

## **APPENDIX 'E'**

### **MANITOBA STREET LIGHTING SPECIFICATIONS**

## E26. INSTALLATION OF STREET LIGHTING AND ASSOCIATED WORKS

### E26.1 DEFINITIONS

LIMITS OF APPROACH means the shortest distance that is permissible between live high voltage (>750 volts) conductors or apparatus and any part of a worker's body, material or tools being handled, or equipment operated.

MANITOBA HYDRO CENTRAL STORES means Manitoba Hydro's Waverley Service and Reclaim Centre - 1840 Chevrier Blvd - Winnipeg, Manitoba

OVERHEAD FEED means an electrical supply via an overhead conductor connected between streetlight standards. Typically strung between standards on a temporary basis.

OVERHEAD SOURCE means an electrical supply from Manitoba Hydro's system. (Typically, an overhead conductor from a wooden distribution pole or a DIP/RISER located on a wooden distribution pole.)

RECLAIM material means existing material that has been removed from Manitoba Hydro's system and to be returned to Manitoba Hydro.

SCRAP material means existing material that has been removed from Manitoba Hydro's system and to be recycled/disposed of by the Contractor.

SURPLUS material means new material that has been requisitioned by the Contractor and not incorporated into the work at the end of the Contract.

WORK CLEARANCE means an ELECTRICAL AND/OR NATURAL GAS FACILITIES LOCATE form (see SAMPLE ONLY included as Appendix D) issued by each of Manitoba Hydro's Customer Service Centre (CSC) affected to permit work to commence (Permit to work).

### E26.2 DESCRIPTION

E26.2.1 The work shall consist of the supply of all supervision, labour, materials (except as indicated under MATERIAL SUPPLIED BY MANITOBA HYDRO below) insurance, tools, backfill and equipment (and their maintenance), transportation, fuel, oil, meals and lodging, mobilization and de-mobilization, and warranty of workmanship as required to install and remove temporary Overhead Feeds, remove existing street light poles as required, install new street light poles and associated underground cables/conduits, all in accordance with the requirements specified in the tender documents.

### E26.3 WORK LOCATIONS

E26.3.1 The proposed street light installation and removals are shown on construction drawings and are as follows:

- (a) Kanata Street from Pandora Avenue to Ravelston Avenue
- (b) Wabasha Street Pandora Street to Regent Avenue
- (c) Day Street from Pandora Avenue to Ravelston Avenue

### E26.4 COORDINATION OF WORK

E26.4.1 The Contractor shall provide a minimum of ten (10) working days notice to Manitoba Hydro prior to the start of construction. The work shall be conducted and coordinated with Manitoba Hydro in a manner to ensure street lighting is maintained at all times for the

duration of the work. The construction drawings provide the Proposed Sequence of Construction.

E26.4.2 The Contractor shall obtain Work Clearance from Manitoba Hydro's Customer Service Centre(s) (CSC) affected prior to the work commencing. No additional compensation shall be paid to the Contractor for delays obtaining Work Clearance for any reason.

E26.4.3 Manitoba Hydro's CSC will provide the Limits of Approach applicable to the Contractor on the Work Clearance form.

## E26.5 ORIENTATION

E26.5.1 Prior to the commencement of the proposed work, the Contractor's crew foremen, electricians, and other key personnel shall attend one (1) day of orientation provided by Manitoba Hydro for various operations such as cable handling, cable splicing/termination, installation of street light poles, concrete bases, luminaires and various other construction standards and procedures. The Contractor will be responsible for all costs associated with personnel salaries, travel, sustenance and overheads, etc., during training.

## E26.6 PRE-CONSTRUCTION MEETING

E26.6.1 Prior to the commencement of the work, the Contractor shall attend a pre-construction meeting with Manitoba Hydro. The agenda for this meeting shall include but not be limited to the following:

- (a) Reference the Contractor's Safe work Procedures;
- (b) Prime Contractor;
- (c) materials;
- (d) sequence of construction;
- (e) communication plan;
- (f) any training requirements & qualifications;
- (g) Drawing and Project review;
- (h) a review of the Contractor's proposed work schedule; and
- (i) any and all other topics of clarification that the Contractor and the Contract Administrator may wish to discuss.

E26.6.2 The Contractor's cost to attend this pre-construction meeting shall be incorporated into the unit prices for the work.

## E26.7 QUALIFICATIONS AND CERTIFICATION

E26.7.1 The Contractor's Crew Foreman, installers and other key Contractor's Personnel shall possess the necessary certification, licensing, training, experience and familiarity with safety rules, procedures and hazards relating to the work. Journeyman Power Line Technician (PLT), Journeyman Lineman, Journeyman Cableman or Journeyman Electricians shall be required to perform portions of this work.

E26.7.2 Journeyman Power Line Technician (PLT), Journeyman Cableman and Journeyman Lineman are also required to possess a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line" issued by the Province of Manitoba.

E26.7.3 Office of the Fire Commissioner Bulletin OFC 18 – 002 dated May 23, 2018 regarding Electrician Licenses discusses the requirements for a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line".

For more information contact:

Office of the Fire Commissioner  
500-401 York Avenue  
Winnipeg, Manitoba R3C 0P8  
Tel. 204-945-3373  
Fax 204-948-2089  
Toll Free: 1-800-282-8069  
[firecomm@gov.mb.ca](mailto:firecomm@gov.mb.ca)

E26.7.4 Licensed Journeyman Electricians or Journeyman PLT or Journeyman Cableman or Journeyman Lineman ARE REQUIRED for all cable handling operations included but not limited to: disconnecting cables in the handhole, installation and removal of temporary overhead feeds, installation and connection of ground rods, streetlight cable splices, termination of streetlight cables in handholds and at luminaires. The Contractor shall employ sufficient qualified personnel on its crews to conform to the Electrician's Licensing Act. The Contractor shall be prepared to provide proof of licences to Manitoba Hydro upon request.

E26.7.5 The Contractor shall assess the hazards associated with the work and have documented Safe work Procedures to perform the work. It is the Contractor's responsibility to train employees on these procedures. The Contractor shall be prepared to provide proof of training to Manitoba Hydro upon request.

#### E26.8 REFERENCED STANDARD CONSTRUCTION SPECIFICATIONS

E26.8.1 In addition to these Specifications, the work to be performed by the Contractor relative to the installation and/or replacement of street lighting poles, concrete bases and associated cabling shall be in accordance with the following:

- (a) Manitoba Hydro 66kV and Below Standards;
- (b) CSA C22.3 No. 7 (latest edition);
- (c) Canadian Electrical Code (CEC) Part 1 (latest edition); and
- (d) Any other applicable codes
- (e) (collectively, the "Standards")

E26.8.2 Revisions and updates to the Manitoba Hydro 66kV and Below Standards are issued periodically and the latest issued version of the Standard will apply. For the convenience of the Contractor for bidding purposes, excerpts of the Manitoba Hydro 66kV and Below Standards have been included as Appendix A.

E26.8.3 In some cases, Municipal, Provincial or Federal laws or this Technical Specification may be more stringent than the CSA Standards. Whenever conflict exists, the Contractor shall comply with the most stringent requirements applicable at the place of the work.

#### E26.9 TOOLS, EQUIPMENT AND MATERIALS

E26.9.1 The Contractor shall be required to provide all tools and equipment required for performing the specified tasks. Equipment shall be in good operating condition, shall be properly maintained using original equipment manufacturer replacement parts and shall be provided with letters of testing/inspection from the manufacturer when requested. Where the equipment is provided as a kit with multiple parts and tools, the kit shall be complete with all parts required to perform the designed task. Contractor fabricated tools or equipment will not be accepted for use.

E26.9.2 The Contractor shall obtain the following specific Electrical Equipment including but not limited to:



- (a) Compression tool or tools and associated dies to perform compressions to a maximum size of 1/0 Al (MD-6 compression tools shall not be used).
- (b) Approved compression tools are:

Manufacture	Type	Model No.	Range
Burndy	In-line, battery	PATMD68-14V	350 Kcmil AL
Cembre	In-line, battery	B54Y (06V081E)	4/0 AWG AL
Burndy	Pistol, battery	BUR PAT60018V	350 Kcmil AL

E26.9.3 Dies shall be of the type shown in Standard CD210-21 and CD 210-24 only, must have identical markings, and compression tool die must match die number stamped on connector.

- (a) Modiewark Model #4444 or Fluke 1AC-II Volt Alert potential Indicator
- (b) Voltage meter – Fluke model #T3C
- (c) Insulated wire cutters – used for cutting cable ends square.

E26.9.4 Alternative equipment manufacturers may be considered upon request by the Contractor and shall be approved for use by Manitoba Hydro prior to use.

E26.9.5 Manitoba Hydro may reject any tools or equipment that do not appear to be in good condition or fail to successfully provide the required function.

**E26.10 MATERIAL SUPPLIED BY MANITOBA HYDRO**

E26.10.1 Manitoba Hydro shall supply all street light poles, concrete bases, breakaway bases, luminaires, street light arms, ground rods, compression sleeves, grommets, nuts, electrical cables, conduits, relays, cable guards, Gel-caps and all other materials noted in the Standards. The Contractor shall sign receipts indicating the location on which the materials are to be used. The material shall be picked up by the contractor from the following locations:

E26.10.2 Manitoba Hydro Central Stores (contact personnel will be provided to the successful contractor).

E26.10.3 Materials requested will be supplied to the Contractor by Manitoba Hydro upon presentation of Manitoba Hydro's Stores Material Order Form. The Contractor shall assume all responsibilities for the loading, unloading, transportation, proper handling, secure storage and working of the materials and shall make replacements at its own expense in case any material is damaged, stolen or lost due to improper handling, storage or poor workmanship.

E26.10.4 The Contractor shall, at the time of materials release, check and confirm the quantity of materials. Shortages, discrepancies, or damages to materials shall be immediately reported in writing to Manitoba Hydro.

E26.10.5 After commencing performance of the work, the Contractor shall continually monitor all material required for the timely completion of the work and shall report additional material requirements to Manitoba Hydro a minimum of 72 hours prior to materials being required to perform the work. No additional compensation shall be paid as a result of delays due to material shortages where additional material requirements were not reported a minimum of 72 hours prior to being required for the work on an active project.

**E26.11 MATERIAL SUPPLIED BY CONTRACTOR**

E26.11.1 The Contractor shall be responsible to furnish gravel, sand, ¾" down limestone, ¼" down limestone, protective hose (i.e. typically 2" fire hose), duct seal and pit-run material for

backfilling around street light poles and around cables as per the Standards. The cost of furnishing the above listed materials shall be incorporated into the unit prices for the work.

#### E26.12 SURPLUS, RECLAIM AND SCRAP MATERIAL

- E26.12.1 Upon completion of the work, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores, all Surplus materials furnished by Manitoba Hydro and not used in the work, regardless of the location of said material at that time.
- E26.12.2 In addition, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores all Reclaim materials from the work specifically HPS luminaires. Manitoba Hydro shall be responsible for the proper disposal of Reclaim HPS luminaires. The HPS bulb shall remain installed and unbroken in the Reclaim luminaire. The Contractor shall handle the Reclaim luminaires with care and shall avoid breaking the bulb or refractor.
- E26.12.3 Manitoba Hydro's preference is to recycle as much Scrap Material as practicable. The Contractor is responsible to remove the Scrap Material, transport to the recycler or Manitoba Hydro approved disposal site, pay for any disposal fees and may retain any recycling value.

#### E26.13 DE-ENERGIZATION AND LOCKOUT

- E26.13.1 **Manitoba Hydro** - Where a standard is supplied from an Overhead Source, Manitoba Hydro's staff shall be responsible to disconnect and isolate the street light standard or standards between the standard and Overhead Source. Some street light standards may be temporarily fed from an Overhead Source. This Overhead Source shall be disconnected and removed by Manitoba Hydro staff prior to commencing with the work. The streetlight circuits will not be Locked Out by Manitoba Hydro.
- E26.13.2 **The Contractor** - The Contractor shall assess the hazards associated with the work and employ its own Safe Work Procedure for the work to be performed. The Contractor's Safe Work Procedure shall include provisions that the street light circuits will not be Locked Out by Manitoba Hydro. The Contractor's Safe Work Procedure shall achieve Lock Out or techniques equivalent to Lock Out.
- E26.13.3 The Contractor shall complete a job planning form (an example is included as Appendix E) on a daily basis before any work commences and provide Manitoba Hydro with copies of the job plans if requested.

#### E26.14 TEMPORARY OVERHEAD FEEDS

- E26.14.1 Manitoba Hydro in consultation with the Contractor will determine if temporary lighting will be provided by the existing street lights or from the new street lights.
- E26.14.2 When using the existing poles for temporary lighting, Manitoba Hydro shall remove an Overhead Source in accordance with DE-ENERGIZATION AND LOCKOUT section above, prior to the Contractor installing a #4 duplex overhead conductor between the existing poles. The #4 duplex overhead conductor will normally be attached to the tenon of the davit arm near the luminaire with a pre-form grip. Older poles may require a spool insulator be attached to the pole using a pre-form grip to support the #4 duplex overhead conductor. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.
- E26.14.3 When using the new poles for temporary lighting, the Contractor shall install the new bases, poles and #4 duplex overhead conductor. The #4 duplex overhead conductor will be attached to the tenon of the davit arm near the luminaire with a pre-form grip. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.

E26.14.4 All material used to provide the temporary overhead feed shall be returned to Manitoba Hydro. Care shall be taken to coil and tag Reclaim conductor for reuse. If used, insulators shall be handled carefully to prevent breakage.

#### E26.15 SAFE EXCAVATION

E26.15.1 The work shall be performed in accordance with the requirements of Manitoba Hydro's Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B and Manitoba Workplace Safety and Health Regulation 217 latest revision.

#### E26.16 SAFE HANDLING

E26.16.1 The Contractor shall apply handling techniques in accordance with Manitoba Workplace Health and Safety Regulation 217 (latest revision).

#### E26.17 ELECTRIC CABLES AND CONDUITS

- (a) The Contractor shall use diligent care and proper equipment in handling of all cables, so as not to injure the jacket and avoid gouging, kinking, scratching or abrading the cables. If any material is damaged to any extent, the Contractor shall repair the damages at its own expense, in a manner approved by Manitoba Hydro or will be charged the full cost of the damaged items.
- (b) Cable reels shall not be dropped and must be handled and placed/stored in an upright position at all times and shall not be laid flat for any purpose or reason. Cable reels shall be adequately supported on hard surface to prevent the reel from sinking into the ground that can cause undue stress on the cables. Cable reels should be inspected for damages prior to use. If a cable reel is found to be defective, such defect shall be reported immediately to Manitoba Hydro.
- (c) The Contractor shall place all material and string the cables in such a manner as to cause the least interference with normal use of the land, street or roadway. All material shall be unloaded in a manner to preserve its condition, prevent loss and/or theft and permit easy access for Manitoba Hydro's inspection.
- (d) The Contractor shall provide Manitoba Hydro's inspector sufficient opportunity, in the sole discretion of Manitoba Hydro, to inspect the work.

#### E26.18 PRECAST CONCRETE BASES

E26.18.1 The Contractor shall handle, store, transport and unload the precast concrete bases in a manner to prevent damage to the threaded bolts and conduit casing.

E26.18.2 Precast Concrete Bases are extremely heavy. Approximate weight of pre-cast concrete bases are found in the Standards. The Contractor shall only use equipment rated for such weight.

#### E26.19 STREET LIGHT POLES AND ARMS

E26.19.1 The Contractor shall handle, store, transport, and provide proper load securement for the poles and arms in a manner to prevent damage.

#### E26.20 LUMINAIRES

E26.20.1 The Contractor shall handle, store, transport and unload the luminaires in their original packaging and in a manner to prevent damage.

#### E26.21 SMALL MATERIAL

E26.21.1 Photo electric cells, shorting caps, shims, nut covers and associated supplies shall be kept in a suitable warehouse provided by the Contractor at its own expense. Photo electric cells shall be transported and stored in such a manner as to prevent breakage.

#### E26.22 CARE OF MATERIALS

E26.22.1 The Contractor shall assume all responsibilities of all the materials and shall replace, at its own expense, any materials damaged, stolen or lost due to improper handling or poor workmanship.

#### E26.23 WIRE AND CABLE REEL STORAGE

E26.23.1 Cable reels shall be stored with the flanges upright and resting on a hard surface. At temporary storage sites where the soil may be soft, preservative-treated plywood sheets may be used to keep the flanges from sinking into the ground.

E26.23.2 If cable reels must be pancaked or stored on their side in vertical racks, do not lift the reel by the top flange. Spacers (two 2 X 4s placed wide side up) should be placed under the bottom flange and between the reels in order to create a space to insert the forks and lift the reels without damaging the cable.

#### E26.24 REEL HANDLING

E26.24.1 When off-loading reels from a truck, reels shall be lowered using a hydraulic gate, hoist or forklift truck. When a reel is rolled from one point to another, care must be taken to see that the reel does not straddle objects such as rocks, pipes, curbs or wooden blocks which could damage the cable or protective covering. A reel should always be rolled on hard surfaces to avoid sinkage and in the opposite direction to the cable wraps to ensure that the reel is rolled in such a direction as to tighten the cable on the reel.

E26.24.2 When using a hoist, install a mandrel through the reel arbour hole and attach a sling. Use a spreader bar approximately 6 inches longer than the overall reel width placed between the sling ends just above the reel flanges. This will prevent bending of the reel flanges and damage to the cable.

E26.24.3 If a forklift is used to move a reel, the reel is to be approached from the flange side. Position the forks such that the reel is lifted by both reel flanges. The lift forks shall not contact the cable.

E26.24.4 Returnable reels shall be returned promptly to Manitoba Hydro Central Stores and in no case later than three (3) days after the completion of the work unless otherwise mutually agreed between the Contractor and Manitoba Hydro.

#### E26.25 PRESSURIZED WATER/VACUUM EXCAVATION

E26.25.1 Pressurized water/vacuum excavation (PW/VE) shall be used to daylight all buried utilities and structures where excavation by other mechanical means would be expected to provide a physical risk to that utility or structure.

E26.25.2 The work shall be performed in accordance with the requirements of Manitoba Hydro's Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B.

#### E26.26 REMOVAL STREET LIGHT POLE FROM EXISTING BASE

E26.26.1 This shall include all work required to remove a street light pole from an existing base as set forth in this Technical Specification. The pole may be on an existing precast concrete base, steel power installed screw base or poured in place concrete base.

- E26.26.2 The Contractor shall furnish all labour, supplies and materials (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the removal of the street light pole from the existing base. Care shall be taken to preserve the luminaire. The luminaire shall be reinstalled on the new street light pole or returned to Manitoba Hydro's stores as instructed by the Manitoba Hydro.
- E26.26.3 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.
- E26.27 REMOVAL OF BASE AND DIRECT BURIED STREET LIGHT POLE
- E26.27.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to remove a base or direct buried street light pole. The base may be poured in place concrete, steel power installed or precast concrete.
- E26.27.2 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.
- E26.27.3 The Contractor is responsible to supply all backfill material as specified in the Standards and carry out all backfill, compacting and leveling of all excavations and voids for removed bases and direct buried street light poles so as to be ready for top soil and seed or sod or as directed by Manitoba Hydro.
- E26.28 INSTALLATION OF FOUNDATION - CONCRETE BASE
- E26.28.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to replace or install a concrete base as set forth in this Specification.
- E26.28.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to install a new or replace a concrete base. Excavation for the precast concrete base shall be to a diameter and depth specified in Standard CD 300-6. All excess material is to be removed by the Contractor.
- E26.28.3 The concrete base shall be set on a bed of  $\frac{3}{4}$ " down limestone. The concrete base backfill material shall be compacted in lifts no more than 150 mm. Backfill material shall be  $\frac{3}{4}$ " down limestone. Compacting of backfill material shall be done using a hydraulic tamper. Alternative tamping methods shall be approved by Manitoba Hydro. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and a layer of sand surrounding the cables to protect it from the limestone. The concrete base shall be installed level in all 4 directions. Final grade must be established prior to installing the concrete bases.
- E26.28.4 The completed backfill shall be at least equal in compaction to undisturbed soil, as required by the Municipal authorities or elsewhere in this Specification. The Contractor shall level all excavations.
- E26.28.5 Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface. Placing of additional backfill material due to settlement shall be at the Contractor's expense.
- E26.28.6 The concrete base shall be oriented in the proper direction to allow the easy entrance of the underground cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. The cable shall be left long enough to extend one (1) metre beyond the top of the hand hole.

## E26.29 BASE MOUNTED STREET LIGHT POLES

- E26.29.1 This shall include all work required to install the street light pole on the concrete base as set forth in this Specification.
- E26.29.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the installation of the pole (straight shaft or davit) on the concrete base.
- E26.29.3 Unless otherwise specified on the construction drawings, the Contractor shall orient the poles so that the hand hole is on the left side of the pole when viewed from the road. A worker should be able to see oncoming traffic when working in the hand hole.
- E26.29.4 The Contractor shall level the street light pole in all 4 directions. Leveling shims may be used.
- E26.29.5 Tightening of bolts shall be performed in a manner that brings the surfaces up evenly. All nuts shall be tightened and torqued in accordance with Standard CD 300-9. The Contractor shall install the nut covers included with the pole.
- E26.29.6 Unless otherwise specified, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.
- E26.29.7 Existing street light poles may have street signs attached. The Contractor shall remove the signs from the existing pole and temporarily reattach the signs to the new pole. The Contractor shall notify Manitoba Hydro of the location where the signs have been removed.

## E26.30 LUMINAIRES AND ASSOCIATED WIRING

- E26.30.1 The Contractor shall furnish labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to install the luminaire and associated wiring. Unless otherwise specified, the luminaire shall be installed with a tilt of zero (0) degrees. The Contractor shall install a length of 2 conductor No. 12 gauge (2C-12) wire from the terminals of the luminaire, through the arm (if applicable), down the pole to the hand hole. One (1) metre of 2C-12 wire shall be left at the hand hole. Impact equipment (air or electric) shall not be used to tighten luminaire mounting bolts. The Contractor shall be liable for damage due to over tightening.
- E26.30.2 The Contractor shall verify the luminaire voltage matches the source voltage as shown on the construction drawings. If luminaire voltage does not match the source voltage, the Contractor shall re-wire the luminaire in accordance with the wiring diagram provided.  
NOTE: Not applicable for LED luminaires.
- E26.30.3 As specified on the construction drawings, the luminaire will require either a photo electric cell (PEC) or shorting cap installed. When installing the PEC the eye shall be oriented north. The Contractor shall also install the appropriate wattage bulb in the luminaire.  
NOTE: Bulb installation not applicable for LED luminaires.

## E26.31 BREAK AWAY BASES

- E26.31.1 Break away bases shall be installed in accordance with Standard CD 300-10. The height of the concrete base above grade shall not exceed 50mm. The surface of the concrete base shall be flat and level. A reaction plate shall be installed between the concrete base and the break-away base.
- E26.31.2 The Contractor shall torque the couplers in accordance with Standard CD 300-10. Impact tools shall not be used to tighten or torque couplers or nuts associated with a break away base.

## E26.32 SPLICING/CONNECTING CABLES

- E26.32.1 The electric cable shall be spliced/terminated as per Standards CD 215-12, CD 215-13, CD 310-1, CD 310-4, CD 310-9 and CD 310-10 with the exception that the Contractor will use a GELCAP-SL-2/0 splice kit (See Appendix C). Termination in the hand hole may include the installation of an inline fuse holder.
- E26.32.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to splice/terminate the street light conductor(s).

## E26.33 EXCAVATION

- E26.33.1 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the completion and maintenance of grade and line of the street light cables and conduit including water control if found to be necessary. The trench shall be graded to conform to the street light cables and conduit so that the street light cables and conduit rest firmly on a smooth surface throughout its length. All stones or other objects which, in the opinion of Manitoba Hydro might damage the street light cable jacket and conduit shall be removed. Where the presence of rock or other condition prevent a satisfactory bed for the cables, 150 mm of well-tamped, clean soil or ¼" down crushed limestone shall be placed in the bottom of the trench. In this case, the spoil bank from trenching operations shall not be allowed to fall into the trench or mix with the soil to be used in backfilling the trench. Loose debris or foreign matter and the spoil bank shall be placed so as not to hinder drainage, damage property, or obstruct traffic.
- E26.33.2 Trenches shall be dug to such a depth that will provide a minimum cover of 600 mm from final grade in sodded areas and 1000 mm in roadways in accordance with Standard CD 305-1.

## E26.34 LAYING CABLES

- E26.34.1 Cables are to be lowered in the trench in an orderly fashion so as to maintain a consistent path and straight alignment. All cables shall be lowered in a continuous run (NO SPLICING) and in accordance with the construction drawings; and shall maintain the necessary separation, where required. All cables shall be of continuous runs and capped and sealed if they are not being installed in the pole at that time. Cables shall not be dragged over paved surfaces.
- E26.34.2 Once a cable is cut its ends must be sealed immediately with an approved and appropriately sized, heat shrink or cold shrink sealing cap to prevent moisture ingress unless the cable is being installed in the pole at that time.
- E26.34.3 During the removal of the cable, the reels shall be placed on jacks, stands or trailers with a bar through the arbour holes which will allow the reel to be turned easily, and the cable to be paid out. Cables can be paid out from the bottom or the top of the reel. Cable in coils shall be handled in a similar manner. This can be achieved by supporting the coil in a vertical plane and rotating it by hand as the cable is carefully uncoiled. The cable shall never be pulled over the flange of a reel, or pulled off the side of a coil, since this will introduce a twist in the cable.
- E26.34.4 During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards.
- E26.34.5 Where specified in the Standards or on the construction drawings, the Contractor shall install the street light cable in a conduit.

## E26.35 INSTALLING CONDUIT AND CABLE BY BORING (HORIZONTAL DIRECTIONAL DRILLING)

- E26.35.1 The Contractor shall dig the approaches and openings necessary to install boring equipment, and the boring equipment used shall be of such a nature as to minimize the opening size required. The boring equipment shall produce a straight hole without unnecessary dips or bends. The bore hole shall be only slightly larger than the outside diameter of the conduits or cables to minimize possible settlement. Cables and conduits shall be pulled in with pulling eyes or using a kelly grip in a manner so as to guard against damage.
- E26.35.2 During construction as the drill bit crosses each existing facility a lookout shall be assigned by the Contractor to visually confirm the drill bit is maintaining a minimum 300 mm clearance from the existing facility all in accordance with Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B. Maximum pulling tensions on any streetlight cable shall be limited to 2.9 kN/0.65 kips.
- E26.35.3 Drilling fluids and associated waste materials shall be disposed of in a manner that minimizes environmental effects.
- E26.35.4 The Contractor shall properly compact the backfill material and will be responsible for placing additional material should settlement occur for the duration of the warranty period.

## E26.36 BURIED UTILITY CROSSINGS

- E26.36.1 All buried obstructions are not necessarily shown on the reference drawings and the locations of those indicated are approximate only.
- E26.36.2 The Contractor shall determine the location of all buried obstructions and shall notify the appropriate authorities and obtain all necessary permits prior to excavation, trenching and directional drilling near or across such obstructions. All buried obstructions where the new buried cable route crosses other utilities including but not limited to gas, water, sewer, telephone and electric lines shall be exposed as per each utilities guidelines by the Contractor, including the use of Pressurized Water/Vacuum Equipment (PW/VE) where necessary. Should any damage occur to such lines during the course of the work, the Contractor shall be responsible for the damage and the costs of repairs to buried obstructions caused by its operations and shall fully indemnify the City of Winnipeg and Manitoba Hydro from and against all claims arising out of such damage. Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B shall be followed when crossing natural gas pipelines and electrical cables by the directional boring method.
- E26.36.3 The PW/VE technique, used to expose underground plant in certain conditions, must be performed in accordance with each utility's requirements, including but not limited to Manitoba Hydro, Manitoba Telecom Services, Shaw Cable, etc. PW/VE costs that the Contractor will incur during the work must be factored into the Contractor's bid prices. The Contractor shall not be entitled to extra compensation for the use of PW/VE on the work.
- E26.36.4 The Contractor shall be responsible to supply all backfill material and carry out all backfill, compacting and leveling of all excavations so as to be ready for topsoil and seed or sod or as directed by Manitoba Hydro.

## E26.37 BENDING CABLES/CONDUITS AND INSTALLATION INTO STANDARDS

- E26.37.1 It is desired to reduce to a minimum the required number of bends and to lay the cables/conduits to conform to the contour of the ground and maintain a normal covering. This shall be accomplished by cutting the trench slightly deeper in approaches to road crossings and drainage ditches. It is intended that the Contractor shall eliminate unnecessary bending by operating the trenching machine at various depths rather than by finishing grading the trench by hand whenever practical.



- E26.37.2 Sharp bends of the cables/conduits shall be avoided at all times. All bends shall meet the requirements set out in this Specification. If excessive bending was exerted on any cable, the cable shall be replaced at the Contractor's cost. During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards. At street light poles the Contractor shall install the ends of the cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and by a layer of sand surrounding the cables to protect it from the limestone. The cable shall be left long enough to extend one (1) metre beyond the hand hole. The street light cable in the trench shall be installed in conduit for mechanical protection and the ends sealed with duct seal supplied by the Contractor. Care shall be taken to prevent damaging the cable where it exits the conduit. The conduit shall only be installed into the concrete base if conduit sizes make it practicable.
- E26.37.3 Unless otherwise directed, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.

#### E26.38 BACKFILL

- E26.38.1 All backfilling material within 300 mm of the cables/conduits shall be clean, free of sod, vegetation, organic material, stones or other debris, and of a consistency as to not create significant voids or air spaces around the cables/conduits. Other backfilling material shall be free of stones greater than 150 mm on their maximum dimension. Where cinders or very acid soil are encountered or where gravel or incompressible fill is required by Municipal authorities, ¼" down crushed limestone shall be placed all around the cables for a depth of at least 300 mm. The completed backfill shall be at least equal in compaction to undisturbed soil or as directed by Manitoba Hydro. Backfill material is to be placed and compacted in lifts not exceeding 300 mm. All excess material is to be removed by the Contractor.
- E26.38.2 Tamping or flushing methods must be used where necessary to give the required compaction. Where tamping is used, hand tampers shall be used to at least 300 mm above the cable before machine tamping may be used. The Contractor shall level all excavations so as to be ready for topsoil and seed or sod or as directed by the Manitoba Hydro. Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface to the satisfaction of the Manitoba Hydro at the Contractor's cost.
- E26.38.3 Excavations remaining where poles have been removed shall be backfilled with spoil, pit run gravel or ¾" down limestone and compacted in lifts of 150mm as directed by Manitoba Hydro. The top 300 mm of the excavation shall be backfilled with topsoil.
- E26.38.4 Excavations remaining where utility crossings have been exposed shall be backfilled with sand or clean spoil and compacted in lifts of 150mm. The top 300 mm of the excavation shall be backfilled with topsoil.
- E26.38.5 Backfill of all excavations shall be in accordance with City of Winnipeg Standard Construction Specification CW 2030 (latest revision), to the satisfaction of the authority having jurisdiction and Manitoba Hydro.

#### E26.39 DEFECTIVE WORK & WARRANTY

- E26.39.1 If any portion of the work fails to comply with the requirements of this Specification, fails within the Warranty period, or if the final tests prove or indicate the existence of any fault or defect in the work, or any part thereof, Manitoba Hydro may forthwith re-execute or make good the faulty or defective work or alter the same to make it comply with requirements of the Specification at the Contractor's expense. Manitoba Hydro shall give the Contractor notice together with particulars of such failure, fault or defect, Manitoba Hydro's cost to re-

execute or make good the faulty or defective work and the Cost shall be deducted from the Contract.

E26.39.2 At the completion of the work for each location, Manitoba Hydro shall prepare and issue a Network Commissioning Report, a sample of which is included as Appendix F, to the Contractor. The Network Commissioning Report shall be dated indicating the commencement of the Warranty period for the work performed at the location.

#### E26.40 AS-BUILT DRAWING

E26.40.1 The Contractor shall provide an as-built drawing or mark-up drawing to Manitoba Hydro which accurately displays the "as-built" location of the buried street light cables, conduits and street light poles.

#### E26.41 MEASUREMENT AND PAYMENT

E26.41.1 Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances

- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the pole, base, luminaire, appurtenances, use of pressurized water/vacuum excavation, transportation of Reclaim, Surplus and Scrap material, payment of associated disposal fees and all other items incidental to the work included in the Specification.

E26.41.2 Removal of 45' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances

- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Removal of 45' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the pole, base, luminaire, appurtenances, use of pressurized water/vacuum excavation, transportation of Reclaim, Surplus and Scrap material, payment of associated disposal fees and all other items incidental to the work included in the Specification.

E26.41.3 Installation of Conduit and #4 AL C/N or 1/0 AL Triplex Streetlight Cable in Conduit by Open Trench Method

- (a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for "Installation of Conduit and #4 AL C/N or 1/0 AL Triplex streetlight cable in Conduit by open trench method." The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the conduit, pulling cable into the conduit, backfilling the trench, buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E26.41.4 Installation of 50 mm Conduit by Boring Method complete with Cable Insertion (#4 AL C/N or 1/0 AL Triplex)









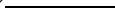





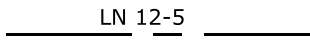





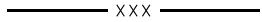




- (a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for "Installation of 50 mm conduit or conduits by boring method complete with cable insertion (#4 AL C/N or 1/0 AL Triplex)." The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of 50mm conduit or conduits by boring method, inserting the #4 AL C/N or 1/0 AL Triplex streetlight cable into the conduit(s), buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.
- E26.41.5 Installation of cable (#4 AL C/N or 1/0 AL Triplex) by boring method.
- (a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for "Installation of cable(s) (#4 AL C/N or 1/0 AL Triplex) by boring method." The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the cable or cables by boring method, buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.
- E26.41.6 Installation of 25'/35' Pole, Davit Arm and Precast Concrete Base Including Luminaire and Appurtenances
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation of 25'/35' pole, davit arm and precast concrete base including luminaire and appurtenances." The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the pole, davit arm, base, luminaire, appurtenances, placing the cable(s) into the base, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.
- E26.41.7 Installation of 45' Pole, Davit Arm and Precast Concrete Base Including Luminaire and Appurtenances
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation of 45' pole, davit arm and precast concrete base including luminaire and appurtenances." The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the pole, davit arm, base, luminaire, appurtenances, placing the cable(s) into the base, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.
- E26.41.8 Installation of One (1) 10' Ground Rod at Every Third Street Light, at the End of a Street Light Circuit or Anywhere Else as Shown on the Design Drawings. Trench #4 Ground Wire up to 1 m From Rod Location to New Street Light and Connect (Hammerlock) to Top of Ground Rod
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation of one (1) 10' ground rod at every third street light, at the end of a street light circuit or anywhere else as shown on the design drawings. Trench #4 ground wire up to 1 m from rod location to new street light and connect (hammerlock) to top of the ground rod." The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for

performing all operations herein described including install one (1) 10' ground rod, trench the #4 ground wire to the new streetlight pole, connect (hammerlock) ground wire to rod and all other items incidental to the work included in the Specification.

