

SECTION 260010
ELECTRICAL GENERAL

1.0 GENERAL

1.01 SCOPE

A. Division 26 includes all Specifications in the 260000 series and the accompanying Electrical Drawings. Provide all labor, materials and equipment, and all necessary operations to provide the complete scope of the electrical systems intended under this Division. Division 26 is not a stand-alone document, but a part of the complete Project Documents.

B. Attention is called to the fact that there are many interfaces between the work required in this Division and the work required in other Divisions. Provide the necessary interface and coordination with other Divisions to provide a complete project.

1.02 EXISTING CONDITIONS

A. Attention is called to the fact that the work is to be performed within an existing, operational facility. Prior to the submission of bids, each bidder shall visit the project site, thoroughly investigate and be familiar with all existing conditions, which will affect their work, especially the work to be performed above the existing ceilings.

B. When this project is finished, the work under this Division shall be complete in every respect, completely integrated with all the existing systems, and left in perfect operating condition. The electrical service to the building shall not be interrupted at any time without written coordination of the building's Owner. All existing electrical equipment removed during the project shall be removed from the site after inspection of the building's Owner. All existing electrical systems required to be operating at the project's completion or required to remain in use during the project shall be reconnected, replaced, rerouted or otherwise made to fit with proper workmanship techniques and left in safe working order.

C. Connect new work to existing work in a neat and workmanlike manner. Where an existing structure must be cut or existing utilities interfere, such obstructions shall be bypassed, removed, replaced or relocated, patched and repaired. Work disturbed or damaged shall be replaced or repaired to its prior condition.

1.03 CODES AND REGULATIONS

A. All work under this Division shall comply with all local building codes, laws, regulations, ordinances and the requirements of the 2023 National Electrical Code.

B. Where conflicts of installation requirements occur between the aforementioned codes, regulations or the Contract Documents, the most restrictive shall govern.

C. Obtain all permits and licenses and pay all fees required by local authorities. Arrange for all necessary inspections required by the authorities having jurisdiction and provide written certificates of approval to the project Owner or his designated representative.

1.04 DEFINITIONS

A. Contract Documents: The complete set of project Drawings and Specifications.

B. Provide: Furnish, install and connect.

C. Work: All materials installed, including all labor to provide complete system.

D. Wiring or Wired: All wire or cable installed in conduit from panelboard to equipment and connected at both ends with all required boxes, connectors, couplings, etc.

E. Conduit: Rigid steel conduit intermediate metal conduit (I.M.C.), electrical metallic tubing (EMT) plastic conduit (PVC), or flexible steel conduit.

1.05 DRAWINGS AND SPECIFICATIONS

A. The Drawings and Specifications together are to be considered as the Contract Documents. Any work shown in one and not shown in the other, or implied by either, shall be provided to give a complete project.

B. Should any conflicts exist between the Drawings and Specifications or there is an item shown/called for which is not clearly defined, immediately submit a request for clarification. No additional monies will be granted later when a conflict is resolved or an item is more clearly defined.

C. The Drawings are schematic and are not intended to show the exact location outlets, etc. or the routing of conduit.

D. The exact location of equipment requiring electrical connections (mechanical equipment, elevators, lights, etc.) shall be as located by other Divisions of the Contract Documents. Refer to the Architectural, Structural and Mechanical Documents for dimensions and details of building construction and provide work described in this Division so that it conforms to the details of the project. The right is reserved to relocate any receptacle, switch or other outlet a maximum of 10'-0" before it is permanently installed without incurring additions to the Contract amount.

1.06 SITE VISIT

A. Visit the site and become familiar with all aspects of the site and existing conditions before submitting Contract price.

B. No allowance will be made for lack of knowledge of existing conditions.

1.07 DEVIATIONS

A. No deviations from the Contract Documents shall be made without the full knowledge and written consent of the Architect.

B. If the existing conditions make it desirable to modify the Contract Documents in regard to any item, provide a written request to the Architect.

2.0 PRODUCTS

2.01 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. All materials used shall be new and shall be stamped with the label of Underwriters Laboratories, Inc. (UL).

B. All materials shall meet the standards of the following associations and institutes where applicable:

- National Fire Protection Association (NFPA)
- American Society of Testing Materials (ASTM)
- American National Standards Institute (ANSI)
- National Electrical Manufacturer's Association (NEMA)
- Institute of Electrical and Electronic Engineers (IEEE)

C. Manufacturers names and catalog numbers specified herein are intended to describe the material and set the standard of quality. All bids shall be based on material specified. Requests for approval of material not specified shall be considered if the request is in written form and submitted to the Architect no later than fourteen (14) days before bid date. All requests shall conform with the provisions of the general and supplementary conditions.

D. Samples of materials requested to be substituted shall be furnished upon the request of the Architect.

2.02 SHOP DRAWINGS AND SUBMITTAL

A. The Engineer's review of shop drawings or submittals is a cursory review to check for general compliances of submittals with the design intent of the Contract Documents. The Engineer's review does not relieve the Contractor of his responsibility of complying with the Contract Documents. All coordination of the work in strict compliance with the Contract Documents is the sole responsibility of the Contractor.

B. The following items shall be submitted for review:

1. Conduit and wire

2. Devices

3. Coverplates

4. Panelboards

5. Fuses

6. Overcurrent devices

7. Disconnect switches

8. Lighting fixtures

9. Lighting control system

10. Dimming system

11. Life safety system

12. Motor starters

C. All shop drawings and submittals shall be submitted in compliance with the requirements of the general and supplementary conditions. All submittals are to be received electronically in .pdf format only.

D. All submittals shall bear the name of the manufacturer to be used, along with all associated options and specific input/output requirements clearly marked.

E. All shop drawings and submittals shall include a stamped indication signifying that the submittal has been reviewed for compliance with the Contract Documents by the Contractor. This stamped indication also represents the fact that the Contractor has checked this submittal for its interaction with all other Divisions and certifies by his signature or initials that all coordination has taken place. The stamp shall include the date, name of the Contracting Firm, the signature of the Contractor, certification of compliance and approval. This stamp shall be on the submittal before the Engineer will review it.

F. The engineer will review an individual submittal not more than twice. If the submittal is rejected again on the second review, the contractor will bear all responsibility for paying for the engineer's time for additional reviews. Such payments to the engineer shall be withheld from the next monthly pay application.

2.03 RECORD (AS-BUILT) DRAWINGS AND MAINTENANCE MANUALS

A. At job completion, submit to the Architect, an electronic set of the latest plans, in .pdf format, showing all deviations from the Contract Documents. The Drawings shall also have dimensions locating all underground conduits.

B. At job completion, submit to the Architect, three (3) hardcopy sets of maintenance and instruction manuals for all equipment furnished on the project. Also provide an electronic copy in .pdf format. Coordinate file delivery method with the architect.

3.0 EXECUTION

3.01 COORDINATION

A. Coordinate all space requirements with all other Divisions before installing any work. Install work such that adequate space will be allotted for all other work from other Divisions to be installed and also will allow room for future access for repair and maintenance.

B. Any work installed without proper coordination shall be relocated at the Architect's direction without increasing the Contract price.

C. During the bidding process or the pricing for a guaranteed maximum price, coordinate with all other Divisions for the total amount of work required in Division 26. Any work shown or implied in another Division requiring work in Division 26 shall be included in the Contract price regardless of whether or not it is addressed in Division 26.

3.02 PROTECTION OF MATERIALS

A. All equipment shall have the original finish when the building is turned over to the Owner.

B. Protect equipment during construction from dirt, water, chemical or mechanical damage, etc. Protect all conduit openings so that no foreign material will enter the conduit.

