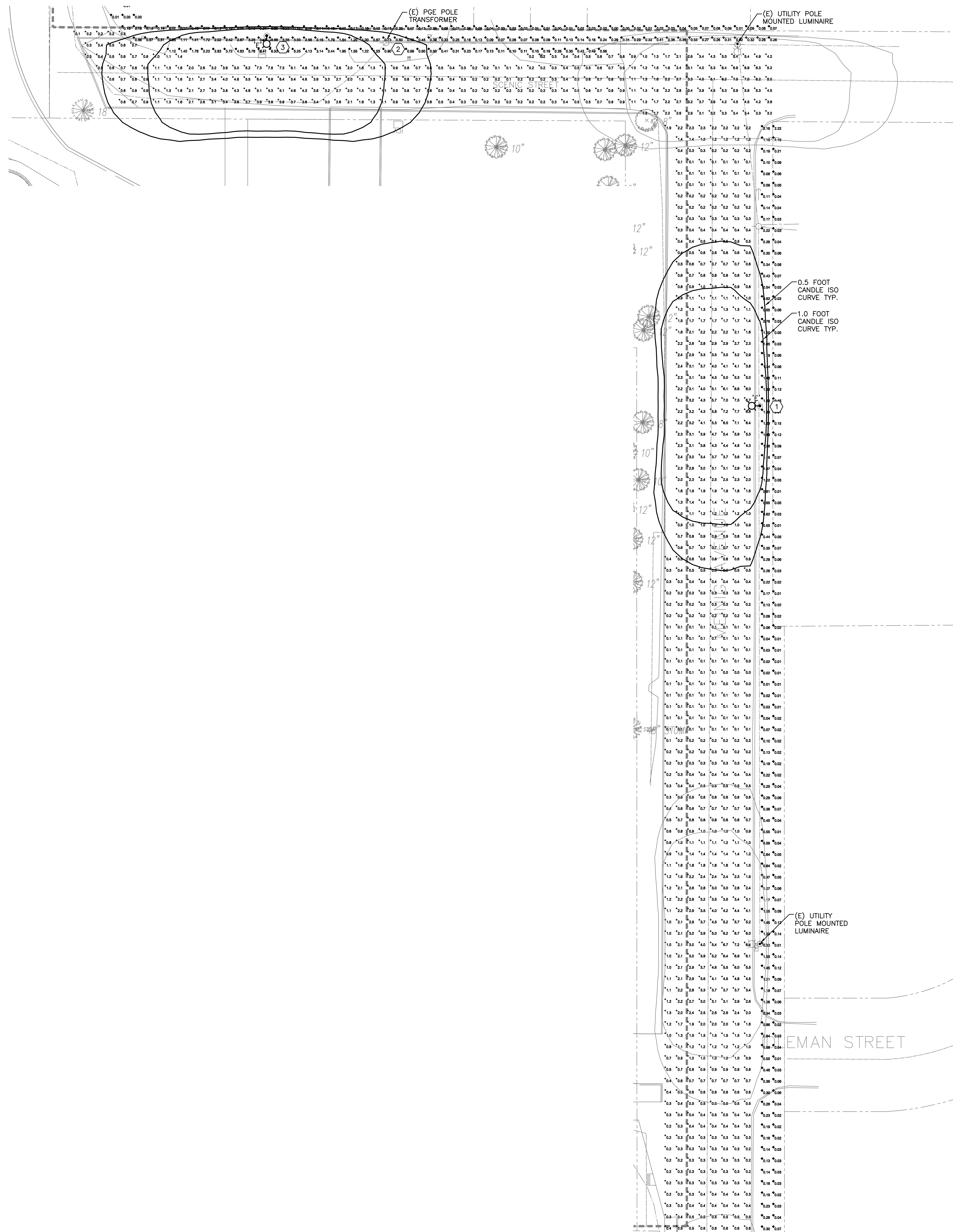
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SCALE AS NOTED  
 DRAWN BY R&W  
 DATE 07.14.23  
 PROJECT NO. 2239

PARK ELECTRICAL AND PHOTOMETRIC

**E1.1**

**R&W**  
 ENGINEERING, INC.  
 9815 S.W. Allen Boulevard  
 Suite 107  
 Beaverton, Oregon 97005  
 Phone: (503) 726-3328  
 Office: (503) 292-6000  
 Email: rwe@rweeng.com  
 Project No. 516.004.001 Contact: SAMANTHA HOLTMAN



**GENERAL NOTES**

- A. ALL EXISTING STREET LIGHTS ARE MOUNTED ON WOOD POLES.
- B. NEW STREET LIGHTS TO BE MOUNTED ON EXISTING WOOD POLES.