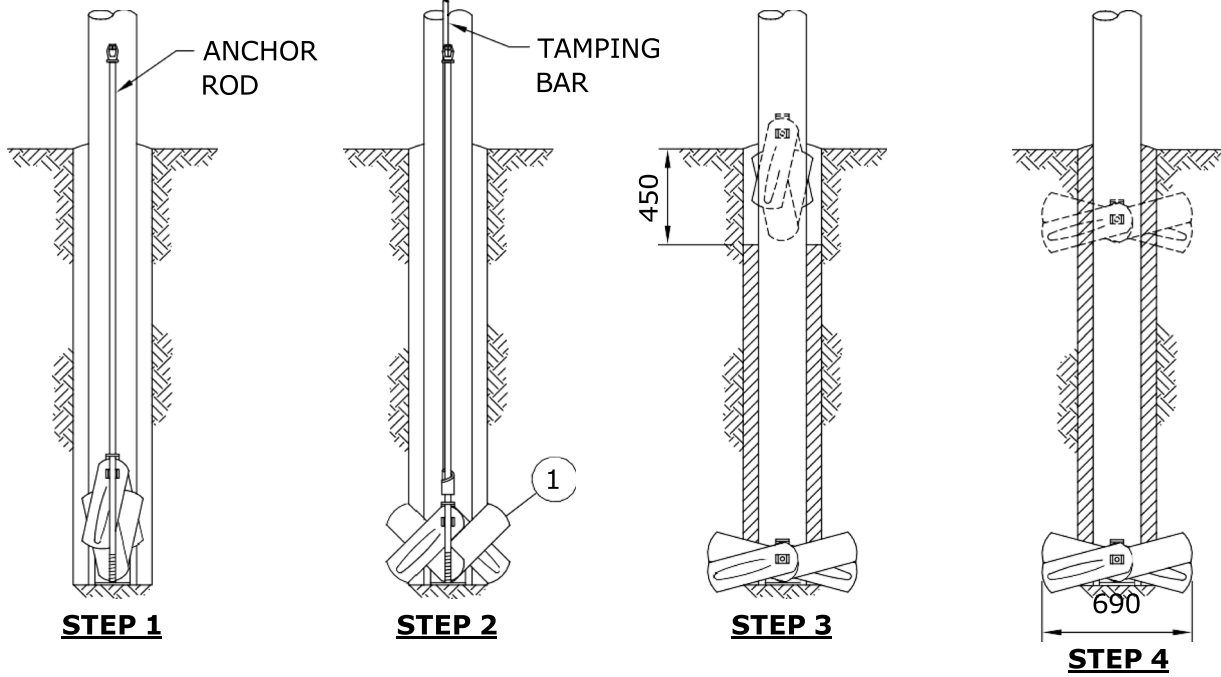
- E26.41.9 Installation of Lower 3 m of Cable Guard, Ground Lug, Cable Up Pole, and First 3 M Section of Ground Rod Per Standard CD 315-5
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Install/lower 3 m of Cable Guard, ground lug, cable up pole, and first 3 m section of ground rod per Standard CD 315-5". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installing the lower section of cable guard, ground lug, ground rod, coiling cable(s) up the pole and all other items incidental to the work included in the Specification.
- E26.41.10 Installation and Connection of Externally-Mounted Relay and PEC Per Standards CD 315-12 and CD 315-13
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation and connection of externally-mounted relay and PEC per Standards CD 315-12 and CD 315-13". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including mounting the relay, PEC, wiring as per the schematic and all other items incidental to the work included in the Specification.
- E26.41.11 Termination of 2/C #12 Copper Conductor to Street Light Cables Per Standard CD310-4, CD310-9 or CD310-10
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Terminate 2/C #12 copper conductor to street light cables per Standard CD310-4, CD310-9 or CD310-10". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including connection of the 2/C # 12 copper conductor to the #4 C/N or 1/0 Al Triplex cable(s) using a GELCAP-SL-2/0 splice kit and all other items incidental to the work included in the Specification.
- E26.41.12 Splicing #4 AL C/N or 2 Single Conductor Street Light Cables
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Splicing #4 Al C/N or 2 single conductor street light cables". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including splicing the #4 AL C/N or 2 single conductor cables in accordance with Standard CD 215-12 and CD 215-13 and all other items incidental to the work included in the Specification.
- E26.41.13 Splicing 1/0 AL Triplex Cable or 3 Single Conductor Street Light Cables
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Splicing 1/0 AL triplex cable or 3 single conductor street light cables". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including splicing the 1/0 Al triplex cable or set of 3 single conductor cables in

accordance with Standard CD 215-12 and CD 215-13 and all other items incidental to the work included in the Specification.

- E26.41.14 Installation of Break-Away Base and Reaction Plate on Base-Mounted Poles up to 35'
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation of break-away base and reaction plate on base mounted poles up to 35'". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the reaction plate, break-away base and all other items incidental to the work included in the Specification.
- E26.41.15 Installation of Overhead Span of #4 Duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed
- (a) This pay item will be measured on per span basis and paid for at the Contract Unit Price per span for "Installation of Overhead Span of #4 duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including attachment of the #4 duplex overhead conductor using a perform grip (c/w spool insulator(s) to davit arm if necessary), sagging conductor, connection of luminaire using 2C#12 copper conductor and all other items incidental to the work included in the Specification.
- E26.41.16 Removal of Overhead Span of #4 Duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed
- (a) This pay item will be measured on a per span basis and paid for at the Contract Unit Price per span for "Removal of Overhead Span of #4 duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by the Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the #4 duplex overhead conductor, spool insulator(s) and all other items incidental to the work included in the Specification.
- E26.41.17 Expose Underground Cable Entrance of Existing Streetlight Pole and Install New Streetlight Cable(s).
- (a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Expose Underground Cable Entrance of Existing Streetlight Pole and Install New Streetlight Cable(s)". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including excavation and exposure of the underground cable entrance by any means necessary including use of pressurized water/vacuum excavation, installation of the new streetlight cables(s), backfill, compaction and all other items incidental to the work included in the Specification.

EQUIPMENT (CONTINUED)		CABLES (CONTINUED)			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION		
	UNDERPASS LUMINAIRE (NUMBER OF UNITS x WATTAGE)	RI/PVCJ	RUBBER INSULATED, POLYVINYL CHLORIDE JACKET		
	HIMAST LIGHTING WITH 3 LUMINAIRES (WATTAGE)	XLPE	CROSS LINKED POLYETHYLENE		
	FAULTED CIRCUIT INDICATOR	TRXLPE	TREE RETARDANT XLPE		
	LIGHTNING ARRESTER	CTS	CORRUGATED TAPE SHIELD		
	GROUND ROD	CN, C/N	CONCENTRIC NEUTRAL		
	HYDRANT GROUND	CNJ	CONCENTRIC NEUTRAL WITH JACKET		
	LOAD BREAK FUSE	PEI	POLYETHYLENE INSULATED		
	FUSE (FUSE RATING)	TPX	TRIPLEX		
	LINE DISCONNECT/SWITCH N.C. : NORMALLY CLOSED N.O. : NORMALLY OPEN	QPX	QUADPLEX		
	LB: LOAD BREAK	<b>PRIMARY</b>			
<b>SERVICES</b>			SPLICE		
			1-PH		
			2-PH		
			3-PH		
			FEEDER IDENTIFICATION (REFER TO CD130-15)		
<b>SERVICES</b>		<b>SECONDARY</b>			
	CROSSING DRAWING		NEUTRAL		
<b>CABLES</b>			SPLICE		
AL	ALUMINUM		1-PH 2 COND SECONDARY		
AS	ALUMINUM SOLID		1-PH 3 COND SECONDARY		
CU	COPPER		3-PH 3 COND		
PILC	PAPER INSULATED, LEAD COVERED		3-PH 4 COND		
DSTA	DOUBLE STEEL TAPE ARMOUR		SL FEED, 1 COND C/N		
RINJ	RUBBER INSULATED, NEOPRENE JACKETED		SL FEED, 2 COND C/N		
			SL FEED TRIPLEX		
APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-11		<b>UNDERGROUND DISTRIBUTION SYMBOLS</b>			
	08-02			2	UPDATED SYMBOLS
	00-02			1	REDRAWN, UPDATED SYMBOLS

## INSTALLATION INSTRUCTIONS



- STEP 1:** SCREW A 3/4" ANCHOR ROD (NOT INCLUDED WITH ANCHOR) INTO THE POLE KEY AND LOWER THE ASSEMBLY, IN THE CLOSED POSITION, INTO THE HOLE ON THE SIDE OPPOSITE THE STRAIN.
- STEP 2:** EXPAND THE KEY INTO SOLID EARTH WITH AN EXPANDING/TAMPING BAR.
- STEP 3:** WHEN THE KEY IS FULLY EXPANDED, REMOVE THE ROD AND REFILL HOLE, CAREFULLY COMPACTING SOIL BACKFILL IN STAGES, TO WITHIN 450mm OF THE GROUND LEVEL.
- STEP 4:** INSTALL A SECOND POLE KEY ON THE OPPOSITE SIDE OF THE POLE FROM THE ORIGINAL KEY, AND EXPAND INTO SOLID EARTH WITH A TAMPING BAR.

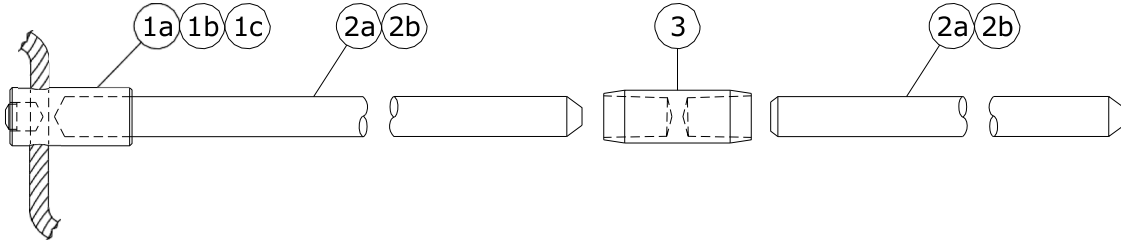
### MATERIAL LIST

ITEM No.	DESCRIPTION	MH CIIC CODE
1.	EXPANDING POLE KEY, 690mm (27 1/4") EXPANDED WIDTH, 276 sq. in. EXPANDING AREA	02 20 01
2.	ROD, ANCHOR 3/4"	71 31 34
3.	BAR, TAMPING	06 10 60

**NOTES:**

- USE WITH SLACK SPANS (SEE CD42-30) AND LIGHTLY LOADED POLES WHERE A GUY & ANCHOR CANNOT BE USED (LOADS LESS THAN 3000N).
- DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY D.R. ORR 15-10-22	17-04	2	REVISED NOTE 1	<b>COMPONENTS AND INSTALLATION OF EXPANDING POLE KEY ANCHORS</b>			
	16-12	1	REVISED ANCHOR ROD, STEP 4, ITEM NO. 3, & NOTE 1				
	15-06	0	REPLACED CD40-48				
DRAWN C.A.	CHECKED G.D./D.O.	DATE 15-06	<b>CD 44-30</b>			SHT 0001 of 1	REV 02



**COPPERWELD - SECTIONAL**

ITEM No.	DESCRIPTION	MH CIIC
1a	HAMMERLOCK FOR #2 & #4 CU	04 60 24
1b	HAMMERLOCK FOR 1/0 & 2/0 CU	06 62 13
1c	HAMMERLOCK FOR 3/0 & 4/0 CU	06 62 14
2a	10' CU-WELD ROD SECTIONAL (SEE NOTE 2)	71 70 10
2b	6' CU-WELD ROD SECTIONAL	00 68 26
3	COUPLING CU-WELD	00 52 27

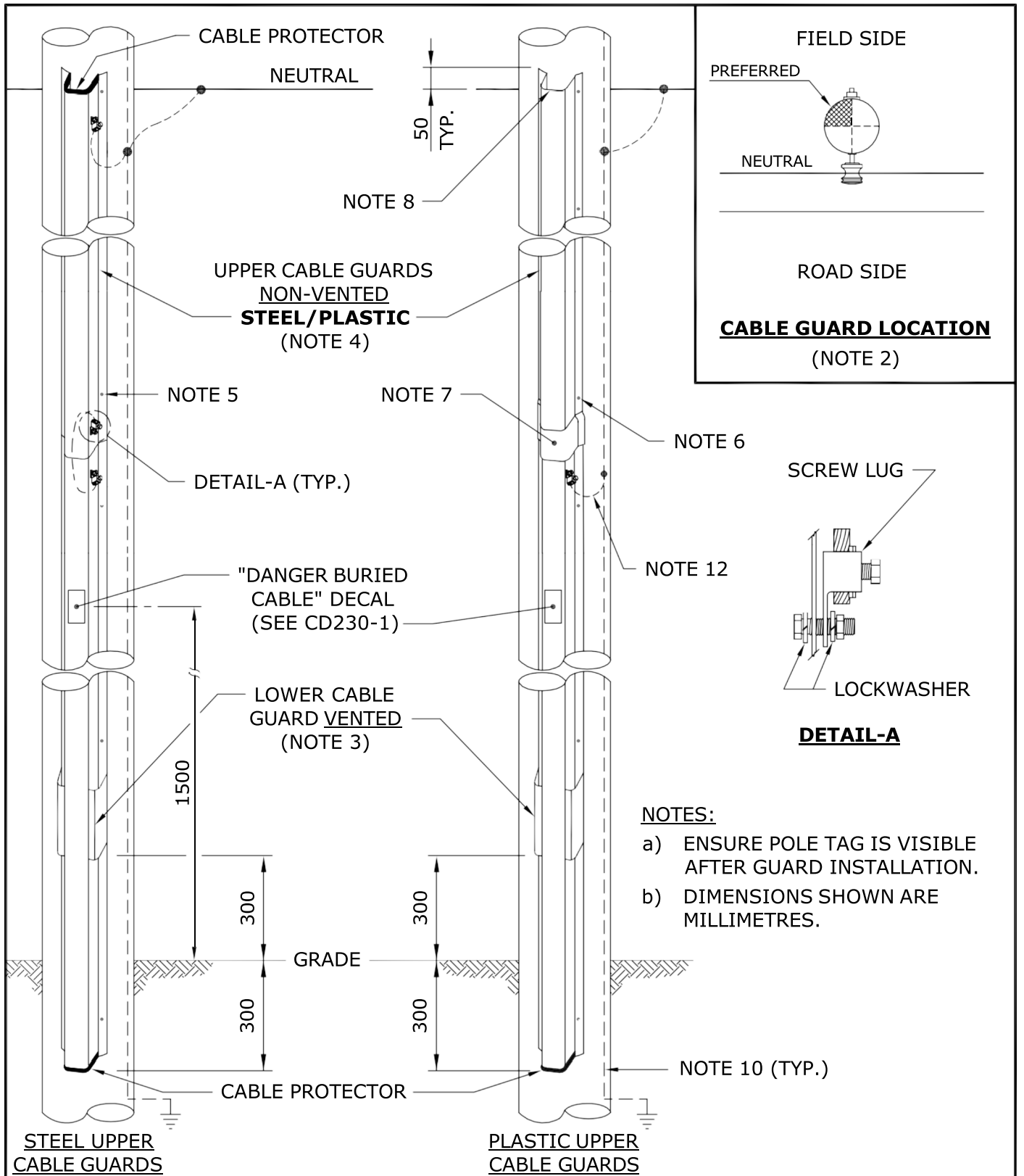
**NOTES:**

- FOR 3/4" GROUND RODS. IF A 5/8" GROUND ROD IS ENCOUNTERED, IT IS TO BE REPLACED WITH A 3/4" ROD.
- FIRST GROUND ROD SHALL BE A 10' ROD.
- FOR 06-62-14 HAMMERLOCK FOR 3/0 & 4/0 CU WHEN USED ON 3/0 CU, HAMMER DRIVE PIN FLUSH WITH TOP OF CONNECTOR AS PER MANUFACTURER'S INSTRUCTIONS.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 99-01-04*

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY D.R. ORR 21-06-01	21-04	4	REVISED ITEM 1b & 1c, ADDED NOTE 3, REMOVED ITEM 4 & 5, RESEALED	<b>GROUND ROD MATERIAL DETAIL</b>			
	13-01	3	ADDED HAMMERLOCK CONNECTOR				
	08-07	2	ADDED ELECTRONIC IGNITER & REVISED TABLE				
DRAWN C.A.	CHECKED G.D.	DATE 21-01	<b>CD 50-7</b>			SHT 0001 of 1	REV 04





**NOTES:**

- a) ENSURE POLE TAG IS VISIBLE AFTER GUARD INSTALLATION.
- b) DIMENSIONS SHOWN ARE MILLIMETRES.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 15-10-29	23-06	5	ADDED SHEET 3	<b>CABLE GUARD DETAILS ON DIP/RISER POLES</b>	
	16-04	4	REVISED NOTE		
	15-10	3	ADDED NOTE a), RESEALED		
DRAWN C.A.	CHECKED K.S.	DATE 15-10		<b>CD 200-63</b>	
				SHT	REV
				0001 OF 3	05

**NOTES:**

1. FOR CABLE GUARD SELECTION GUIDE, REFER TO DRAWING CD200-66.
2. TO PROVIDE A SAFER CLIMBING SURFACE AND TO PREVENT VEHICULAR DAMAGE TO THE CABLE GUARD, THE PREFERRED ATTACHMENT OF THE CABLE GUARD TO THE POLE SHOULD BE IN THE QUADRANT AS SHOWN.
3. THE LOWER CABLE GUARD SHALL BE GALVANIZED STEEL AND VENTED.
4. UPPER CABLE GUARD SHALL BE PLASTIC FOR THE 50mm & 90mm GUARDS AND GALVANIZED STEEL FOR THE 130mm GUARD.
5. ATTACH GALVANIZED STEEL CABLE GUARD TO POLE WITH 3/8" LAG SCREWS (72-60-03).
6. ATTACH THE PLASTIC CABLE GUARD TO THE POLE WITH #16 x 2" WOOD SCREWS (72-95-10), C/W FLAT WASHERS (86-10-04).
7. POSITION THE LAP-JOINT OF THE PLASTIC CABLE GUARD DOWN & OVER LAPPED A MINIMUM OF 25mm ONTO THE VENTED CABLE GUARD.
8. ENSURE THAT THE INNER EDGE IS BEVELLED.
9. CABLE GUARD TO EXTEND 50mm ABOVE THE NEUTRAL CONDUCTOR.
10. GROUNDING AND BONDING CONDUCTORS SHALL BE #4 BARE COPPER.
11. FOR GROUNDING CONNECTIONS, REFER TO DRAWING CD200-60.
12. BOND VENTED CABLE GUARD AT THIS POINT.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 99-11-03*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 15-10-29	23-06	3	ADDED SHEET 3	<b>CABLE GUARD DETAILS ON DIP/RISER POLES</b>	
	16-04	2	ADDED FLAT WASHERS TO NOTE 6		
	15-10	1	RESEALED		
DRAWN C.A.	CHECKED K.S.	DATE 15-10	<b>CD 200-63</b>		SHT 0002 of 3
					REV 03

SECONDARY CABLE	TYPICAL USAGE
#4 AL. CONCENTRIC NEUTRAL	STREET LIGHT CIRCUITS
1/0 AL. TRIPLEX	SECONDARY RESIDENTIAL SERVICES AND HEAVILY LOADED STREET LIGHT CIRCUITS WHERE VOLTAGE DROP MAY BE A PROBLEM
4/0 AL. TRIPLEX	SECONDARY RESIDENTIAL SERVICES
350 TRIPLEX	SECONDARY RESIDENTIAL SERVICES
4/0 AL. TRIPLEX	THREE PHASE SECONDARY SERVICES ADD #2 Cu BARE NEUTRAL UP TO 200 AMP
350 AL. QUADRAPLEX	THREE PHASE SECONDARY SERVICES 400 AMP OR 200A OVER 75m
750 AL. OR 1000 CU.	THREE PHASE SECONDARY SERVICES OVER 400 AMPS

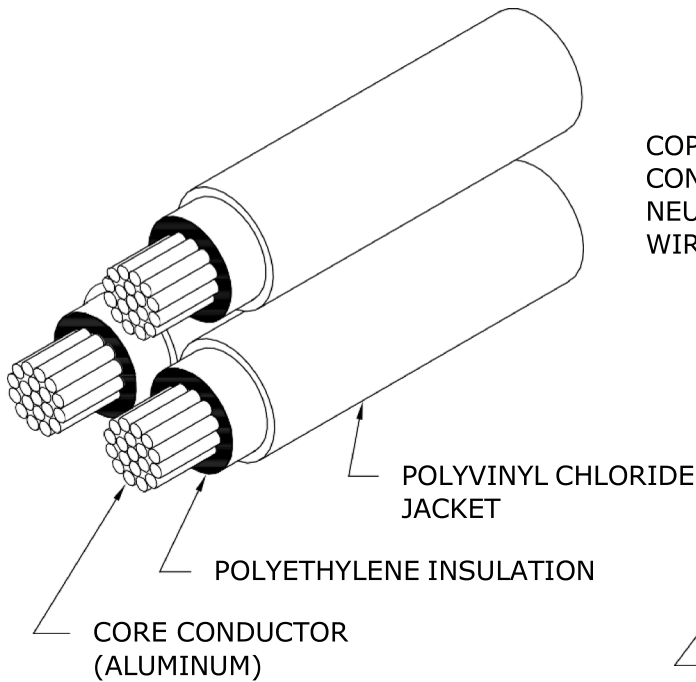
NOTE:

SEE CD225-4 FOR SIZING AND SPACING OF SINGLE AND THREE PHASE CONDUCTORS.

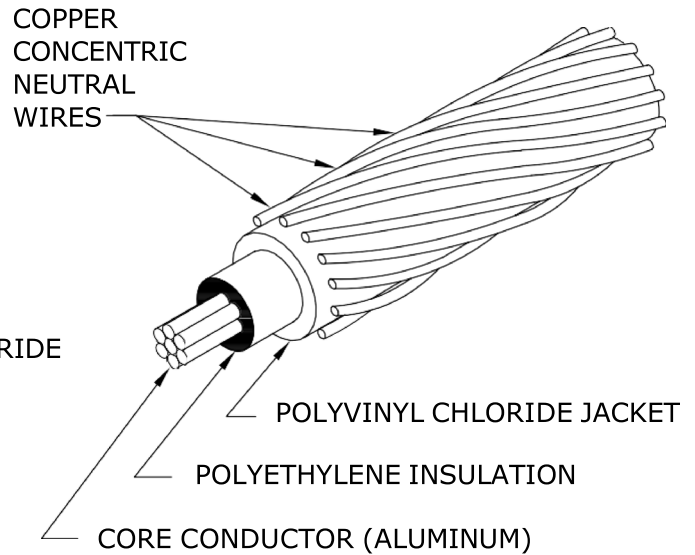
*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 88-03-29*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-01-25	17-01	11	ADDED 4/0 AL TRIPLEX TO TABLE, RESEALED	<b>UNDERGROUND SECONDARY CABLE</b>	
	06-03	10	ADDED NOTE AND 350 TRIPLEX		
	99-04	9	4/0 AL. TRIPLEX, NOTE CHANGED		
DRAWN C.A.	CHECKED K.S.	DATE 17-01	<b>CD 210-12</b>		SHT 0001 of 2
					REV 11

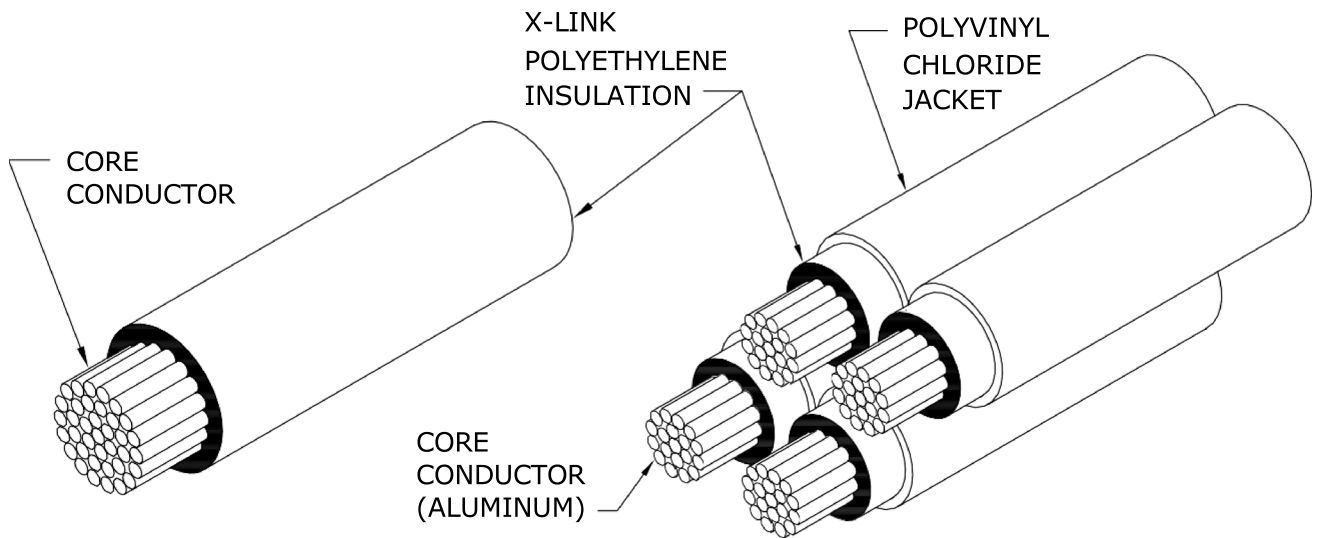
# BASIC CONSTRUCTION OF UNDERGROUND SECONDARY CABLES



**1/0 & 4/0 AND 350 TRIPLEX**



**# 4 CONCENTRIC NEUTRAL CABLE**



**750 kcmil (AL) & 1000 kcmil (CU) RWU**

**350 kcmil QUADRAPLEX**

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03	06-03	2	REPLACED 4/0 TRIPLEX WITH 4/0 & 350 TRIPLEX	<b>UNDERGROUND SECONDARY CABLE</b>		
	95-01	1	C/N WIRES NO LONGER TINNED			
	93-07	0	500 MCM DELETED 350 750 kcmil ADDED FORMERLY CD210-3			
DRAWN W.B./CAD	CHECKED B.H.	DATE 93-07		<b>CD 210-12</b>		SHT 0002 of 2
						REV 02

## UNDERGROUND SECONDARY CABLE

VOLTAGE RATING	600V	600V	600V	600V	1000V	1000V	1000V
CORE CONDUCTOR SIZE	#4	1/0	4/0	350 kcmil	750 kcmil	1000 kcmil	1000 kcmil
CORE CONDUCTOR MATERIAL	ALUM.	ALUM.	ALUM.	ALUM.	ALUM.	ALUM.	COPPER
TYPE OF CABLE	C/N	TRIPLEX	TRIPLEX	TRIPLEX OR QUADPLEX	1-COND.	1-COND.	1-COND.
NEUTRAL SIZE AND TYPE	#6 CU. Concentric Neutral	1/0 ALUM.	4/0 ALUM.	350 kcmil ALUM.	NONE	NONE	NONE
MIN. BENDING RADIUS (mm)	125	115	150	180	250	300	300
DC RESISTANCE @ 20°C (OHMS/km)	1.360	0.538	0.269	0.163	0.076	0.057	0.035
** DIRECT BURIED AMPACITY (@ 20°C ambient)	125	215	300	420	* 725	* 840	* 1080
VENTED CABLE GUARD AMPACITY (@ 20°C ambient)	100	175	250	330	575	680	855
*** BURIED DUCT AMPACITY (@ 20°C ambient)	70	130	195	265	425	495	630
CONDUCTOR DIAMETER (mm)	5.4	8.9	12.7	15.8	25	26.9	26.9
NOMINAL DIA. OVER INSUL. (mm)	8.6	12.5	16.5	21.6	31.4	33.5	33.5
NOMINAL DIA. OVER JACKET (mm)	12.74	14.7	17.8	22.8	N/A	N/A	N/A
LINEAL MASS (kg/km)	N/A	760	1320	2200/2900	1330	1369	4983
COLD SHRINK END CAPS (MH CIIC)	N/A	15 31 40	15 31 40	15 31 60	15 31 75	15 31 75	15 31 75
HEAT SHRINK END CAPS (MH CIIC)	03 67 31	03 67 31	03 67 31	03 67 30	01 79 82	03 48 63	03 48 63

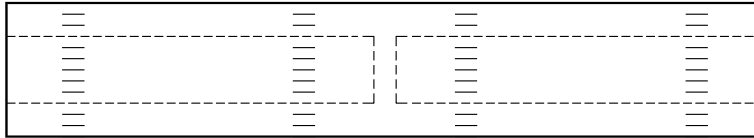
\* PROVIDED MULTIPLE CONDUCTORS PER PHASE ARE SPACED AS SHOWN IN DRAWING CD225-4.

\*\* CABLES DIRECTLY BURIED OUT OF PADMOUNT TRANSFORMERS OR PEDESTALS.

\*\*\* CABLES IN NON-VENTED CABLE GUARDS OR IN CONDUITS LONGER THAN 2 METRES.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS				
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 16-03-30	17-01	5	REVISED TABLE	<b>STANDARD UNDERGROUND SECONDARY CABLE DATA</b>				
	16-03	4	ADDED 1000 kcmil ALUM. COND., REVISED DATE, RESEALED					
	08-12	3	ADDED COLD & HEAT SHRINK CAPS AND LINEAL MASS TO TABLE					
DRAWN C.A.	CHECKED J.R.	DATE 16-03		<b>CD 210-15</b>			SHT 0001 of 1	REV 05



- FOR SPLICING SECONDARY ALUMINUM/COPPER CONDUCTORS.
- NOT SUITABLE FOR USE ON PRIMARY CONDUCTORS.
- COMPLETE WITH BARRIER TO PREVENT MOISTURE MIGRATION.
- FILLED WITH SYNTHETIC INHIBITOR.
- STAMPED WITH CONDUCTOR AND DIE SIZE.
- **COMPRESSION TOOL DIE MUST MATCH DIE NUMBER STAMPED ON CONNECTOR.**
- WIRE BRUSH ALL CONDUCTORS PRIOR TO INSTALLING CONNECTOR.

**\* UNDERGROUND SECONDARY CABLE COMPRESSION CONNECTORS**

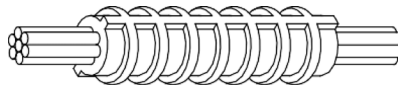
CONDUCTOR SIZE		STORES CODE	TOOL (DIES)	
FROM	TO		PREFERRED	ALTERNATE
#4	#4	74 27 64	Y35 (UCSA 22)	** MD6 (WCSA 22, BG)
1/0	#2	74 27 30		
1/0	1/0	74 27 65		
4/0	1/0	74 27 67	Y35 (UCSA 24)	** MD6 (WCSA 24, 249)
4/0	4/0	74 27 68		
350	4/0	74 27 78	Y35 (UCSA 28)	---
350	350	74 27 72		
750	500	74 27 27	Y46/ADPT (UCSA 30)	---

\* FOR CONNECTING INSULATED ALUMINUM TO BARE COPPER, REFER TO DRAWING CD215-13.

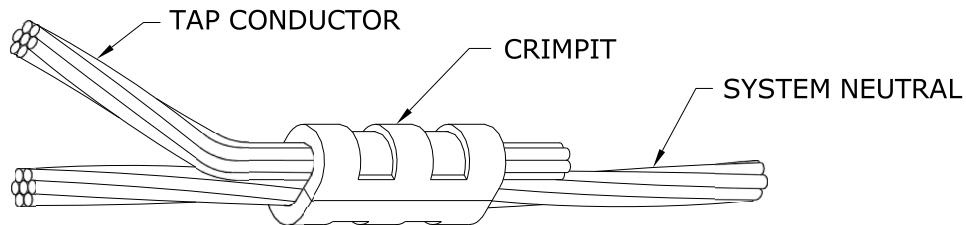
\*\* ROTATE MD6 TOOL 180° AFTER EVERY CRIMP.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03				<b>UNDERGROUND SECONDARY CABLE COMPRESSION CONNECTORS</b>		
		95-09	2			350-4/0 CONNECTOR ADDED
		95-01	1			NOTE ON MD6 TOOL ADDED
DRAWN W.B./CAD	CHECKED G.W.	DATE 93-07	<b>CD 210-21</b>		SHT 0001 of 1	
					REV 02	

- COMPRESSION TOOL DIE MUST MATCH DIE NUMBER STAMPED ON CONNECTOR.
- WIRE BRUSH CONDUCTORS PRIOR TO INSTALLING COMPRESSION CONNECTORS.



<b>UNDERGROUND NEUTRAL COMPRESSION CONNECTORS</b>			
CONDUCTOR SIZE		STORES CODE	TOOL (DIES)
FROM	TO		
#4	#4	74 32 04	MD6 (162)
#2	#2	74 32 02	MD6 (163)
2/0	2/0	74 31 26	MD6 (166)
4/0	4/0	74 31 28	Y35 (168)
350	350	74 32 31	Y35 (267)



<b>UNDERGROUND NEUTRAL "C" TYPE (CRIMPIT) COMPRESSION CONNECTORS</b>			
<b>* (FOR USE ON COPPER CONDUCTORS ONLY)</b>			
CONDUCTOR SIZE		STORES CODE	TOOL (DIES)
RUN	TAP		
#6 - #4	#6	74 41 10	MD6 (BG)
#4	#4	74 40 90	MD6 (BG)
#2	#4	74 40 80	MD6 (WC)
#2	#2	74 40 70	MD6 (WC)
1/0 - 2/0	1/0 - 2/0	74 41 12	Y35 (UO)
3/0 - 250	#6 - 2/0	74 41 15	Y35 (U997)
3/0 - 250	3/0 - 250	74 41 16	Y35 (U997)
300 - 500	#6 - 2/0	54 23 60	Y46 (P1011)
300 - 500	3/0 - 250	18 30 74	Y46 (P1011)

\* FOR CONNECTING BARE COPPER TO INSULATED ALUMINUM, REFER TO DRAWING CD215-13.

