MN/DOT SPECIFICATION FOR A ROADWAY LIGHTING SERVICE CABINET

LIGHTING SERVICE CABINET TYPE: L1 & L2
04/06/2017
SPECIFICATIONS FOR L1 & L2 LIGHTING SERVICE CABINETS

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1. GENERAL

1.1. The lighting cabinet and all sub-assemblies shall be listed by a National Recognized Testing Laboratory (NRTL) as defined by the U.S. Department of Labor. The testing laboratory must be listed by OSHA in its scope of recognition for the applicable tests being conducted as required by this specification. A list of recognized testing labs for products sold in the United States may be found on the U.S. Department of Labor’s web site:

http://www.osha.gov/

1.2. The cabinet shall be listed and labeled by a NRTL as being in compliance with UL508 and UL508A.

1.3. Shall have a NEMA 3R rating for the enclosure.

1.4. Shall be a single phase, 3 wire, weatherproof cabinet, and shall contain circuit breakers, lighting contactor(s), photoelectric control with test switch(es), power distribution blocks when specified, and neutral/ground bonding bar(s).

1.5. Shall provide photoelectric control for roadway lighting.

  1.5.1. Shall have a Mn/DOT approved photoelectric control mounting receptacle and a Mn/DOT approved photoelectric control. See section 6 of this document.

1.6. Shall be in compliance with the current edition of the National Electrical Code.

1.7. Shall be in compliance with current edition of the National Fire Protection Association (NFPA) 70E Standard for Electrical Safety In the Workplace.
2. CABINET ENCLOSURE

2.1. Shall be a pad mounted, rain tight enclosure with pad mounting gasket.

2.2. Shall be rectangular in shape with the top of the cabinet extending over the front door.

2.3. Shall have dimensions of 60 inches high, 33 inches wide and 14 inches deep.

2.4. Shall have a cabinet roof that is crowned, slanted to the rear or have Cross-Brakes in the roof to prevent standing water,

   2.4.1. Shall provide a 2 inch overhang above the door beyond the front of the cabinet.

   2.4.1.1. Shall have an overhang with a rain tight vent assembly to provide ventilation.

   2.4.1.2. Shall be baffled to resist the entrance of water into the cabinet.

   2.4.1.3. Shall provide drainage to the exterior of the cabinet for any water entering the vent.

   2.4.1.4. Shall be designed to prevent insect intrusion.

2.5. Shall be constructed from a minimum 0.125 inch thick aluminum conforming to the requirements of ASTM B 209 for 5052-H32 aluminum sheet.

2.6. Shall have an anodized finish. Anodized finish applies to the dead front door.

   2.6.1. The Aluminum cabinet shall be anodized after all machining has been completed.

   2.6.2. After fabrication the aluminum surfaces must have anodic coating as per MIL-A-8625 for Type II, Class I Coating except:
   
   The outer surface coating is 0.0007 in;
   The coating weighs 27 mg per 645 mm²;
   The coating is sealed by immersion in a 100 degrees C. aqueous 5 percent nickel acetate solution for 15 minutes, or submersion in room temperature fluoride based sealant for a minimum of 8 minutes followed by an immediate hot water dip of 5 minutes. The water temperature in the hot water dip tank must be a minimum of 72 degrees C.
   
   Before applying the anodic coating, the aluminum shall be:
   Etched with inhibited alkaline cleaner at 70 degrees C for 5 minutes;
   Rinsed with cold water;
   Immersed in a 50 percent (by volume) nitric acid solution for 2 minutes at 20 degrees C;
   Rinsed with cold water.

2.7. Shall have all external hardware, including all nuts and bolts for the cabinet enclosure, constructed of stainless steel. For door hinge requirements see section 2.16.
2.8. Shall have all internal hardware constructed of zinc plated steel.

2.9. Shall have all sharp edges in any wire way covered to prevent any damage to conductor insulation.

2.10. Shall ensure that adequate clearance is maintained for conductors entering or exiting the cabinet.

2.11. Shall provide the required wire routing bend radius space as defined by the National Electrical Code Article (300).

2.12. Shall have bottom flanges with four 1 inch by 2 inch slotted holes for mounting the cabinet to anchor rods. The bottom flange with slotted holes shall meet the following requirements:

   2.12.1. Shall be reinforced on the top side of the flange with a second piece of 0.125 inch aluminum at least 6 inches long and same width as the mounting flange that is welded in place.

   2.12.2. Shall be capable of being secured to a concrete foundation by four (4) anchor rods, nuts and washers on a 26 inch wide by 11 inch deep rectangular anchor rod pattern, measured from anchor rod centers.