**NOTES THIS SHEET**

- ① NEW STREET STREET LIGHT.
- ② EXISTING WOOD POLE WITH EXISTING ATTACHMENTS TO BE RELOCATED WEST AS SHOWN ON SITE PLAN.
- ③ NEW LOCATION FOR RELOCATED WOOD POLE.

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 LANDSCAPE ARCHITECTS PC  
 1100 NW Gilson #3B Portland OR 97209 T 503.295.2437

**SANDY COMMUNITY CAMPUS PARK**  
 CITY OF SANDY  
 CITY OF SANDY PARKS AND RECREATION  
 17225 SMITH AVE  
 SANDY, OR 97055

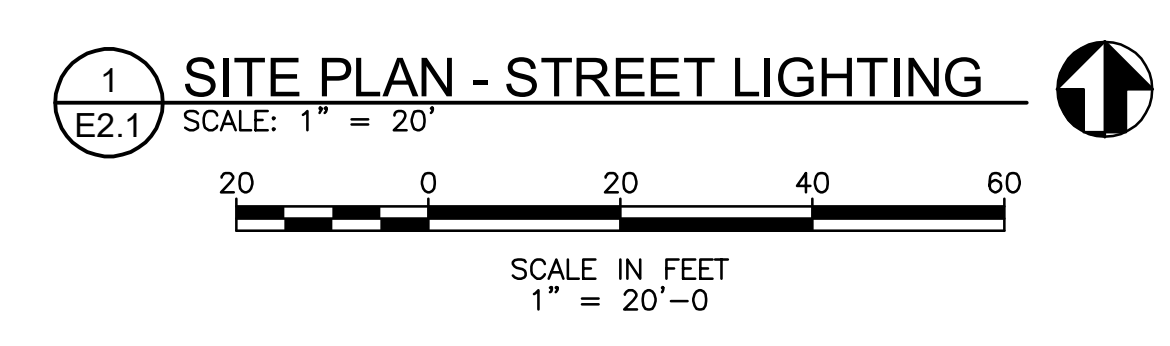
LAND USE SUBMITTAL

REVISIONS

SCALE AS NOTED  
 DRAWN BY R&W  
 DATE 06.20.23  
 PROJECT NO. 2239

STREET PHOTOMETRIC

**E2.1**



**R&W**  
**ENGINEERING, INC.**  
 9615 S.W. Allen Boulevard  
 Suite 107  
 Beaverton, Oregon 97005  
 Phone: (503) 292-3328  
 Office: (503) 292-6000  
 E-mail: rwe@rweg.com  
 Project No. 516.004.001      Contact: SAMANTHA HOLMAN



# SPECIFICATIONS

## SECTION 26 000 ELECTRICAL

### PART 1-GENERAL

#### 1.1 SUMMARY

- A. Electrical systems required for this work includes labor, materials, equipment, and services necessary to complete installation of electrical work shown on Drawings, specified herein or required for a complete operable facility and not specifically described in other Sections of these Specifications. Among the items required are:
  1. Service and distribution equipment shown on Drawings.
  2. Feeders to distribution panels, Heating-Ventilating and Air Conditioning (HVAC) equipment, Owner provided equipment and other equipment as detailed.
  3. Branch circuit wiring from the distribution panels for lighting, receptacles, motors, signal systems and other detailed circuit wiring.
  4. Luminaires, control switches, receptacles, relays, supports and other accessory items.
  5. Wiring and power connections for motors installed for heating, cooling and ventilation.
- B. Fees:
  1. Obtain and pay for electrical permits and inspections from local authorities having jurisdiction (AHJs).