APPROVED  ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS							
	10-12	2	ADDED CONNECTOR							
	95-01	1	NOTES REARRANGED							
	93-07	0	CONNECTORS ADDED, FORMERLY CD210-8							
DRAWN W.B./CAD			CHECKED K.C.H.		DATE 93-07		<b>CD 210-24</b>		SHT	REV
			0001 of 1						02	

THERE ARE THREE METHODS FOR SPLICING 600 VOLT UNDERGROUND SECONDARY CABLES:

- 1) HEAT SHRINK INSULATING TUBING SPLICE
- 2) PRE-STRETCHED INSULATING TUBING SPLICE
- 3) TAPED SPLICE

750 kcmil AND 1000 kcmil CABLES, USED IN CONJUNCTION WITH 3-PHASE COMMERCIAL SERVICES, SHALL NOT BE SPLICED, EXCEPT FOR EMERGENCY REPAIRS.

**GENERAL INSTRUCTIONS:**

1. a) FOR 1/0 AND 4/0 TRIPLEX CABLES:

- REMOVE ANY DAMAGED OR CONTAMINATED PORTIONS OF CABLE.
- TRAIN CABLES INTO FINAL POSITION (DO NOT SNAKE IN TRENCH).
- CUT CABLES SQUARE AND BUTT ENDS.
- STAGGER SPLICES.
- PROCEED TO STEP 2.

b) FOR #4 CONCENTRIC NEUTRAL CABLE:

- REMOVE ANY DAMAGED OR CONTAMINATED PORTIONS OF CABLE.
- TRAIN CABLES INTO FINAL POSITION WITH ENDS OVERLAPPING C/L BY 150mm.
- TIGHTLY TWIST CONCENTRIC NEUTRAL WIRES INTO A BUNDLED CONDUCTOR FOR APPROXIMATELY 250mm AND TEMPORARILY FOLD BACK.
- CUT OFF APPROXIMATELY 100mm OF CABLE FROM EACH END.
- PROCEED TO STEP 2.

2. SELECT APPROPRIATE SLEEVE AND DIE ACCORDING TO DRAWING CD210-21.

3. SELECT SPLICING METHOD (FOR CORRECT MANUFACTURED SPLICES, REFER TO TABLE ON SHEET 2 of 3).

**NOTE:**

FOR SPLICING BARE COPPER NEUTRAL WIRE TO INSULATED ALUMINUM CABLE, REFER TO DRAWING CD215-13.

4. REMOVE JACKET AND INSULATION FROM CABLES AS PER FIGURE 1 OR FOLLOW MANUFACTURERS INSTRUCTIONS; BE CAREFUL NOT TO NICK INSULATION OR CONDUCTOR.

5. CLEAN CONDUCTOR WITH WIRE BRUSH. INSTALL CONNECTOR.

**NOTE:**

EXCEPT FOR TAPED SPLICE, SLIDE TUBING OVER ONE CONDUCTOR BEFORE INSTALLING CONNECTOR.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11	17-10	3	REMOVED RAYCHEM RAYVOLVE SPLICING, RESEALED	<b>SPLICES FOR UNDERGROUND SECONDARY CABLES</b>					
	96-05	2	NOTES REVISED, SHEET 3 ADDED						
	95-01	1	NOTES 3, 7 & TABLE ADDED						
DRAWN C.A.	CHECKED K.S.	DATE 17-10	<b>CD 215-12</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 3</td> <td>03</td> </tr> </table>	SHT	REV	0001 of 3	03
SHT	REV								
0001 of 3	03								



6. CLEAN JACKET (50mm), INSULATION, AND CONNECTOR WITH AN APPROVED CLEANING SOLVENT (S.C.# 43 11 95).

7. COMPLETE SELECTED SPLICE (AS CHOSEN IN STEP 3).

NOTE:

TO COMPLETE #4 CONCENTRIC NEUTRAL SPLICE, PROCEED TO STEP 8.

8. FOR #4 CONCENTRIC NEUTRAL CABLE: (CONT'D)

a) APPLY 1 LAYER OF 1/4 STRETCHED 50mm WIDE RUBBER MASTIC TAPE (S.C.#78 55 28) OVER CENTRE OF COMPLETED SPLICE.

b) TRAIN TWISTED CONCENTRIC NEUTRAL WIRE (STEP 1b) INTO FINAL POSITION ALLOWING ADEQUATE CLEARANCE FOR MD6 PRESS.

c) PLACE "C" TYPE COMPRESSION CONNECTOR OVER TWISTED WIRES AND CRIMP. REFER TO DRAWING CD210-24.

d) TRIM OFF PROTRUDING WIRES AND COMPRESS WITH PLIERS ELIMINATING ANY SHARP ENDS.

e) APPLY A 100mm STRIP OF 50mm WIDE RUBBER MASTIC TAPE OVER CONNECTOR AND PROTRUDING WIRES.

NOTE:

SHINY SIDE AGAINST CONNECTOR AND THE 100mm LENGTH PARALLEL TO CONNECTOR AND WIRE.

f) FORM TAPED CONCENTRIC NEUTRAL CONNECTION AND WIRES AROUND SPLICE AND CABLE.

g) APPLY 2 LAYERS 3/4 STRETCHED COLD WEATHER VINYL TAPE (S.C.#78 55 98) OVER TAPED CONCENTRIC NEUTRAL CONNECTION AND SPLICE, APPROXIMATELY 50mm WIDE.

MANUFACTURED SPLICES FOR SECONDARY CABLES		
CONDUCTOR SIZE	TYPE OF SPLICE	STORES CODE
#4 TO 1/0	PRESTRETCHED	85 13 10
4/0 TO 350	PRESTRETCHED	85 13 40
	HEAT SHRINK	85 13 50

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED  ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
	17-08	4	REVISED TABLE, RESEALED	<b>SPLICES FOR UNDERGROUND SECONDARY CABLES</b>
	15-02	3	REMOVED RAYVOLVE SPLICE FROM TABLE	
08-03	2	REVISED TABLE AND NOTE 6		
DRAWN C.A.	CHECKED K.S.	DATE 17-08	<b>CD 215-12</b>	
			SHT 0002 of 3	REV 04

**FOR TAPED SPLICE**

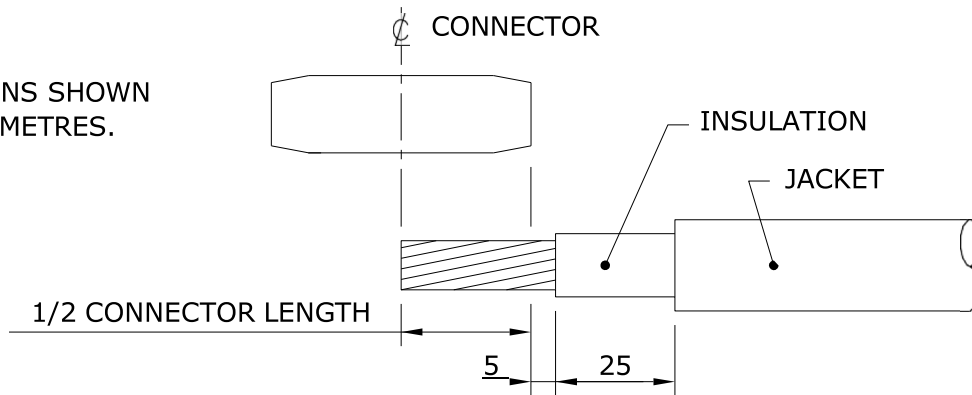
TAPES SHALL ONLY BE APPLIED DIRECTLY FROM ROLL ONTO SPLICE, HALF LAPPED AND STRETCHED TO 3/4 OF THEIR ORIGINAL WIDTH.

1. APPLY 3 LAYERS OF SELF-AMALGAMATING ETHYLENE PROPYLENE RUBBER (E.P.R.) TAPE (S.C.#78 55 23) AS PER FIGURE 2.
2. APPLY 2 LAYERS OF COLD WEATHER VINYL TAPE (S.C.#78 55 98) AS PER FIGURE 2.

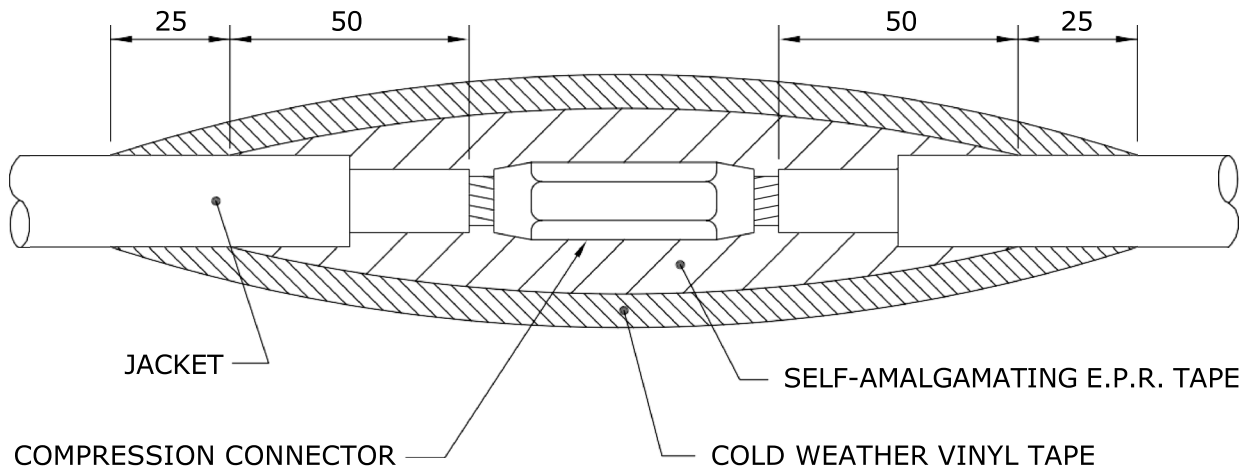
OR

APPLY 3 LAYERS OF SELF-AMALGAMATING HIGH TEMPERATURE SILICONE TAPE (S.C.#03 74 67). VINYL TAPE IS NOT REQUIRED.

**NOTE:**  
DIMENSIONS SHOWN  
ARE MILLIMETRES.



**FIGURE 1**



**FIGURE 2**

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 97-01-08*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11				<b>SPLICES FOR UNDERGROUND SECONDARY CABLES</b>		
		17-10	2			RESEALED
		10-12	1			REVISED COMPRESSION CONNECTOR AND NOTE 2
DRAWN C.A.	CHECKED K.S.	DATE 17-10		<b>CD 215-12</b>		
						SHT 0003 of 3

**CABLE PREPARATION:**

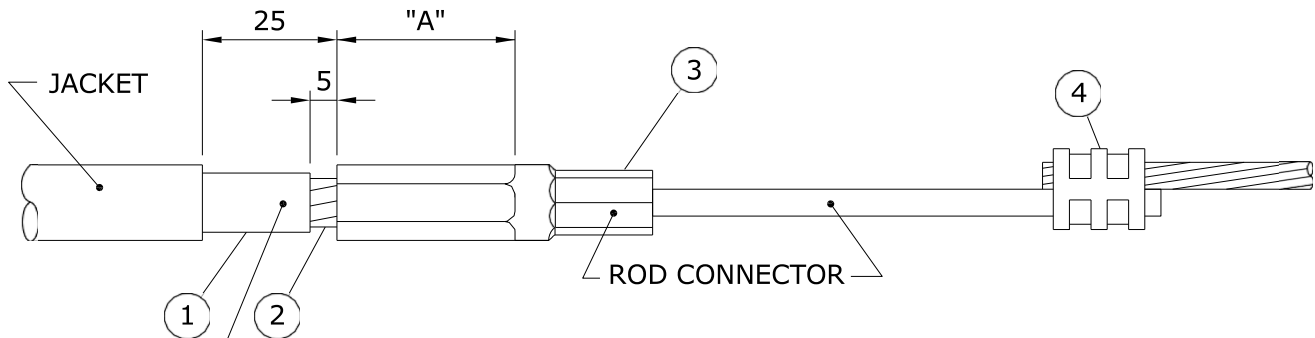
- ① REMOVE PVC (POLYVINYL CHLORIDE) JACKET TO DIMENSION "A" PLUS 25mm.
- ② REMOVE POLYETHYLENE INSULATION TO DIMENSION "A" PLUS 5mm. USE ABRASIVE TAPE (SC. 78 50 04) ON ALL CONNECTON SURFACES.
- ③ INSTALL ROD CONNECTOR AS PER TABLE BELOW AND FIGURE 1.

CONDUCTOR SIZE	* ROD CONNECTOR STORES CODE No.	PRESS	DIE
1/0 ALUMINUM	74 27 62	Y35/MD6	CSA 22
4/0 ALUMINUM	74 27 69	Y35/MD6	CSA 24

\* ROD IS FACTORY CRIMPED INTO CONNECTOR

- ④ CONNECT BARE COPPER STRANDED WIRE TO ROD CONNECTOR AS PER TABLE BELOW. USE ABRASIVE TAPE ON ALL CONNECTON SURFACES.

CONDUCTOR SIZE	CONNECTOR STORES CODE No.	PRESS	DIE
COPPER ROD TO #4 COPPER STRANDED	74 40 90	Y35/MD6	WBG
COPPER ROD TO #2 COPPER STRANDED	74 40 70	MD6	WC



**FIGURE 1**

**NOTE:** DIMENSIONS SHOWN ARE MILLIMETRES.

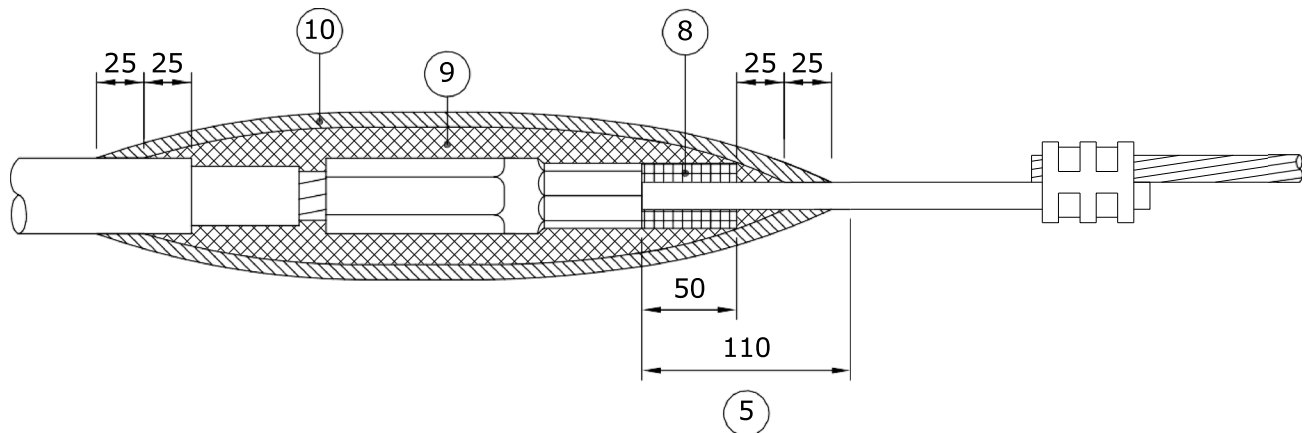
APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03			<b>SPLICING SECONDARY NEUTRAL (BARE COPPER TO INSULATED ALUMINUM)</b>		
	08-11	2			REVISED TABLE AND COMPRESSION CONNECTOR
	94-10	1			ROD CONNECTOR ADDED
DRAWN W.B./CAD	CHECKED B.H./K.C.H.	DATE 94-06	<b>CD 215-13</b>		
			SHT 0001 of 2	REV 02	

**TAPING:**

- 5 ABRASE ROD PORTION OF ROD CONNECTOR WITH ABRASIVE TAPE AS SHOWN IN FIGURE 2.
- 6 CLEAN JACKET, INSULATION & ROD CONNECTOR WITH AN APPROVED CLEANING SOLVENT (S.C.# 43 11 95).
- 7 CUT ONE PIECE OF RUBBER MASTIC TAPE (S.C. 78 55 28) INTO EITHER A 50mm WIDE x 75mm LONG STRIP FOR 1/0 CONNECTOR OR A 50mm WIDE x 125mm LONG STRIP FOR 4/0 CONNECTOR.
- 8 APPLY THE PRECUT STRIP OF RUBBER MASTIC TAPE 1/4 STRETCHED, SHINING SIDE DOWN ONTO THE ROD AS SHOWN IN FIGURE 2.
- 9 APPLY 2 LAYERS OF HALF LAPPED 3/4 STRETCHED SELF AMALGAMATING ETHYLENE PROPYLENE RUBBER TAPE (S.C.# 78 55 23) AS SHOWN IN FIGURE 2.
- 10 APPLY 2 LAYERS OF HALF LAPPED 3/4 STRETCHED COLD WEATHER VINYL TAPE (S.C.# 78 55 98) AS SHOWN IN FIGURE 2.

**NOTE:**

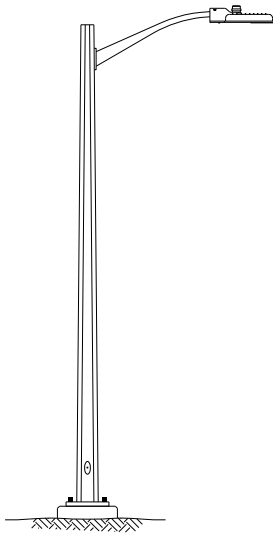
WHEN INSTALLING A MANUFACTURED SPLICE INCLUDE STEPS 5 THRU 8 WITH THE MANUFACTURERS INSTRUCTIONS. THIS WILL PROVIDE THE PROPER INSULATION AND MOISTURE SEAL.



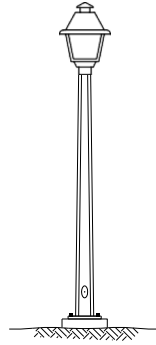
**FIGURE 2**

**NOTE:** DIMENSIONS SHOWN ARE MILLIMETRES.

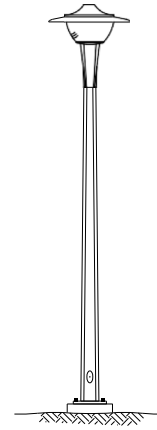
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03				<b>SPLICING SECONDARY NEUTRAL (BARE COPPER TO INSULATED ALUMINUM)</b>		
		08-11	2			REVISED NOTE 6 & COMPRESSION CONNECTOR
		94-10	1			TAPING PROCEDURE REVISED
DRAWN W.B./CAD	CHECKED K.C.H.	DATE 94-06	<b>CD 215-13</b>		SHT 0002 of 2	
					REV 02	



**STRAIGHT SHAFT**



**POST-TOP BM  
COLONIAL**  
(BASE MOUNTED)



**POST-TOP BM  
CONTEMPORARY**  
(BASE MOUNTED)

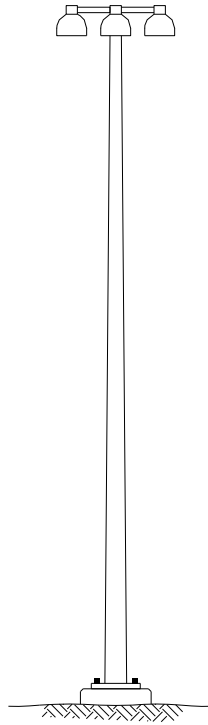
POLE TYPE	COLOUR	MOUNTING HEIGHT m (ft)	ARM REACH m **	BOLT SQUARE mm	BOLT CIRCLE mm	STORES CODE NO.	CABLE LENGTH m ***
STRAIGHT SHAFT	GALVANIZED	7.7 (25)	1.8	179 - 206 (SLOTTED)	254 - 292 (SLOTTED)	05-05-78	11
STRAIGHT SHAFT *	GALVANIZED	9.1 (30)	3.0	197 - 206 (SLOTTED)	279 - 292 (SLOTTED)	05-05-79	14
STRAIGHT SHAFT	GALVANIZED	10.7 (35)	3.0	206	292	05-05-80	15
STRAIGHT SHAFT ****	GALVANIZED	10.7 (35)	3.0	206	292	06-02-01	15
STRAIGHT SHAFT	GALVANIZED	13.7 (45)	3.0	243	343	05-05-81	18
STRAIGHT SHAFT	GALVANIZED	16.8 (55)	1.8	N/A	483	75-46-55	20
STRAIGHT SHAFT	GALVANIZED	19.8 (65)	1.8	N/A	483	75-46-65	23
POST-TOP BM COLONIAL	BLACK POWDER COAT	4.7 (15)	N/A	179 - 206 (SLOTTED)	254 - 292 (SLOTTED)	75-41-15	6
POST-TOP BM CONTEMPORARY	GALVANIZED	6.1 (20)	N/A	179 - 206 (SLOTTED)	254 - 292 (SLOTTED)	75-41-22	7

**NOTES:**

- \* FOR REPLACEMENT PURPOSES; NOT TO BE USED FOR NEW INSTALLATIONS.
- \*\* DO NOT MOUNT ALUMINUM ARM ON 16.8m AND 19.8m. DO NOT USE ALUMINUM ARMS WITH 1000W HPS LUMINAIRES. STRAIGHT SHAFT POLES CAN ACCOMMODATE A MAXIMUM OF 2 ARMS.
- \*\*\* LENGTH OF 2 CONDUCTORS #12 CABLE REQUIRED PER POLE.
- \*\*\*\* POLE INCLUDES A 1 1/8" DIAMETER HOLE AT 5m (STREET SIDE) FOR DECORATIVE LIGHTING RECEPTACLE. WIRE AS PER CD315-24.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 21-07-30	21-07	4	ADDED STRAIGHT SHAFT, REMOVED DAVIT BM & SQUARE BM, REVISED NOTES, RESEALED	<b>STANDARD STEEL STREET LIGHT POLES</b>			
	13-01	3	ADDED CONTEMPORARY AND COLONIAL POLES				
DRAWN	CHECKED	DATE		SHT		REV	
C.A.	L.D.	21-07		<b>CD 300-1</b>		0001 OF 1	04



**HI-MAST**

POLE TYPE	COLOUR	MOUNTING HEIGHT m (ft)	ARM REACH m	BOLT SQUARE mm	BOLT CIRCLE mm	STORES CODE NO.	CABLE LENGTH m
HI-MAST	GALVANIZED	30.5 (100)	N/A	PER DESIGN	PER DESIGN	N/A	N/A

**NOTE:**

HI-MAST POLES ARE DESIGNED PER INSTALLATION.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	21-07	3	REMOVED STRAIGHT SHAFT, UPDATED NOTES	<b>NON-STANDARD STREET LIGHT POLES</b>			
	18-04	2	ADDED SHEET 2, TABLE & NOTES, RESEALED				
	92-11	1	CHANGE ALUM. TO STEEL ARM				
DRAWN C.A.	CHECKED J.R.	DATE 18-04	<b>CD 300-2</b>		SHT 0001 of 2	REV 03	

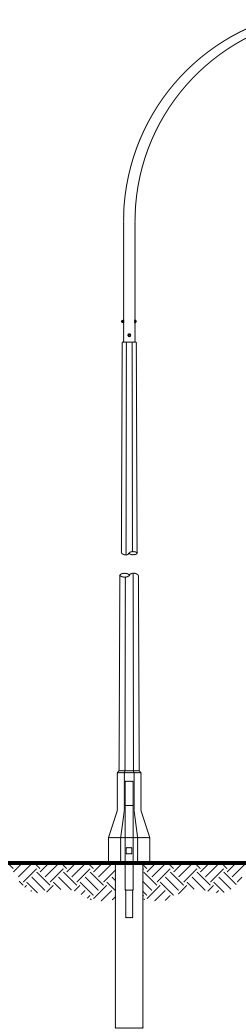
THERE ARE A NUMBER OF STYLES AND TYPES OF STREET LIGHT POLES WHICH HAVE BEEN USED, IN LIMITED QUANTITIES, IN ORDER TO MEET ROADWAY LIGHTING REQUIREMENTS IN SPECIAL CIRCUMSTANCES.

DAVIT TYPE STREET LIGHT POLES WITH DOUBLE AND TRIPLE ARM ARRANGEMENTS HAVE BEEN PURCHASED TO LIGHT INTERSECTIONS WITH UNUSUAL ROADWAY CONFIGURATIONS. STRAIGHT SHAFT ALUMINUM POLES WITH TAPERED ALUMINUM BRACKET ARMS HAVE BEEN USED FOR BRIDGE LIGHTING AND IN OTHER CIRCUMSTANCES, PRIMARILY FOR ESTHETIC REASONS.

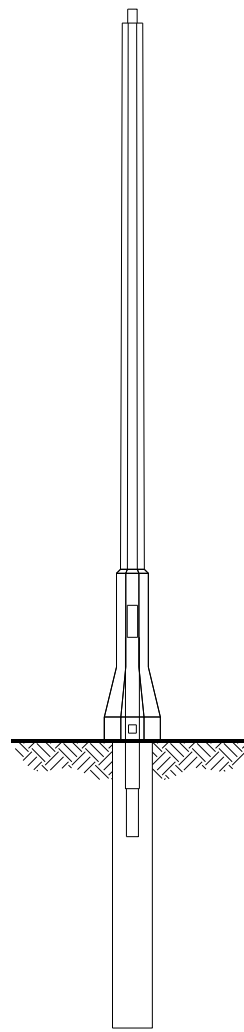
SPECIAL STREET LIGHT POLES HAVE BEEN USED AT LARGE HIGHWAY INTERCHANGES AND ON MAJOR ROADWAYS WHERE HIGHER MOUNTING HEIGHTS CAN BE USED EFFECTIVELY TO DRASTICALLY REDUCE THE NUMBER OF POLES WHICH WOULD OTHERWISE BE REQUIRED. THE TWO MOST COMMON STYLES OF POLES USED TO ACHIEVE SUCH HIGHER MOUNTING HEIGHTS (i.e. 16.8m, 19.8m AND 30.5m).

NON-STANDARD STREET LIGHT POLES ARE, ON OCCASION, AVAILABLE FROM CENTRAL STORES, BUT GENERALLY, NON-STANDARD STREET LIGHT POLES MUST BE PURCHASED AS REQUIRED.

APPROVED  ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS  <p style="text-align: center;"><b>NON-STANDARD STREET LIGHT POLES</b></p>			
DRAWN C.A.	CHECKED L.D.	DATE 18-04	<p style="text-align: center;"><b>CD 300-2</b></p>		SHT 0002 of 2	REV 00



**DAVIT DB**  
(DIRECT BURIAL)



**POST-TOP DB**  
(DIRECT BURIAL)

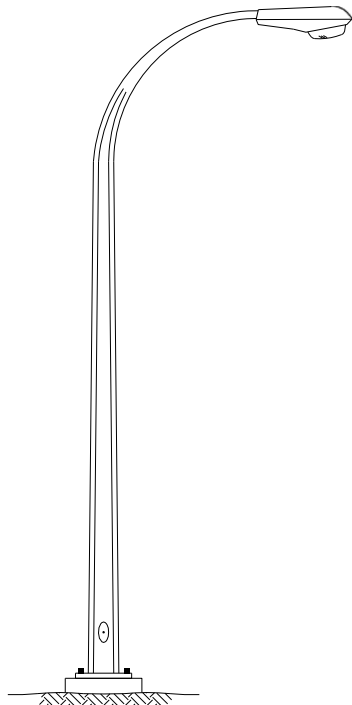
POLE TYPE	COLOUR	MOUNTING HEIGHT m (ft)	ARM REACH m	STORES CODE NO.	CABLE LENGTH m *
POST-TOP DB	BLACK	4.7 (15)	N/A	03 67 39	6
DAVIT DB	BLACK	11.3 (37)	3.0	03 65 29	15
DAVIT DB	BLACK	13.7 (45)	3.0	03 65 30	18

**NOTES:**

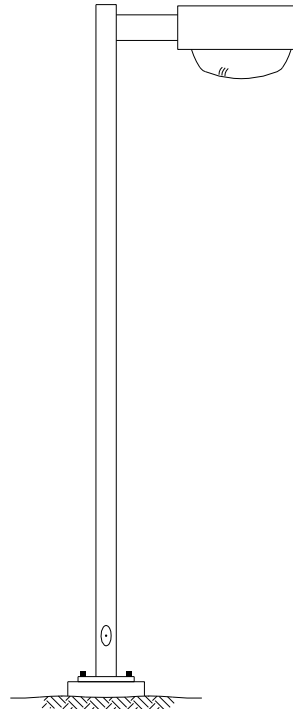
\* LENGTH OF 2 CONDUCTORS #12 CABLE REQUIRED PER POLE.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY D.R. ORR 13-02-12				<b>STANDARD CONCRETE STREET LIGHT POLES</b>					
DRAWN C.A.	CHECKED L.D./D.O.	DATE 13-01	<b>CD 300-3</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
SHT	REV								
0001 of 1	00								





**DAVIT BM**  
(BASE MOUNTED)



**SQUARE BM**  
(BASE MOUNTED)

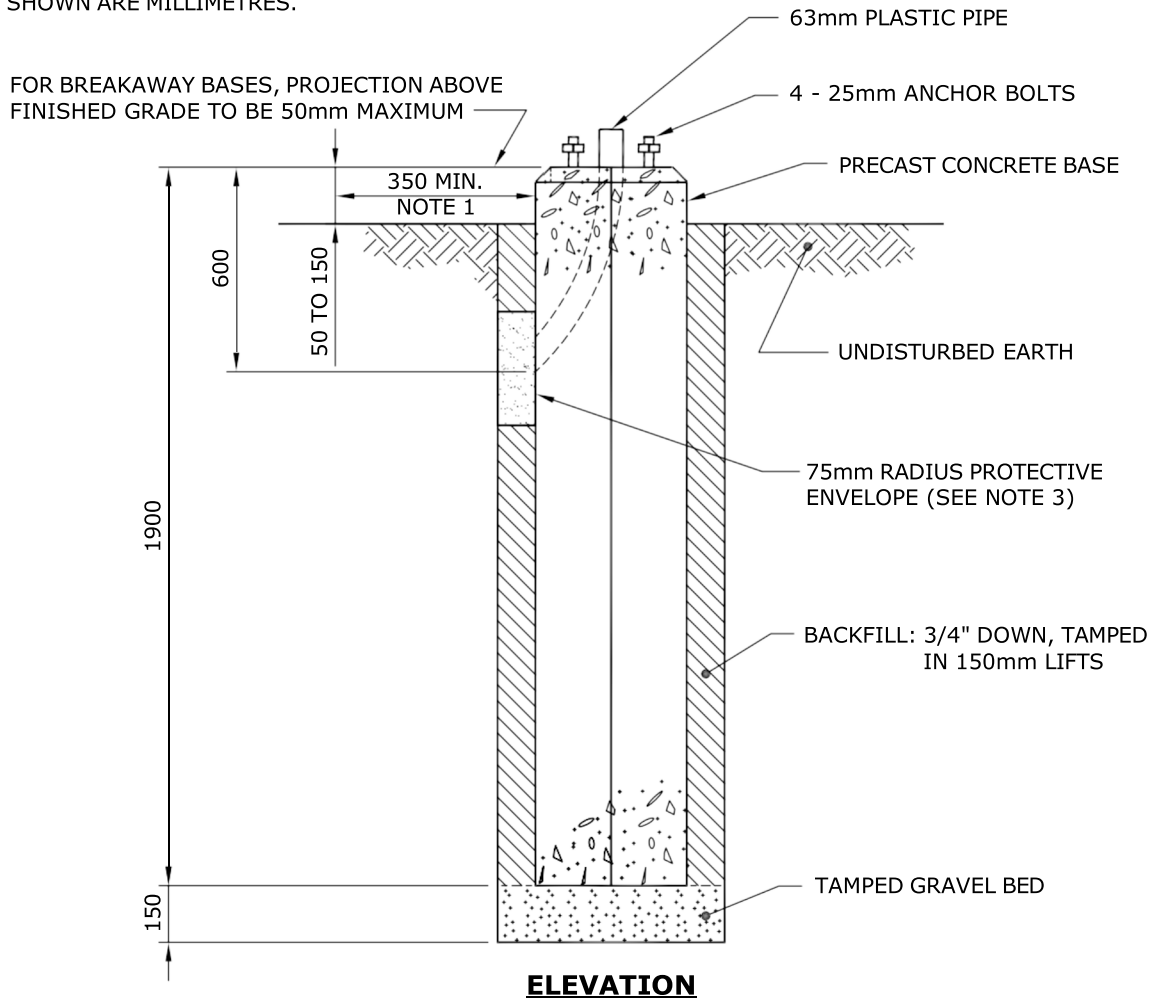
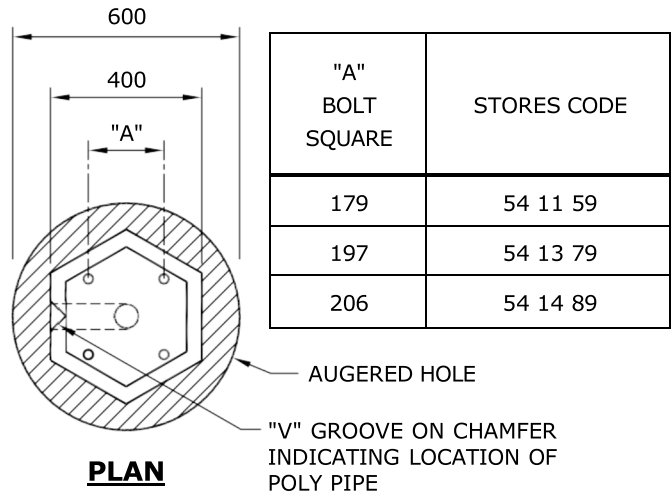
POLE TYPE	COLOUR	MOUNTING HEIGHT m (ft)	ARM REACH m	BOLT SQUARE mm	BOLT CIRCLE mm	STORES CODE NO.	CABLE LENGTH m
DAVIT BM	GALVANIZED	7.7 (25)	1.8	179	254	75 42 26	11
DAVIT BM	GALVANIZED	9.1 (30)	2.4	197	279	75 43 30	13
DAVIT BM	GALVANIZED	10.7 (35)	3.0	206	292	75 44 36	15
DAVIT BM	GALVANIZED	13.7 (45)	3.0	243	343	75 46 45	18
SQUARE BM	DARK BRONZE	6.1 (20)	0.5	179	254	75 42 20	8
SQUARE BM	DARK BRONZE	10.7 (35)	0.5	206	292	75 45 30	14

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 21-07-30				<b>DISCONTINUED</b> <b>STREET LIGHT POLES</b>					
DRAWN C.A.	CHECKED L.D.	DATE 21-07	<b>CD 300-4</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
SHT	REV								
0001 of 1	00								

## 7.7 - 10.7 STREET LIGHT POLES

**NOTES:**

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
  - a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
  - b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. DIMENSIONS SHOWN ARE MILLIMETRES.