2.13. Shall have four (4) anchor rods, nuts, and washers provided with each L1 or L2 lighting cabinet. The anchor rods, nuts, and washers shall meet the following requirements:

   2.13.1. Shall have anchor rods and nut in accordance with the provisions of Mn/DOT 3385 for Type A Anchor Rods.

   2.13.2. Shall have anchor bolts die stamped AB36. Blue top only bolt identification is not acceptable.

   2.13.3. Shall be nominal .75 inch diameter by 12 inches +/- 0.50 long with a 2.00 +/- 0.50 inch Ell on one end, and the other end shall be threaded a minimum of 4 inches.

   2.13.4. Shall be galvanized full length in accordance with the provisions of Mn/DOT 3392.

   2.13.5. Shall have stainless steel washers which have a 2 inch outside diameter (O.D.).

2.14. Shall have a bottom gasket that consists of:

   2.14.1. Four (4) strips, sized to fit base.

   2.14.2. Include corner hole/slots to accommodate the 0.75 inch anchor rods.

   2.14.3. Gasket material 0.5 inch thick solid butyl rubber or 60 durometer commercial grade EPDM rubber.

   2.14.4. Provide 0.25 inch gap for water drainage. The gasket assembly must be constructed such that when laid out prior to the cabinet installation there is a 0.25 inch gap in the bottom gasket assembly to allow for potential water drainage from the inside of the cabinet.
2.15. Shall have two compartments Right and Left:

2.15.1. Right Compartment (Main Cabinet) shall provide space for the lighting service panel and the photoelectric control circuit.

2.15.1.1. The right compartment shall be 60 inches high, 27 inches wide and 14 inches deep.

2.15.1.2. Shall have a removable internal service panel for mounting all of the electrical components required in the cabinet.

2.15.1.2.1. The service panel shall be installed 6 inches from the bottom of the cabinet to provide access to the anchor bolts when mounting the cabinet.

2.15.2. Shall provide a hinged anodized aluminum dead front door to protect against accidental contact with live electrical parts.

2.15.2.1. No components or switches shall be mounted directly to the dead front door.

2.15.2.2. The anodized aluminum dead front door must have cutout provisions for breakers and the luminaire control/test by-pass switch.

2.15.2.3. Shall open to the right.

2.15.2.4. Shall be hinged on the right.

2.15.2.5. Shall have 2, ¼ turn latches on the left side to secure the door in the closed position.

2.15.2.6. Shall have the functions of all switches, breakers and devices that protrude thru the dead front door labeled.

2.15.2.7. Shall have a see thru covered opening to allow viewing of the transient suppression status indicator.

2.15.2.8. Shall have the following white background label installed with ¼ inch tall black font:

PLACE MnDOT REQUIRED AVAILABLE FAULT CURRENT CALCULATION LABEL BELOW

2.15.2.8.1. Shall be located on the outside upper half of the dead front door.

2.15.2.8.2. Shall have a 6 inch by 6 inch blank area below the label reserved for the contractor’s available fault current calculation label to be added by others.
2.15.3. Shall have two circular windows at the right upper back corner of the cabinet for the photocell.

2.15.3.1. One window shall be on the back cabinet wall and the other shall be on the right cabinet wall.

2.15.3.2. The windows shall have a diameter of 3.5 inches.

2.15.3.3. The windows shall be of 0.125 inch thick Lexan or Makrolon and be installed in a manner that does not sacrifice the weather-tightness or the security of the cabinet.

2.15.4. Left Compartment (Below Meter Socket, Line Side Wire Way):

2.15.4.1. Shall have an attached enclosed left compartment to provide space for the 2 inch conduit containing the power utility conductors to the meter.

2.15.4.2. This compartment shall be 36 inches high, 6 inches deep and 14 inches wide.

2.15.4.3. Shall provide a hinged anodized aluminum dead front door to protect against accidental contact with live electrical parts.

2.15.4.3.1. No components or switches shall be mounted directly to the dead front door.

2.15.4.3.2. Shall open to the right.

2.15.4.3.3. Shall be hinged on the right.

2.15.4.3.4. Shall have 2, ¼ turn latches on the left side to secure the door in the closed position.

2.15.4.3.5. Shall have the function of the breaker that protrudes thru the dead front door labeled (Cold Sequence Disconnect).

2.15.4.3.6. Shall cover the opening in the dead front door for the cold sequence disconnect circuit breaker in a cabinet that does not use the circuit breaker, 120/240 applications.

2.15.4.4. Shall have termination lugs for the line side utility power which support #6 AWG to 350 MCM / kcmil aluminum or copper wires.