#### 1.2 DEFINITIONS

- A. Provide: To furnish and install, complete and ready for the intended use.
- B. Furnish: Supply and deliver to the project site, ready for unpacking, assembly and installation.
- C. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at the project site as required to complete items of work furnished by others.

#### 1.3 SUBMITTALS

- A. Operation and Maintenance Documentation: Provide copies of certificates of code authority acceptance, test data, product data, guarantees, warranties, and the like.
- B. Shop Drawings: Provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like.
- C. Record Drawings: Show changes and deviations from the Drawings. Include written Addendum and change order items. Make changes to Drawings in a neat, clean, and legible manner.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of the National Electric Code (NEC), latest adopted version with amendments by local AHJs.
- B. Conform to latest adopted version of the International Building Code (IBC) with amendments by local AHJs.
- C. Furnish products listed by Underwriters' Laboratories, Inc. (UL) or other testing firm acceptable to AHJ.
- D. Conform to requirements of the serving electric, telephone, and cable television utilities.

#### 1.5 SEQUENCING AND SCHEDULING

- A. For the proper execution of the work cooperate with other crafts and contracts as needed.
- B. To avoid installation conflicts, thoroughly examine the complete set of Contract Documents. Resolve conflicts prior to installation.
- C. Prior to installation of feeders to equipment requiring electrical connections, examine the manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that the electrical characteristics detailed in the Contract Documents are consistent with the electrical characteristics of the actual equipment being installed.

#### 1.6 WARRANTY

- A. Driver: Manufacturer's Warranty: 5 years for electronic type drivers, based on date of manufacturer embossed on drivers, current with installation date. Warranty includes normal cost of labor for replacement of driver.
- B. Contractor shall guarantee all provided workmanship and materials for 12-months after project closeout.

### PART 2-PRODUCTS

#### 2.1 MATERIALS

- A. Provide new electrical materials of the type and quality detailed, listed by UL, bearing their label wherever standards have been established. Indicated brand names and catalog numbers are used to establish standards of performance and quality. The description of materials listed herein governs in the event that catalog numbers do not correspond to materials described herein.
- B. Include special features, finishes, accessories, and other requirements as described in the Contract Documents regardless of the item's listed catalog number.
- C. Provide incidents not specifically mentioned herein or noted on Drawings, but needed to complete the system or systems, in a safe and satisfactory working condition.
- D. Firestopping Foam Sealant: Foam sealant for use around conduit penetrations to prevent passage of smoke, fire, toxic gas or water. Maintain seal before, during and after fire. In and around conduit for thermal break at penetration of barrier between heated and unheated spaces. Chase Technology Corporation CTC PR-855, Fire Foam, Thomas & Betts.

#### 2.2 RACEWAYS

- A. Galvanized Rigid Steel Conduit (GRC): Federal Specification WWC-581 and American National Standards Institute (ANSI) C80.1.
- B. Intermediate Metal Conduit (IMC): Federal Specification WWC-581.
- C. Electrical Metallic Tubing (EMT): Federal Specification WWC-563 and ANSI C80.3.
- D. Flexible Conduit: Reduced wall flexible steel conduit. Federal Specification WWC-566.
- E. Conduit Fittings:
  1. Bushings: Malleable iron with plastic insulator lining, 150C rated.
  2. Ground Bushings: Malleable iron with plastic insulating liner and aluminum grounding lug rated for copper or aluminum conductor, 150C rated.
  3. EMT Connectors and Couplings:
    - a. Set Screw Type: Zinc plated steel, insulated throat connectors.
    - b. Compression Type: Zinc plated steel, insulated throat connectors, raintight up to 2-inch.