3.03 TESTS, DEMONSTRATION AND INSTRUCTIONS

A. Functional Testing:

- Test all systems described in this Division in the presence of the Owner or a designated representative upon completion of the work. Demonstrate that the installation is in accordance with Contract Documents.
- For all new lighting and lighting control systems within the Contract Documents, the contractor shall obtain the services of a licensed professional engineer (registered to the state this project is within) to perform system commissioning in compliance with local energy conservation codes. The contractor shall demonstrate in the presence of the commissioning agent that the installation of such systems are in accordance with the Contract Documents.

B. Any work found not to be in compliance with the Contract Documents shall be repaired or replaced without incurring any additions to the Contract price.

C. Provide to the Owner and System Commissioning Agent, all instruction on maintenance and operation of all systems and equipment provided under this Division. Provide all necessary tools and personnel to thoroughly present these instructions. The documentation shall include the following, at minimum:

- Submittal data indicating all selected options.
- Operation and maintenance manual for all equipment and systems. Include routine maintenance actions and cleaning procedures.
- A schedule for inspecting and recalibrating, where applicable.
- A narrative of how each system is intended to operate, including any recommended set points where adjustment is available.

D. At project completion, prior to obtaining Certificate of Occupancy, present at final inspection to the jurisdiction's AHJ a signed and dated statement of system commissioning for all lighting and lighting control systems. The format of the statement of system commissioning shall be in the form required by the state's energy conservation codes and/or AHJ requirements. The document shall be signed by the contractor's licensed professional engineer representative.

3.04 GUARANTEE

A. All systems, equipment, components, work, etc. provided under this Division shall be covered by a one year guarantee starting at the time of final acceptance of the work by the Owner. Any defects in the work, systems, equipment or components found during this year shall be corrected at no charge. The guarantee shall include providing all necessary cutting, patchwork, repainting, etc. to make the work complete and new.

B. Present this guarantee and any additional warranties or guarantees on furnished equipment or systems to the Architect. All equipment or system guarantees are in addition to the general guarantee.

END OF SECTION

SECTION 261000
ELECTRICAL BASIC MATERIALS & METHODS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section shall comply with the provisions of Section 260010.

B. This Section describes the basic electrical materials and installation methods that are acceptable and applicable to Division 26.

2.0 PRODUCTS

2.01 CONDUIT

A. Galvanized rigid steel conduit shall be low carbon, hot-dipped galvanized both inside and out with threaded joints.

B. Intermediate metal conduit (IMC) shall be steel, galvanized both inside and out with threaded joints.

C. Electrical metallic tubing (EMT) shall be steel, galvanized both inside and out.

D. Plastic conduit (PVC) shall be schedule 40 PVC heavy wall type. A grounding conductor shall be provided.

E. Flexible metal conduit shall be flexible steel conduit tubing and shall meet Underwriters Laboratories Standard for Flexible Steel Conduit.

F. Liquid-tight flexible metal conduit and liquid-tight non-metallic conduits shall be liquid-tight and sunlight resistant.

G. Steel conduit approved manufacturers are Allied, Triangle and Republic.

H. PVC conduit approved manufacturers are Carlon and Triangle.

2.02 CONDUIT FITTINGS

A. Rigid conduit and IMC conduit fittings shall be zinc-coated, ferrous metal and taper threaded type.

B. EMT fittings shall be zinc-coated metal and hexnut compression or set-screw type. EMT connectors shall have insulated throats.

C. PVC fittings, elbows and cement shall be produced by the same manufacturer. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

D. Conduit connections to switchboards, motor control centers, transformers, panel cabinets, and pull boxes shall have grounding wedge lugs between the bushing and the box or locknuts designed to bite into the metal.

E. Each conduit end shall be provided with either an insulated throat connector or separate locknut and insulated bushing. Bushing shall be installed before any wire is pulled.

F. Conduit fittings approved manufacturers are Raco, Steel City, O.Z. Gedney, Thomas & Betts and Appleton.

G. Expansion fittings shall be provided in all conduit which crosses and expansion joint.

2.03 CONDUCTORS

A. Conductors shall be copper of 98% conductivity, 600 volt insulation. Sizes specified are AWG gauge for No. 4/0 and smaller and circular mils (MCM) for all sizes larger than no. 4/0. Conductors No. 10 and smaller shall be solid and type "THHN" or "THWN" insulation. No. 8 and larger shall be stranded and type "THW" or "XHHW" insulation.

2.04 OUTLETS

A. Outlet boxes and covers shall be of such form and dimensions as to be adapted to their specified usage, locations, size and quantity of conduit, and size and quantity of conductors entering the boxes. In special "Fire Rated" partitions, outlets shall comply with ASTM No. E119.

B. Flush ceiling outlets for surface or pendant mounted lighting fixtures shall be one-piece 4" square or octagonal pressed steel boxes. Boxes for devices in unfinished masonry walls or stud walls shall be pressed steel, square corner, sectional switch boxes, or shall be 4" square box with a square cornered tile wall cover, set flush with masonry construction. Boxes in concrete ceiling slab shall be octagonal, shallow concrete boxes. Welded boxes are not acceptable.

C. All outlet boxes in plaster or masonry walls or ceiling shall be provided with plaster rings.

D. Junction boxes and all outlets not indicated as containing wiring devices or lighting fixtures shall have covers. Covers for outlets in walls shall be as specified for wall switches and receptacles.

E. Outlet boxes exposed to the weather and outlet boxes for vaportight lighting fixtures and devices shall be of cast iron corrosion resistant type.

F. Outlet box approved manufacturers are Appleton, Raco, Steel City or Crouse-Hinds.

2.05 DISCONNECT SWITCHES

A. Disconnect switches shall be "heavy-duty" type, enclosed switches of quick-make, quick-break construction. Switches shall be horsepower rated for 600 volts AC as required. Lugs shall be UL listed for copper and aluminum.

B. Padlocking provisions shall be provided for padlocking in the OFF position.

C. Switches shall be furnished in NEMA 1 General purpose enclosure unless noted otherwise. Switches located on the exterior of the building or in "wet" locations shall have NEMA 3R enclosures.

D. Fused disconnect switches shall have rejection type fuse clips with dual element, current limiting fuses of rating shown.

E. Disconnect switches shall be mounted to structure. Disconnect switches shall not be mounted to mechanical equipment or ductwork.

2.06 NAMEPLATES

A. Nameplates shall have 3/8" high engraved letters.

B. 120 or 208 volts: white core laminated bakelite with black finish.

C. 277 or 480 or higher volts: white core laminated bakelite with red finish.

D. Nameplate shall indicate the panel name and the name of the device or equipment where the power supply/feeder originates.

2.07 WALL SWITCHES

A. Wall switches shall be plastic, totally enclosed, quiet type, self-grounding, 277 volts and 20A rating and shall match existing if possible and equal the following:
Single Pole: Hubbell No. CS1221, or equal by Leviton, P&S or Cooper.
Double Pole: Hubbell No. CS1222, or equal by Leviton, P&S or Cooper.
Three-Way: Hubbell No. CS1223, or equal by Leviton, P&S or Cooper.
Four-Way: Hubbell No. CS1224, or equal by Leviton, P&S or Cooper.

B. Color shall be as selected by architect.

C. Flush motor switches with red pilot light and with overload protection for fractional horsepower motors shall be Hubbell No. HBL1221PL.

D. Key switches shall be Hubbell No. HBL1221L 20A Series or approved equal by P&S or Leviton.

2.08 WALL MOUNTED OCCUPANCY SWITCHES

A. The passive infrared sensor shall be a completely self-contained control system that replaces a standard toggle switch. Sensor shall have ground wire for safety. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent and inductive loads. Triac and other harmonic generating devices shall not be allowed.

B. Sensor shall cover up to 1000 sq. ft. for walking motion, with a field of view of 180 degrees.

C. Sensor shall have system which provides superior 180 degree coverage.

D. Sensor shall operate at 120 VAC or 277 VAC.

E. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 500 watt incandescent; 0 to 800 watts fluorescent or 1/6 hp @ 120 VAC, 60 Hz; and 0 to 1200 watts fluorescent or 1/3 hp @ 277 VAC, 60 Hz.

F. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay adjustable from 15 seconds to 30 minutes.

G. Sensor shall have standard 5 year warranty and shall be UL and CUL listed.

H. Sensor shall be Wattstopper W1 Series, Leviton Decora Series or approved equal by engineer.

2.09 RECEPTACLES

A. Duplex receptacles shall be plastic, two-pole, three wire, self-grounding, side wired, 125 volts and 15A rating and shall match existing if possible and be equal to the following:
Duplex receptacles shall be Hubbell No. CR5262 Series, or equal by Leviton, P&S or Cooper. Isolated ground type shall be Hubbell No. CR5252IG Series, or equal by Leviton, P&S or Cooper.

B. Single receptacles shall be two-pole, three wire, self-grounding, side wired, 125 volts and 20A rating and shall be equal to the following: Single receptacles shall be Hubbell No. HBL5361 Series, or equal by Leviton, P&S or Cooper. Isolated ground type to be Hubbell No. IG-5361 Series, or equal by Leviton, P&S or Cooper.

C. Ground fault circuit interrupt (GFI) receptacles shall be Hubbell GFR5352, or equal by P&S, Leviton or Cooper.

D. Color shall be as selected by the Architect.

2.10 COVERPLATES

A. Coverplates for flush mounted devices shall be standard size (color or finish to be selected by the architect), Hubbell "P" Series or equal by Leviton, P&S or Cooper.

B. Telephone outlet coverplates shall have same finish as above and have a bushed hole in the center.

C. Coverplates for exterior devices shall be self-closing, die cast aluminum Hubbell WP8M or equal by Leviton, P&S or Cooper.

2.11 PLYWOOD BACKBOARDS

A. Provide plywood backboards where shown. Backboards shall be minimum 3/4" thick and sized as shown or to accommodate equipment indicated to be mounted thereon.

B. Secure plywood to the building structure and paint with two coats of gray stain.

2.12 SMOKE AND FIRE STOP FITTINGS

A. Smoke and Fire Stop Fittings shall be UL listed for that purpose. The fittings used to seal conduit either on the outside of the conduit, busway or cable or internally shall have heat activated intumescent material, which expands to fill all voids. Smoke and fire stop fittings shall be O.Z./Gedney "FIRE-SEAL" or Dow Corning Silicone RTV foam with an hourly fire-rating equal to or higher than the rating of the floor, ceiling or wall through which the cable or conduit passes. The seals for conduit shall be of the flanged type.

2.13 FUSES

A. Provide all fuses. All fuses shall be of the same manufacturer. All fuses shall be of the high interrupting rating (200,000 Amps), current limiting type and manufactured by Busmann. Fuses shall be provided for each fuse outlet and the specified quantity of fuses shall be furnished for spares.

B. Circuits 0 to 600 ampere shall be protected by rejection type, current limiting BUSSMANN LOWPEAK Dual Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK-1.

C. Circuits 601 to 6000 ampere shall be protected by current limiting BUSSMANN HI-CAP Time-Delay Fuses KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. The terminals shall be opened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in 0.1 seconds or less and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

D. Furnish and turn over to the Owner a minimum of one (1) set of spare fuses (set consisting of three fuses) for each type and rating of fuse used. When the number of fuse sets of the same type and rating actually installed exceeds five (5) sets, furnish an additional spare set of fuses for each five (5) or fraction thereof.

E. Provide a cabinet in which to store all spare fuses, Busman Catalog No. SFC

F. Acceptable manufacturers are Busman or equal by Littelfuse.

3.0 EXECUTION

3.01 CONDUIT

A. Rigid steel (or IMC) shall be used for service entrance and all feeders and branch circuits where exposed to damage.

B. EMT shall be used for branch circuits, fire alarm and telephone when not underground or in concrete in contact with the earth.

C. Schedule 40 PVC may be used for all underground feeders, service entrance conductors when encased in 4" of concrete on all sides, or under the lowest floor slab.

D. Conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box and pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each system will be electrically continuous from service to all outlets such that a good ground is provided. All conduit from cabinets and junction boxes shall terminate in approved outlet boxes or conduit fittings. Conduit connections to any box which has no threaded hub shall be double locknutted.

E. Provide junction boxes or pull boxes where shown and where necessary to avoid excessive runs or too many bends between outlets. The conduit sizes shown may increase if desired to facilitate the pulling of cables.

F. All conduit shall be concealed unless indicated otherwise. Install exposed conduit parallel with or at right angles to the building walls and support from walls or ceilings at intervals required by Code with approved galvanized iron clamps or hangers. Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures, service entrance conductors when encased in 4" of concrete on all sides, or under the lowest floor slab.

G. Minimum size conduit for branch circuits shall not be smaller than 1/2". Home runs shall extend from outlets shown to panel designated. Home runs shown shall not be combined. Home run conduit shall not be smaller than 3/4".

H. At couplings, conduit ends shall be threaded so that they meet in the coupling. Right and left hand couplings shall not be used; conduit couplings of the Erikson Type shall be used at locations requiring such joints.

I. All conduit for future use, for telephone wire, or for data

communication cable, shall be left with No. 16 gauge wire pulled in them or a pull line as manufactured by Ideal, and the ends securely corked or capped.

J. Expansion fittings shall be installed in all conduit which pass through the cross-sectional area of expansion joints.

K. Provide non-hardening elastic type duct seal compound, Neer No. DC., 3M Co. "Scotchfil", or Gardner Bender duct seal, for each conduit entering the building from outside and for each conduit passing from one space into another which is normally at a lower temperature.

L. Provide watertight conduit hubs on conduit terminating in a box or cabinet exposed to the weather.

M. Space in sleeves or around conduit that pass through fire resistive or fire rated walls, partitions, floors or ceilings shall be closed by packing with an unlabeled fire resistive material that will maintain the rating of the barrier penetrated.

N. Space in sleeves or around conduit that pass through fire resistive or fire rated walls, partitions, floors or ceilings shall be closed by packing with an unlabeled fire resistive material that will maintain the rating of the barrier penetrated.

3.02 FLEXIBLE CONDUIT

A. PVC extruded cover flexible conduit shall be used in making short flexible connections to rotating or vibrating machinery or equipment. The flexible conduit at these locations shall be as short as possible, but shall have a minimum length of 12".

B. A green stranded bonding jumper shall be installed outside of a flexible conduit that extends directly from a non-flex conduit to a rotating or vibrating machine. Where a junction box is used, the green stranded bonding jumper shall be installed inside the flexible conduit and attached to the junction box and to the machine. When the bonding jumper is installed outside of the flexible conduit, plastic wire straps shall be used 6" o.c. to secure the jumper to the flexible conduit.

C. Flexible metal (MC) conduit system may be utilized where concealed in walls and/or millwork only. MC Cable shall run from point of exit from wall or millwork to nearest structurally support junction box. MC cable will not be permitted to be installed in the above ceiling space and shall not pass through a fire rated partition. Conductor colors of the MC cable shall comply with 261000.3.03 D.

1. MC cable shall be constructed to have an insulated, copper ground conductor. Sheathing with a bare aluminum conductor shall not be used as the ground.

3.03 WIRING

A. All conductors shall be installed in conduit. No conductors shall be pulled into the conduit until the conduit system is complete and plaster had dried. Wire pulling lubricants shall be Gardner-Bender "Wireaide" or Ideal "Yellow 77".

B. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with pressure type connectors, Gardner Bender "Winggard" or Ideal "Wingnut". Tape shall be "Scotch" No. 33 for indoor and No. 88 for outdoor or Gardner Bender No. 95-661. Where connection is made to any terminals of more than 30 amperes capacity and where conductors larger than No. 10 are connected to any terminal, copper terminal lugs shall be bolted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used. Aluminum conductors, if used for service conductors, shall be made with high compression lugs as manufactured by Square D, Ideal or MAC.