2.15.4.4.1. Shall have the bottom of each lug mounted 20 inches above the bottom of the cabinet.

2.15.4.5. Shall have a cold sequence disconnect ahead of the meter in 240/480 volt service cabinets.

2.15.4.6. Shall have an opening and a water tight hub on the top of this compartment to facilitate wiring to the meter socket. The edge of the opening shall be properly protected.
2.15.4.7. Shall have a 24 inch x 14 inch weather tight hinged door (opening to the right) with a lockable hasp.

2.15.4.7.1. Shall have the bottom of the door 9 inches from the bottom of the cabinet.

2.15.4.7.2. Shall have door hinges and lockable hasp constructed of stainless steel or other non-corroding material.

2.15.4.7.2.1. The hasp shall support a pad lock with a 3/8\textsuperscript{th} inch shaft

2.16. Shall have a front door for the right compartment that meets the following requirements:

2.16.1. Shall have a door that allows easy access for all equipment installed in the cabinet.

2.16.2. Shall have a door that opens to the right.

2.16.3. Shall have the bottom of the door at least 9 inches from the bottom of the cabinet.

2.16.4. Shall have two sets of 4 inch x 10 inch louvered vents, with screening or perforated metal, installed approximately 10 inches from the bottom. The two sets of vents shall be separated by approximately 2 inches.

2.16.4.1. Shall have screening on the inside of the cabinet to prevent insect intrusion.

2.16.5. Shall have the door secured with the following requirements:

2.16.5.1. Shall have a door that is equipped with a three point locking mechanism which operates from a single easy turning handle. The upper and lower locking points of the three point locking mechanism shall each have a pair of nylon rollers.

2.16.5.2. Shall have a handle that is constructed from Aluminum or Stainless Steel. This handle shall be a minimum of .625 inch) diameter or .5 inch square.

2.16.5.3. Shall have a handle that has provisions for pad locking. The pad locking provision is required so the cabinet is in compliance with Occupational Safety & Health Administration (OSHA) Standard 1910.147 The control of hazardous energy (lockout/tagout).

2.16.5.4. Shall have a handle which opens the door with a clockwise turning motion. This motion shall not interfere with the key for the lock, or any other enclosure mechanism.

2.16.5.5. Shall have a door lock that does not interfere with the rotation of the door handle. This lock shall be a standard police lock and key. The lock must work with existing police keys having a 1.75 inch long shank

2.16.5.6. Shall have one key provided with each cabinet.

2.16.5.7. Shall have a lock that is designed to prevent the latch from being pushed or pried back from the outside to gain unauthorized entry
2.16.6. Shall have a lock access hole that has an aluminum swing away cover to prevent entry of rain and snow. The swing away cover shall completely cover the access hole with a minimum of .125 inch overlay on all sides of the opening.

2.16.7. Shall have an external door attached to the enclosure with 3 lift off hinges.

   2.16.7.1. Shall have hinges constructed of stainless steel or other non-corroding material.

   2.16.7.2. Shall have hinges fastened to the door and cabinet with stainless steel bolts.

       2.16.7.2.1. If the bolts are accessible from the exterior of the cabinet the bolts must be tamper proof.

2.16.8. Shall have door openings which have an outdoor rated NRTL listed neoprene gasket to form a complete seal with the enclosure.

2.17. Shall have cabinet lifting provisions that meet the UL requirements for the NEMA 3R. The lifting provisions shall consist of two aluminum lifting ears mounted to the enclosure, allowing a bar or hooks to be inserted through both ears for lifting the cabinet. The lifting ears shall have a lifting capacity equal to the weight of the completely wired cabinet plus 25 percent, a 227 kg (500 pound) capacity minimum. Each lifting ear shall have a 1 inch hole, the bottom of which shall be flush with the top of the cabinet or within 1/8 inch of the cabinet. The top of the lifting ears shall be between 2 inches and 2 1/8 inches above the cabinet. The lifting ears shall be secured to the cabinet by corrosion resistant bolts.

2.18. Shall exhibit good workmanship and good aesthetic appearance.

2.19. All seams and joints shall be smooth and even, without cracks or pinholes. There shall be no sharp corners or jagged edges.

2.20. Shall have exterior seams for both cabinet and doors that are continuously welded or sealed with 100 percent silicone sealant. All exterior welds shall be ground smooth. All sharp edges shall be removed.
3. ELECTRICAL COMPONENTS AND WIRING

3.1. Shall have copper conductors only. Aluminum conductors are unacceptable.

3.2. Shall have sufficient slack in all conductors in the cabinet to allow for expansion and contraction of the conductors.