#### 2.3 WIRES AND CABLES

- A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back. Conductors 3AWG and larger, minimum insulation rating of 75C. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
- B. MC Cable: High strength galvanized steel or aluminum flexible armor. Full length minimum size No. 12 copper ground wire, THHN 90C conductors, full length tape marker. Overall PVC or nylon cable tape. Short circuit throat insulators. Manufacturers: Alfes, AFC, or Carol. AC/MC cable allowed only for 20 amp branch circuits concealed in accessible building void, walls or ceiling space.
- C. Type NM, type NMC, and type NMS cables: Annealed copper conductors, 600 volt rated. Minimum size No. 12 with ground wire for 20A. 90C rated PVC, nylon jacketed insulation per NEC Article 334; protect from damage per NEC Article 300.4.
- D. SO Cable: Annealed copper conductors, 600 volt rated, minimum size No. 12, with ground wire, maximum of six current carrying conductors and ground per cable. 90C rated thermostat jacket. Manufacturers: Tiger Brand.

#### 2.4 BOXES

- A. Luminaire Outlet: 4-inch octagonal box, 1.5-inches deep with 3/8-inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.
- B. Device Outlet: Minimum 4-inch square, minimum 1.5-inches deep. Single or 2-gang flush device raised covers. Raco Series 681 and 686 or Bowers.
- C. Multiple Devices: Three or more devices at common location. Install 1-piece gang boxes with 1-piece device cover, one device per gang.
- D. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- E. Provide J-box(es) per NEC Article 314; provide listed NM fitting.

#### 2.5 WIRING DEVICES

- A. Finish: Verify finish with Architect.
- B. Wall Switches: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage. Arrow-Hart 1221, Leviton 1221, Pass & Seymour 20AC1, Bryant 4901, Hubbell 1221.
- C. Pilot Light Switches: Lighted handle, toggle type, red, neon pilot lamp. Pilot lamp energized when load is energized. 20 amp/120 volt. Arrow-Hart 1991-PL, Leviton 1221-PL, Pass & Seymour 20AC1-PL, Bryant 4901-PL, Hubbell 1221-PL.
- D. Receptacles: Straight parallel blade 15 amp, 125 volt, 2-pole - 3 wire grounding. Arrow-Hart 5352, Leviton 5352, Pass & Seymour 5352, Bryant 5352.
- E. Ground Fault Interrupter Receptacle: Feed through type, 20 amp, 125VAC. Hubbell IG-5362, Arrow-Hart IG-5362, Leviton, Pass & Seymour, Bryant.
- F. Finish Plates: Stainless Steel. Verify finish with Architect.
- G. Provide Tamper resistant receptacles per NEC 210.52 and 406.11.

#### 2.6 SAFETY DISCONNECTS

- A. Toggle Type Disconnect Switches: 120 volt, 1-pole, 20 amp, 1 HP maximum. NEMA 1 enclosure for indoors, NEMA 3R enclosure for outdoors.
- B. Heavy duty disc. Provide heavy duty disconnect switches where shown or as required by NEC. All safety switches shall be of the heavy duty type, 600A rated with number of poles and amperage rating as required. Provide NEMA 3R switches for those located outside. Fused switches shall have properly sized fuses for equipment being served.

#### 2.7 SUPPORTING DEVICES

- A. Hangers: Kindorf B-905-2A channel, H-119-D washer, C105 strap, 3/8-inch rod with ceiling flange.
- B. Pipe Straps: Two-hole galvanized or malleable iron.

#### 2.8 ELECTRICAL IDENTIFICATION

- A. Engraved Labels: Determine plastic laminate, white with black core, 1/16-inch thick, manufactured by Lamicoid. Engravers standard letter style, minimum 3/16-inch high letters. Drill or punch labels for mechanical fastening except where adhesive mounting is necessary because of substrate. Use self tapping stainless steel screws.
- B. Conductor Numbers: Manufacturers standard vinyl-cloth self-adhesive cable and conductor markers of the wraparound type.
- C. Branch Circuit Schedules: Provide branch circuit identification schedules, typewritten, clearly filed out, to identify load connected to each circuit and location of load.
- D. Distribution Panelboards: Breaker matching Plug-in type; AFCI per NEC 210.12 where shown.