C. Each conduit shall have a minimum of two (2) conductors pulled in unless that particular conduit is noted as being for systems other than electrical circuitry and/or future use or unless noted otherwise.

D. Conductors for lighting and receptacle circuits shall have color coded jackets. The wiring shall be color coded with the same color used with its respective phase through the entire job as follows:

208/120 Volt System	480/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - Gray
Ground - Green	Ground - Green

E. The feeder and service entrance conductors shall be color coded by the use of colored plastic tape applied within 6" of each conductor end.

F. Branch circuit conductors shall not be smaller than No. 12 and where the home run from center of load exceeds 100'-0", the conductors from home run outlet to panel shall be No. 10 minimum.

G. For branch circuits terminating in outlet without device, leave minimum of 12" of slack wire coiled for connection of equipment. All conductors shall be identified with proper circuit numbers at terminals, junction boxes at panelboards within 6" of conductor ends.

A. Provide galvanized steel or cast type boxes for all outlets.

B. Where outlet boxes are used to support lighting fixtures, the outlet box shall be anchored to the structural members of the building per NEC 314.27.

C. Outlet boxes shall be flush mounted unless they are specifically shown as being used with exposed conduit or are located above a ceiling.

D. Where outlets are supplied from conduit run in or below floor slabs, the conduit shall be stubbed up at the location shown and the wall built up around the conduit.

E. Cuts for outlet boxes in masonry walls shall be made so that the coverplate will completely cover the cut. The mounting height of switch, receptacle and other outlets may be varied slightly, with the Architect's approval, so that the outlet box, top or bottom, will occur at a masonry joint.

F. The edge of all outlet boxes shall be flush with the surface in which they are recessed. The devices that fit into the outlet boxes shall be screwed tight before the coverplate is installed and the coverplate shall not be used as a means of tightening the devices in place.

G. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted one directly over the other, on the centerline of the group.

3.05 NAMEPLATES

A. Provide specified nameplates on the main switchboard, distribution panels, feeder switches, feeder breakers, panelboards motor control centers, disconnect switches, contactors, starters, transformers, start-stop push buttons and motor switches.

B. Provide nameplates on every device in the main switchboard, distribution panels and motor control centers.

C. Nameplates for surface mounted equipment shall be installed on the exterior of equipment with sheetmetal screws. Nameplates for flush or recessed mounted equipment shall be installed on the inside of the panel door or cover with epoxy cement.

3.06 WALL SWITCHES AND RECEPTACLES

A. Where more than one device is indicated at a location, the devices shall be gang-mounted in combined multi-gang boxes and covered jointly by a common coverplate. Provide barriers as required by the devices and voltages being used.

3.07 COVERPLATES

A. All junction boxes, outlet boxes, multi-gang switch boxes, utility boxes, etc., shall be covered with a coverplate. The coverplate

shall be installed in accordance with the manufacturer's instructions and shall be secured to the wall or structure with screws or bolts. The coverplate shall be secured to the wall or structure with screws or bolts. The coverplate shall be secured to the wall or structure with screws or bolts.

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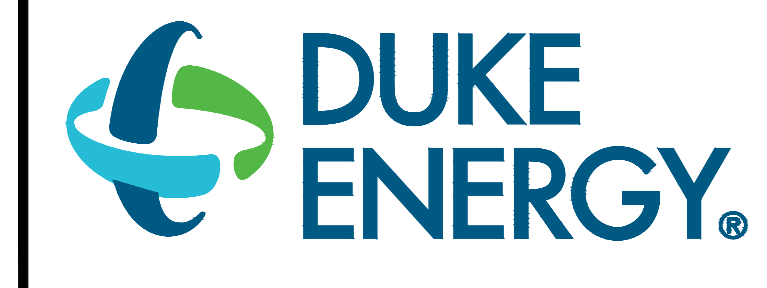
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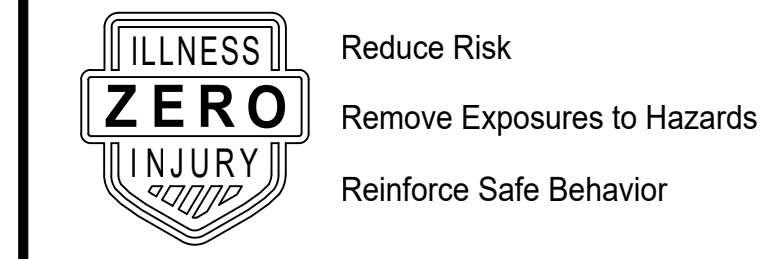
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P.O. BOX 1007
CHARLOTTE, NC 28201

Safety Expectations:



BW & A Barrett, Woodyard and Associates, Inc.
License # C-2225
420 Minuet Ln.
Charlotte, North Carolina 28217
(p

LIGHTING FIXTURE SCHEDULE									
FIXTURE TYPE	MANUFACTURER AND CATALOG INFORMATION	LAMPS			DRIVER		TOTAL WATTS	DESCRIPTION	MOUNTING
		QTY.	TYPE	WATTS	QTY.	TYPE			
A	HIGH BAY FIXTURE, METALUX UHB LED SERIES OR APPROVED EQUAL.	-	LED	100W	1	DRIVER 0-10V	100W	HIGH BAY FIXTURE, METALUX UNIVERSAL VOLTAGE.	SUSPENDED
AE	SAME AS TYPE 'A' EXCEPT PROVIDE WITH EMERGENCY 90 MINUTE BATTERY PACK.	-	LED	13627LUM 4000K	-	-	-	-	-
B	HIGH BAY FIXTURE, METALUX UHB LED SERIES OR APPROVED EQUAL.	-	LED	147W	1	DRIVER 0-10V	147W	HIGH BAY FIXTURE, METALUX UHB LED SERIES, UNIVERSAL VOLTAGE.	SUSPENDED
BE	SAME AS TYPE 'B' EXCEPT PROVIDE WITH EMERGENCY 90 MINUTE BATTERY PACK.	-	LED	19607LUM 5000K	-	-	-	-	-
C	EXTERIOR WALL PACK, COOPER LUMARK WP LED SERIES, OR APPROVED EQUAL.	-	LED	3500LUM 4000K	1	DRIVER 0-10V	60W	LED WALL PACK LIGHT, COOPER LUMARK SERIES, UNIVERSAL VOLTAGE.	WALL
REH	RECESSED EMERGENCY FIXTURE, COOPER AEL2 SERIES OR APPROVED EQUAL, PROVIDED WITH 90 MINUTE BATTERY PACK.	-	LED	3500LUM 4000K	1	-	5W	EMERGENCY FIXTURE, UNIVERSAL VOLTAGE.	WALL
X	EMERGENCY EXIT FIXTURE, SURE LITE SERIES.	-	LED	3500LUM 4000K	1	-	5W	EMERGENCY EXIT FIXTURE, UNIVERSAL VOLTAGE.	SUSPENDED

LIGHT FIXTURE SCHEDULE NOTES:

- ALL FINISH TYPES SHOULD BE COORDINATED WITH THE ARCHITECT/INTERIOR DESIGNER(S).
- ALL TRIMS AND INSTALLATION REQUIREMENTS SHALL BE COORDINATED WITH THE CEILING TYPE IN WHICH IT IS TO BE INSTALLED. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT CEILING TYPE FOR WHICH THE FIXTURE IS TO BE INSTALLED.
- FIXTURE TYPES NOTED ON PLAN WITH SUFFIX 'E' INDICATES FIXTURE TO BE PROVIDED WITH 90 MINUTE MINIMUM BATTERY BACK-UP. (E.G. L1E, L2E, ETC...)