3.3. Shall not have any butt spliced conductors.
   3.3.1. No splicing of conductors will be permitted.

3.4. All wiring shall be a minimum of 14 AWG, THHN, or THWN unless otherwise specified.

3.5. Shall have a self-contained meter socket and enclosure rated for 200 Ampere, 480 volts with a lever actuated positive bypass mechanism mounted to the left cabinet wall facing to the left.
   3.5.1. Shall have the neutral connection for the meter at the 9 o clock position.
   3.5.2. Shall be a Milbank U4801-XL-5T9, Landis + Gyr 40405-02CO, (or approved by MNDOT and local power utilities)
       http://www.milbankmfg.com/
   3.5.3. Shall have a meter mounting height in a range from 4 feet to 5 feet. This dimension is measured from the bottom of the cabinet to the center of the meter socket.

3.6. Shall have a ground rated watertight conduit hub (Myers Hub) installed at the top of the left compartment to provide a wire way for the line side conductors into the meter socket enclosure.
   3.6.1. Bond the hub to the ground bus.

3.7. Shall have two copper power distribution blocks to provide tapping from the primary feeds to the 100 amp circuit breaker.
   3.7.1. Shall be suitable for use with 90°C (194°F) conductors; shall be rated for 600 volts.
   3.7.2. Shall have a flammability rating of UL 94V-0.
   3.7.3. Shall have a clear see thru Lexan or Makrolon cover preventing accidental contact with the block.

3.8. Shall have an enclosed photoelectric control (see PHOTOELECTRIC CONTROL section 6).

3.9. Shall have tin or silver plated copper bus bars rated for both copper and aluminum conductors.

3.10. Shall have 10 point Ground bus with cu/al rating each position of the bus shall accommodate #14 thru #2 stranded or solid conductors.
   3.10.1. L2 Cabinets shall have an additional 10 point Grounding bus installed.
3.11. Shall have a 10 point Neutral bus cu/al rating each position of the bus shall accommodate #14 thru #2 stranded or solid conductors.

3.11.1. L2 Cabinets shall have an additional 10 point Neutral bus installed.

3.12. Shall have separate neutral and ground buss.

3.13. The ground rod conductor shall always be connected to the ground bus. A stranded green insulated # 4 AWG bonding jumper shall be run from the ground bus to the neutral bus.

3.14. Shall have provisions for proper grounding of the neutral bus to a ground rod located within the area of the lighting service cabinet enclosure.

3.15. Shall Provide 3 utility wire termination lugs in line side wire way enclosure on the left side of the cabinet.

3.15.1. Lugs shall accommodate 6 AWG wire thru 350 MCM / kcmil aluminum or copper wires.

3.15.2. Shall have appropriate size wires run from the termination lugs to the meter socket on 120/240 Volt cabinets.

3.15.3. Shall have appropriate size wires run from the termination lugs to the cold sequence disconnect and then from the cold sequence disconnect to the meter socket on 240/480 Volt cabinets.

3.16. Type L1 Service Cabinets:

3.16.1. Shall be provided with one 2-pole, 100 Amp, 240/480 VAC rated main circuit breaker.

3.16.1.1. Shall be thermo-magnetic.

3.16.1.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.1.3. Shall carry a minimum 22,000 AIR.

3.16.1.4. Shall be rated for 100 Amps of continuous current at 40ºC (104ºF).

3.16.2. Shall have one 2-pole, 100 Amp, 240/480 VAC rated lighting contactor.

3.16.2.1. Shall be normally open.

3.16.2.2. Shall be electrically held, or mechanically held

3.16.2.3. Shall be rated for tungsten filament and ballast loads.

3.16.2.4. Shall have an operating coil rated at 120VAC or 240 VAC.

3.16.2.5. Shall have a series rating of 22,000 AIR or above.

3.16.2.6. Shall have a label that clearly states the contactor is series rated for 22,000 AIR.
3.16.2.7. Shall be wired to the load side of the main circuit breaker and the line side of the luminaire breakers.

3.16.3. Shall have one 2 pole 20-Amp, 240/480 VAC rated branch circuit breaker for each four wire lighting branch circuit.

3.16.3.1. Shall be thermo-magnetic.

3.16.3.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.3.3. Shall have branch circuit breakers rated for 20 Amps of continuous current at 40ºC (104ºF).

3.16.3.4. Shall carry a minimum 22,000 AIR.

3.16.3.5. Shall accept 4 AWG copper wires.

3.16.4. Cabinet shall have Four 2 pole 20-Amp branch circuit breakers for lighting branch circuit four wire cable assemblies.