#### 2.9 GROUNDING MATERIALS

- A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors. Mechanical type of connectors are not acceptable. Manufacturers: Burndy Hyground Compression System, Erco/Codweld, Amp Ampack Grounding System or approved.
- B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.
- C. Telecommunications Grounding Bar: 1/4-inch thick by 4-inch high by 20-inch long copper ground bar with insulators.

#### 2.10 SWITCHBOARD AND DISTRIBUTION PANELBOARD CONSTRUCTION

- A. Manufacturers: Cutler-Hammer or approved.
- B. Standards: Comply with requirements of UL 891, NEMA PB2 and NEC 384 in construction of switchboards. Provide short circuit current rating (Integrated Equipment Rating, IER) for panelboards.
- C. Distribution Panelboards:
  1. Enclosure: Flush panelboards rated 600 amp or less provide maximum enclosure depth of 6 inches. Provide galvanized metal finish.
  2. Bussing: Copper bar with suitable electroplating (tin) for corrosion control at connection. Provide ground bar to accommodate specified terminal lugs.
  3. Provide fully rated integrated equipment rating greater than the available fault current. See drawings for available fault current, if drawings do not have the available fault currents then coordinate with serving electric utility.
  4. Breakers: Bolt-on type.
  5. Cover: Hinged door, flush lift latch and lock, two keys per panel. Key branch circuit panelboards alike, medium light gray finish suitable for field painting to match wall finish.
  6. Equipment: All panelboards to be installed will be manufactured by Cutler-Hammer. All panelboards greater than 600A will be series Pow-Line 4 or approved equal. All other panelboards will be series Pow-Line 3a or approved equal.
- D. Switchgear: All switchgear to be installed will be Cutler-Hammer, series Pow-R-Line C or approved equal.

#### 2.11 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers: One, two or three-pole bolt on, single handle common trip, rated 15 to 800 amp, as indicated on Drawings. Overcenter toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position. Calibrate for operation in 40C ambient temperature.

#### 2.12 LED LIGHT FIXTURES

- A. General:
  1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
  2. LED light fixtures shall include reduction of hazardous substances (RoHS) - compliant.
  3. LED drivers shall include the following features unless otherwise indicated:
    - a. Minimum Efficiency: 85% AT FULL LOAD.
    - b. Minimum Operating Ambient Temperature: -20' C. (-4' F.)
    - c. Input Voltage: 120-277V ( $\pm 10\%$ ) AT 60 HZ.
    - d. Integral Short Circuit, Open Circuit, and Overload Protection.
    - e. Power Factor:  $\geq 0.95$ .
    - f. Total Harmonic Distortion:  $\leq 20\%$ .
    - g. Comply with FCC 47 CFR Part 15.
  4. LED modules shall include the following features unless otherwise indicated:
    - a. Comply with IES LM-79 and LM-80 requirements.
    - b. Minimum CRI80 and color temperature 3000K unless otherwise specified in lighting fixture schedule.
    - c. Minimum Rated Life: 50,000 hours per IES L70.
    - d. Light output lumens as indicated in the lighting fixture schedule.
- B. LED Downlights:
  1. Housing, LED Driver, AND LED Module shall be products of the same manufacturer.
- C. LED Troffers:
  1. LED Drivers, Modules, and Reflector shall be acceptable, serviceable, and replaceable from below the ceiling.
  2. Housing, LED Driver, and LED Module shall be products of the same manufacturer.

### PART 3-EXECUTION

#### 3.1 EXAMINATION

- A. Drawings are diagrammatic with symbols representing electrical equipment, outlets, luminaires, and wiring. Examine the entire set of Drawings to avoid conflicts with the other systems. Determine exact route and installation of electrical wiring and equipment with conditions of construction.
- B. Clarification:
  1. The Drawings govern in matters of quantity, the Specification in matters of quality. In event of conflict on Drawings or in the Specifications, the greater quantity and the higher quality apply.
  2. Should the Electrical Documents indicate a condition conflicting with the governing codes and regulations, refrain from installing that portion of the work until clarified by Architect.