NEW PANEL UB SECTION 1									
VOLTAGE: 120/208 3		AMP: 200 MCB		10K AIC SE RATED NEMA 3R					
DESCRIPTION	KW	BKR	CK	PH	CK	BKR	KW	DESCRIPTION	
PANEL REC	0.18	20/1	1	A	2	20/1	0.3	SP-1	
REC	0.72	20/1	3	B	4	20/1	0.41	LFS INTERIOR	
NEMA 6-30R	1.2	30/2	5	C	6	20/1	0.4	OVERHEAD DOOR	
----	1.2	----	7	A	8	----	0	SPACE	
NEMA 6-30R	1.2	30/2	9	B	10	----	0	SPACE	
----	1.2	----	11	C	12	----	0	SPACE	
NEMA 6-30R	1.2	30/2	13	A	14	----	0	SPACE	
----	1.2	----	15	B	16	----	0	SPACE	
NEMA 6-30R	1.2	30/2	17	C	18	----	0	SPACE	
----	1.2	----	19	A	20	----	0	SPACE	
SPACE	0	----	21	B	22	----	0	SPACE	
SPACE	0	----	23	C	24	----	0	SPACE	
SPACE	0	----	25	A	26	----	0	SPACE	
SPACE	0	----	27	B	28	----	0	SPACE	
SPACE	0	----	29	C	30	----	0	SPACE	
SPACE	0	----	31	A	32	----	0	SPACE	
SPACE	0	----	33	B	34	----	0	SPACE	
SPACE	0	----	35	C	36	----	0	SPACE	
SPACE	0	----	37	A	38	----	0	SPACE	
SPACE	0	----	39	B	40	----	0	SPACE	
SPACE	0	----	41	C	42	----	0	SPACE	
A TOTAL	4.08	VLL PH		0.90 RECEPTACLES					
B TOTAL	3.53	208 3		0.00 HEATING					
C TOTAL	4.00			0.70 AC/MOTORS					
				0.41 LIGHTING					
				9.60 MISC.					
				0.00 WATER HEATERS					
				0.00 ELEVATORS					
				0.00 KITCHEN EQUIP					
CONN. KW	11.61								
CONN. Amps	32.23								

TOTAL DEMAND LOAD	
RECEPTS: 100% 1ST 10 KW + 50% REMAINING:	= 0.9 KVA
HEAT: 100% :	= 0 KVA
AC/MOTORS: 125% LARGEST + 100% REMAINING:	= 0.7 KVA
LIGHTING: 125%:	= 0.5125 KVA
MISC: 100%:	= 9.6 KVA
WATER HEATER: 125%:	= 0 KVA
ELEVATORS: PER NEC:	= 0 KVA
KITCHEN EQUIP: PER NEC :	= 0 KVA
TOTAL DEMAND LOAD KW:	= 11.7125 KVA
TOTAL DEMAND LOAD AMPS:	= 32.51 AMP

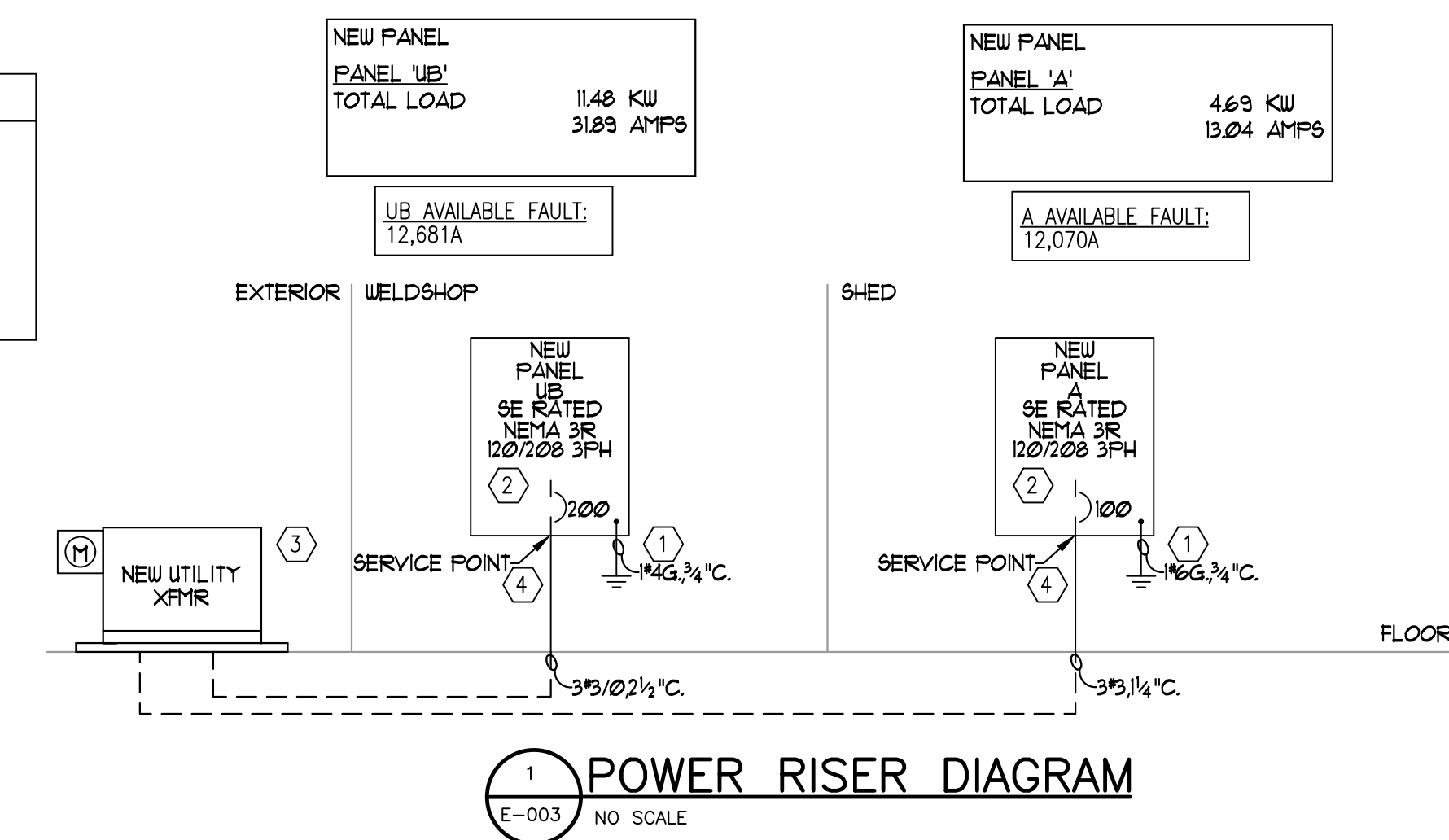
NEW PANEL A SECTION 1									
VOLTAGE: 120/208 3		AMP: 100 MCB		10K AIC SE RATED NEMA 3R					
DESCRIPTION	KW	BKR	CK	PH	CK	BKR	KW	DESCRIPTION	
DED REC	0.18	20/1	1	A	2	20/1	0.88	LFS INTERIOR	
DED REC	0.18	20/1	3	B	4	20/1	0.88	LFS INTERIOR	
DED REC	0.36	20/1	5	C	6	20/1	0.36	LFS EXTERIOR	
DED REC	0.36	20/1	7	A	8	----	0	SPACE	
DED REC	0.36	20/1	9	B	10	----	0	SPACE	
DED REC	0.36	20/1	11	C	12	----	0	SPACE	
DED REC	0.18	20/1	13	A	14	----	0	SPACE	
DED REC	0.18	20/1	15	B	16	----	0	SPACE	
SPACE	0	----	17	C	18	----	0	SPACE	
SPACE	0	----	19	A	20	----	0	SPACE	
SPACE	0	----	21	B	22	----	0	SPACE	
SPACE	0	----	23	C	24	----	0	SPACE	
SPACE	0	----	25	A	26	----	0	SPACE	
SPACE	0	----	27	B	28	----	0	SPACE	
SPACE	0	----	29	C	30	----	0	SPACE	
SPACE	0	----	31	A	32	----	0	SPACE	
SPACE	0	----	33	B	34	----	0	SPACE	
SPACE	0	----	35	C	36	----	0	SPACE	
SPACE	0	----	37	A	38	----	0	SPACE	
SPACE	0	----	39	B	40	----	0	SPACE	
SPACE	0	----	41	C	42	----	0	SPACE	
A TOTAL	1.60	VLL PH		2.16 RECEPTACLES					
B TOTAL	1.60	208 3		0.00 HEATING					
C TOTAL	1.08			0.00 AC/MOTORS					
				2.12 LIGHTING					
				0.00 MISC.					
				0.00 WATER HEATERS					
				0.00 ELEVATORS					
				0.00 KITCHEN EQUIP					
CONN. KW	4.28								
CONN. Amps	11.88								