3.16.4.1. Shall have the dead front labeled Luminaire 1 thru 4.

3.16.5. Shall have circuit breakers and lighting contactor contacts rated for 240/480 VAC for lighting circuits serving luminaires rated at 120 VAC or 240 VAC. The lighting contactor coil shall be rated for 120 VAC or 240 VAC.

3.16.6. Shall have one, 1 pole 15 AMP Breaker (Labeled Photocell Control)

3.16.6.1. Shall be thermo-magnetic.

3.16.6.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.6.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.16.6.4. The photo cell control circuit breaker shall carry a minimum 22,000 AIR.

3.16.7. Shall have one, 2 pole 20 AMP Breaker (Labeled TVSS)

3.16.7.1. Shall be thermo-magnetic.

3.16.7.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.7.3. The photo cell control circuit breaker shall be rated for 20 Amps of continuous current at 40 degrees C.

3.16.7.4. The photo cell control circuit breaker shall carry a minimum 22,000 AIR.

3.16.7.5. Shall be connected to the load side of the main circuit breaker.
3.16.8. **240/480 VAC** (RMS) Cabinets shall have one, 1 pole 15 AMP Breaker (Labeled Convenience Receptacle Primary)

3.16.8.1. Shall be thermo-magnetic.

3.16.8.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.8.3. The convenience receptacle primary circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.16.8.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.16.8.5. This circuit breaker is connected to the main power bus and the primary windings of the 240 to 120 VAC step down transformer.

3.16.9. **240/480 VAC** (RMS) Cabinets shall have one, 1 pole 15 AMP Breaker (Labeled Convenience Receptacle Secondary)

3.16.9.1. Shall be thermo-magnetic.

3.16.9.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.9.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.16.9.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.16.9.5. This circuit breaker is connected to the secondary windings of the step down transformer and to the line side of the convenience receptacle.

3.16.10. **120/240 VAC** (RMS) Cabinets shall have one, 1 pole 20 AMP Breaker (Labeled Convenience Receptacle)

3.16.10.1. Shall be thermo-magnetic.

3.16.10.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.16.10.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.16.10.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.16.10.5. In the case of **120/240 VAC** (RMS) this circuit breaker is connected to the main power bus and the line side of the convenience receptacle.
3.16.11. For 240/480 VAC cabinets provide a step down transformer for the convenience receptacle meeting the following requirements:

3.16.11.1. NRTL listed or recognized.

3.16.11.2. Volt Amp (VA) rating of 2000 or above.

3.16.11.3. Shall have electrical isolation between the primary and secondary windings of the transformer.

3.16.11.4. 240 VAC (RMS) primary winding.

3.16.11.5. 120 VAC (RMS) secondary winding.

3.16.11.6. Ground one side of the secondary windings to reestablish a grounded conductor for the convenience receptacle.

3.17. Type L2 Service Cabinets:

3.17.1. Shall be provided with two 2 pole, 100 Amp, 240/480 VAC rated main circuit breakers.

3.17.1.1. Shall be thermo-magnetic.

3.17.1.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.1.3. Shall carry a minimum 22,000 AIR.

3.17.1.4. Shall be rated for 100 Amps of continuous current at 40ºC (104ºF).

3.17.2. Shall have two 2-pole, 100 Amp, 240/480 VAC rated lighting contactors.

3.17.2.1. Shall be normally open.

3.17.2.2. Shall be electrically or mechanically held

3.17.2.3. Shall be rated for tungsten filament and ballast loads.

3.17.2.4. Shall have an operating coil rated at 120VAC or 240 VAC.

3.17.2.5. Shall be wired to the load side of the main circuit breaker and the line side of the luminaire breakers.

3.17.2.6. Shall have a series rating of 22,000 AIR or above.

3.17.2.7. Shall have a label that clearly states the contactor is series rated for 22,000 AIR.
3.17.3. Shall have one 2 pole 20-Amp, 240/480 VAC rated branch circuit breaker for each lighting branch circuit four wire cable.

3.17.3.1. Shall be thermo-magnetic.

3.17.3.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.3.3. Shall carry a minimum 22,000 AIR.

3.17.3.4. Shall be rated for 20 Amps of continuous current at 40°C (104°F).

3.17.3.5. Shall accept 4 AWG copper wires.

3.17.4. Cabinet shall have eight 2 pole 20-Amp branch circuit breakers for lighting branch circuit four wire cable assemblies.

3.17.5. Shall have circuit breakers and lighting contactor contacts rated for 240/480 VAC for lighting circuits serving luminaires rated at 120 VAC or 240 VAC. The lighting contactor coil shall be rated for 120 VAC or 240 VAC.