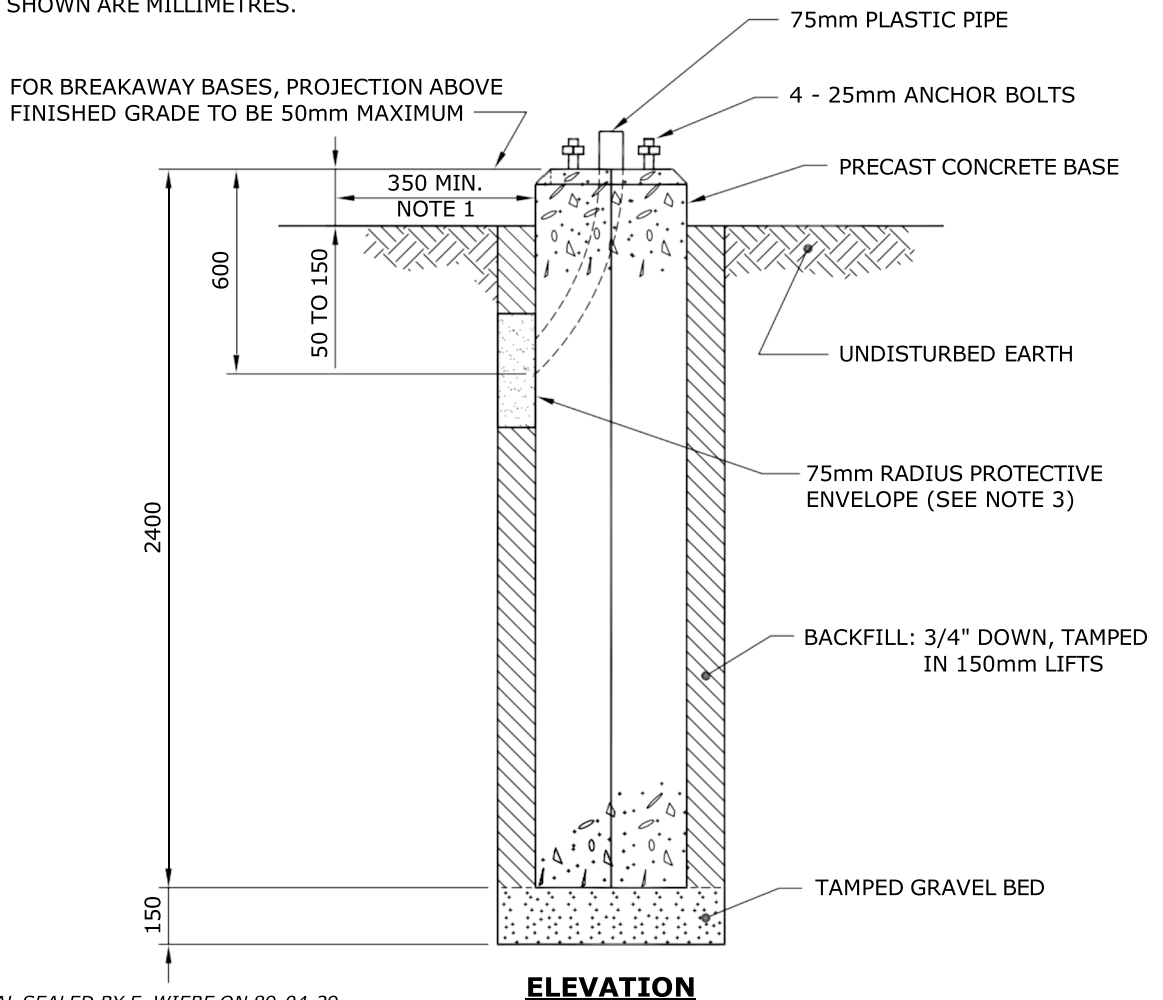
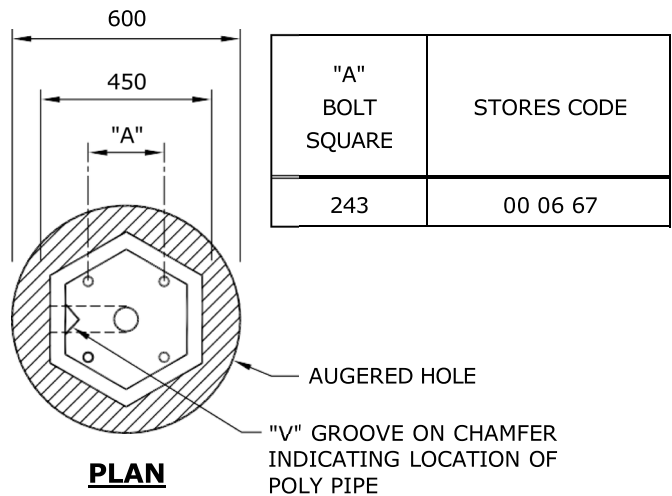


APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-29	10-08	3	CHANGED BACKFILL NOTES, AND ADDED SHEET 3	
	99-05	1	SHEET 2 of 2 ADDED, 7.7 - 10.7 STREET LIGHT ADDED	
	96-10	1	V-GROOVE LOCATION, POLY PIPE SIZE NOTES CHANGED	
DRAWN W.B./CAD	CHECKED L.D./K.C.H.	DATE 88-06	<b>INSTALLATION OF PRECAST CONCRETE BASE</b>	
			<b>CD 300-6</b>	SHT 0001 OF 3
			REV 03	

### 13.7 STREET LIGHT POLE

**NOTES:**

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
  - a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
  - b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. DIMENSIONS SHOWN ARE MILLIMETRES.



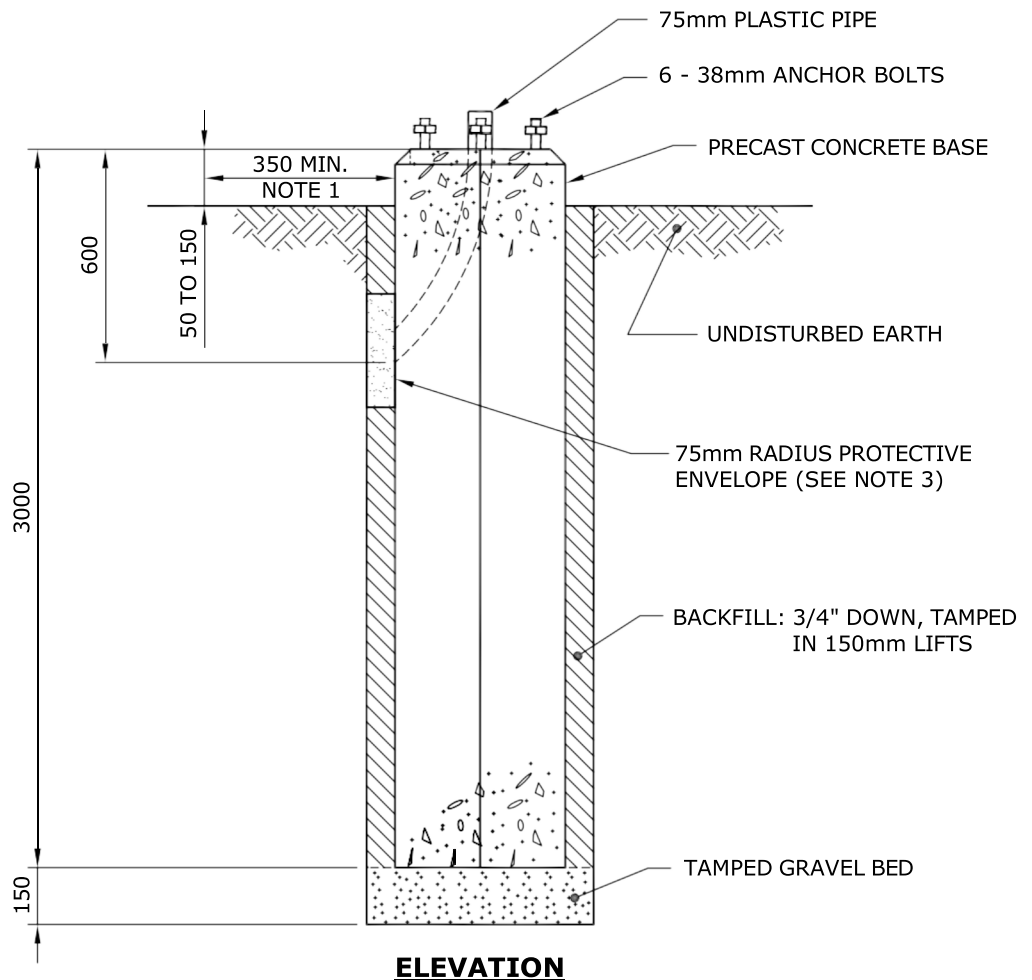
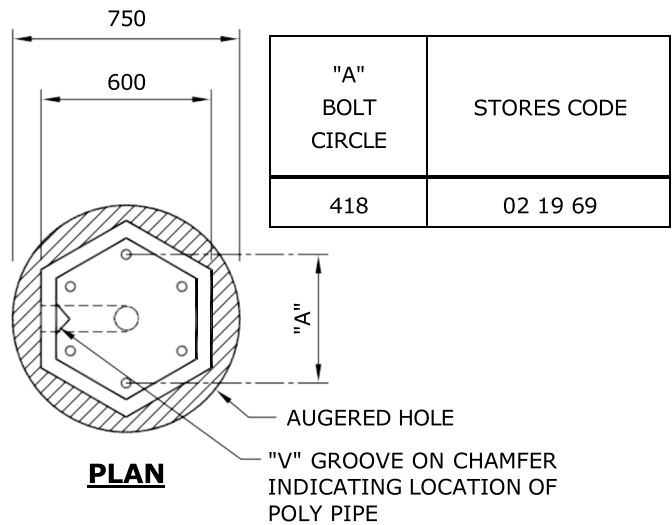
SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-29

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 23-01-31	23-01	2
	ADDED 50mm NOTE FOR BREAKAWAY BASES, RESEALED	
	10-08	1
CHANGED BACKFILL NOTES, AND ADDED SHEET 3		<b>INSTALLATION OF PRECAST CONCRETE BASE</b>
DRAWN C.A.	CHECKED L.D.	DATE 23-01
<b>CD 300-6</b>		SHT 0002 OF 3
		REV 02

## 16.8m & 19.8m STREET LIGHT POLE

**NOTES:**

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
  - a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
  - b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. DIMENSIONS SHOWN ARE MILLIMETRES.

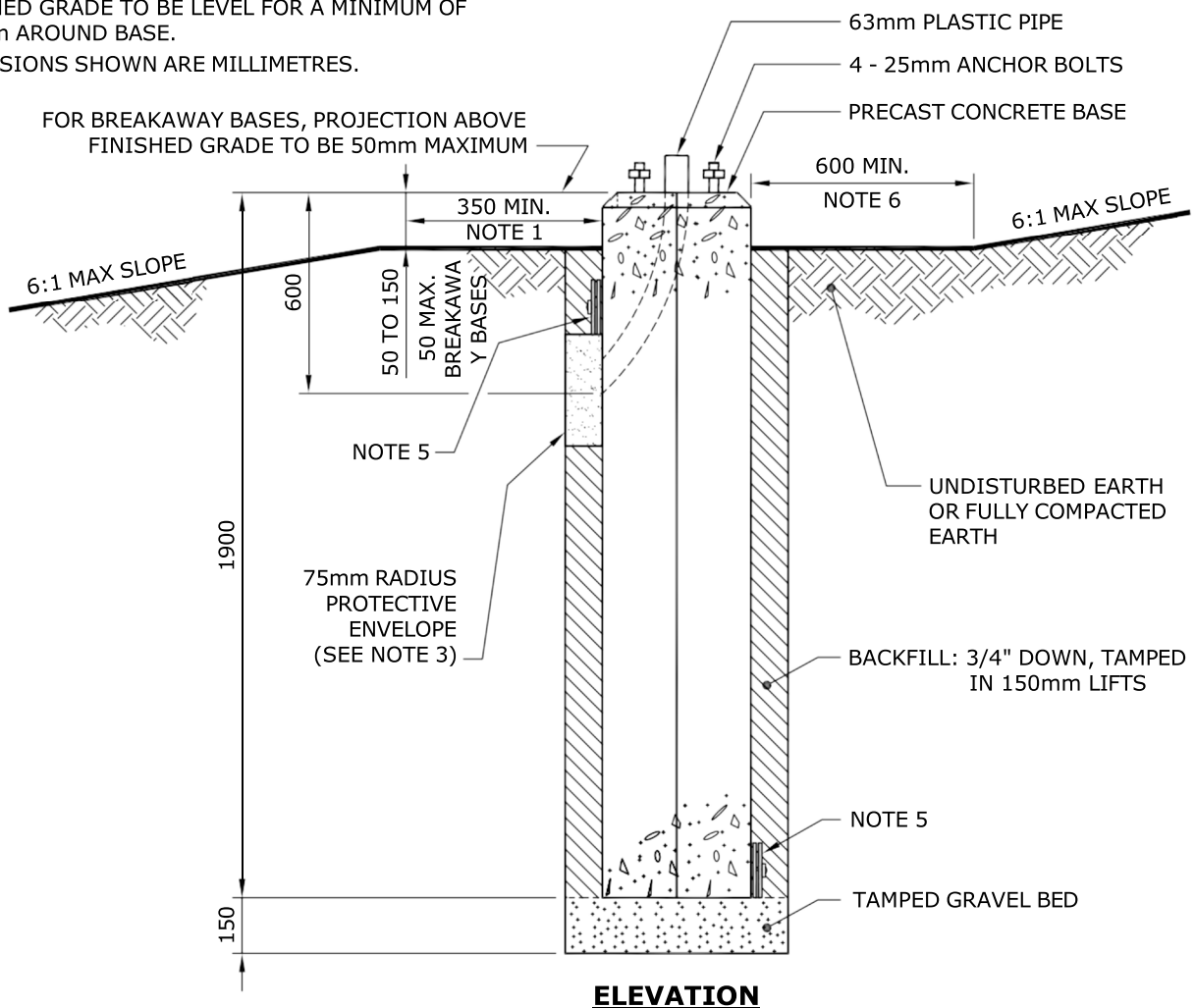
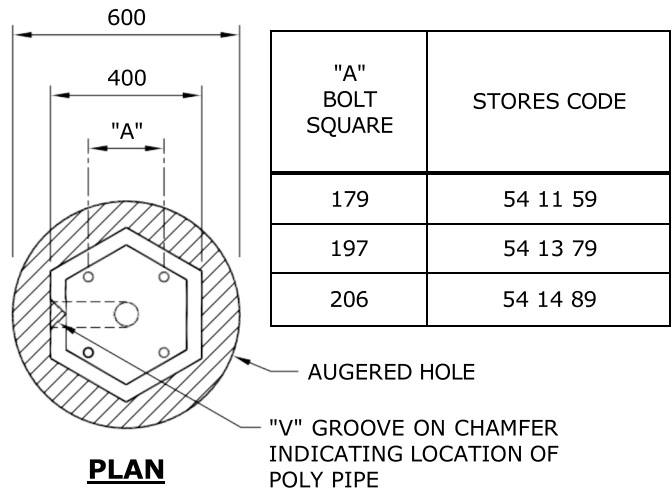


APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 10-08-13		<b>INSTALLATION OF PRECAST CONCRETE BASE</b>		
DRAWN C.A.	CHECKED L.D./K.C.H.	DATE 10-08	<b>CD 300-6</b>	SHT 0003 OF 3
				REV 00

## 7.7 - 10.7 STREET LIGHT POLES

**NOTES:**

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
  - a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
  - b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. INSTALL EXPANDING POLE KEY ANCHOR PER CD44-30. ENSURE TOP ANCHOR DOES NOT OBSTRUCT CONDUIT ENTRY HOLE.
6. FINISHED GRADE TO BE LEVEL FOR A MINIMUM OF 600mm AROUND BASE.
7. DIMENSIONS SHOWN ARE MILLIMETRES.

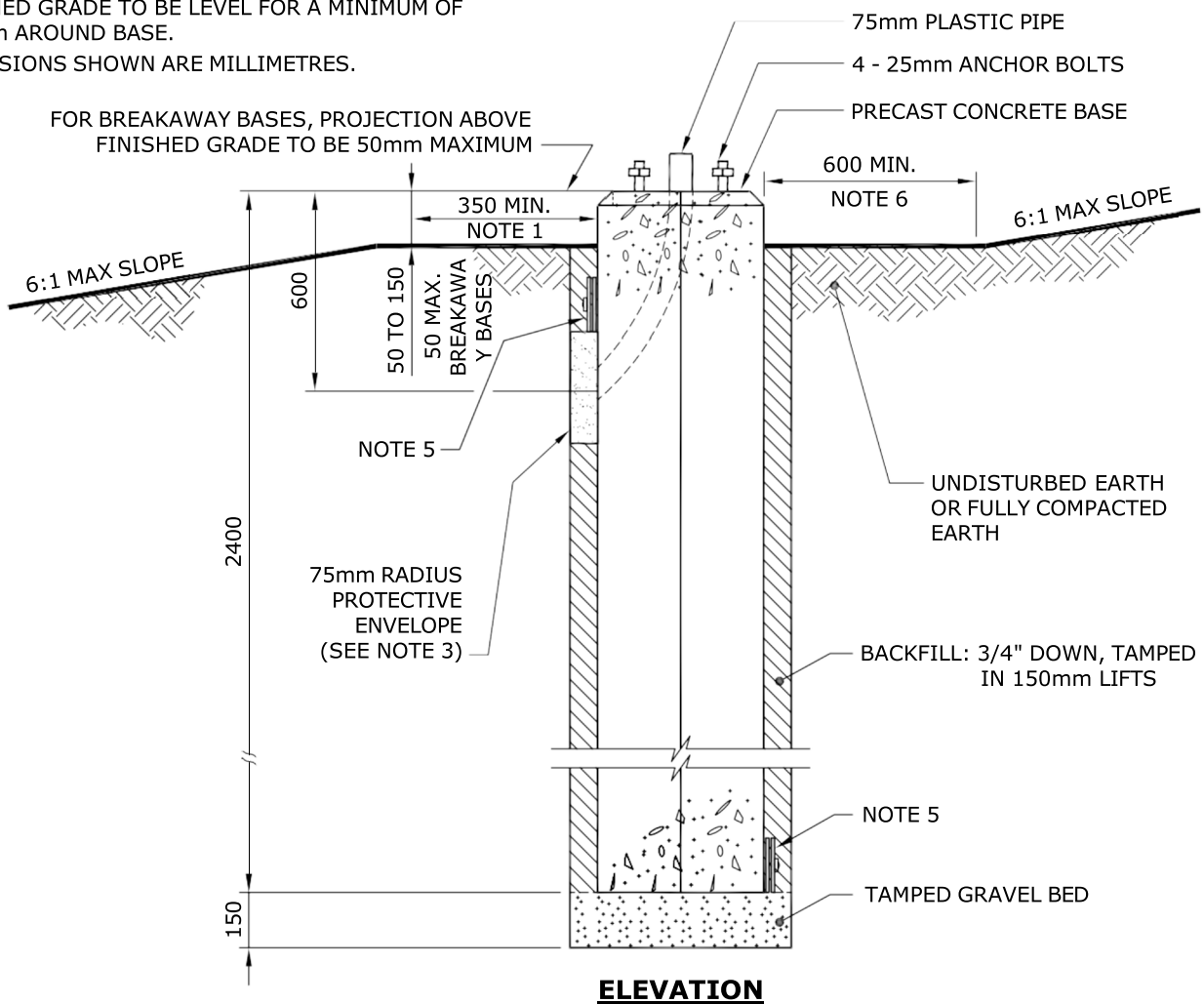
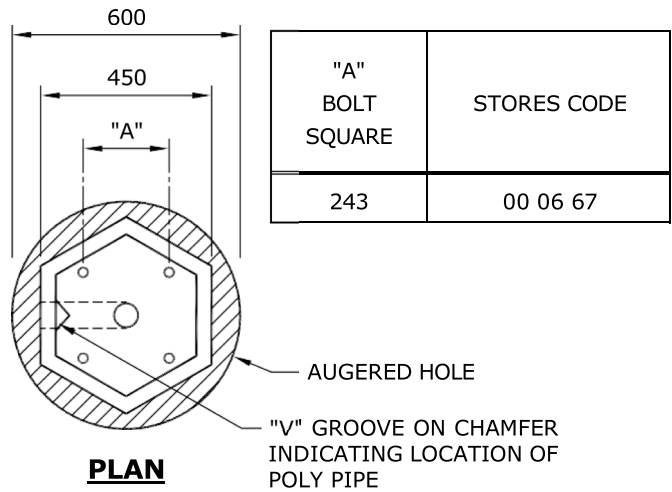


APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 19-10-08		<b>INSTALLATION OF PRECAST CONCRETE BASE ON SLOPE</b>	
DRAWN C.A.	CHECKED L.D.	DATE 19-10	<b>CD 300-7</b>
			SHT 0001 OF 2
			REV 00

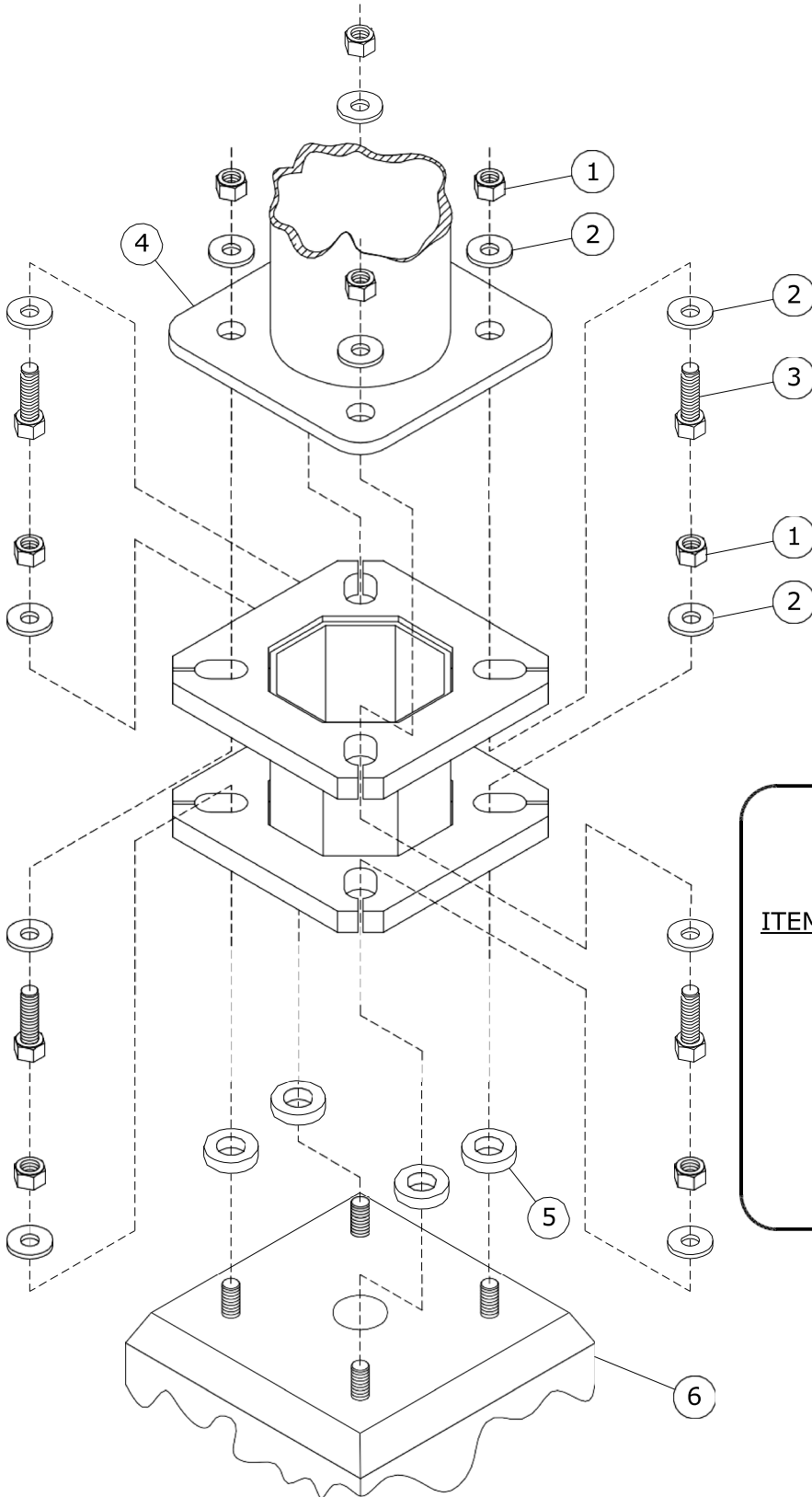
### 13.7 STREET LIGHT POLE

**NOTES:**

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
  - a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
  - b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. INSTALL EXPANDING POLE KEY ANCHOR PER CD44-30. ENSURE TOP ANCHOR DOES NOT OBSTRUCT CONDUIT ENTRY HOLE.
6. FINISHED GRADE TO BE LEVEL FOR A MINIMUM OF 600mm AROUND BASE.
7. DIMENSIONS SHOWN ARE MILLIMETRES.



APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 19-10-08		<b>INSTALLATION OF PRECAST CONCRETE BASE ON SLOPE</b>	
DRAWN C.A.	CHECKED L.D.	DATE 19-10	<b>CD 300-7</b>
			SHT 0002 OF 2
			REV 00



**MATERIAL LIST**

<u>ITEM No.</u>	<u>DESCRIPTION</u>
1.	NUT 1" - UNC
2.	WASHER 1"
3.	BOLT 1" - UNC
4.	LIGHT STANDARD
5.	SHIMS - AS REQUIRED
6.	FOUNDATION

**CIIC# 04 92 81**

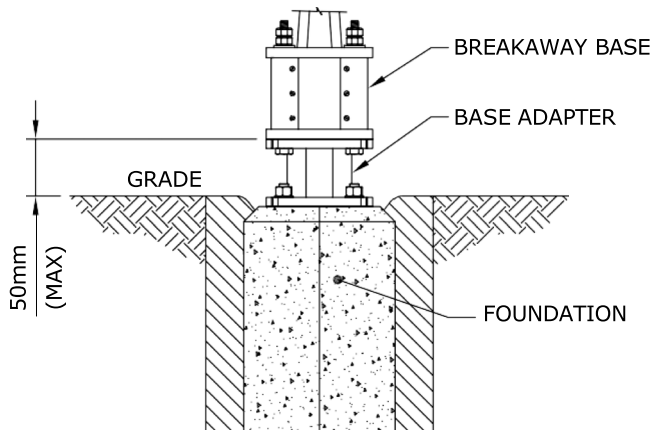
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 19-10-08				<b>ANCHOR BASE ADAPTER INSTALLATION</b> <b>254mm BCD TO 292mm BCD</b> <b>(4.7m TO 10.7m STANDARDS)</b>	
DRAWN C.A.	CHECKED L.D.	DATE 19-10	<b>CD 300-8</b>		SHT 0001 of 2
					REV 00

**APPLICATIONS:**

1. ANCHOR ROD TO ANCHOR ROD HOLE MISALIGNMENT.
2. FOUNDATION EXTENSION TO RAISE BURIED ANCHOR BASE OF LIGHT STANDARD TO GRADE.

**RESTRICTIONS:**

1. INSTALL ONLY GOOD LIGHT STANDARDS ON GOOD FOUNDATIONS AS PER CORPORATE POLICIES P348-4, "REPLACING ORNAMENTAL LIGHT STANDARDS", AND P348-5, "REPLACING OR RESETTING CONCRETE FOUNDATIONS".
2. INSTALL THE SAME TYPE OF LIGHT STANDARD AS PREVIOUS.
3. FOUR STANDARDS MOUNTED ON 179, 197, AND 206 BASES ONLY. POST TOP OR SINGLE ARM LIGHT STANDARDS OF MAXIMUM HEIGHT 10.7m (35').
4. ONLY ONE ADAPTER PLATE PER LIGHT STANDARD IS ALLOWED, DO NOT STACK.



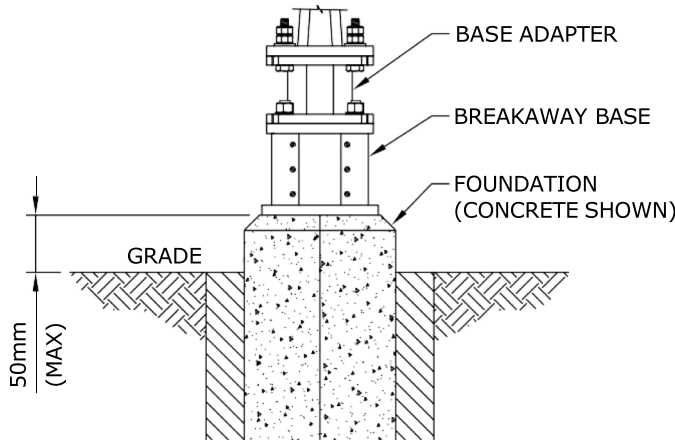
**FOUNDATION EXTENSION WITH BREAKAWAY BASE**

**BREAKAWAY BASES:**

1. MAXIMUM ELEVATION OF BOTTOM OF BREAKAWAY BASE IS 50mm AS SHOWN.

**ANCHORING:**

1. LEVELING SHIMS ARE TO BE USED BETWEEN THE FOUNDATION AND BASE ADAPTER (WHEN REQUIRED).
2. ALL ANCHORING CONNECTIONS ARE TO BE TIGHTENED PER CD300-9, "METHOD FOR ANCHOR ROD TIGHTENING".



**ANCHORAGE MISALIGNMENT WITH BREAKAWAY BASE**

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 19-10-08				<b>ANCHOR BASE ADAPTER INSTALLATION</b> <b>254mm BCD TO 292mm BCD</b> <b>(4.7m TO 10.7m STANDARDS)</b>	
DRAWN C.A.	CHECKED L.D.	DATE 19-10			
			<b>CD 300-8</b>		SHT 0002 of 2
					REV 00



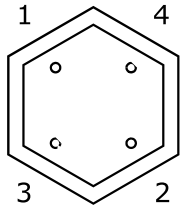
TO DEVELOP THE REQUIRED TENSION ON ANCHOR RODS, THE TURN-OF-NUT METHOD IS USED.

**TURN-OF-NUT**

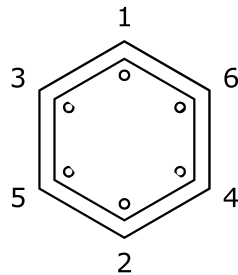
1. ENSURE ALL ANCHOR RODS AND NUTS ARE FREE OF DEBRIS AND THAT THE ANCHOR RODS ARE LUBRICATED.
2. PLACE POLE ONTO CONCRETE PILE, INSTALL WASHERS AND NUTS AND TIGHTEN UNTIL DEVELOPING A SNUG-TIGHTENED CONNECTION.

**SNUG-TIGHTENED:** THE TIGHTNESS THAT IS ATTAINED AFTER A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL FORCE OF A WORKER USING AN ORDINARY ONE FOOT LONG WRENCH.

3. TIGHTENING OF THE BOLTS MUST BE PERFORMED IN A MANNER THAT BRINGS THE FAYING SURFACES UP "EVENLY" AS PER THE STAR PATTERN TIGHTENING SEQUENCE.



FOUR ANCHOR BOLT PATTERN  
(13.7m AND BELOW)



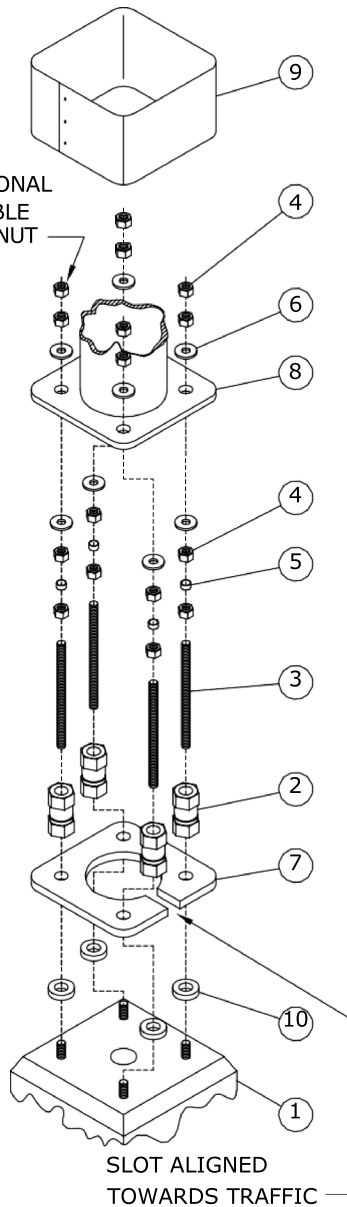
SIX ANCHOR BOLT PATTERN  
(16.8m AND 19.8m)

4. ENSURE THE POLE IS PLUMB AND ADD LEVELING SHIMS IF REQUIRED. SNUG-TIGHTEN THE ANCHOR BOLTS AGAIN.
5. BEVELED WASHERS ARE REQUIRED IF THE NUT CANNOT BE BROUGHT INTO FIRM CONTACT WITH THE BASE PLATE.
6. MARK THE REFERENCE LOCATION OF THE NUT AFTER SNUG-TIGHTENING THE PLUMB POLE.
7. FINAL TIGHTENING OF NUTS IS PERFORMED IN INCREMENTS AS PER THE STAR PATTERN, WITH A MINIMUM OF TWO FULL TIGHTENING CYCLES. PROPER TENSIONING IS ACHIEVED WHEN THE NUT IS ROTATED 1/3 OF A TURN BEYOND SNUG-TIGHT. THE TOLERANCE FOR THIS IS PLUS 20°.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 10-08-13				<b>METHOD FOR ANCHOR ROD TIGHTENING</b>					
DRAWN C.A.	CHECKED L.D.	DATE 10-08	<b>CD 300-9</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
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THE FOLLOWING INSTALLATION INSTRUCTIONS ARE APPLICABLE TO NEW OR EXISTING BREAKAWAY BASE INSTALLATIONS ON CONCRETE BASES.