#### 3.2 MOTORS/APPLIANCE/UTILIZATION BRANCH CIRCUIT WIRING

- A. Electrical Connections: Connect equipment, whether furnished by Owner or other Divisions of the Contract, electrically complete.
- B. Connect motor branch circuits complete from panel to motor as required by code and manner herein described.
- C. Appliance/Utilization Equipment: Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering devices and coverplates.

#### 3.3 INSTALLATION

- A. Install electrical equipment complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of the electrical equipment, examine the instructions thoroughly.
- B. Noise Control: Do not place outlet boxes at opposite side of partitions or walls back to back. Do not place contactors, transformers, starters or similar noise producing devices on walls which are common to occupied spaces unless specifically called for on Drawings. Where such devices must be mounted on walls common to occupied spaces, mount or isolate in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
- C. Firestopping: Coordinate with the Drawings the location of fire rated walls, ceilings, floors and the like. When these assemblies are penetrated by electrical equipment, seal around the equipment with approved firestopping material. Install firestopping material complete as directed the manufacturer's installation instructions.
- D. Conduit:
  1. Conceal conduits. Epiused conduits are permitted only in the following areas: Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished materials. Existing walls that are concrete or block construction and where specifically noted on the Drawings.
  2. Do not install conduits on surface of building exterior, across roof, on top of parapet walls, or across floors.
  3. Below Grade Conduit and Cables: Place a minimum 3-inch cover of sand or clean earth fill around the cable or conduit on a leveled trench bottom. Lay conduit on a smooth level trench bottom, so that contact is made for its entire length. Remove water from trench before electrical conduit is installed.
  4. Conduit Terminations: Provide conduits shown on Drawings which terminate without box, panel, cabinet or conduit fitting with conduit connector or bushing.
  5. Conduit Size: Minimum trade size 1/2-inch.
  6. Provide pull cord in empty conduits.

#### 7. Conduit Use Locations:

- a. Underground: PVC.
- b. Cast-in-Place Concrete, Masonry, Damp Locations and Subject to Mechanical Damage: GRC or IMC.
- c. Dry, Protected: GRC, IMC, EMT.
- d. Sharp Bends and Elbows: GRC, EMT use factory elbows.
- e. Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.
- f. Motors and equipment connections subject to movement or vibration and subjected to the following conditions; exterior location, moist or humid atmosphere, water spray, oil or grease use PVC coated light tight flexible metallic conduit.
- g. The cable to be installed vertically in wall from j-box up to accessible building void space unless other wise noted.
- 8. Branch Circuits: Do not change the intent of the branch circuits or controls without approval. Homeruns for 20 amp branch circuits may be combined to a maximum of six conductors in a homerun. Apply derating factors as required by NEC 310. Increase conductor size as needed.

#### E. Wires and Cables:

- 1. Conductor Installation: Install conductors with care to avoid damage to insulation. Do not apply greater tension on conductors than recommended by manufacturer during installation.
- 2. Conductor Size and Quantity: Install no conductors smaller than 12AWG unless otherwise shown. Provide required conductors for a fully operable system.
- 3. MC Cable Allowed in the Following Locations Only: In areas where there is an accessible ceiling. Do not use in areas where there is no accessible ceiling.

#### F. Boxes:

- 1. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- 2. Provide weatherproof outlets for locations exposed to weather or moisture.
- 3. Code Compliance: Comply with NEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to NEC 370, except as noted otherwise.
- 4. Mount Center of Outlet Boxes as Required by Americans With Disabilities Act (ADA), or Noted on Drawings, the Following Distance above the Floor:
  - a. Control Switches: 48-inches.
  - b. Receptacles: 18-inches.
  - c. Telecom Outlets: 18-inches.
  - d. Other Outlets: As indicated in other Sections of Specifications or as detailed on Drawings.
- G. Provide NEC-required disconnect switches whether specifically shown on Drawings or not. Provide disconnect switch at each motor location within 6-feet unless otherwise noted. Coordinate fuse ampere rating with installed equipment. Fuse ampere rating variance between original design information and installed equipment, size in accordance with Busmann Fusetron 40C recommendations.

#### H. Supporting Devices:

- 1. Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with Seismic Zone 3 requirements.
- 2. Provide vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.