3.17.6. Shall have one, 1 pole 15 AMP Breaker (Labeled Photocell Control)

3.17.6.1. Shall be thermo-magnetic.

3.17.6.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.6.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.17.6.4. The photo cell control circuit breaker shall carry a minimum 22,000 AIR.

3.17.7. Shall have two, 2 pole 20 AMP Breaker (Labeled TVSS 1 and TVSS 2)

3.17.7.1. Shall be thermo-magnetic.

3.17.7.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.7.3. The photo cell control circuit breaker shall be rated for 20 Amps of continuous current at 40 degrees C.

3.17.7.4. The photo cell control circuit breaker shall carry a minimum 22,000 AIR.

3.17.7.5. Shall be connected to the load side of each main circuit breaker.

3.17.8. Shall have the dead front labeled Luminaire 1 thru 8.
3.17.9. 240/480 VAC\textsubscript{(RMS)} Cabinets shall have one, 1 pole 15 AMP Breaker (Labeled Convenience Receptacle Primary)

3.17.9.1. Shall be thermo-magnetic.

3.17.9.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.9.3. The convenience receptacle primary circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.17.9.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.17.9.5. This circuit breaker is connected to the main power bus and the primary windings of the 240 to 120 VAC step down transformer.

3.17.10. 240/480 VAC\textsubscript{(RMS)} Cabinets shall have one, 1 pole 15 AMP Breaker (Labeled Convenience Receptacle Secondary)

3.17.10.1. Shall be thermo-magnetic.

3.17.10.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.10.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.17.10.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.17.10.5. This circuit breaker is connected to the secondary windings of the step down transformer and to the line side of the convenience receptacle.

3.17.11. 120/240 VAC\textsubscript{(RMS)} Cabinets shall have one, 1 pole 20 AMP Breaker (Labeled Convenience Receptacle )

3.17.11.1. Shall be thermo-magnetic.

3.17.11.2. Shall be full size breakers. No half high, dual or tandem circuit breakers are acceptable.

3.17.11.3. The photo cell control circuit breaker shall be rated for 15 Amps of continuous current at 40 degrees C.

3.17.11.4. The convenience receptacle circuit breaker shall carry a minimum 22,000 AIR.

3.17.11.5. In the case of 120/240 VAC\textsubscript{(RMS)} this circuit breaker is connected to the main power bus and the line side of the convenience receptacle.
3.17.12. For 240/480 VAC cabinets provide a step down transformer for the convenience receptacle meeting the following requirements:

3.17.12.1. NRTL listed or recognized.
3.17.12.2. Volt Amp (VA) rating of 2000 or above.
3.17.12.3. Shall have electrical isolation between the primary and secondary windings of the transformer.
3.17.12.4. 240 VAC (RMS) primary winding.
3.17.12.5. 120 VAC (RMS) secondary winding.
3.17.12.6. Ground one side of the secondary windings to reestablish a grounded conductor for the convenience receptacle.

3.18. Shall have machine printed labels that are waterproof and smudge proof and rated for outdoor use. Silk–Screening of the panels would be acceptable.

3.19. Shall have all circuit breaker loads labeled with on and off positions, and identified with the load which it is carrying, labeled Main, Convenience Receptacle, Luminaire 1 thru 8.

3.19.1. Shall have all circuit breakers clearly labeled in a manner that will not deteriorate due to moisture or age.

3.20. Shall be in compliance with current edition of the National Fire Protection Association (NFPA) 70E Standard for Electrical Safety In the Workplace.
Each external cabinet door including the line side wire way door and the internal dead front door shall be labeled with the following:

Warning
Potential Arc Flash Hazard
PPE Required

Labels shall be placed on the external door and the dead front door and the utility wire way access door.

3.20.1. Shall be clearly labeled in a manner that will not deteriorate due to moisture or age.
4. TRANSIENT VOLTAGE SURGE SUPRESSION

4.1. A transient Voltage Surge Suppressor (TVSS) shall be located in the cabinet behind the dead front door.

4.1.1. The suppressor shall be listed by a Nationally Recognized Testing Laboratory (NRTL) as being compliant with UL 1449 Third Edition.

4.1.2. The suppressor for 120/240 VAC (RMS) service cabinets shall be Advanced Protection Technologies Inc. SPDEE model number S50A120V2PN or (MnDOT approved equal).

4.1.3. The suppressor for 240/480 VAC (RMS) service cabinets shall be Advanced Protection Technologies Inc. SPDEE model number S50A277V2PN, or (MnDOT approved equal).