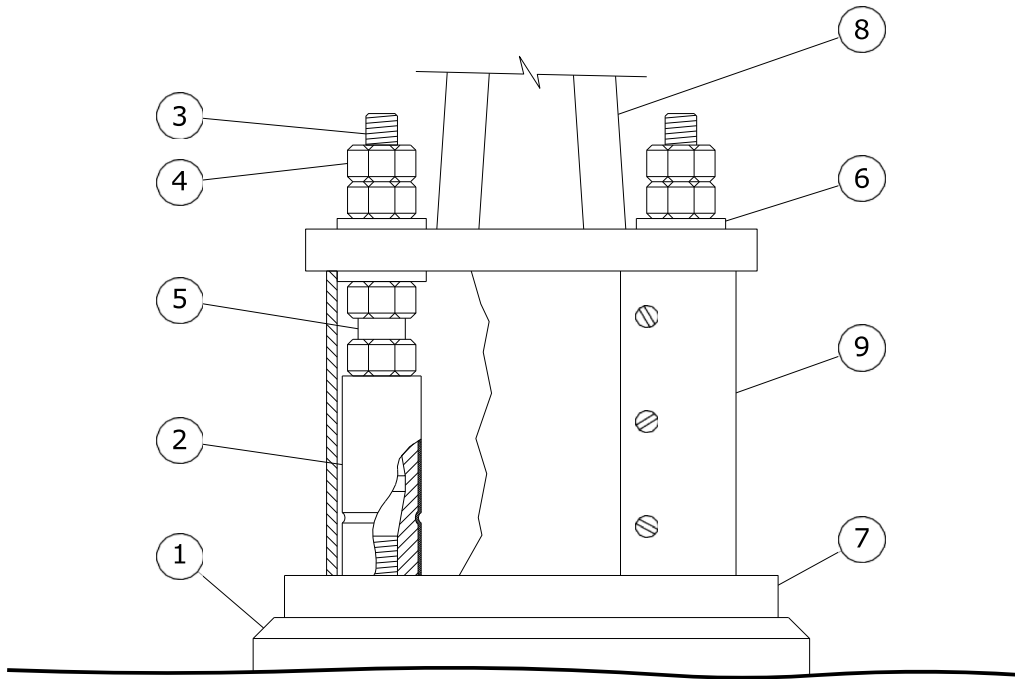
**PROCEDURE:**



1. CLEAN THE TOP SURFACE OF THE CONCRETE BASE AND ENSURE SURFACE IS FLAT AND LEVEL WITH NO SPALLING OR OTHER SURFACE CONDITIONS THAT MAY AFFECT THE PERFORMANCE OF THE COUPLERS.
  2. THE PREFERRED MAXIMUM HEIGHT ABOVE LEVEL GRADE TO THE BASE OF THE COUPLER IS 50mm OR LESS. THIS PROVIDES THE RECOMMENDED CLEARANCE IN THE EVENT OF A COLLISION WITH THE STRUCTURE.
  3. MEASURE THE HEIGHT OF THE THREADED ANCHOR BOLTS ABOVE THE REACTION PLATE AND VERIFY THIS MEASUREMENT IS BETWEEN 1 1/4" AND 1 5/8".
  4. IF THE EXPOSED LENGTH OF THE ANCHOR BOLT IS GREATER THAN THE RECOMMENDED LENGTH, OPTIONAL SPACERS MAY BE USED (ITEM 10).
  5. IT IS RECOMMENDED THAT THE THREADED ANCHOR BOLT-COUPLER CONNECTION BE COATED WITH RUST-INHIBITING GREASE. THIS WILL FACILITATE REMOVAL OF THE COUPLER WHEN IT IS NECESSARY. A SUITABLE PRODUCT FOR THIS APPLICATION IS ARCAN 1, A WHITE, WATER RESISTANT GREASE MARKETED BY IMPERIAL OIL LTD.
  6. THREAD THE COUPLER ASSEMBLY ON EACH ANCHOR BOLT (IF THE COUPLER ASSEMBLY UPPER STUD BECOMES LOOSE AS A RESULT OF HANDLING, ENSURE THAT THE STUD IS ENGAGED AT LEAST 38mm, BUT NOT MORE THAN 44mm IN THE COUPLER BEFORE LOCKING WITH THE LOCK NUT.)
  7. SNUG UP EACH COUPLER AGAINST THE CONCRETE BASE. TIGHTEN EACH COUPLER ALTERNATELY AND INCREMENTALLY, BY MEANS OF A WRENCH OR A PIPE WRENCH ON THE BOTTOM HEX OF THE COUPLER. USE THE TURN-OF-NUT METHOD AS PER CD300-9.
- NOTE: TIGHTENING THE COUPLER ON THE TOP HEX MAY WEAKEN THE COUPLER AT THE MACHINED GROOVE AND MAKE THE COUPLER UNUSEABLE.**
8. BRING THE LEVELING NUTS (AND HENCE, THE LOWER WASHERS) INTO A LEVEL PLANE AS DESIRED MAKING CERTAIN THAT AT LEAST ONE PLASTIC SPACER REMAINS IN CONTACT WITH ITS LEVELING NUT AND ITS LOCK NUT.
  9. PLACE THE POLE BASE OVER THE PROTRUDING STUDS, AND SECURE THE POLE WITH THE UPPER WASHERS AND RETAINING NUTS.
  10. WITH THE POLE IN THE REQUIRED VERTICAL ORIENTATION, AND BEFORE FINAL TIGHTENING, ENSURE THAT ALL LEVELING NUTS, RETAINING NUTS AND UPPER AND LOWER WASHERS ARE MADE SNUG AGAINST THE POLE BASE PLATE.
  11. TIGHTEN THE RETAINING NUTS WITH THE TURN-OF-NUT METHOD AS PER CD300-9.
  12. MAKE THE NECESSARY WIRING CONNECTIONS, AND INSTALL THE PROTECTIVE SHROUD.

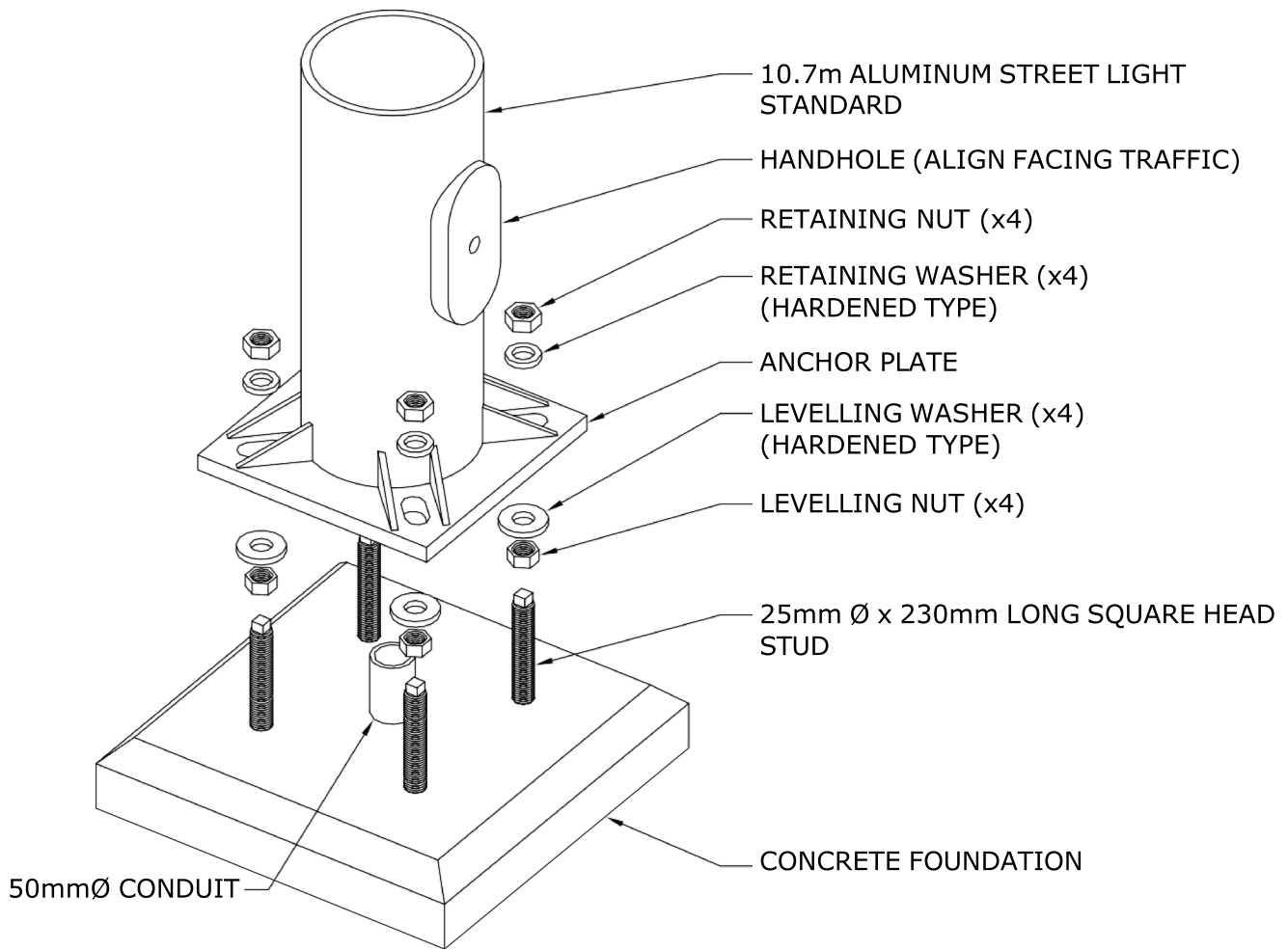
SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY D.R. ORR 16-06-27	16-06	4	CORRECTED TYPO, RESEALED	<b>BREAKAWAY BASE INSTALLATION</b>	
	10-08	3	UPDATED STANDARD, REVISED TITLE, AND ADDED SHEET 2		
	07-06	2	REVISED NOTE 4 AND ADDED NOTE 5		
DRAWN C.A.	CHECKED L.D.	DATE 16-06		<b>CD 300-10</b>	
				SHT 0001 of 2	REV 04

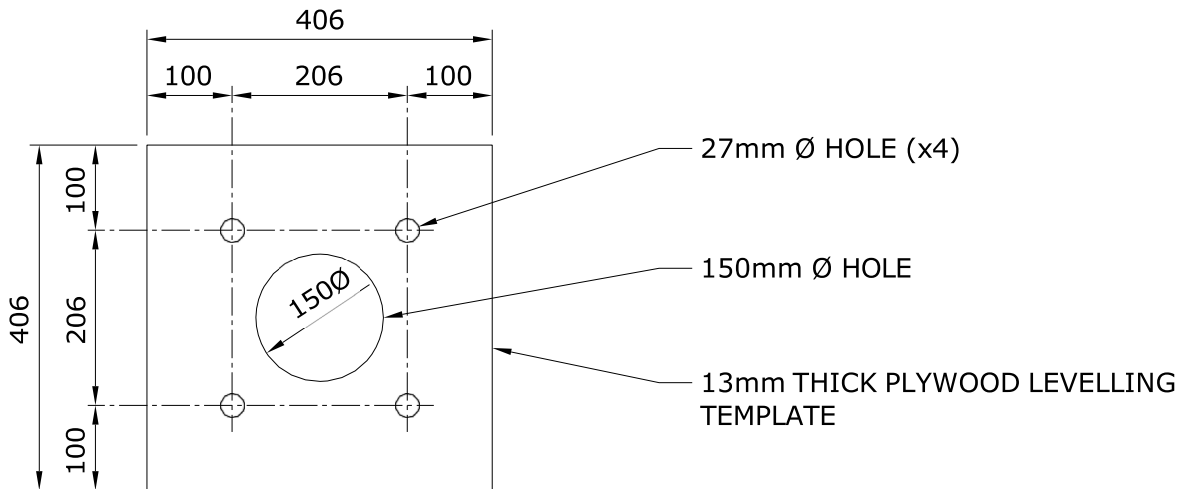


BILL OF MATERIAL		
ITEM NO.	DESCRIPTION	QUANTITY
1	CONCRETE BASE	1
2	COUPLING	4
3	1" - 8 UNC GALV. STUD	4
4	1" - 8 UNC GALV. HEAVY HEX NUT	16
5	SPACER	4
6	1" GALV. FLAT WASHER	8
7	REACTION PLATE	1
8	POLE	1
9	SHROUD ASSEMBLY	1
10	GALV. SHIM	4

APPROVED  ORIGINAL DRAWING SEALED BY K.C. HAMILTON 10-08-13	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
			<b>BREAKAWAY BASE INSTALLATION</b>	
DRAWN C.A.	CHECKED L.D.	DATE 10-08	<b>CD 300-10</b>	
			SHT 0002 of 2	REV 00



**MOUNTING DETAIL**



**LEVELLING TEMPLATE**

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY D.R. ORR 13-02-13				<p align="center"><b>INSTALLATION OF ALUMINUM STREET LIGHT STANDARDS ON BRIDGES AND DIVIDER STRIPS</b></p>	
DRAWN C.A.	CHECKED L.D.	DATE 13-01	<p align="center"><b>CD 300-11</b></p>		
			SHT 0001 of 2		REV 00

**ALUMINUM STREET LIGHT STANDARD MOUNTING INSTRUCTIONS**

1. ENSURE MOUNTING STUDS ARE COATED WITH WHITE LITHIUM GREASE AND ARE FREE OF DIRT AND OTHER CONTAMINANTS.
2. INSTALL LEVELLING NUTS AND WASHERS. ENSURE THEY ARE LEVEL IN ALL DIRECTIONS BY USING THE LEVELLING TEMPLATE AND A CARPENTER'S LEVEL. FAILURE TO ENSURE LEVEL MOUNTING SURFACE MAY RESULT IN A CRACKED ANCHOR BASE UPON FASTENING CONNECTION WITH AN IMPACT GUN.
3. POSITION ALUMINUM STREET LIGHT STANDARD ONTO LEVELLING WASHERS AND NUTS.
4. INSTALL RETAINING WASHERS AND NUTS TO A SNUG FIT (A FEW IMPACTS WITH IMPACT GUN).
5. SNUG TIGHTENING IS TO PROGRESS SYSTEMATICALLY AND THEN RE-TIGHTENING IN THE SAME SYSTEMATIC MANNER UNTIL THE CONNECTION IS FULLY COMPACTED.
6. TIGHTEN NUTS SYSTEMATICALLY BY 2/3 OF AN ADDITIONAL TURN. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.

**NOTES:**

1. STUD SHOULD NOT TURN IN FERRULE WHILE TIGHTENING.
2. SQUARE HEAD STUD TO PROTRUDE APPROXIMATELY ONE NUT THICKNESS BEYOND RETAINING NUT.
3. WHERE THE REMOVAL OF THE STUDS FOR REPAIR OR REPLACEMENT IS REQUIRED, THE FERRULES AND THE STUDS SHALL BE CLEANED TO REMOVE THE OLD THREAD LOCKING COMPOUND. NEW THREAD LOCKING COMPOUND (LOCKTITE 262) SHALL BE APPLIED TO THE INSERTION LENGTH OF THE STUDS PRIOR TO TIGHTENING TO FULL DEPTH.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY D.R. ORR 13-02-13				<b>INSTALLATION OF ALUMINUM STREET LIGHT STANDARDS ON BRIDGES AND DIVIDER STRIPS</b>	
DRAWN	CHECKED	DATE	<b>CD 300-11</b>		SHT
C.A.	L.D.	13-01			0002 of 2

**STREET LIGHT POLES \***

<b>POLE TYPE</b>	<b>MOUNTING HEIGHT m (ft)</b>	<b>MATERIAL</b>	<b>WEIGHT *, ** kg (±10%)</b>
STRAIGHT SHAFT	10.7 (35)	ALUMINUM	91
DAVIT (DB)	11.3 (37)	CONCRETE	998
DAVIT (DB)	13.7 (45)	CONCRETE	1087
POST TOP (DB)	6.1 (20)	CONCRETE	544
DAVIT	7.7 (25)	STEEL	97
DAVIT	9.1 (30)	STEEL	125
DAVIT	10.7 (35)	STEEL	157
DAVIT	13.7 (45)	STEEL	219
DAVIT	16.8 (55)	STEEL	330
DAVIT	19.8 (65)	STEEL	428
POST TOP	4.7 (15)	STEEL	53
POST TOP	6.1 (20)	STEEL	68
STRAIGHT SHAFT	7.7 (25)	STEEL	90
STRAIGHT SHAFT	9.1 (30)	STEEL	113
STRAIGHT SHAFT	10.7 (35)	STEEL	172
STRAIGHT SHAFT	13.7 (45)	STEEL	220
STRAIGHT SHAFT	16.8 (55)	STEEL	388
STRAIGHT SHAFT	19.8 (65)	STEEL	557
HI-MAST	30.5 (100)	STEEL	3300

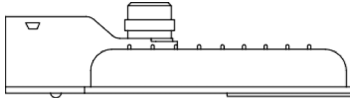
\* ALL POLES ARE BASE MOUNTED EXCEPT CONCRETE.

\*\* WEIGHTS DO NOT INCLUDE ARMS OR LUMINAIRES.

\*\*\* WEIGHTS GATHERED FROM MANUFACTURER'S DRAWING.

<b>BASES</b>	
<b>TYPE</b>	<b>WEIGHT kg (±10%)</b>
179	605
197	605
206	605
243	970
418	2151

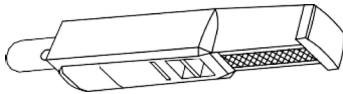
APPROVED  ORIGINAL DRAWING SEALED BY D.R. ORR 16-01-14	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS							
	21-07	2	ADDED HI-MAST POLE TO TABLE							
	18-04	1	UPDATED TABLES							
DRAWN C.A.			CHECKED J.R.		DATE 16-01		<b>CD 300-18</b>		SHT	REV
									0001 of 1	02



**LED ROADWAY LUMINAIRE**

\* THESE LUMINAIRES PROVIDE A VERY WIDE BEAM PATTERN (IES TYPE IV). CAREFUL CONSIDERATION OF LIGHT TRESPASS MUST BE GIVEN WHEN INSTALLING NEAR RESIDENTIAL HOUSING. IN THESE CASES, CONSIDER USING THE 500W.

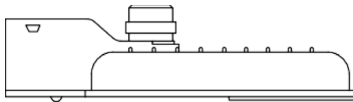
LED ROADWAY LUMINAIRES			
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC	
		GREY	BLACK
40 W LED	70 W HPS	05 15 44	05 15 71
60 W LED	100 W HPS	05 15 45	05 15 73
90 W LED	150 W HPS	05 15 47	05 15 74
150 W LED	250 W HPS	05 15 48	05 15 75
240 W LED	400 W HPS	05 15 49	05 15 76
500 W LED	1000 W HPS	06 55 67	
600 W LED *	1000 W HPS	06 55 66	



**LED LANE LUMINAIRE**

- LED LANE LUMINAIRES ARE AVAILABLE WITH GREY COATING ONLY.

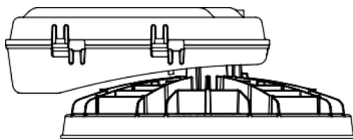
LED LANE LUMINAIRES		
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC
50 W LED	70 W HPS	05 15 50



**LED DUSK-TO-DAWN LUMINAIRE**

- LED DUSK-TO-DAWN LUMINAIRES ARE AVAILABLE WITH GREY COATING ONLY.

LED DUSK-TO-DAWN (AREA) LUMINAIRES		
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC
60 W LED	100 W HPS	05 15 51
90 W LED	150 W HPS	05 15 52

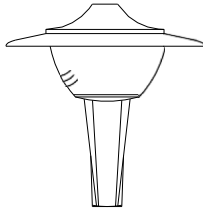


**LED HI-MAST LUMINAIRE**

LED HI-MAST LUMINAIRES		
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC
300 W LED	400 W HPS	06 34 98

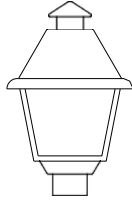
- THERE HAVE BEEN OCCASIONS WHERE A 1000W HPS LUMINAIRE WAS USED TO REPLACE A 400W HPS HI-MAST LUMINAIRE. IN THESE CASES, REPLACE THEM WITH THE 300W LED HI-MAST LUMINAIRE.
- ALL LED LUMINAIRES AUTOMATICALLY ADJUST FOR EITHER A 120V OR 240V SUPPLY.
- ALL LED LUMINAIRES COME WITH A PHOTOCCELL RECEPTACLE.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY D.R. ORR 15-02-11			<b>STANDARD LED LUMINAIRES</b>		
	21-07	2			ADDED 500W & 600W ROADWAY AND 300W HI-MAST LUMINAIRES
	16-12	1			REVISED NOTES
DRAWN C.A.	CHECKED J.R.	DATE 15-02	<b>CD 300-24</b>		
			SHT 0001 of 2	REV 02	



**LED POST TOP LUMINAIRE  
- CONTEMPORARY**

LED POST TOP LUMINAIRES - CONTEMPORARY		
LUMINAIRE WATTAGE (NOMINAL)	CIIC	PHOTOMETRIC DISTRIBUTION
60 W LED	05 17 30	ASYMMETRICAL



**LED POST TOP LUMINAIRE  
- COLONIAL**

LED POST TOP LUMINAIRES - COLONIAL		
LUMINAIRE WATTAGE (NOMINAL)	CIIC	PHOTOMETRIC DISTRIBUTION
60 W LED	05 17 28	ASYMMETRICAL
60 W LED	05 17 29	SYMMETRICAL



**LED POST TOP LUMINAIRE  
- ACORN**

LED POST TOP LUMINAIRES - ACORN		
LUMINAIRE WATTAGE (NOMINAL)	CIIC	PHOTOMETRIC DISTRIBUTION
60 W LED	05 17 26	ASYMMETRICAL
60 W LED	05 17 27	SYMMETRICAL



**LED POST TOP LUMINAIRE  
- OCTAGONAL LANTERN**

LED POST TOP LUMINAIRES - OCTAGONAL LANTERN		
LUMINAIRE WATTAGE (NOMINAL)	CIIC	PHOTOMETRIC DISTRIBUTION
60 W LED	05 17 32	ASYMMETRICAL
60 W LED	05 17 33	SYMMETRICAL

- LED CONTEMPORARY LUMINAIRES ARE AVAILABLE WITH GREY COATING ONLY. ALL OTHER DECORATIVE LUMINAIRES ARE BLACK.
- ALL LED LUMINAIRES AUTOMATICALLY ADJUST FOR EITHER A 120V OR 240V SUPPLY.
- ALL LED LUMINAIRES COME WITH A PHOTOCCELL RECEPTACLE.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY D.R. ORR 15-02-11	21-07	2	CORRECTED TYPO	
	16-12	1	REVISED NOTES	
	<b>STANDARD LED LUMINAIRES</b>			
DRAWN C.A.	CHECKED J.R.	DATE 15-02	<b>CD 300-24</b>	
			SHT 0002 of 2	REV 02



**TRENCH AND PLOW-IN LOCATION**

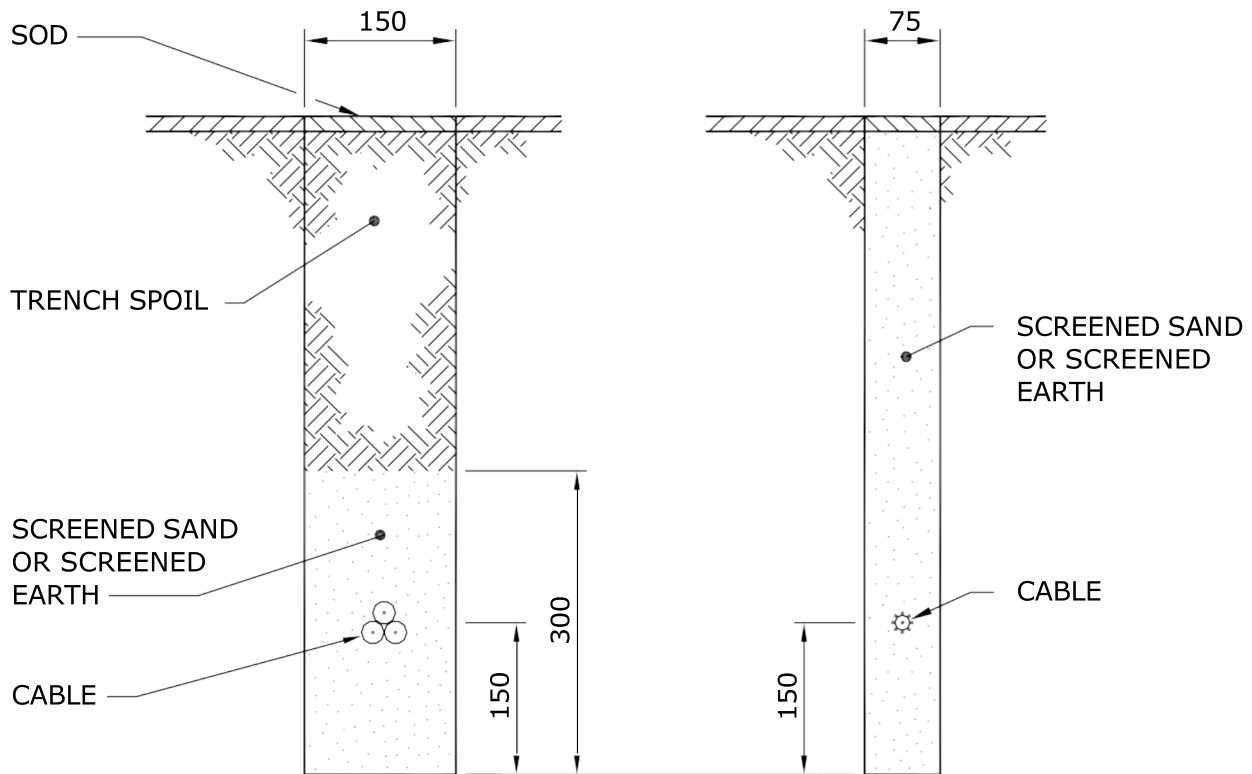
GENERALLY, THE TRENCH LOCATION WILL DICTATE THE LOCATION OF THE LIGHT STANDARDS. CONTACT SHALL BE MADE WITH THE GOVERNING MUNICIPAL AUTHORITY TO DETERMINE THEIR SET BACK REQUIREMENTS. CONTACT SHALL ALSO BE MADE WITH THE CITY OF WINNIPEG UNDERGROUND STRUCTURES OR THE INDIVIDUAL UTILITIES OUTSIDE WINNIPEG TO DETERMINE THE EXISTENCE AND EXACT LOCATION OF OTHER UTILITIES PLANT. THIS INFORMATION WILL BE INCLUDED ON THE WORK ORDER PLANS.

**DEPTH OF BURIAL**

THE CABLE SHALL BE BURIED BELOW THE SURFACE OF THE EARTH A MINIMUM OF 600mm IN SODDED AREAS AND 1000mm IN ROADWAYS.

**TRENCH DETAILS**

TYPICAL TRENCH DETAILS FOR SODDED AREAS ARE SHOWN BELOW, FOR TRENCH DETAILS UNDER ROADWAYS REFER TO DRAWING CD205-14. SEE NOTES ON SHEET 2 of 2.



NOTE: DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	96-01	3	ROADWAY DEPTH ADDED	<b>PLOWING AND TRENCHING DETAILS FOR UNDERGROUND STREET LIGHT CIRCUITS</b>	
	95-09	2	BURIAL DEPTH NOTE ADDED		
	94-04	1	COMBINED WITH DWG. CD305-2		
DRAWN W.B./CAD	CHECKED	DATE 88-07	<b>CD 305-1</b>		SHT 0001 OF 2
				REV 03	

NOTES:

1. FOR TYPICAL TRENCH DETAIL INSTALLATION UNDER ROADWAYS, REFER TO DRAWING CD205-14.
2. THESE ARE ALTERNATIVE TRENCH WIDTHS. A 75mm TRENCH IS PREFERABLE WHERE THE GROUND IS FIRM AND A CLEAN CUT CAN BE MADE. A 150mm TRENCH IS PREFERABLE WHERE THE GROUND IS TOO LOOSE TO MAINTAIN A FIRM TRENCH WALL.
3. THE CABLES INDICATED IN THE VIEWS CAN BE USED IN EITHER TRENCH.
4. THE 75mm TRENCH SHALL BE BACKFILLED WITH SCREENED SAND OR SCREENED EARTH.
5. THE 150mm TRENCH SHALL BE BACKFILLED WITH THE TRENCH SPOIL IF IT IS FREE FROM ROCKS OR DEBRIS. IF THE TRENCH SPOIL CONTAINS ROCKS OR DEBRIS, SCREENED SAND OR SCREENED EARTH SHALL BE INSTALLED AS SHOWN.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<b>PLOWING AND TRENCHING DETAILS FOR UNDERGROUND STREET LIGHT CIRCUITS</b>		
		96-01	2			NOTES REVISED
		94-04	1			COMBINED WITH DWG. CD305-2
DRAWN W.B./CAD	CHECKED	DATE 88-07	<b>CD 305-1</b>		SHT 0002 of 2	
					REV 02	

1. **GENERAL**

PLOWED-IN CABLES SHALL BE PULLED TO 1m ABOVE GRADE AT EACH STREET LIGHT STANDARD LOCATION. THE CABLE DEPTH SHALL BE MAINTAINED AT THE 600mm PLOW DEPTH AS CLOSE AS POSSIBLE TO THE STREET LIGHT STANDARD LOCATION BEFORE RAISING THE PLOW. THE PLOW SHALL BE RETURNED TO THE 600mm PLOW DEPTH AS CLOSE AS POSSIBLE TO THE CENTRE LINE OF THE STREET LIGHT STANDARD LOCATION.

CABLES LAID IN TRENCHES SHALL HAVE SUFFICIENT SLACK TO ALLOW FOR FUTURE MOVEMENT OR SETTLING OF THE TRENCH FLOOR. CABLES SHALL PROJECT 1m ABOVE GRADE AT EACH LOCATION.

2. **USE OF POLYETHYLENE PIPE**

2.1 WHERE CABLES ARE INSTALLED UNDER EXISTING PAVEMENT, POLYETHYLENE PIPE SHALL BE INSTALLED TO PROTECT THE CABLES IF THE HOLE IS AUGERED OR PUSHED THROUGH MATERIAL CONTAINING ROCKS, STONES, OR DEBRIS.

2.2 AT THE JUNCTION OF THE MAIN TRENCH AND THE STREET OR DRIVEWAY CROSSING, THE BOTTOM OF THE TRENCH SHALL BE BACKFILLED AND TAMPED TO THE LEVEL OF THE POLYETHYLENE PIPES TO PREVENT SHARP BENDS IN THE CABLE AND TRAPPING OF WATER IN THE PIPE.

3. **SPLICES - UNDERGROUND CABLES**

UNDERGROUND STREET LIGHT CABLES (i.e. #4 ALUMINUM CONCENTRIC NEUTRAL CABLE AND 1/0 TRIPLEXED CABLE) ARE TO BE SPLICED USING AN APPROPRIATE COMPRESSION SLEEVE (SEE DRAWING CD210-21) AND THE SPLICE IS TO BE INSULATED USING ONE OF THE FOLLOWING METHODS:

- 1) RAYCHEM RAYVOLVE SPLICE
- 2) PRE-STRETCHED INSULATING TUBING SPLICE
- 3) HEAT SHRINK INSULATING TUBING SPLICE
- 4) TAPED SPLICE

FOR COMPLETE INSTRUCTIONS REGARDING THE ABOVE SPLICES, REFER TO DRAWING CD215-12.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		94-04 1 DWG. REFERENCE CHANGED		<b>INSTALLATION OF STREET LIGHT CABLES</b>	
		DATE 88-07		<b>CD 310-1</b>	

4. **CABLE END CAPS**

STREET LIGHT CABLES WHICH ARE NOT GOING TO BE SPLICED OR TERMINATED IMMEDIATELY FOLLOWING INSTALLATION SHALL BE CUT SQUARE AND SEALED WITH AN END CAP. REFER TO DRAWING CD215-21 FOR DETAILS.

5. **GROUNDING OF STREET LIGHT STANDARDS**

5.1 ALL STREET LIGHT STANDARDS SHALL BE GROUNDED BY CONNECTING THE NEUTRAL TO THE GROUND STUD INSIDE THE STANDARD. REFER TO DRAWING CD310-4 FOR DETAILS.

5.2 A GROUND ROD SHALL BE INSTALLED AND CONNECTED TO THE GROUND STUD AT THE LAST STANDARD ON JACKETED STREET LIGHT CIRCUITS.

5.3 A GROUND ROD SHALL BE INSTALLED AND CONNECTED TO THE GROUND STUD AT EVERY THIRD STANDARD AND AT THE LAST STANDARD ON C/N STREET LIGHT CIRCUITS.

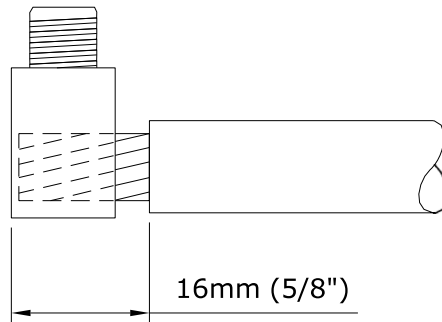
*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY P.S.C. LOEWEN 22-09-23				<b>INSTALLATION OF STREET LIGHT CABLES</b>		
		22-09	2			ADDED NOTE 5.3, REVISED NOTE 5.2
		94-04	1			DWG. REFERENCE CHANGED
DRAWN C.A.	CHECKED L.D.	DATE 22-09	<b>CD 310-1</b>		SHT 0002 of 2	
					REV 02	

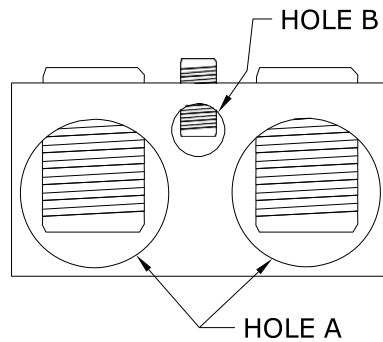
**RAYCHEM GELCAP CIIC# 04-29-36**

**GENERAL INSTRUCTIONS:**

1. REMOVE 16mm (5/8") OF INSULATION AND CLEAN EXPOSED ENDS.



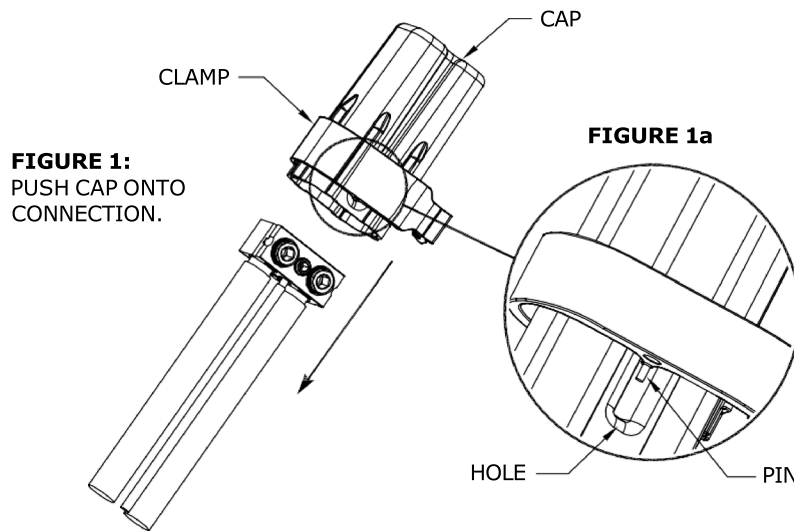
2. INSERT CONDUCTORS INTO CORRECT HOLES AND TORQUE AS SHOWN:



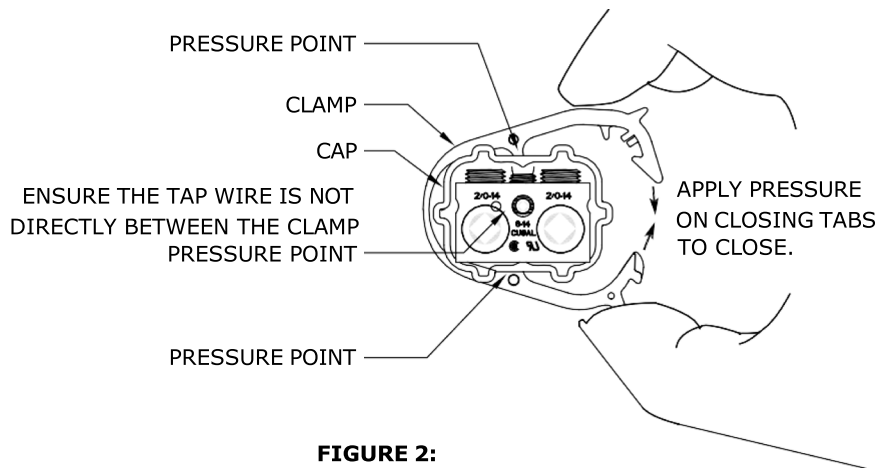
HOLE A		HOLE B	
WIRE RANGE	RECOMMENDED TORQUE VALUES	WIRE RANGE	RECOMMENDED TORQUE VALUES
#14 - 2/0 • STREET LIGHT CIRCUIT CABLES • GROUNDING CONNECTIONS • CONCENTRIC NEUTRAL • FUSE HOLDER WIRE	14 - 20 N-m (120 - 180 in-lbs)	#14 - #6 • LAMP LEADS	14 - 17 N-m (120 - 150 in-lbs)

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05			<b>RAYCHEM GELCAP SPLICE</b>		
DRAWN	CHECKED	DATE	<b>CD 310-3</b>	SHT	REV
C.A.	L.D.	17-11		0001 of 3	00

- INSTALL CLAMP ON CAP. ENSURE THE TWO PINS ON THE BOTTOM EDGE OF THE CLAMP MATE WITH THE HOLES OF THE CAP AS SHOWN IN FIGURE 1a BELOW.