TOTAL DEMAND LOAD	
RECEPTS: 100% 1ST 10 KW + 50% REMAINING:	= 2.16 KVA
HEAT: 100% :	= 0 KVA
AC/MOTORS: 125% LARGEST + 100% REMAINING:	= 0 KVA
LIGHTING: 125%:	= 2.65 KVA
MISC: 100%:	= 0 KVA
WATER HEATER: 125%:	= 0 KVA
ELEVATORS: PER NEC:	= 0 KVA
KITCHEN EQUIP: PER NEC :	= 0 KVA
TOTAL DEMAND LOAD KW:	= 4.81 KVA
TOTAL DEMAND LOAD AMPS:	= 13.35 AMP

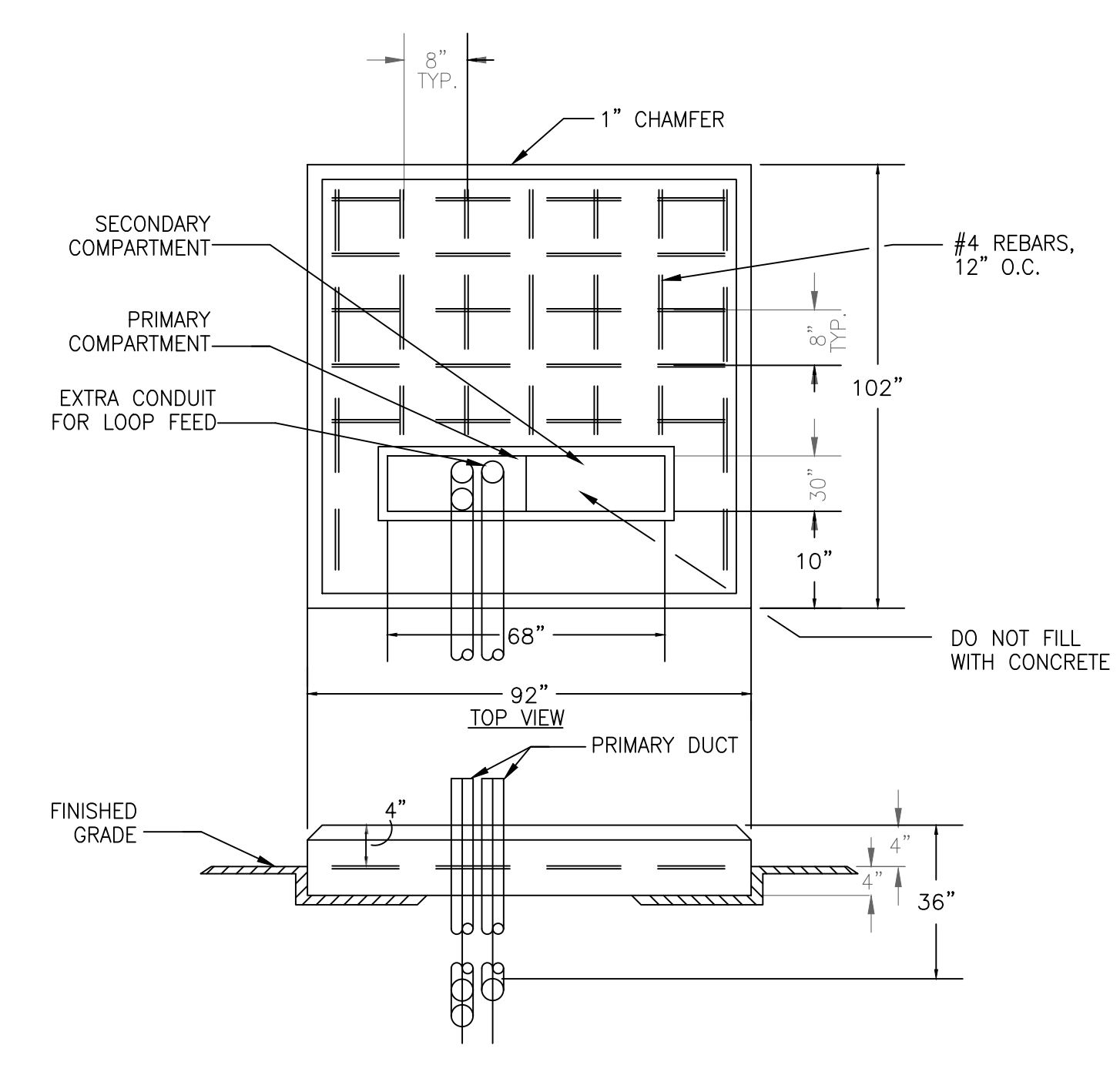
LIGHTING CONTROL	SPACE TYPES									
	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM	CLASSIFICATION/TYPE/ROOM
AUTOMATIC CONTROL	OCUPANCY SENSOR (AUTOMATIC ON/OFF)	●	●	●	●	●	●	●	●	●
VACANCY SENSOR (MANUAL ON/AUTOMATIC OFF)	●	●	●	●	●	●	●	●	●	●
TIME OF DAY	●	●	●	●	●	●	●	●	●	●
TRIP SWITCH	●	●	●	●	●	●	●	●	●	●
PHOTOCELL CONTROL	●	●	●	●	●	●	●	●	●	●
ON/OFF	●	●	●	●	●	●	●	●	●	●
LIGHTING REDUCTION (ON/OFF)	●	●	●	●	●	●	●	●	●	●
STEP-DIMMING	●	●	●	●	●	●	●	●	●	●
DIMMING	●	●	●	●	●	●	●	●	●	●
MULTI-ZONE DIMMING	●	●	●	●	●	●	●	●	●	●
SCENE-CONTROL	●	●	●	●	●	●	●	●	●	●
TIME OF DAY OVERRIDE SWITCH	●	●	●	●	●	●	●	●	●	●
KEY SWITCH	●	●	●	●	●	●	●	●	●	●

NOTE:
1. LIGHTING CONTROLS ARE NOT REQUIRED AREAS DESIGNATED FOR SECURITY OR EMERGENCY, INTERIOR EXIT RAMPS, STAIRWAYS, AND PASSAGEWAYS, AND EMERGENCY EGRESS LIGHTING THAT IS NORMALLY OFF.
2. OCCUPANCY SENSORS AT THE MINIMUM SHALL AUTOMATICALLY TURN OFF LIGHTS WITHIN 30 MINUTES OF ALL OCCUPANTS LEAVING THE SPACE.
3. MANUAL CONTROL SHALL BE READILY ACCESSIBLE TO OCCUPANTS, AND SHALL BE LOCATED WHERE THE CONTROLLED LIGHTS ARE VISIBLE, OR SHALL IDENTIFY THE AREA SERVED BY THE LIGHTS AND INDICATE THEIR STATUS.