#### I. Electrical Identification:

- 1. Conductor Identification: Apply markers on each conductor for power, control, signaling and communications circuits.
- 2. LED light fixtures shall include reduction of hazardous substances (RoHS) - compliant.
- 3. Labels: Disconnect switches, relays, contactors, time switches, override switches, service disconnects, distribution switches, branch circuit panelboards, and central or master unit of each electrical system including communication/signaling systems.

#### J. Service and Distribution: New 120/240V 1-phase service fed from existing 25KVA pole mounted transformer. See 5/ED.1 circuit diagram for service load information. See sheet E1.1 for location.

#### K. Grounding:

- 1. Performance Requirements: Supplement the grounded neutral of the secondary distribution system with an equipment grounding system to properly safeguard the equipment and personnel. Install equipment grounding such that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide a low impedance path for possible ground fault currents.
- 2. Raceway Grounding: Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger grounding conductor is included with circuit, use grounding bushing with log-in lug. Install ground bushings on metallic raceway terminations in pull boxes, panelboards and the like for circuits with overcurrent protection set at 60 amp and greater.
- 3. Install equipment grounding conductor, code size minimum in nonmetallic and metallic raceway systems.
- 4. Motors, Equipment and Appliances: Install code size equipment grounding conductor from outlet box to (motor) equipment frame or manufacturer's designated ground terminal.
  1. LED Drivers, Modules, and Reflector shall be products of the same manufacturer.
- 5. Receptacles: Connect ground terminal of receptacle to equipment ground system by No. 14 conductor bolted to outlet box. Self grounding nature of receptacle devices does not eliminate conductor bolted to outlet box.

#### L. Control Devices:

- 1. Install time switches and other automatic control devices in accessible locations near the source of power or grouped at a common location in mechanical rooms or similar spaces.
- 2. Install photoelectric control devices at such locations as necessary to be most effective. Avoid locating photoelectric devices in or at locations where they can be influenced by other than natural light or under eaves. Verify location of equipment with Architect.

#### M. Lighting:

- 1. Install luminaire of types indicated where shown and at indicated heights; in accordance with manufacturer's written instructions and with recognized industry practices.
- 2. Avoid interference with and provide clearance for equipment. Where the indicated locations for the luminaires conflict with the locations for equipment, change the locations for the luminaires as directed by Architect.
- 3. Suspended Luminaires: Mounting heights indicate the clearances between the bottom of the luminaire and the finished floors.
- 4. Support Luminaires: Anchor supports to the structural slab or to structural members within a partition, or above a suspended ceiling.
- 5. Provide lighting indicated on Drawings with a luminaire of the type designated and appropriate for the location. Where outlet symbols appear on Drawings without a type designation provide a luminaire the same as those used in similar or like locations.

#### 3.4 FIELD QUALITY CONTROL

- A. Tests: Conduct tests of equipment and systems to demonstrate compliance with requirements specified in Division 26. Refer to individual Specification Sections for required tests. Document tests and include in Closeout Documents.
- B. Verify electrical characteristics of equipment prior to installation of conduits and wiring for equipment.
- C. Coordinate HVAC voltage requirements with Drawings and equipment submittals prior to rough in.
- D. Wiring Device Tests: Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct defective wiring.
- E. Verification of Conditions: Verify ceiling construction, recessing depth and other construction details prior to release of luminaire for alignment.
- F. Test each GFCI receptacle and each AFCI circuit breaker.

#### 3.5 CLEANING

- A. Remove dirt and debris caused by the execution of the electrical work. Leave the entire electrical system installed in clean, dust-free and proper working order.
- B. Thoroughly clean the exterior and the interior of each switchboard and distribution panelboard in accordance with manufacturer's installation instructions.
- C. Where finish of luminaires or enclosures is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.
- D. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.

#### END OF SECTION

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LAND USE SUBMITTAL

REVISIONS  
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SCALE AS NOTED  
DRAWN BY R&W  
DATE 06.20.23  
PROJECT NO. 2239

ELECTRICAL SPECIFICATIONS

**E3.1**