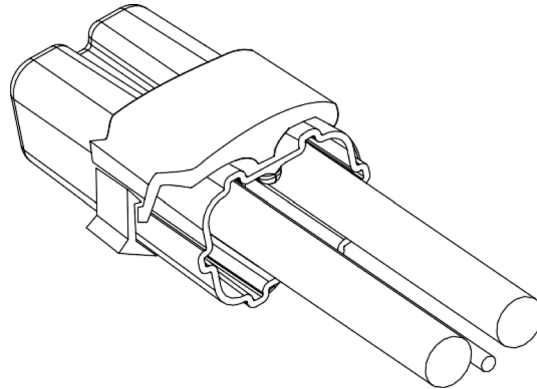
- INSTALL CAP BY HOLDING ALL WIRES AND PUSHING THE CAP OVER THE CONNECTION ASSEMBLY UNTIL IT GOES NO FURTHER AS SHOWN IN FIGURE 1 ABOVE.
- SNAP CLAMP CLOSED. IF NECESSARY, USE PLIERS TO SNAP CLAMP CLOSED AS SHOWN IN FIGURE 2 BELOW.



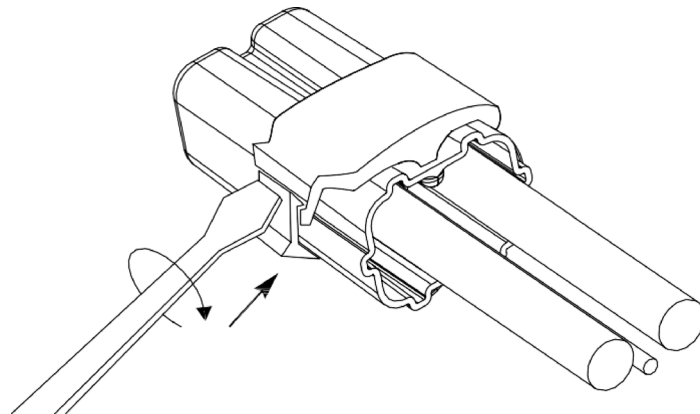
**FIGURE 2:**  
CLAMP PRESSURE POINTS SHOULD FIT INTO OPPOSING GROOVES OF CAP AND APPLY PRESSURE BETWEEN CABLES. SNAP CLAMP CLOSED.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05			<b>RAYCHEM GELCAP SPLICE</b>					
DRAWN C.A.	CHECKED L.D.	DATE 17-11	<b>CD 310-3</b>	<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0002 of 3</td> <td>00</td> </tr> </table>	SHT	REV	0002 of 3	00
SHT	REV							
0002 of 3	00							

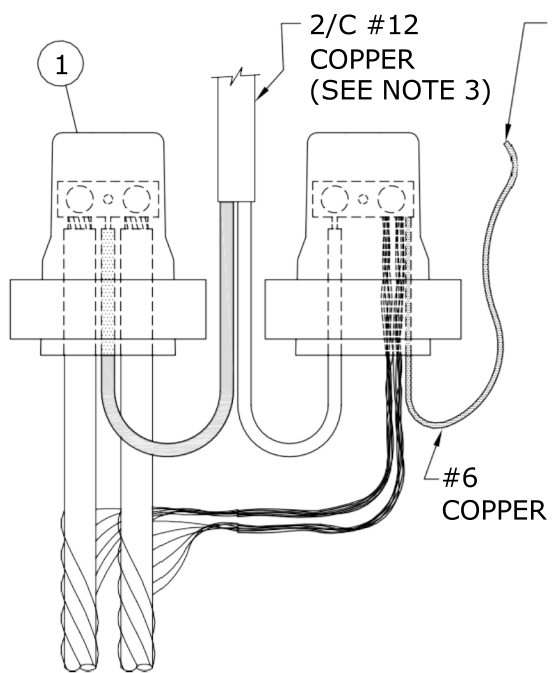
6. INSPECT THE INSTALLATION BY GENTLY PULLING ON THE CAP ENSURING IT IS LOCKED IN PLACE AND COVERS CONNECTOR AND BARE CONDUCTOR. THERE SHOULD BE NO EXPOSED METAL. ENSURE TAP CABLE IS NOT CAUGHT BETWEEN PRESSURE POINTS OF CLAMP. INSTALLATION IS COMPLETE.



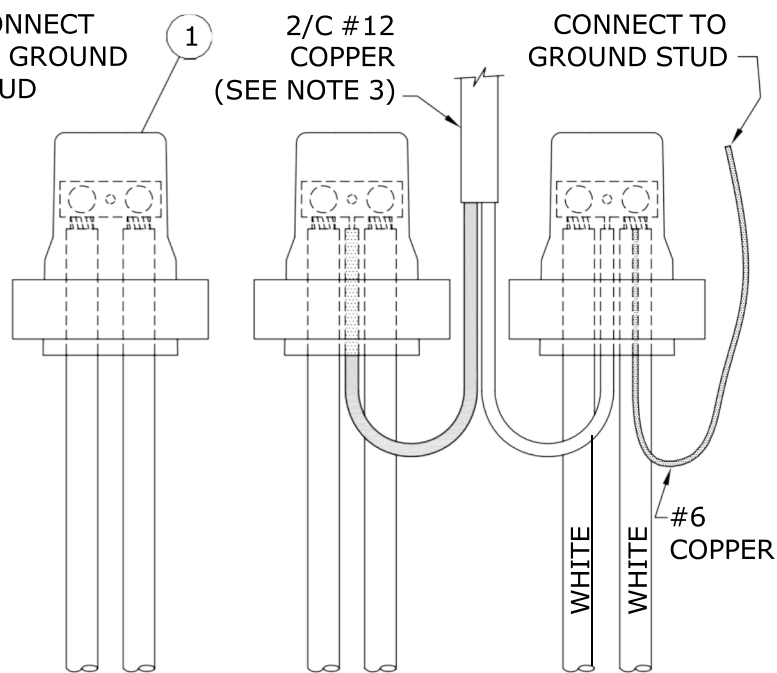
7. TO REMOVE, INSERT SCREWDRIVER BETWEEN THE CLOSING TABS AND TWIST TO OPEN THE CLAMP. REMOVE CAP SLOWLY FROM CONNECTION ALLOWING GEL TO REMAIN IN CAP.



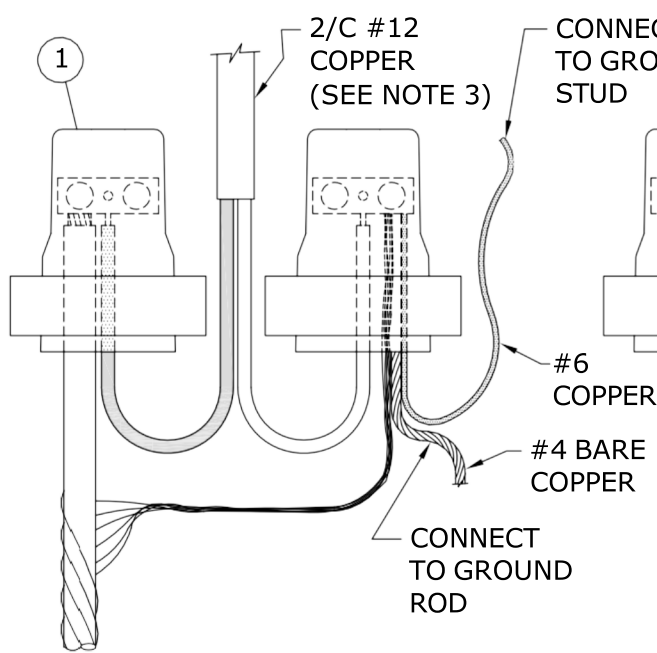
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05				<b>RAYCHEM GELCAP SPLICE</b>					
DRAWN C.A.	CHECKED L.D.	DATE 17-11	<b>CD 310-3</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0003 of 3</td> <td>00</td> </tr> </table>	SHT	REV	0003 of 3	00
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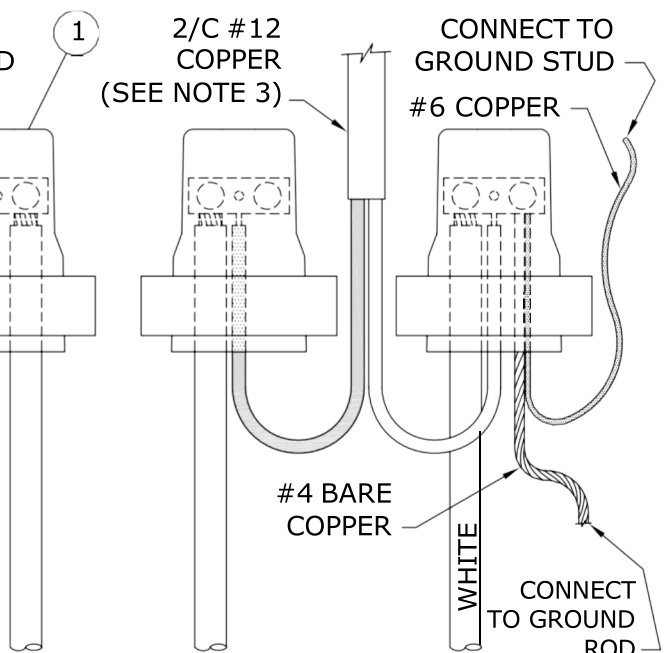
**No. 4 ALUMINUM C/N CABLE  
(TYPICAL FEED THROUGH)**



**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL FEED THROUGH)**



**No. 4 ALUMINUM C/N CABLE  
(TYPICAL END OF CIRCUIT)**

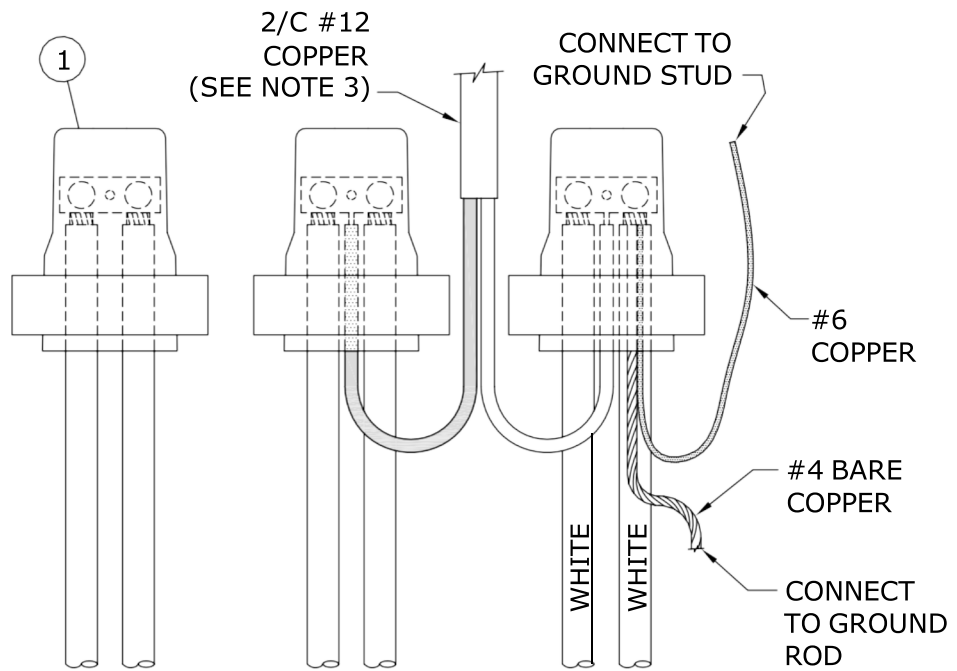


**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL END OF CIRCUIT)**

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	22-09	4	ADDED CONNECTION TO GROUND STUD FOR C/N CABLE	
	21-06	3	ADDED NOTE FOR DUAL LUMINAIRE SUPPLY	
DRAWN C.A.	CHECKED L.D./P.L.	DATE 18-04	<b>CD 310-4</b>	





**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL EVERY THIRD STANDARD)**

**BILL OF MATERIAL**

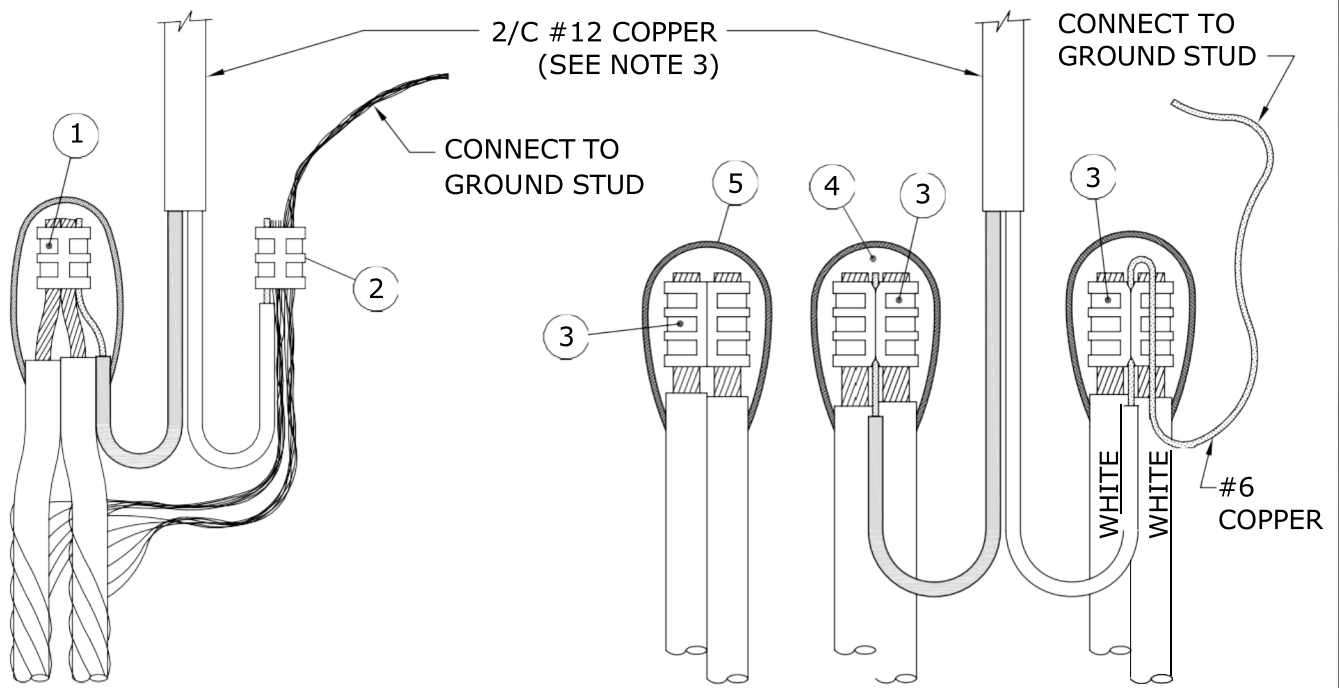
ITEM No.	DESCRIPTION	STORES CODE No.	
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX
1	GEL CAP	04-29-36 (2 REQUIRED)	04-29-36 (3 REQUIRED)

NOTES:

- 1. LEAVE SUFFICIENT SLACK ON CONDUCTORS TO ALLOW REMOVAL FROM HANDHOLE FOR MAINTENANCE.**
- REFER TO DRAWING CD310-3 FOR GEL CAP INSTALLATION INSTRUCTIONS.
- INSTALL PARALLEL 2/C #12 COPPER FOR DOUBLE LUMINAIRE STANDARDS. TIE TOGETHER IN HANDHOLE.

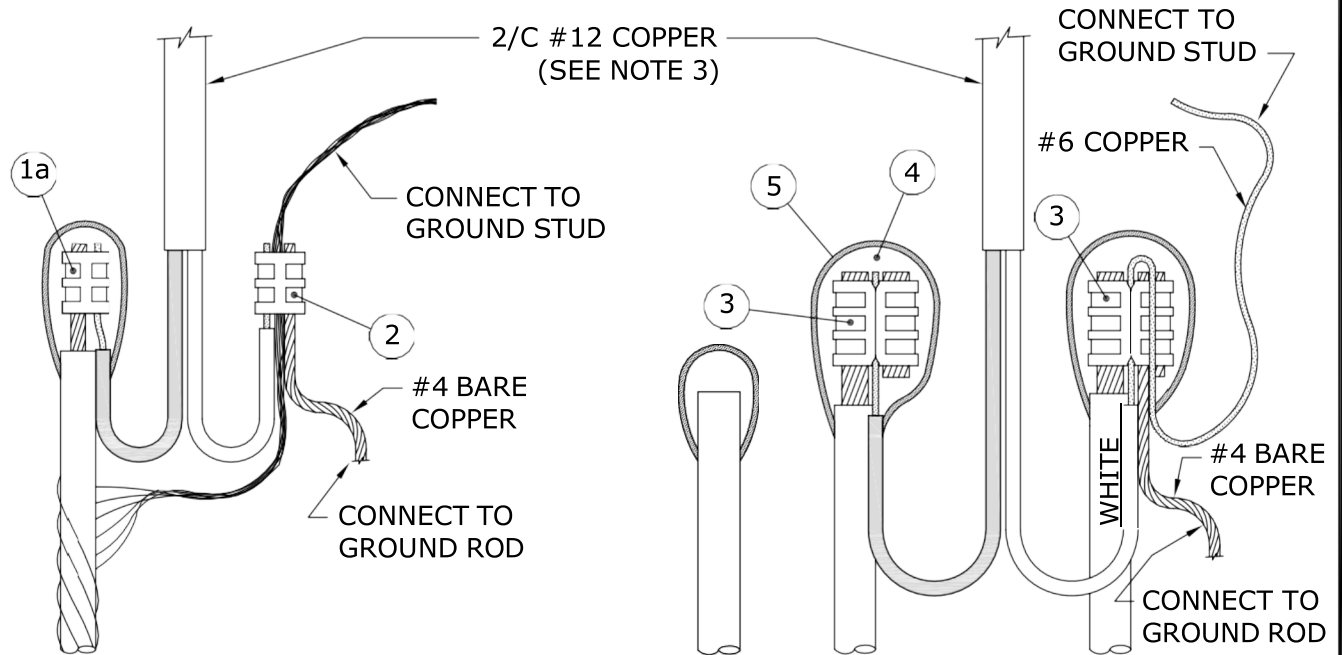
*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	22-09	2	ADDED DETAIL FOR EVERY THIRD STREET LIGHT STANDARD	
	18-04	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4. ADDED NEW BOM WITH GELCAP, REVISED TITLE, RESEALED	
DRAWN C.A.	CHECKED L.D./P.L.	DATE 18-04	<b>CONNECTION DETAIL IN STREET LIGHT STANDARD</b>	
<b>CD 310-4</b>				



**No. 4 ALUMINUM C/N CABLE  
(TYPICAL FEED THROUGH)**

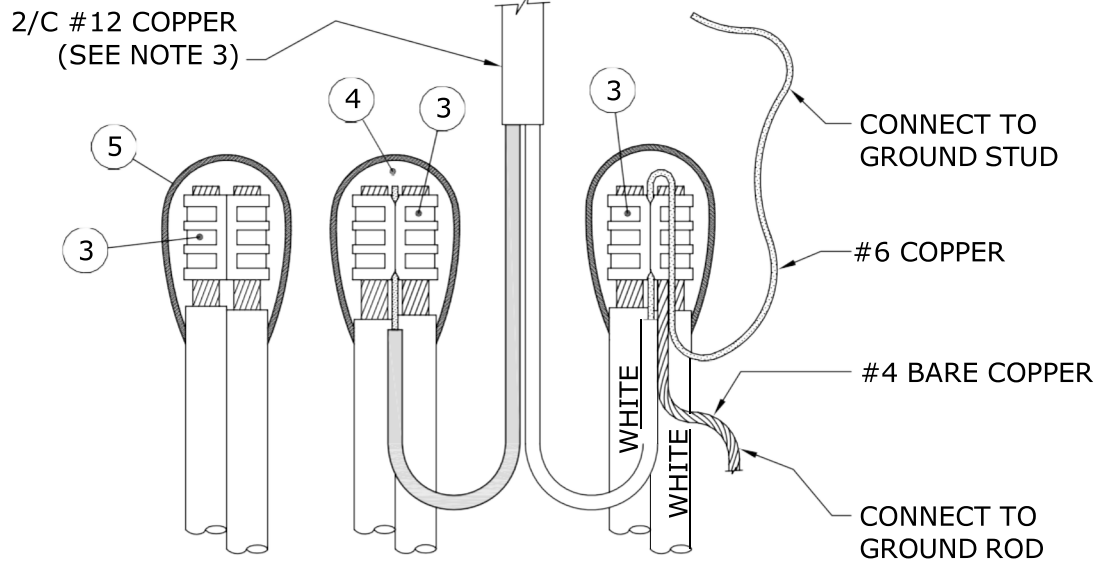
**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL FEED THROUGH)**



**No. 4 ALUMINUM C/N CABLE  
(TYPICAL END OF CIRCUIT)**

**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL END OF CIRCUIT)**

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS							
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	22-09	2	ADDED COPPER LABEL FOR #4 BARE & #6							
	21-06	1	ADDED NOTE FOR DUAL LUMINAIRE SUPPLY							
	18-04	0	MOVED FROM SHEET 1							
DRAWN C.A.			CHECKED L.D./P.L.		DATE 18-04		<b>CD 310-4</b>		SHT	REV
									0003	of 4



**1/0 ALUMINUM TRIPLEX CABLE  
(TYPICAL EVERY THIRD STANDARD)**

**BILL OF MATERIAL**

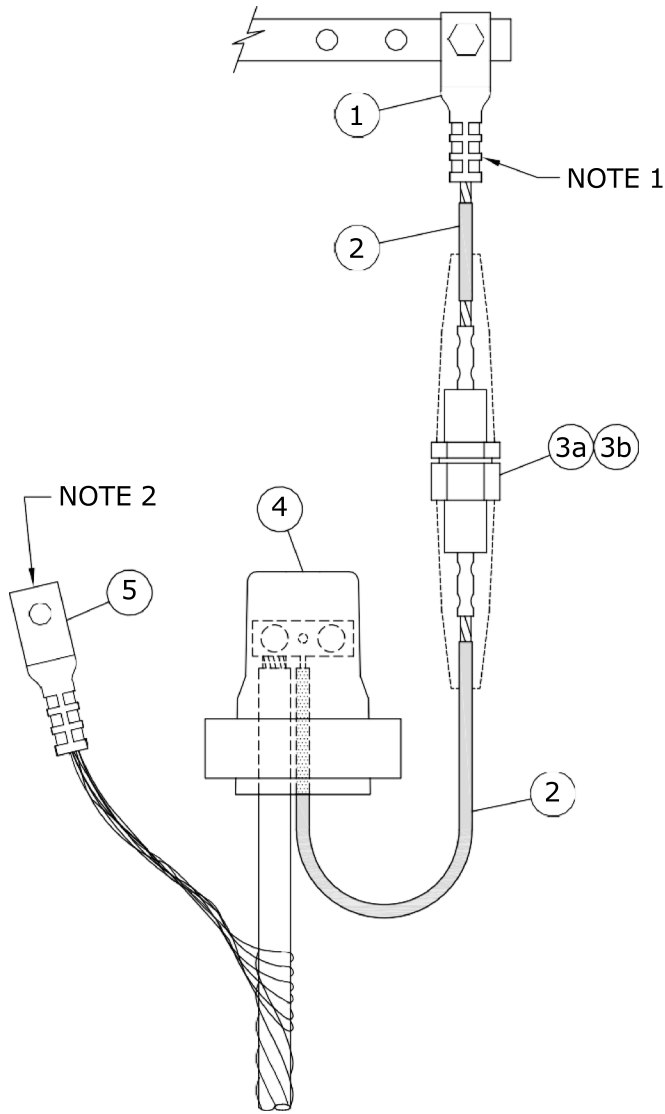
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	'C' TYPE AL. COMPRESSION TAP	74-41-30	---	1
1a	'H' TYPE AL. COMPRESSION TAP	74-40-10	---	1 *
2	'C' TYPE CU. COMPRESSION TAP	74-40-90	---	1
3	'H' TYPE AL. COMPRESSION TAP	---	74-40-60	3 **
4	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
5	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

- \* FOR END OF CIRCUIT WHEN USING ONLY ONE CABLE.
- \*\* AT END OF CIRCUIT, QUANTITY MAY BE LESS THAN SHOWN.

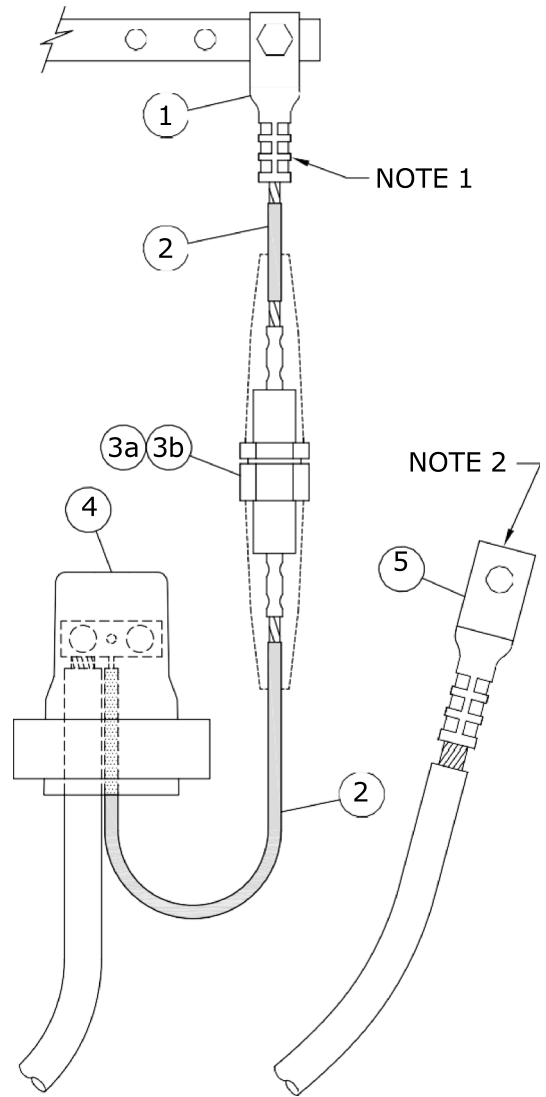
**NOTES:**

- 1. LEAVE SUFFICIENT SLACK ON CONDUCTORS TO ALLOW REMOVAL FROM HANDHOLE FOR MAINTENANCE.**
2. FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.
3. INSTALL PARALLEL 2/C #12 COPPER FOR DOUBLE LUMINAIRE STANDARDS. TIE TOGETHER IN HANDHOLE.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11			<b>CONNECTION DETAIL IN STREET LIGHT STANDARD</b>		
	22-09	1			ADDED DETAIL FOR EVERY THIRD STREET LIGHT STANDARD
	18-04	0			MOVED FROM SHEET 2
DRAWN C.A.	CHECKED L.D./P.L.	DATE 18-04	<b>CD 310-4</b>		
			SHT 0004 of 4	REV 01	



**No. 4 ALUMINUM  
C/N CABLE**



**1/0 ALUMINUM  
TRIPLEX CABLE**

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05	17-11	2	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP, DWG, RESEALED	<b>STREET LIGHT CIRCUIT PROTECTED BY A 60A FUSE AT TRANSFORMER</b>	
	94-04	1	CONN. REVISED DUE TO INSUL. NEUTRAL		
DRAWN C.A.	CHECKED L.D.	DATE 17-10		<b>CD 310-8</b>	

**BILL OF MATERIAL**

ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY *
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	LUG, TERMINAL, COMPRESSION	44-66-63	44-66-63	1
2	WIRE, #6 CU., 600V, PVC	93-10-06	93-10-06	1m
3a	FUSEHOLDER, 60A C/W BOOTS	31-91-60	31-91-60	1
3b	FUSE, STREET LIGHT, 60A	31-14-60	31-14-60	1
4	GEL CAP	04-29-36	04-29-36	1
5	LUG, TERMINAL, COMPRESSION	44-66-60	44-66-65	1

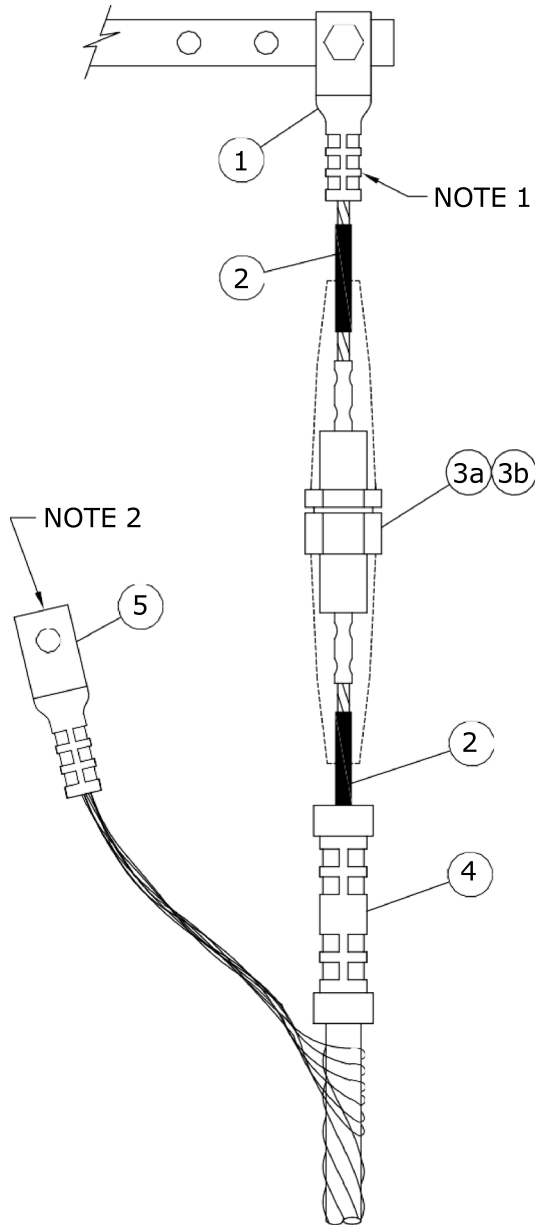
\* WHEN CONNECTING BOTH LEGS OF 1/0 ALUMINUM TRIPLEX, DOUBLE QUANTITY OF MATERIAL EXCEPT FOR ITEM No. 5.