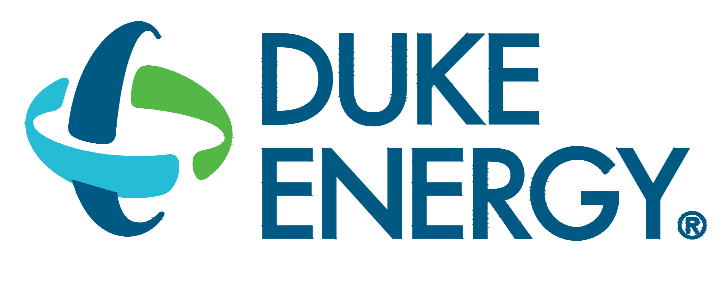
AVAILABLE SHORT CIRCUIT FAULT CURRENT
BASED ON INFORMATION PROVIDED BY THE UTILITY COMPANY, THE CALCULATED MAXIMUM FAULT CURRENT AVAILABLE AT THE POINT OF SERVICE IS 56,523 AMPS. ALL EQUIPMENT SHALL BE COORDINATED AND RATED NO LESS THAN THE AVAILABLE FAULT CURRENT AS CALCULATED.



- LEGEND NOTES:**
(APPLY TO THIS SHEET ONLY)
- GROUND PER NEC 250.
 - PROVIDE ARC-FLASH HAZARD WARNING PER NEC 110.16.
 - PAD MOUNT UTILITY TRANSFORMER PROVIDED BY UTILITY COMPANY. COORDINATE EXACT LOCATION WITH LOCAL UTILITY AND CIVIL. MAINTAIN SUFFICIENT DISTANCE BETWEEN TRANSFORMER AND BUILDING AS REQUIRED TO MEET LOCAL CODES. PROVIDE REINFORCED CONCRETE PAD PER POWER CO. SPECIFICATIONS ON LEVEL GRADE. EXCAVATE, FILL, AND COMPACT EARTH TO ESTABLISH A SECURE LEVEL FOUNDATION WHILE MAINTAINING WORKING CLEARANCES. PAD SHALL HAVE PARTITION BETWEEN LOW VOLTAGE AND HIGH VOLTAGE WIRING COMPARTMENTS. REFER TO DETAIL XXX FOR ADDITIONAL INFORMATION. PROVIDE DUKE ENERGY COMPLIANT METER ADJACENT TO TRANSFORMER. COORDINATE ALL REQUIREMENTS FOR PERMANENT POWER WITH DUKE ENERGY.
 - SERVICE POINT LOCATION, CONDUCTORS INDICATED FROM THE SERVICE POINT BACK TO THE PAD MOUNTED TRANSFORMER ARE TO BE PROVIDED/EXTENDED BY THE UTILITY COMPANY UNLESS OTHERWISE DETERMINED BY THE CONTRACTOR IN CONVERSATION WITH THE UTILITY.



- GENERAL NOTES:**
(APPLIES ONLY TO THIS DETAIL 2/E-002)
- CONFIRM DIMENSIONS WITH POWER COMPANY, DUKE ENERGY.
 - SERVICE DUCT SHALL BE LOCATED IN THE EXTREME RIGHT SIDE OF THE SECONDARY COMPARTMENT.
 - PRIMARY DUCT SHALL EXTEND BEYOND EDGE OF PAD IN DIRECTION OF INCOMING CABLES.
 - MATERIAL FOR PRIMARY DUCT SHALL BE FURNISHED BY POWER COMPANY.
 - THE PAD SHALL HAVE A MINIMUM CLEARANCE OF 10' FROM ALL BUILDINGS.
 - CONCRETE SHALL HAVE A MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH OF NOT LESS THAN 3000 POUNDS. PAD SHALL BE CURED NOT LESS THAN 72 HOURS.
 - SOIL UNDERNEATH PADS SHALL BE FREE OF ROOTS AND OTHER ORGANIC MATERIALS AND BE THOROUGHLY TAMPED TO PREVENT WASHING. EXERCISE CARE IN BACKFILLING AND GRADING AROUND PAD.
 - USE FIRE ANT CONTROL (CN 9220092158) UNDER ENTIRE PAD INCLUDING OPENINGS.
 - OTHER UTILITIES ARE NOT TO BE INSTALLED UNDER TRANSFORMER PAD.



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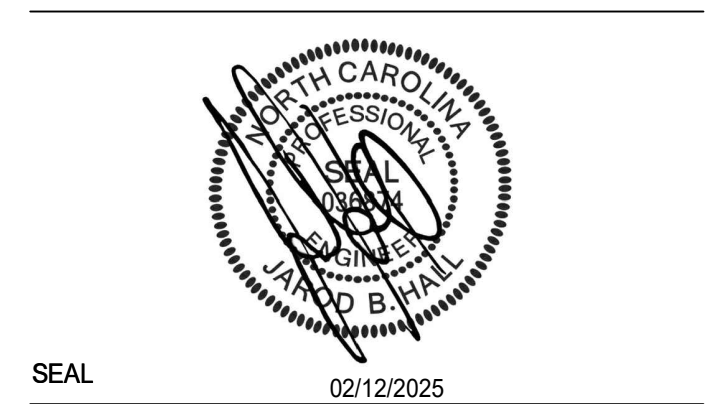
Safety Expectations:

ILLNESS ZERO
INJURY ZERO

Reduce Risk
Remove Exposures to Hazards
Reinforce Safe Behavior

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BWA JOB # 2022-0632



DUNN OPERATIONS CENTER

OPS CENTER OUTBUILDINGS

REVISION	DATE	BY	CHKD
1	12/12/2025	XXX	XXX
2			
3			
4			
5			
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7			
8			
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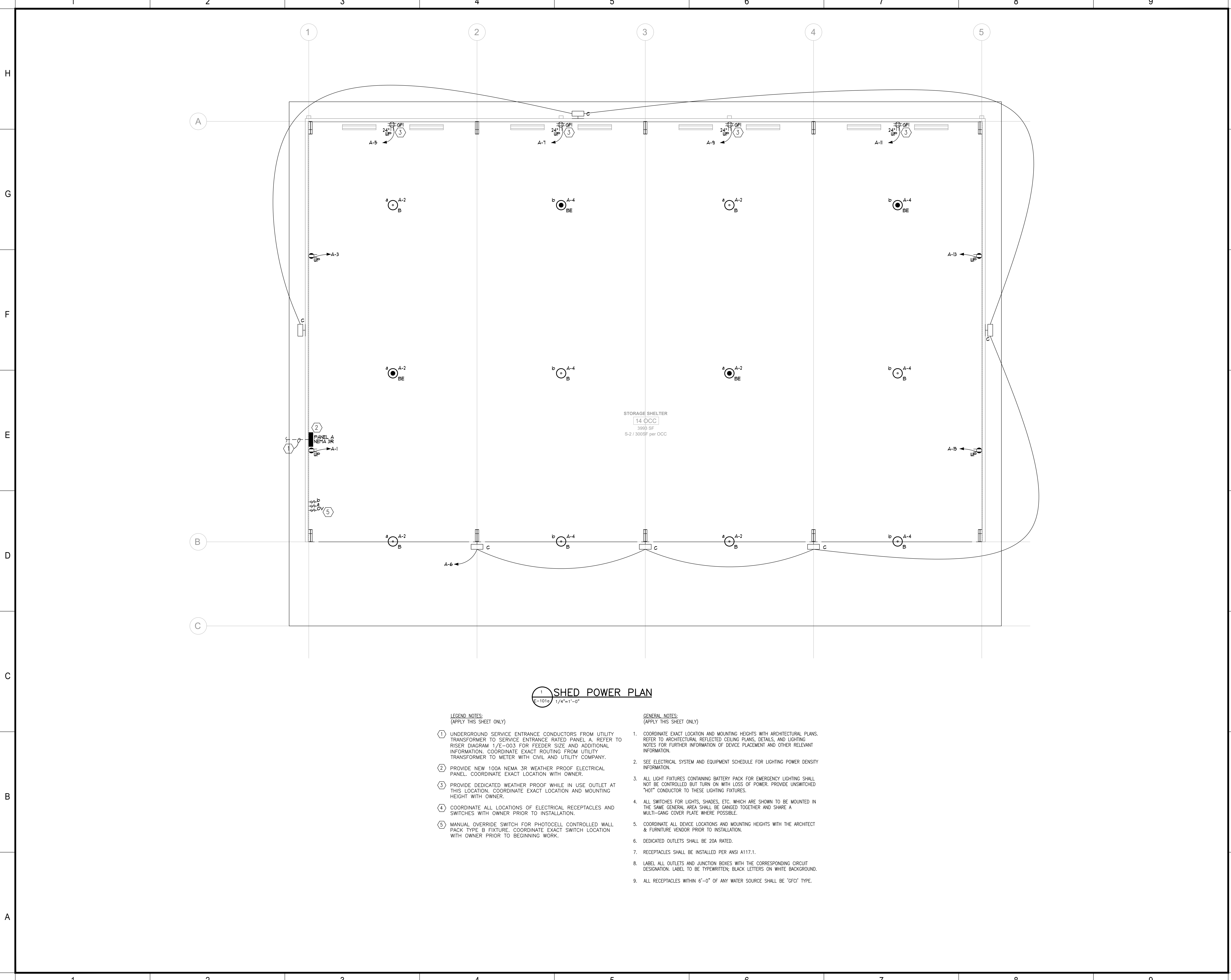
PROJECT NO:
DRAWING NUMBER
CFD-XXXX-E-0004-41CC2B