4.1.4. The neutral input shall be connected directly to the neutral bus.

4.1.5. The ground connection shall be connected directly to the ground bus.

4.1.6. All connections shall be made using the 10AWG wire provided with the suppressor, no splices or terminations in these conductors will be acceptable. The wires for these connections shall be as short and straight as possible and they shall have no more than one bend with a radius of no less than 2 inches.

4.1.7. The suppressor shall be located and mounted so viewing of the status indications may be accomplished without removing any panels or covers. Viewing the status of the transient suppression status indicator will not require opening the dead front door.

4.1.8. Location of the suppressor in the cabinet shall facilitate easy replacement in the future.

4.2. Shall be wired to a dedicated two pole 20 amp circuit breaker labeled TVSS.

4.3. Shall have one TVSS unit provided with each L1 service cabinet.

4.4. Shall have two TVSS units provided with each L2 service cabinet.

5. CONVENIENCE RECEPTACLE

5.1. Shall have a 120 VAC (RMS) convenience receptacle in accordance with the NEC Article 210.64.

5.2. Shall Be a Ground Fault Circuit Interrupter (GFCI) type.

5.3. Shall be a 15 Amp receptacle in 240/480 VAC cabinets.

5.4. Shall be a 20 Amp receptacle in 120/240 VAC cabinets.

5.5. Shall be grounded.

5.6. Shall be accessible when the front exterior door is open and the dead front door is closed and latched.

5.7. Shall be mounted a minimum of 2 feet above the bottom of the cabinet.
5.8. Shall not be mounted to the dead front door.

5.9. Shall have a label on the dead front door that reads “Convenience Receptacle”

6. PHOTOELECTRIC CONTROL

6.1. Shall Control AC power being delivered the lighting contactor control coil.

6.2. Shall provide a 3- pole, 3-wire locking type mounting receptacle for photoelectric control. This photo control receptacle must be in full compliance with the most current edition of ANSI C136.10.

6.2.1. Shall have a rotatable photocell socket such that the photo sensing input of the photocell may be rotated to face either window.

6.2.2. Shall have a base that is constructed of cast aluminum.

6.2.2.1. Shall be an Area Lighting Research Part # AM-2-A-NB or (MN/DOT approved equal).


6.3. Shall be designed to provide adequate clearance to easily install or remove the photocell.

6.4. Shall include a photoelectric control in accordance with the specification found on the Mn/DOT WEB site titled “Photo Cells”.

Approved photoelectric controls can be found on the Mn/DOT Approved Products List for Lighting:

http://www.dot.state.mn.us/products/index.html

6.5. Shall provide a 2-position test switch with "AUTO" and "TEST" positions to allow by-passing the photocell to turn roadway lights on for testing.

6.5.1. Shall have an Auto/Test Switch that is a heavy duty, single, double throw, two position rotary switch.

6.5.1.1. The test switch shall operate as follows:

6.5.1.1.1. One switch position shall be labeled "AUTOMATIC" and the other switch position shall be labeled "TEST".

6.5.1.1.2. In the "AUTOMATIC" position, the test switch shall connect the coil of the lighting contactor to the AC+ (SWITCHED) from the photoelectric control, providing photoelectric control of the lighting circuit.

6.5.1.1.3. In the "TEST" position, the test switch shall connect the coil of the lighting contactor to the AC+ (UNSWITCHED) from the photoelectric control, providing power to the lighting circuit regardless of the state of the photoelectric control.
6.5.1.2 The test switch shall be Allen Bradley 800-TH2A, Schneider Electric 9001KS11BH13, Eaton 10250T1311 (or MN/DOT approved equal)

6.5.2. Shall have the functions of the switch labeled on the dead front panel.

6.6. Shall have power to operate the photo control being fed from the 15 AMP (Photocell Control) circuit breaker to protect the photocell, test switch, and contactor coil circuit.

6.6.1. Shall be labeled Photocell Control.

6.6.2. Shall have the function of the switch position labeled on the dead front door.

7. COLD SEQUENCE DISCONNECT

7.1. Shall have a cold sequence disconnect mounted in the left compartment below the meter socket (line side wire way) on all 240/480 VAC Type L1 and L2 service cabinets.

7.2. The cold sequence disconnect is not required on 120/240 VAC cabinets.

7.3. The cold sequence disconnect shall utilize a circuit breaker that is appropriately rated for the application.

7.4. Shall have a cold sequence disconnect circuit breaker rated for 480 VAC and meet the following requirements:

7.4.1. L1 breakers shall be rated for 100 Amps of continuous current at 40º C (104º F).

7.4.2. L2 breakers shall be rated for 200 Amps of continuous current at 40ºC (104ºF).

7.4.3. L1 breakers shall carry a minimum 22,000 AIR.

7.4.4. L2 breakers shall carry a minimum 35,000 AIR.

8. UTILITY TERMINATION LUG’S AND WIRING

8.1. Shall have three utility termination lugs in each cabinet.

8.1.1. Shall have the bottom of each lug mounted 20 inches above the bottom of the cabinet.

8.2. Shall be fully wired from the utility termination lugs to the line side of the meter socket for 120/240 VAC cabinets.