NOTES:

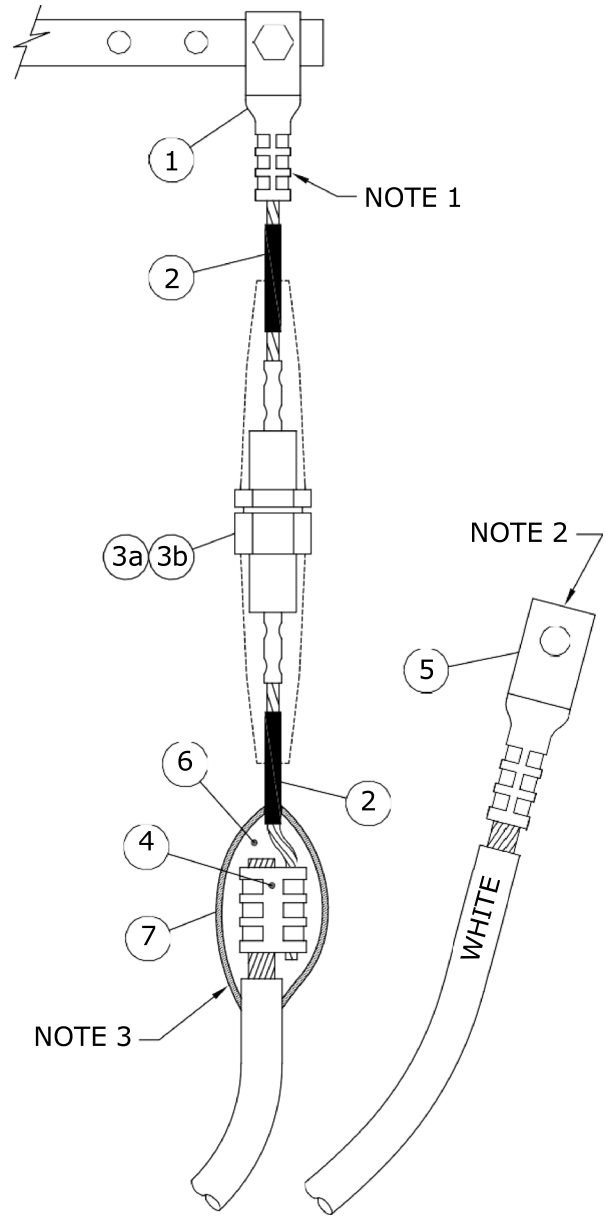
- FOR INFORMATION ON COMPRESSION TERMINAL LUGS, REFER TO DRAWING CD210-27.
- CONNECT TO SECONDARY GROUND BUSHING.
- REFER TO DRAWING CD310-3 FOR GEL CAP INSTALLATION INSTRUCTIONS.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05				<b>STREET LIGHT CIRCUIT PROTECTED BY A 60A FUSE AT TRANSFORMER</b>	
		17-11	1		
DRAWN C.A.	CHECKED L.D.	DATE 17-10		<b>CD 310-8</b>	



**No. 4 ALUMINUM  
C/N CABLE**



**1/0 ALUMINUM  
TRIPLEX CABLE**

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05			<b>STREET LIGHT CIRCUIT PROTECTED BY A 60A FUSE AT TRANSFORMER</b>	
	17-11	0		
DRAWN C.A.	CHECKED L.D.	DATE 17-10	<b>CD 310-8</b>	

**BILL OF MATERIAL**

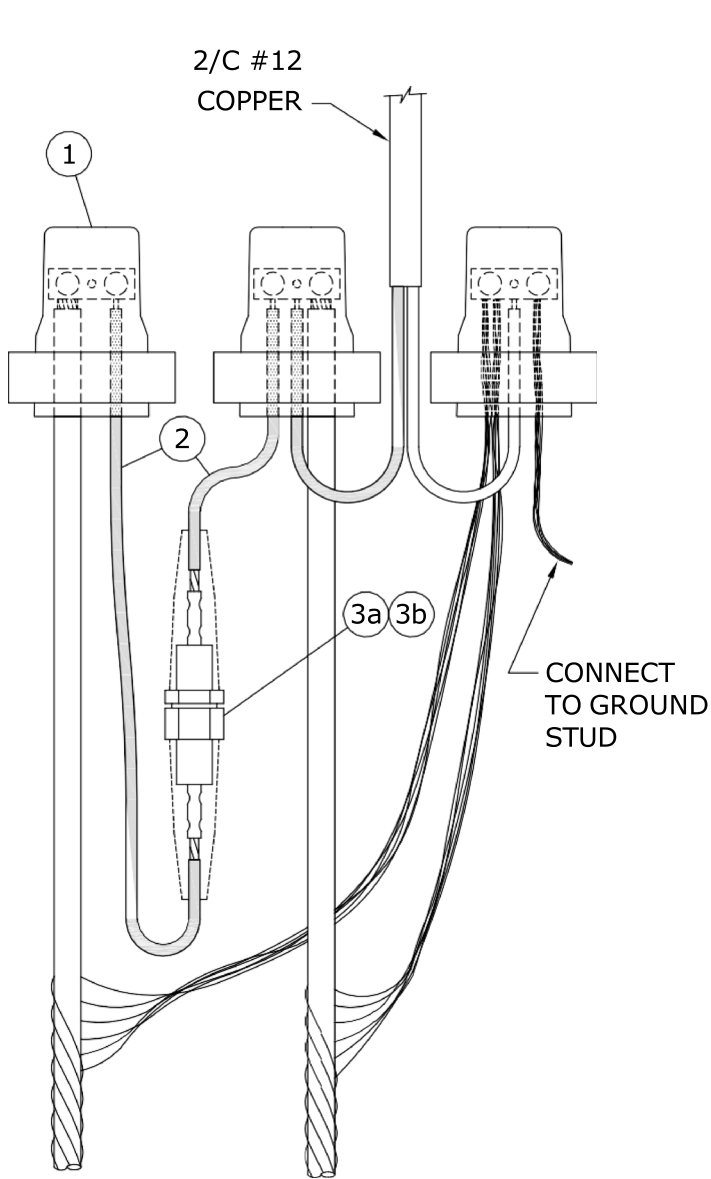
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY *
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	LUG, TERMINAL, COMPRESSION	44-66-63	44-66-63	1
2	WIRE, # 6 CU., 600V, PVC	93-10-06	93-10-06	1m
3a	FUSEHOLDER, 60A C/W BOOTS	31-91-60	31-91-60	1
3b	FUSE, STREET LIGHT, 60A	31-14-60	31-14-60	1
4	INSULATED SLEEVE	74-45-50	---	1
	'H' TYPE COMPRESSION TAP	---	74-40-30	1
5	LUG, TERMINAL, COMPRESSION	44-66-60	44-66-65	1
6	TAPE, SELF-AMALGAMATING EPR	---	78-55-23	1/4 ROLL
7	TAPE, COLD WEATHER VINYL	---	78-55-98	1/4 ROLL

\* WHEN CONNECTING BOTH LEGS OF 1/0 ALUMINUM TRIPLEX, DOUBLE QUANTITY OF MATERIAL EXCEPT FOR ITEM No. 5.

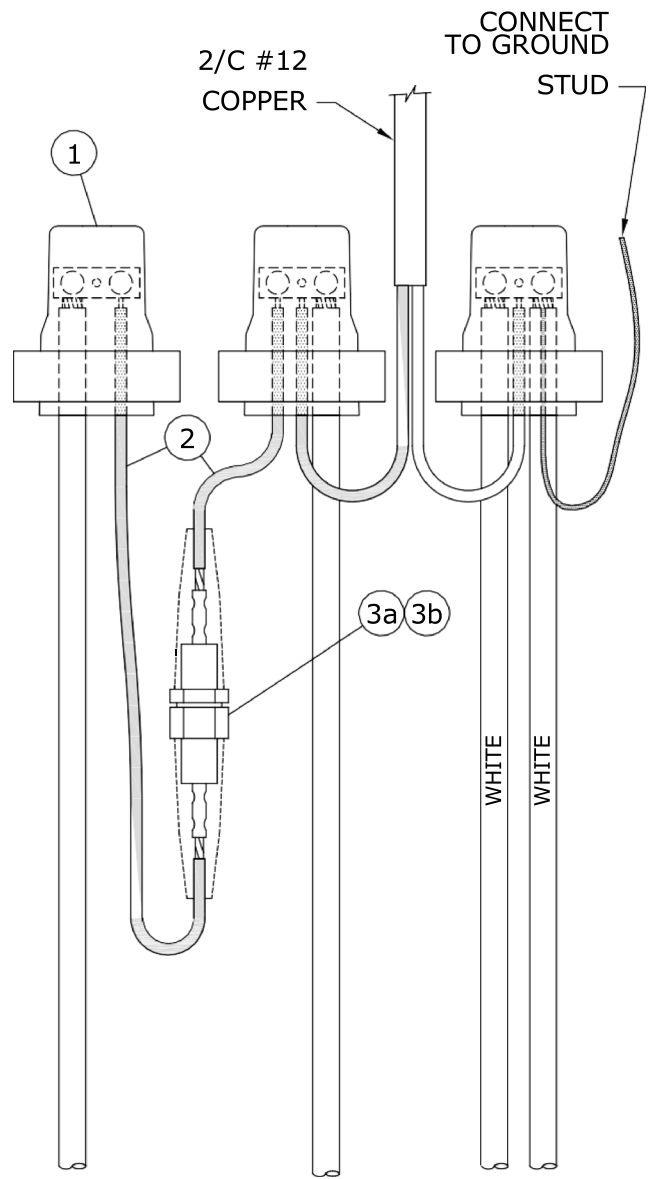
NOTES:

- FOR INFORMATION ON COMPRESSION TERMINAL LUGS, REFER TO DRAWING CD210-27.
- CONNECT TO SECONDARY GROUND BUSHING.
- FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05		17-11 0		<p align="center"><b>STREET LIGHT CIRCUIT PROTECTED BY A 60A FUSE AT TRANSFORMER</b></p>			
DRAWN C.A.	CHECKED L.D.	DATE 17-10		<b>CD 310-8</b>		SHT	REV
						0004 of 4	00



**No. 4 ALUMINUM C/N CABLE**



**1/0 ALUMINUM TRIPLEX CABLE**

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05	17-11	2	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP, DWG, RESEALED	<b>STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD</b>	
	94-04	1	CONN. REVISED DUE TO INSUL. NEUTRAL		
DRAWN C.A.	CHECKED L.D.	DATE 17-11		<b>CD 310-9</b>	



**BILL OF MATERIAL**

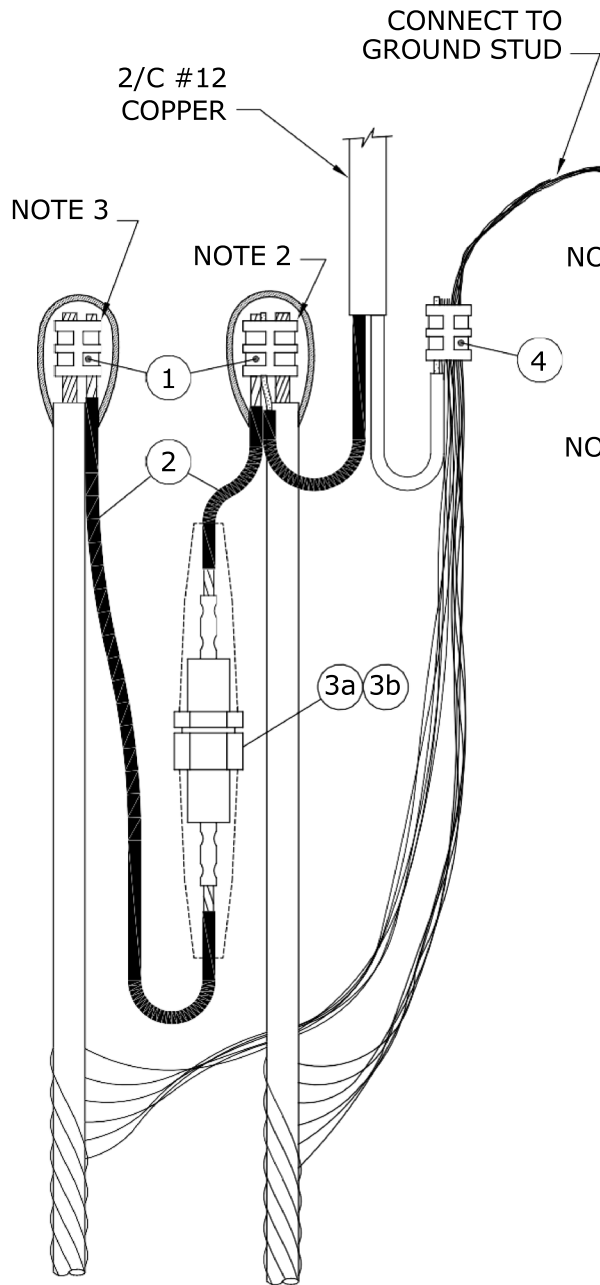
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	GEL CAP	04-29-36	04-29-36	3
2	WIRE, # 8 CU., 600V, PVC	93-10-08	93-10-08	1m
3a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
3b	FUSE, 30A	31-14-30	31-14-30	1

NOTES:

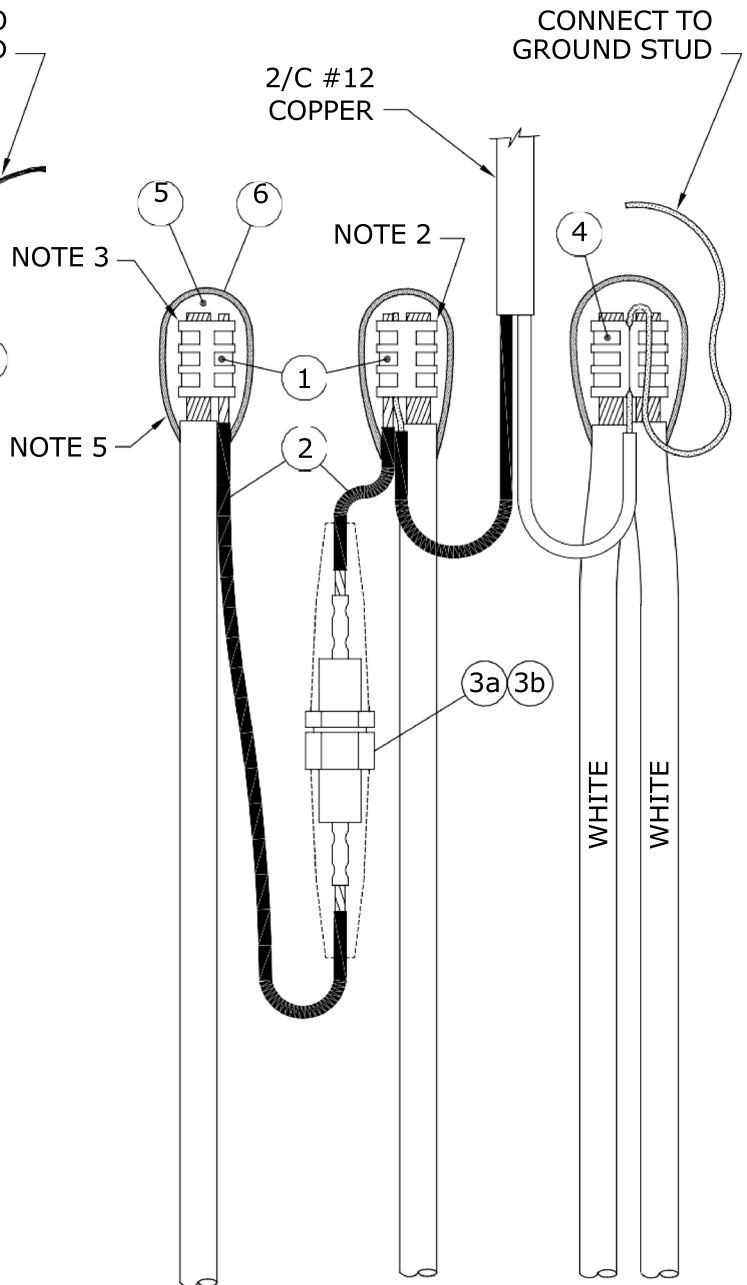
- 1. LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR GEL CAP INSTALLATION INSTRUCTIONS, REFER TO DRAWING CD310-3.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05				<b>STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD</b>	
		17-11	1		
DRAWN C.A.	CHECKED L.D.	DATE 17-11	<b>CD 310-9</b>		SHT 0002 of 4
					REV 01



**No. 4 ALUMINUM C/N CABLE**



**1/0 ALUMINUM TRIPLEX CABLE**

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05			<b>STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD</b>	
	17-11	0		
DRAWN C.A.	CHECKED L.D.	DATE 17-11	<b>CD 310-9</b>	

**BILL OF MATERIAL**

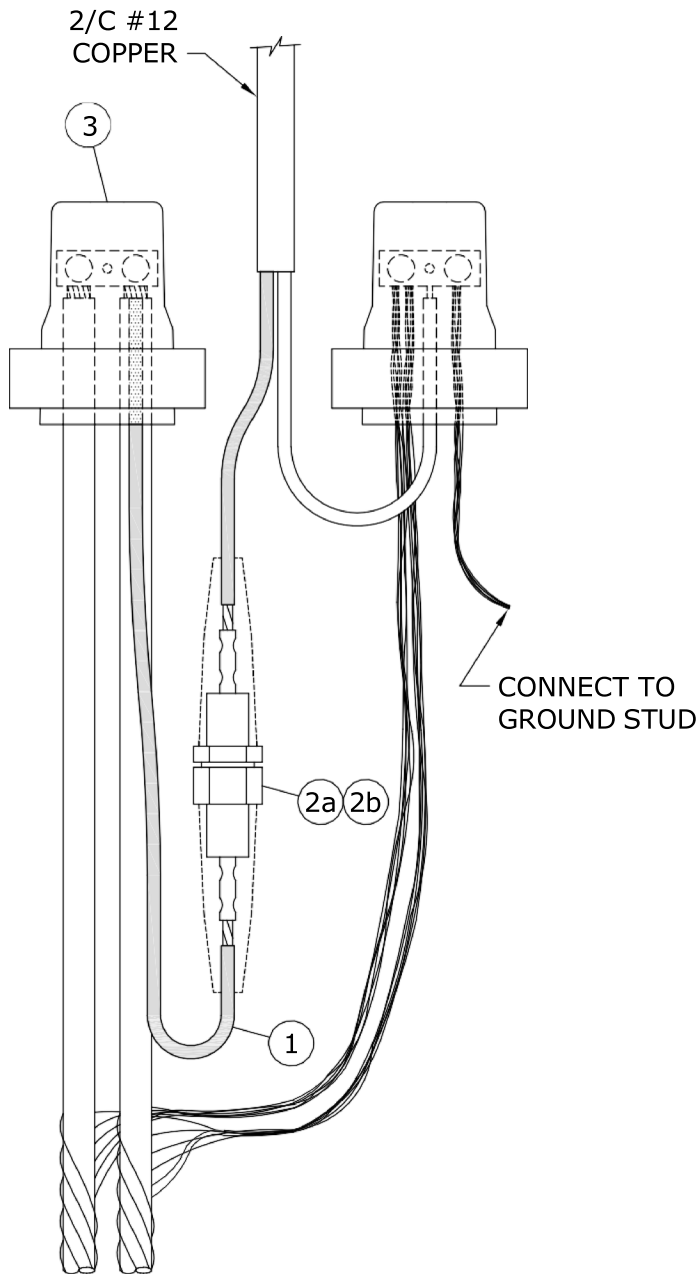
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	'H' TYPE COMPRESSION TAP	74-40-10	74-40-30	2
2	WIRE, # 8 CU., 600V, PVC	93-10-08	93-10-08	1m
3a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
3b	FUSE, 30A	31-14-30	31-14-30	1
4	'C' TYPE COMPRESSION TAP	74-40-90	---	1
	'H' TYPE COMPRESSION TAP	---	74-40-60	1 *
5	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
6	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

\* WHEN USING 1/0 ALUMINUM TRIPLEX 1 ADDITIONAL 'H' TYPE COMPRESSION TAP (S.C.# 74 40 60) IS REQUIRED TO CONNECT SECOND (FEED THROUGH) HOT LEG.

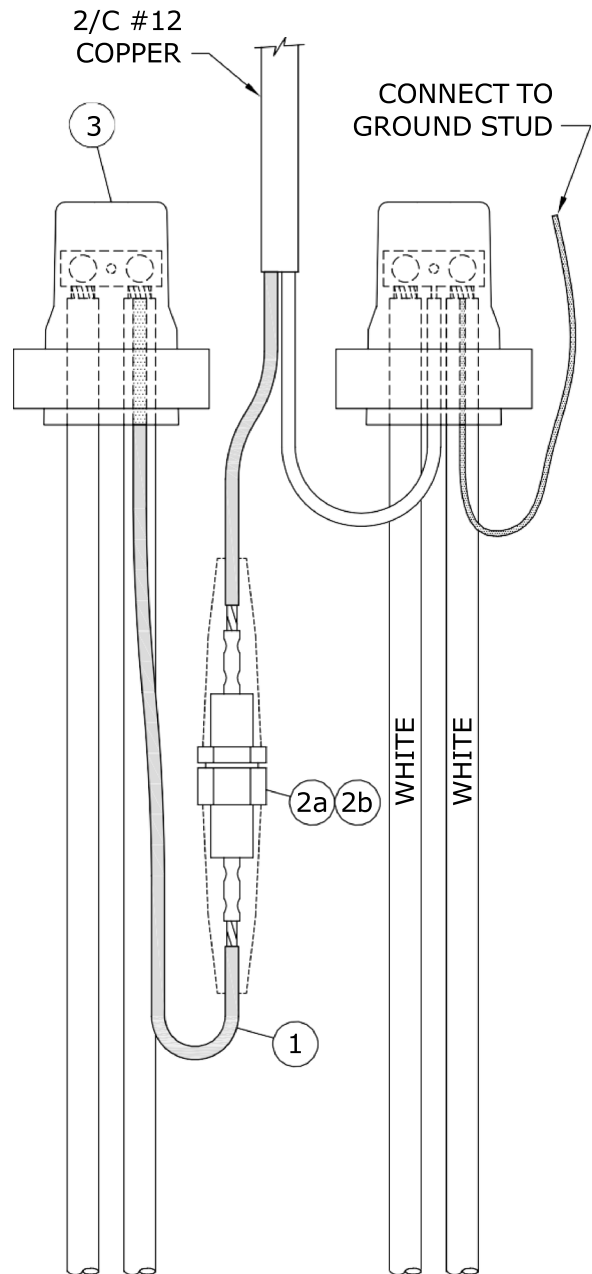
NOTES:

- LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
- INSERT #12 COPPER AND #8 COPPER IN SMALL GROOVE.
- INSERT DOUBLE THICKNESS OF #8 COPPER IN SMALL GROOVE.
- FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
- FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05		17-11 0		<p align="center"><b>STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD</b></p>			
DRAWN C.A.	CHECKED L.D.	DATE 17-11		<b>CD 310-9</b>		SHT	REV
						0004 of 4	00



**No. 4 ALUMINUM C/N CABLE**



**1/0 ALUMINUM TRIPLEX CABLE**

**NOTE:**

RECOMMENDED FOR PROTECTING LUMINAIRES WHICH ARE TO BE MOUNTED ON STREET LIGHT POLES 16.8m AND HIGHER.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04	3	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP, DWG, RESEALED	<b>INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD</b>	
	95-01	2	NOTE ADDED		
DRAWN C.A.	CHECKED L.D.	DATE 18-04	<b>CD 310-10</b>		SHT 0001 of 4
					REV 03

**BILL OF MATERIAL**

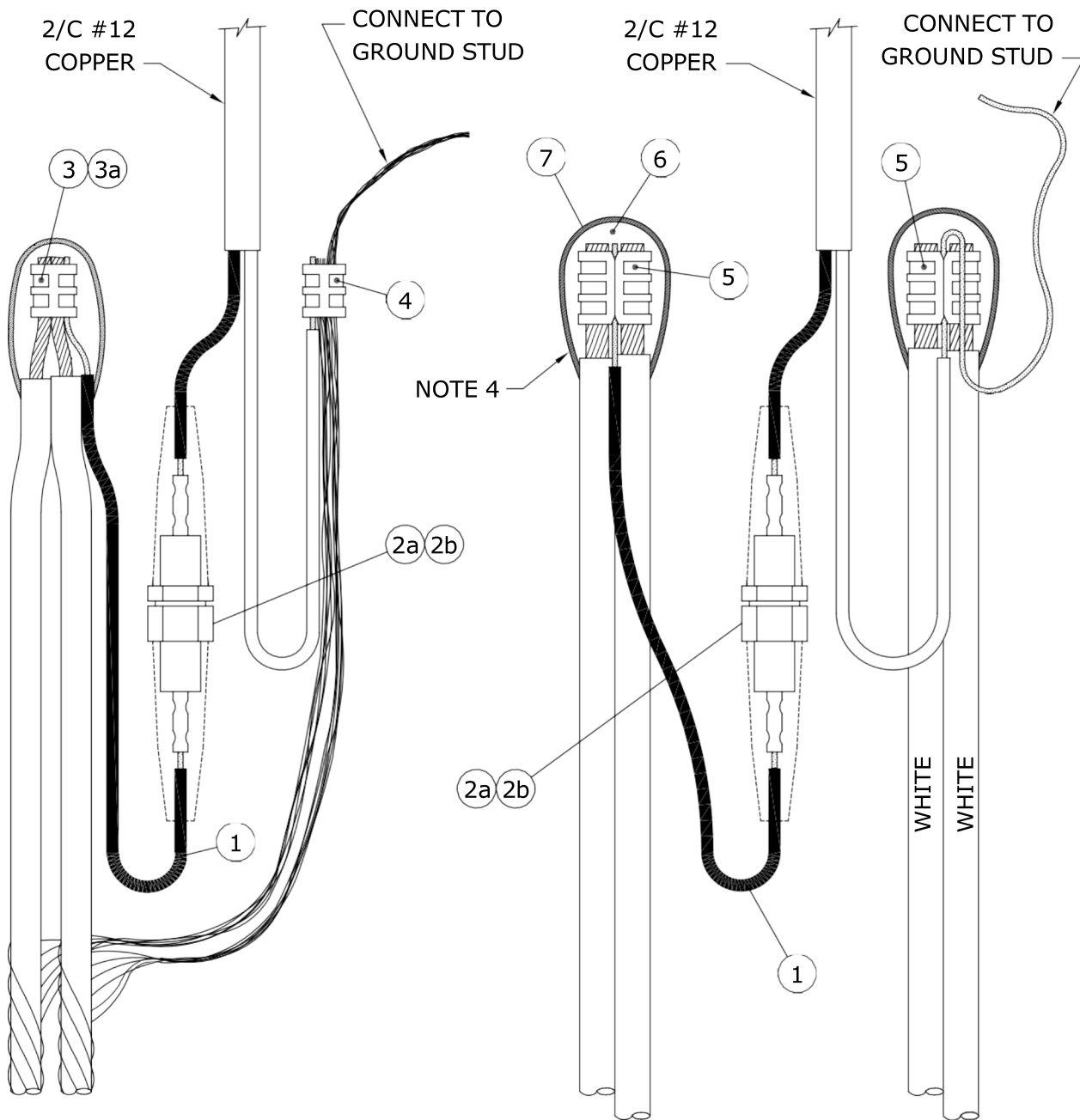
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	2/C #12 COPPER	93-52-12	93-52-12	1m
2a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
2b	FUSE, STREET LIGHT, 15A	31-14-15	31-14-15	1
3	GEL CAP	04-29-36	04-29-36	2

NOTES:

- 1. LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR END OF CIRCUIT, REFER TO DRAWING CD310-4.
4. FOR GEL CAP INSTALLATION INSTRUCTIONS, REFER TO DRAWING CD310-3.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS				
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11		<table border="1"> <tr> <td>18-04</td> <td>1</td> <td>ADDED SHT 3 &amp; 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, RESEALED</td> </tr> </table>		18-04	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, RESEALED	<p align="center"><b>INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD</b></p>	
				18-04	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, RESEALED		
DRAWN C.A.	CHECKED L.D.	DATE 18-04	<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0002 of 4</td> <td>01</td> </tr> </table>		SHT	REV	0002 of 4	01
SHT	REV							
0002 of 4	01							
			<b>CD 310-10</b>					



**No. 4 ALUMINUM C/N CABLE**

**1/0 ALUMINUM TRIPLEX CABLE**

**NOTE:**

RECOMMENDED FOR PROTECTING LUMINAIRES WHICH ARE TO BE MOUNTED ON STREET LIGHT POLES 16.8m AND HIGHER.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11			<b>INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD</b>	
	18-04	0		
DRAWN C.A.	CHECKED L.D.	DATE 18-04	<b>CD 310-10</b>	

**BILL OF MATERIAL**

ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	2/C # 12 COPPER	93-52-12	93-52-12	1m
2a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
2b	FUSE, STREET LIGHT, 15A	31-14-15	31-14-15	1
3	'C' TYPE AL. COMPRESSION TAP	74-41-30	---	1
3a	'H' TYPE AL. COMPRESSION TAP	74-40-10	---	1 *
4	'C' TYPE CU. COMPRESSION TAP	74-40-90	---	1
5	'H' TYPE AL. COMPRESSION TAP	---	74-40-60	3 **
6	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
7	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

- \* FOR END OF CIRCUIT WHEN USING ONLY ONE CABLE.
- \*\* AT END OF CIRCUIT, QUANTITY MAY BE LESS THAN SHOWN.

NOTES:

1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR END OF CIRCUIT, REFER TO DRAWING CD310-4.
4. FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS			
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11		18-04 0		<p align="center"><b>INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD</b></p>			
DRAWN C.A.	CHECKED L.D.	DATE 18-04		<b>CD 310-10</b>		SHT	REV
						0004 of 4	00

SUPPLY VOLTAGES

THE SUPPLY VOLTAGE FOR STREET LIGHT CIRCUITS MAY BE PROVIDED BY POLE-MOUNTED DISTRIBUTION TRANSFORMERS OR BY PAD-MOUNTED DISTRIBUTION TRANSFORMERS.

THE MAJORITY OF ROADWAY LUMINAIRES ARE RATED FOR OPERATION ON EITHER 120 VOLT OR 240 VOLT CIRCUITS AND ARE FACTORY WIRED FOR 120 VOLT OPERATION EXCEPT FOR 400 WATT H.P.S. LUMINAIRES WHICH ARE RATED FOR 120/240 VOLT OPERATION BUT ARE FACTORY WIRED FOR 240 VOLT OPERATION.

IN CASES WHERE EXCESSIVE VOLTAGE DROP IN A STREET LIGHTING CIRCUIT IS A PROBLEM, A SUPPLY VOLTAGE OF 240/480 MAY BE USED. A SUPPLY VOLTAGE OF 240/480 CAN BE OBTAINED FROM TWO SINGLE PHASE POLE-MOUNTED DISTRIBUTION TRANSFORMERS CONNECTED AS SHOWN ON DRAWING CD315-2. IF A SINGLE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMER WITH A 240/480 VOLT SECONDARY IS REQUIRED, THE TRANSFORMER MUST BE ORDERED FROM THE MANUFACTURER (SEE DRAWING CD315-2).

CAUTION:

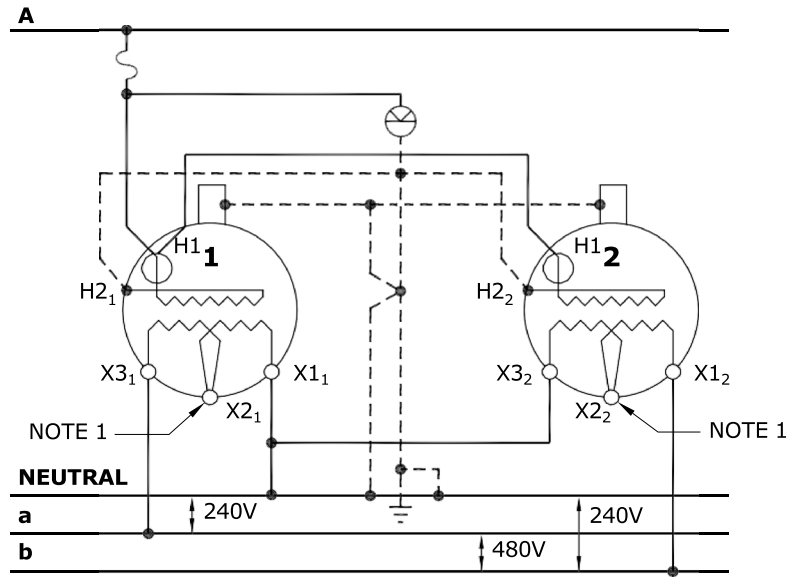
PRIOR TO CONNECTING LUMINAIRES TO A 240 VOLT SUPPLY CIRCUIT IT IS IMPORTANT TO CHECK THE INTERNAL CONNECTIONS TO THE TERMINAL BLOCK TO ENSURE THAT THE UNIT IS PROPERLY CONNECTED FOR 240 VOLT OPERATION.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28			<b>SUPPLY VOLTAGES FOR STREET LIGHT CIRCUITS</b>	
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-08	<b>CD 315-1</b>	
			SHT 0001 of 1	REV 00

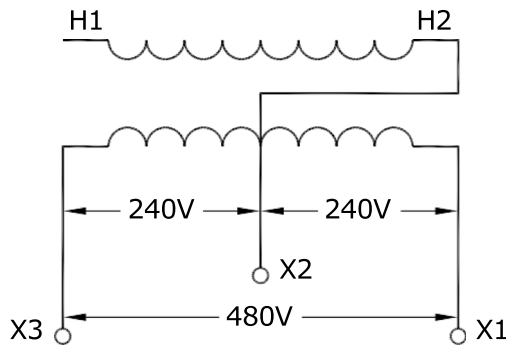


**NOTE:**

1. X2 SECONDARY GROUNDING STRAP MUST BE REMOVED.



SECONDARY VOLTAGE 240/480V GROUNDED. TWO SINGLE-PHASE POLE-MOUNTED TRANSFORMERS WITH 120/240V SECONDARIES.



SECONDARY VOLTAGE 240/480V GROUNDED. SINGLE-PHASE PAD-MOUNTED TRANSFORMER AS SUPPLIED BY MANUFACTURER

**SAFETY PRECAUTION**

1. SINGLE PHASE PAD MOUNTED TRANSFORMERS WITH ABOVE SECONDARY VOLTAGES TO HAVE WARNING SIGN "**CAUTION - 240/480V SECONDARY - SEE NAMEPLATE**", STENCILLED ON THE OUTSIDE OF THE TRANSFORMER NEAR NAMEPLATE.
2. NAMEPLATES OF MODIFIED TRANSFORMERS TO BE REVISED.

**PURCHASE OF 240/480 VOLT TRANSFORMER**

1. INCLUDE ABOVE WARNING SIGN REQUIREMENT IN PURCHASE DESCRIPTION.

*SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28*

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 21-06-09	21-06	3	ADDED NOTE 1, RESEALED	<b>240/480 VOLT SUPPLY FOR STREET LIGHT CIRCUITS</b>	
	13-01	2	REVISED DIAGRAM		
	90-04	1	DROPOUT DELETED		
DRAWN C.A.	CHECKED D.F./L.D.	DATE 21-06	<b>CD 315-2</b>		SHT 0001 of 1
					REV 03

CONTROL METHODS

1. LUMINAIRES CONTROLLED INDIVIDUALLY BY PHOTO-ELECTRIC CELL

THE PREFERRED METHOD FOR PROVIDING ON/OFF CONTROL OF A STREET LIGHT LUMINAIRE IS TO INSTALL A PHOTO-ELECTRIC CELL ON EACH LUMINAIRE, IF LUMINAIRES ARE MOUNTED ON HIGHER POLES (IN EXCESS OF 10.7 M OR 35 FT.) WHERE IT IS DIFFICULT TO REACH THE LUMINAIRE WITH THE LOCAL DISTRICT BUCKET TRUCK, CONSIDERATION SHOULD BE GIVEN TO USING A PHOTO-ELECTRIC CONTROLLED EXTERNALLY-MOUNTED RELAY SYSTEM.

2. PHOTO-ELECTRIC CONTROLLED EXTERNALLY-MOUNTED RELAY

SEVERAL LUMINAIRES CAN BE CONTROLLED SIMULTANEOUSLY BY INSTALLING A PHOTO-ELECTRIC CONTROLLED, EXTERNALLY MOUNTED RELAY, ON A WOOD POLE (SEE CD315-11) OR ON A STEEL STREET LIGHT POLE (SEE CD315-12). SINGLE POLE (SINGLE CIRCUIT) RELAYS ARE AVAILABLE WITH EITHER A 30 AMP OR A 60 AMP RATING. A BY-PASS SWITCH MAY BE INSTALLED TO PROVIDE A MEANS OF ACTIVATING THE STREET LIGHT CIRCUIT FOR DAYLIGHT MAINTENANCE PURPOSES.