ELECTRONIC FILE NAME:
DRAWN BY: **SEB** 2/12/25
CHK'D BY: **XXX** **XXX**

E-MAIL: **jhall@barrettwoodyard.com**

SHEET TITLE:
POWER RISER DIAGRAM, AND PANEL SCHEDULE

SHEET NO.
E-004



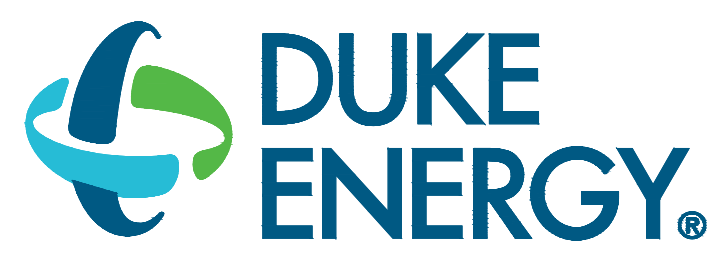
1 SHED POWER PLAN
E-101a 1/4"=1'-0"

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

- ① UNDERGROUND SERVICE ENTRANCE CONDUCTORS FROM UTILITY TRANSFORMER TO SERVICE ENTRANCE RATED PANEL A. REFER TO RISER DIAGRAM 1/E-003 FOR FEEDER SIZE AND ADDITIONAL INFORMATION. COORDINATE EXACT ROUTING FROM UTILITY TRANSFORMER TO METER WITH CIVIL AND UTILITY COMPANY.
- ② PROVIDE NEW 100A NEMA 3R WEATHER PROOF ELECTRICAL PANEL. COORDINATE EXACT LOCATION WITH OWNER.
- ③ PROVIDE DEDICATED WEATHER PROOF WHILE IN USE OUTLET AT THIS LOCATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH OWNER.
- ④ COORDINATE ALL LOCATIONS OF ELECTRICAL RECEPTACLES AND SWITCHES WITH OWNER PRIOR TO INSTALLATION.
- ⑤ MANUAL OVERRIDE SWITCH FOR PHOTOCCELL CONTROLLED WALL PACK TYPE B FIXTURE. COORDINATE EXACT SWITCH LOCATION WITH OWNER PRIOR TO BEGINNING WORK.

GENERAL NOTES:
(APPLY THIS SHEET ONLY)

- 1. COORDINATE EXACT LOCATION AND MOUNTING HEIGHTS WITH ARCHITECTURAL PLANS. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS, DETAILS, AND LIGHTING NOTES FOR FURTHER INFORMATION OF DEVICE PLACEMENT AND OTHER RELEVANT INFORMATION.
- 2. SEE ELECTRICAL SYSTEM AND EQUIPMENT SCHEDULE FOR LIGHTING POWER DENSITY INFORMATION.
- 3. ALL LIGHT FIXTURES CONTAINING BATTERY PACK FOR EMERGENCY LIGHTING SHALL NOT BE CONTROLLED BUT TURN ON WITH LOSS OF POWER. PROVIDE UNSWITCHED "HOT" CONDUCTOR TO THESE LIGHTING FIXTURES.
- 4. ALL SWITCHES FOR LIGHTS, SHADES, ETC. WHICH ARE SHOWN TO BE MOUNTED IN THE SAME GENERAL AREA SHALL BE GANGED TOGETHER AND SHARE A MULTI-GANG COVER PLATE WHERE POSSIBLE.
- 5. COORDINATE ALL DEVICE LOCATIONS AND MOUNTING HEIGHTS WITH THE ARCHITECT & FURNITURE VENDOR PRIOR TO INSTALLATION.
- 6. DEDICATED OUTLETS SHALL BE 20A RATED.
- 7. RECEPTACLES SHALL BE INSTALLED PER ANSI A117.1.
- 8. LABEL ALL OUTLETS AND JUNCTION BOXES WITH THE CORRESPONDING CIRCUIT DESIGNATION. LABEL TO BE TYPEWRITTEN; BLACK LETTERS ON WHITE BACKGROUND.
- 9. ALL RECEPTACLES WITHIN 6'-0" OF ANY WATER SOURCE SHALL BE "GFCI" TYPE.



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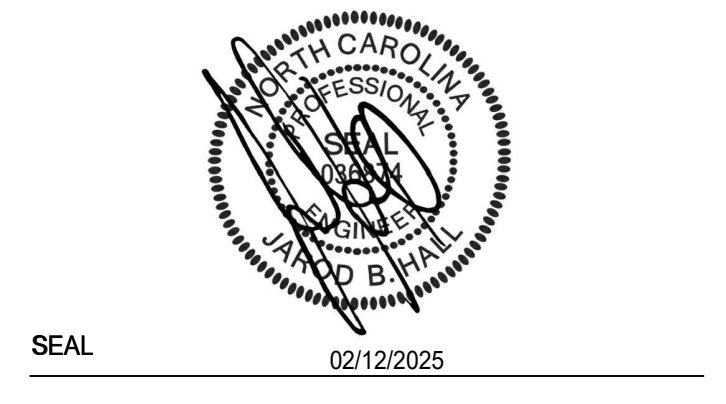
Safety Expectations:

ILLNESS ZERO INJURY ZERO

- Reduce Risk
- Remove Exposures to Hazards
- Reinforce Safe Behavior

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BWA JOB # 2022-0632



SEAL
DUNN OPERATIONS CENTER

OPS CENTER OUTBUILDINGS

REVISION	DATE	BY	CHK'D	ISSUED FOR CONSTRUCTION
1	02/12/2025	SEB	XXX	ISSUED FOR CONSTRUCTION

PROJECT NO:
DRAWING NUMBER:
CFD-XXXX-E-0110a-41CC2B

ELECTRONIC FILE NAME:
DRAWN BY: **SEB** 2/12/25
CHK'D BY: **XXX** **XXX**
E-MAIL: **jhall@barrettwoodyard.com**

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SHEET TITLE:
SHED POWER PLAN - ELECTRICAL

SHEET NO.
E-101a