8.3. Shall be fully wired from the utility termination lugs to the line side of the cold sequence disconnect circuit breaker. Additional wiring shall be run from the load side of the cold sequence disconnect to the line side of the meter socket for 240/480 VAC cabinets.
9. CABINET AIR RATING

9.1. The L1 and L2 Service Cabinets shall have a minimum overall rating of 22,000 AIR.

9.2. The use of current limiting fusing to achieve the AIR/AIC rating is not acceptable.

9.3. Shall be labeled in accordance with article 110.22 of the NEC.

9.3.1. The label should read as follows:

CAUTION- SERIES COMBINATION SYSTEM RATED 22,000 AMPERES.
IDENTIFIED REPLACEMENT COMPONENTS REQUIRED

10. EXTERNAL LABELING

10.1. Only MN/DOT approved and required safety labels may be applied to the exterior of the cabinet.

10.1.1. Shall have machine printed labels that are water proof and smudge proof and rated for outdoor use.

10.2. The manufacturer may not apply a company logo or company name to the exterior of the cabinet.

11. CABINET DRAWING SUBMITTAL

11.1. The manufacture must provide individual detailed drawings of the cabinet and sub-assemblies prior to submitting the cabinet for approval.

11.1.1. The individual drawings shall include but will not be limited to the following:

11.1.1.1. Detailed dimensional drawings of the exterior of the cabinet.

11.1.1.2. Detailed dimensional drawings of all internal compartments and panels of the cabinet

11.1.1.3. Detailed drawings of all safety covers and locations if required.

11.1.1.4. Detailed drawing of where all safety and manufacturer labeling must be placed.

11.1.2. Any modifications to the drawings Mn/DOT deems necessary must be completed by the manufacturer and final drawings provided to the department and approved by Mn/DOT prior to the cabinet being placed on the Mn/DOT APL.
12. ALLIANT ENERGY APPROVAL

Once the cabinet has been placed on the MN/DOT approved products list the manufacturer must submit and get their product listed on the Alliant Energy’s APL at no cost to the Department. The manufacturer must obtain Alliant energy approval within one year of being placed on the MN/DOT APL. Failure to comply with this requirement will result in the listed product being removed from the MN/DOT Approved Products List.

Additional information regarding Alliant Energy’s Approved Products List (Electric Service Equipment) may be found by following the link below.

http://www.alliantenergy.com/index.htm

13. CABINET MODIFICATIONS

Once the cabinet has been accepted by MN/DOT as meeting the requirements of this specification and placed on the MN/DOT APL no substitution of materials or modification of the cabinet design will be allowed unless the manufacturer has received written permission from Mn/DOT allowing the substitution or change. Failure to comply with this requirement will result in the listed product being removed from the MN/DOT Approved Products List.

14. CABINETS SUPPLIED TO MNDOT CONSTRUCTION PROJECTS

14.1. All versions of the L1 and L2 lighting cabinets must be supplied with the full complement of lighting branch circuit breakers as defined in section 3 above.

14.2. Each L1 cabinet shall have 4 lighting branch circuit breakers.

14.3. Each L2 cabinet shall have 8 lighting branch circuit breakers.
15. CABINET DRAWINGS AND SCHEMATICS

All example drawings and schematics provided in this section of the specification are for reference only.

L1 120/240 or 240/480
Front View
Schematic
L1 120/240VAC
General Component Layout
L1 240/480VAC

METER SOCKET
MAIN BREAKERS
DISTRIBUTION TERMINAL BLOCK WITH LEXAN COVER
2kVA TRANSFORMER
120V NEUTRAL BAR
COLD SEQUENCE DISCONNECT BREAKER & TERMINATION BLOCK (INSIDE CONNECTION BOX)
CIRCUIT 1 CIRCUIT BREAKERS
PHOTOCELL TERMINAL BLOCK
CIRCUIT 1 CONTROL SWITCH
GFI RECEPTACLE
CIRCUIT 1 SURGE PROTECTOR
CIRCUIT 1 CONTACTOR
NEUTRAL BAR
GROUND BAR

FRONT ELEVATION
(DOORS REMOVED)
Schematic
L2 120/240VAC