3. STREET LIGHT RELAY USING STREET LIGHT CONTROL

ACTIVATING SUCCESSIVE SECTIONS OF STREET LIGHTING CIRCUITS BY MEANS OF A SERIES OF RELAYS (KNOWN AS A CASCADE CONTROLLED SYSTEM) IS NO LONGER USED AS A CONTROL METHOD. HOWEVER, SOME CASCADE CONTROLLED RELAY SYSTEMS REMAIN IN SERVICE. THE CONNECTION DIAGRAMS FOR A CASCADE CONTROLLED RELAY SYSTEM ARE SHOWN ON DRAWING CD315-14. DOUBLE POLE (DOUBLE CIRCUIT) RELAYS ARE NO LONGER PURCHASED, THEREFORE, DOUBLE POLE RELAYS WHICH FAIL MUST BE REPLACED WITH TWO SINGLE POLE RELAYS. BOTH THE SINGLE AND DOUBLE POLE OLDER STYLE RELAYS HAVE A 5 AMP FUSE PROTECTING THE RELAY COIL.

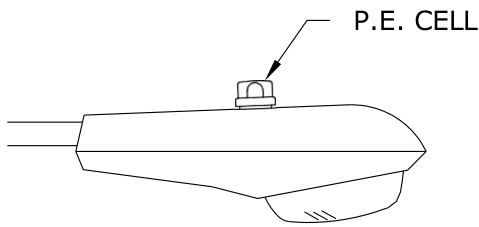
4. STREET LIGHT RELAY USING PILOT WIRE CONTROL

PILOT WIRE CONTROL SYSTEMS ARE NO LONGER USED FOR NEW CONSTRUCTION. HOWEVER, SOME PILOT WIRE CONTROL SYSTEMS REMAIN IN SERVICE. THE CONNECTION DIAGRAMS FOR PILOT WIRE CONTROL SYSTEMS ARE SHOWN ON DRAWING CD315-15. DOUBLE POLE (DOUBLE CIRCUIT) RELAYS ARE NO LONGER PURCHASED. THEREFORE, DOUBLE POLE RELAYS WHICH FAIL MUST BE REPLACED WITH TWO SINGLE POLE RELAYS.

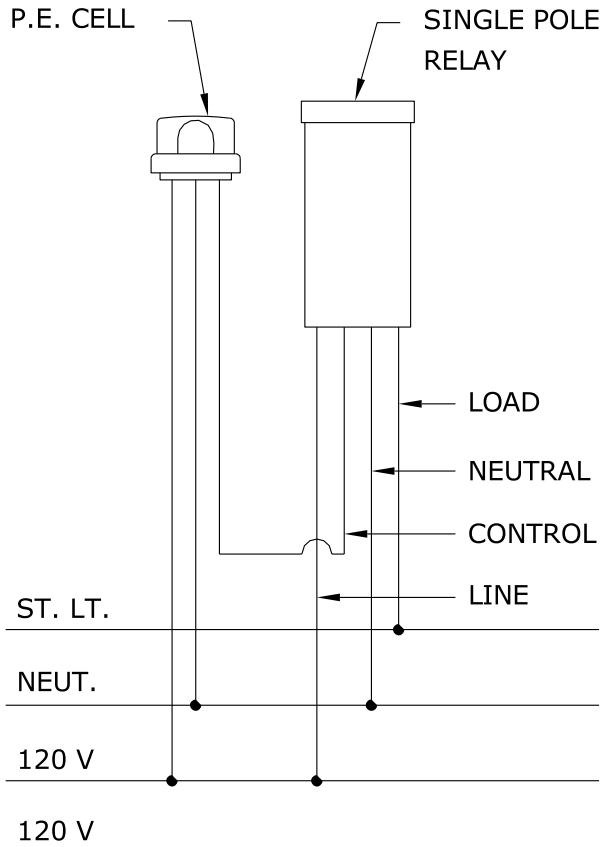
5. PHOTO-ELECTRIC CONTROLLED RELAY IN BASE OF STANDARD

COMPACT RELAYS, MOUNTED IN THE BASE OF STEEL STREET LIGHT STANDARDS ARE NO LONGER USED FOR NEW CONSTRUCTION. THE COMPACT RELAY IS ACTIVATED VIA THE PHOTO-ELECTRIC CONTROLLER ON THE LUMINAIRE. IF A COMPACT RELAY FAILS AN EXTERNALLY-MOUNTED RELAY AND PHOTO-ELECTRIC CONTROLLER SHOULD BE INSTALLED (SEE CD315-12 AND CD315-13).

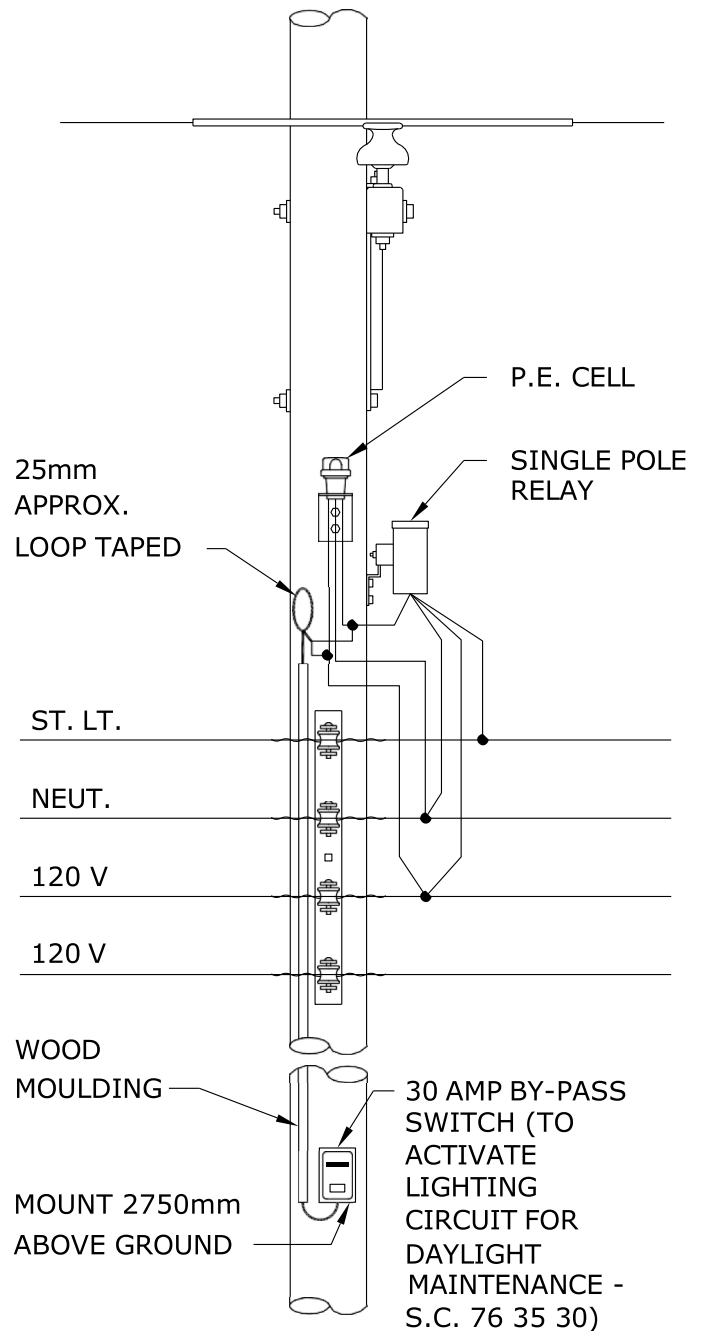
APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28			<b>CONTROL METHODS FOR STREET LIGHT CONTROLS</b>		
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-08	<b>CD 315-10</b>		SHT 0001 of 1
					REV 00



INDIVIDUALLY CONTROLLED LUMINAIRE



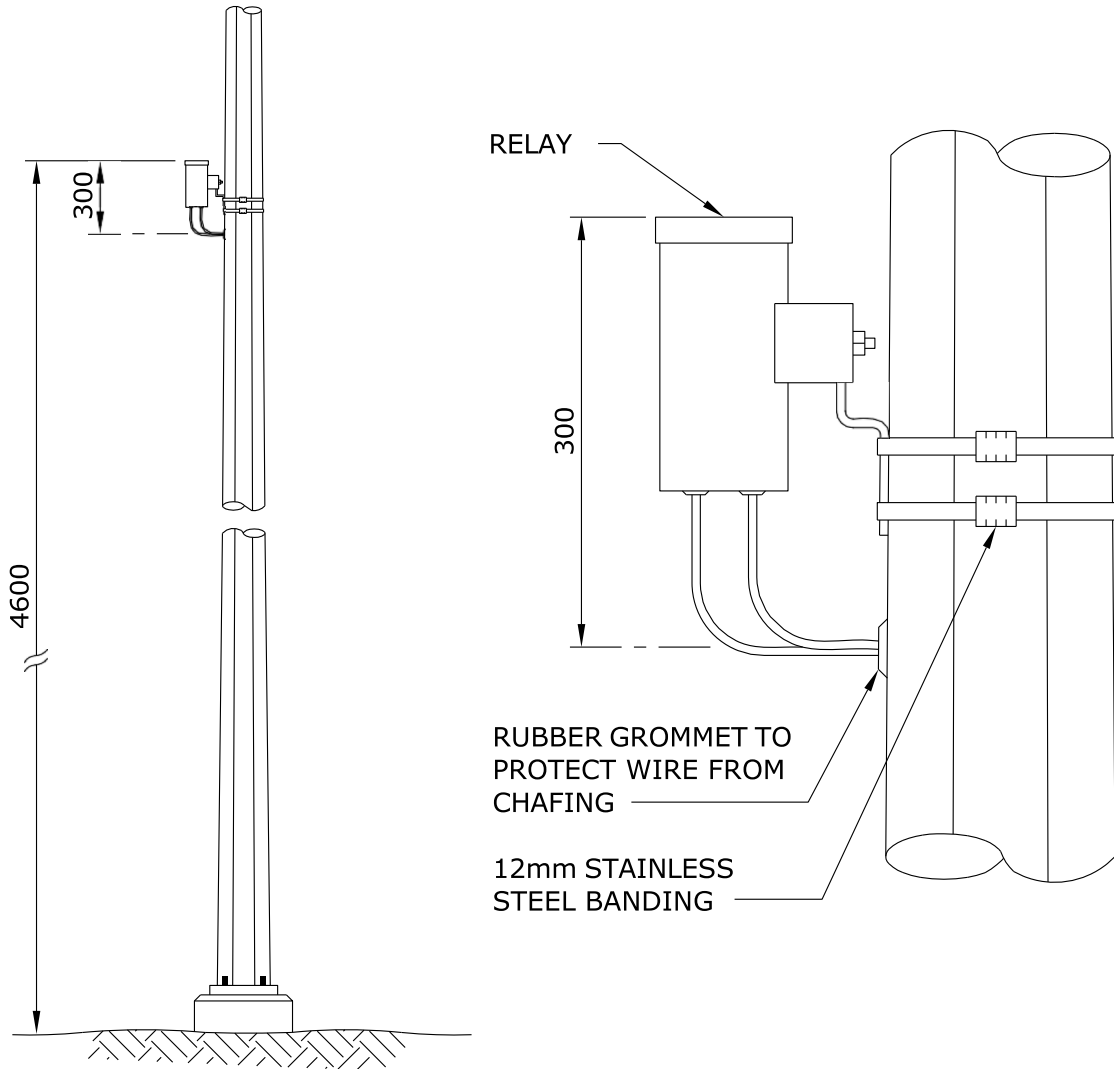
SINGLE POLE (SINGLE CIRCUIT) RELAY CONNECTIONS



SINGLE POLE (SINGLE CIRCUIT) RELAY C/W BY-PASS SWITCH

NOTE:  
P.E. CELL MUST BE MOUNTED SO THAT CELL WINDOW FACES NORTH.

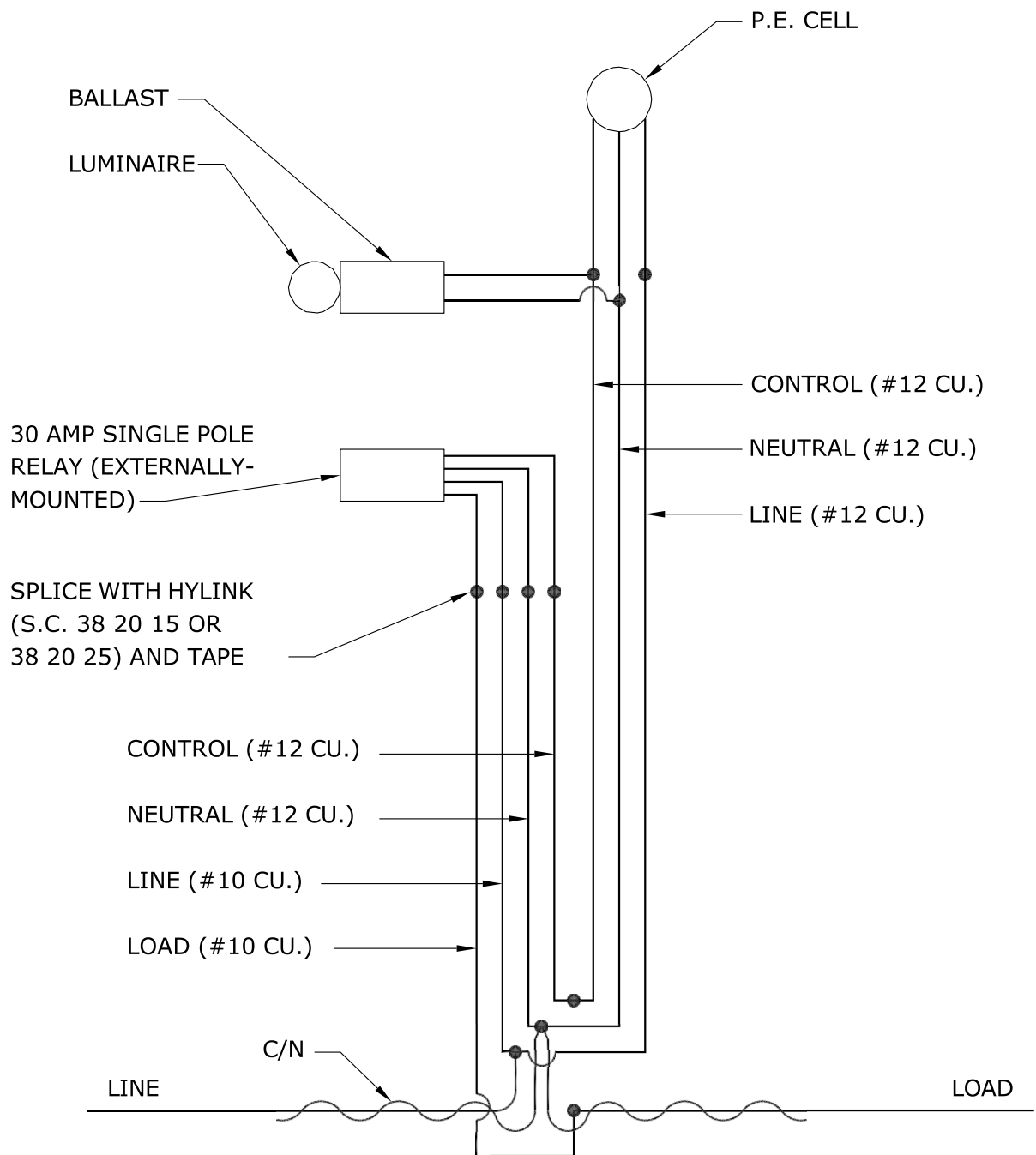
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<p><b>PHOTO-ELECTRIC CELL, RELAY AND BY-PASS SWITCH CONNECTION DIAGRAM</b></p> <p><b>CD 315-11</b></p>	
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	SHT 0001 of 1		



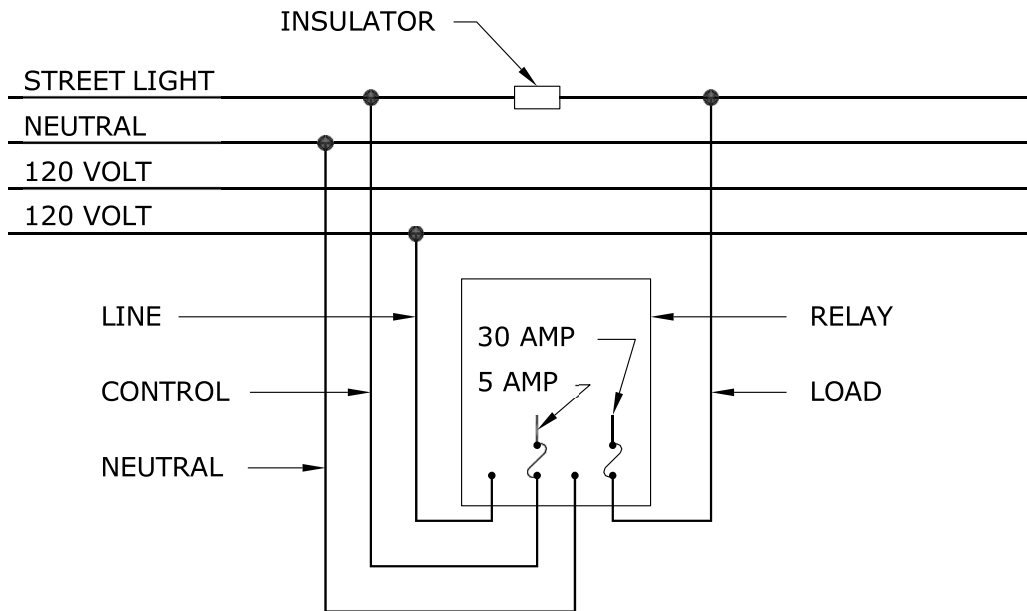
**NOTES:**

1. DRILL 25mm HOLE AT A POINT 4.3m ABOVE FINISHED GRADE.
2. INSTALL RUBBER GROMMET IN HOLE.
3. BAND RELAY TO POLE USING 12mm STAINLESS STEEL BANDING MATERIAL SO THAT THE TOP OF THE RELAY IS 300mm ABOVE THE CENTRE OF THE HOLE.
4. CONNECT RELAY LEADS TO 4.3m LENGTHS OF EQUAL SIZED CONDUCTOR AND PUSH SPLICES INSIDE POLE.
5. TAPE EXPOSED RELAY LEADS INTO A BUNDLE.
6. DIMENSIONS SHOWN ARE MILLIMETRES.

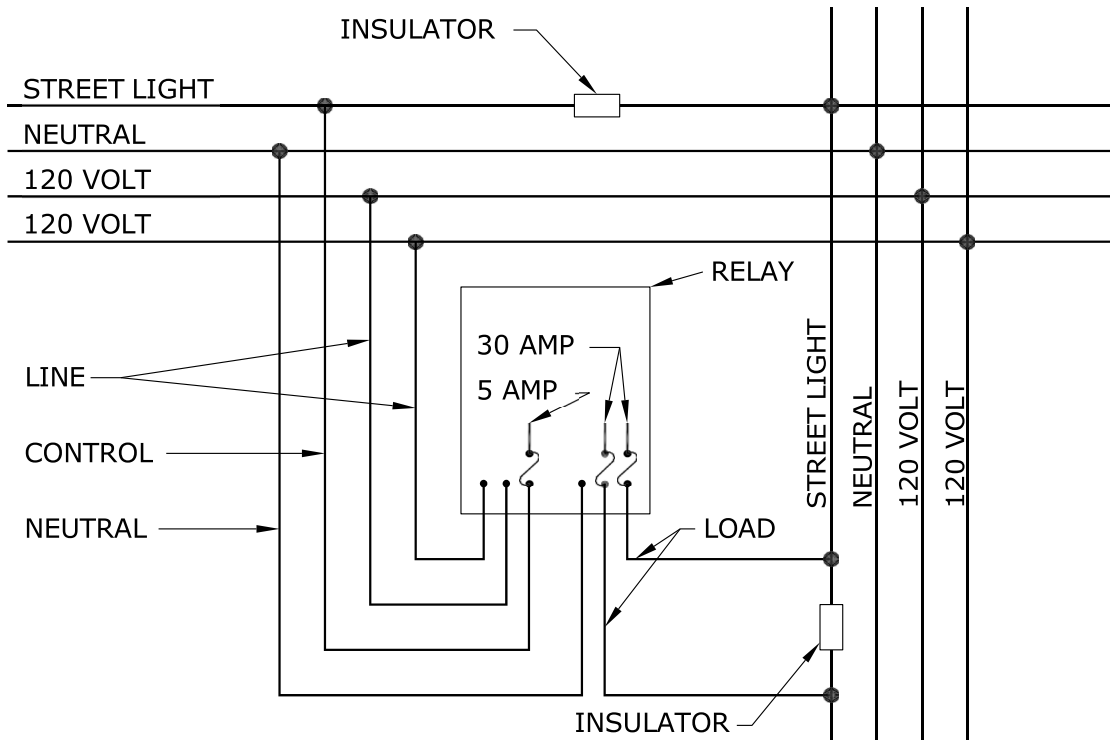
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<b>INSTALLATION OF EXTERNALLY-MOUNTED RELAY</b>					
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	<b>CD 315-12</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
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0001 of 1	00								



APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28			<b>CONNECTION SCHEMATIC FOR EXTERNALLY-MOUNTED RELAY</b>	
	94-03	1		
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	<b>CD 315-13</b>	
			SHT 0001 of 1	REV 01



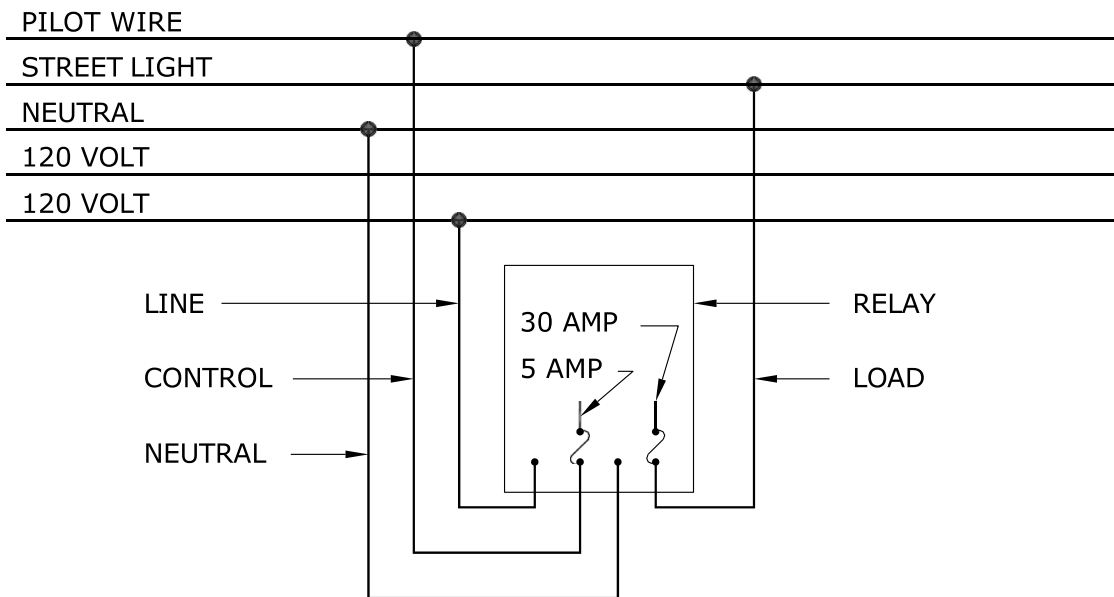
SINGLE POLE (SINGLE CIRCUIT) RELAY



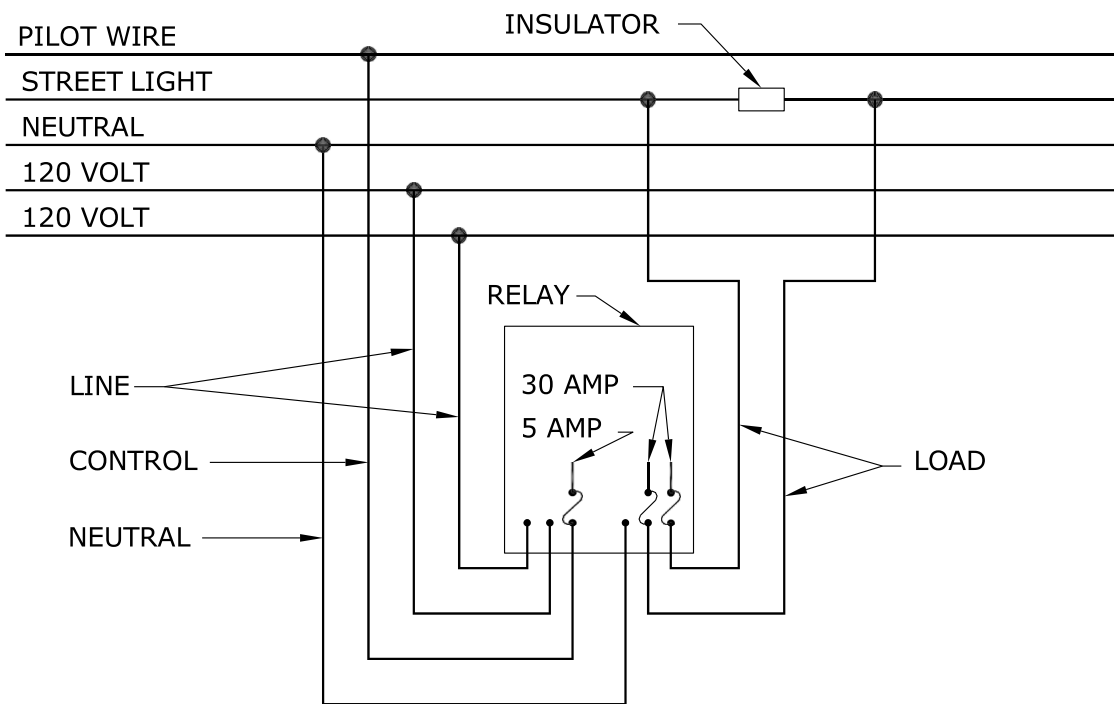
DOUBLE POLE (DOUBLE CIRCUIT) RELAY

**NOTE:**  
 CASCADE SYSTEM NOT USED FOR NEW CONSTRUCTION.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<b>STREET LIGHT RELAY CONNECTIONS USING STREET LIGHT CONTROL (CASCADE SYSTEM)</b>					
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	<b>CD 315-14</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
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SINGLE POLE (SINGLE CIRCUIT) RELAY

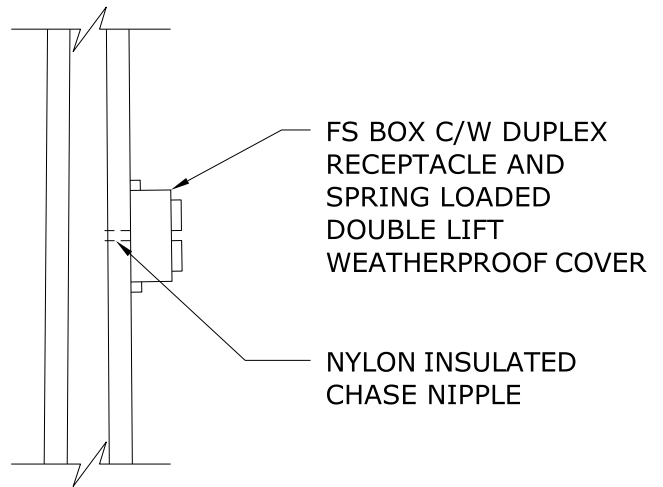
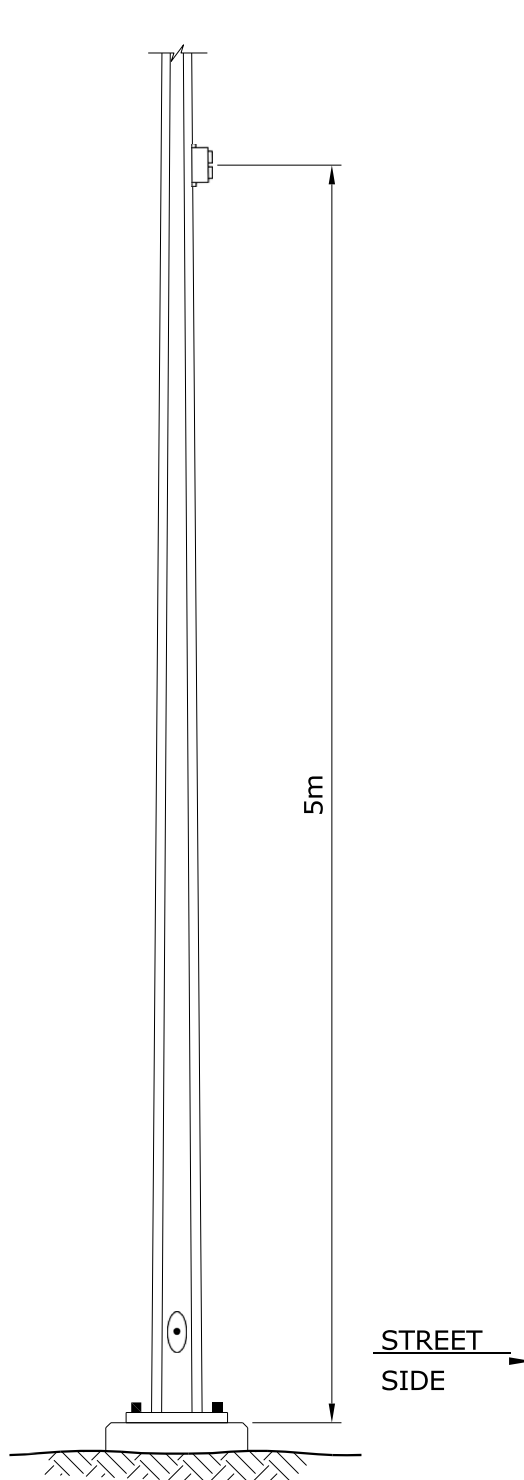


DOUBLE POLE (DOUBLE CIRCUIT) RELAY

**NOTE:**

PILOT WIRE SYSTEMS NOT USED FOR NEW CONSTRUCTION.

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<b>STREET LIGHT RELAY CONNECTIONS USING PILOT WIRE</b>					
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	<b>CD 315-15</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
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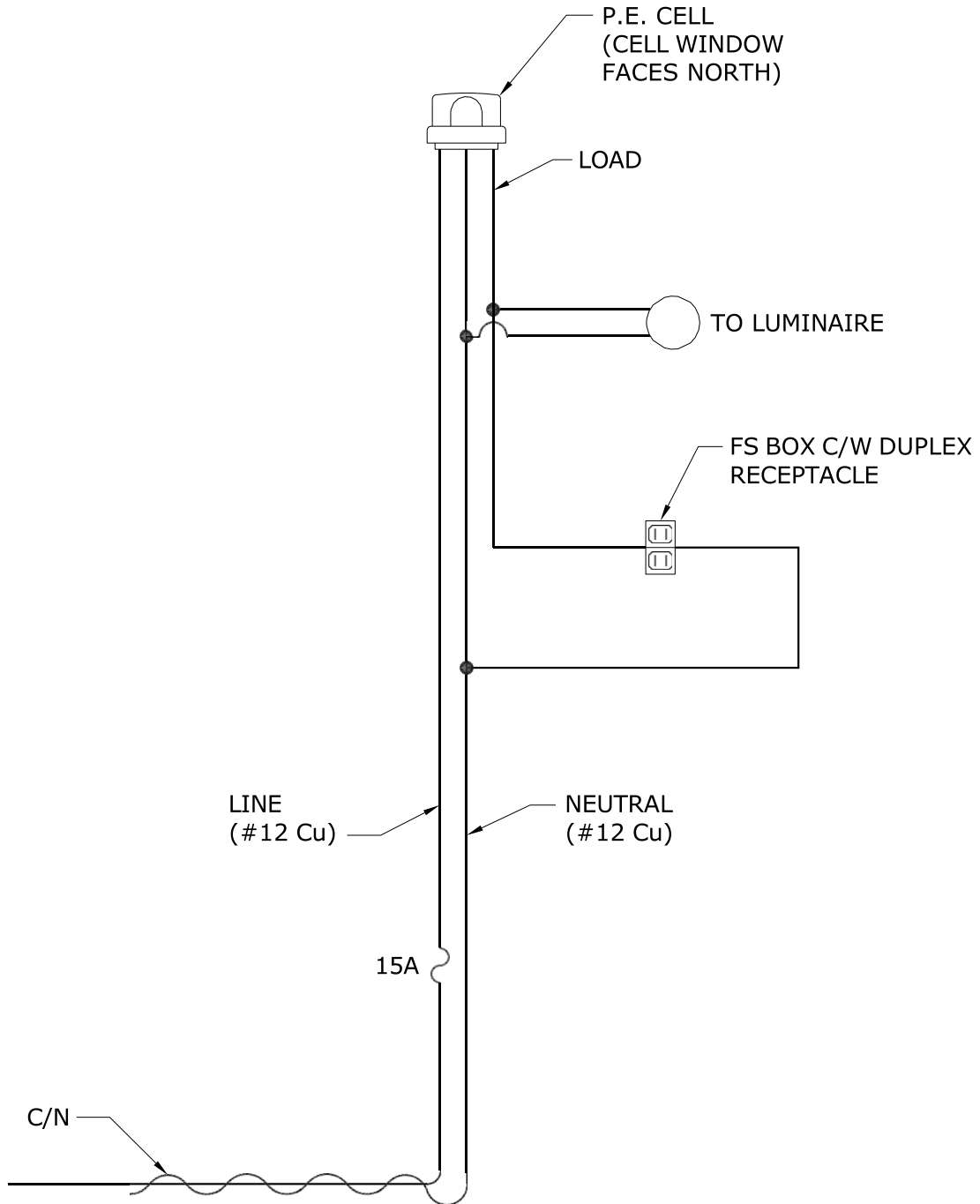


**NOTES:**

1. DRILL 30mm (1 1/8") DIA. HOLE 5 METRES ABOVE BASE OF POLE.
2. INSTALL 30A INLINE FUSEHOLDER FUSED AT 15A.
3. IF INSTALLED ON A CONTROLLED STREET LIGHT CIRCUIT, CONDUCTORS TO BE CONNECTED VIA RECEPTACLE TO LUMINAIRE.
4. IF INSTALLED ON AN UNCONTROLLED STREET LIGHT CIRCUIT, CONDUCTORS TO BE CONNECTED TO LUMINAIRE. RECEPTACLE TO BE CONNECTED TO P.E. CELL NEUTRAL AND CONTROL WIRES IN LUMINAIRE.
5. CONDUCTORS TO BE 2/C #12 PVC STREET LIGHT CABLE.
6. PUBLIC AUTHORITY MUST BE ADVISED AS TO MAXIMUM LOAD WHICH MAY BE CONNECTED TO RECEPTACLE.

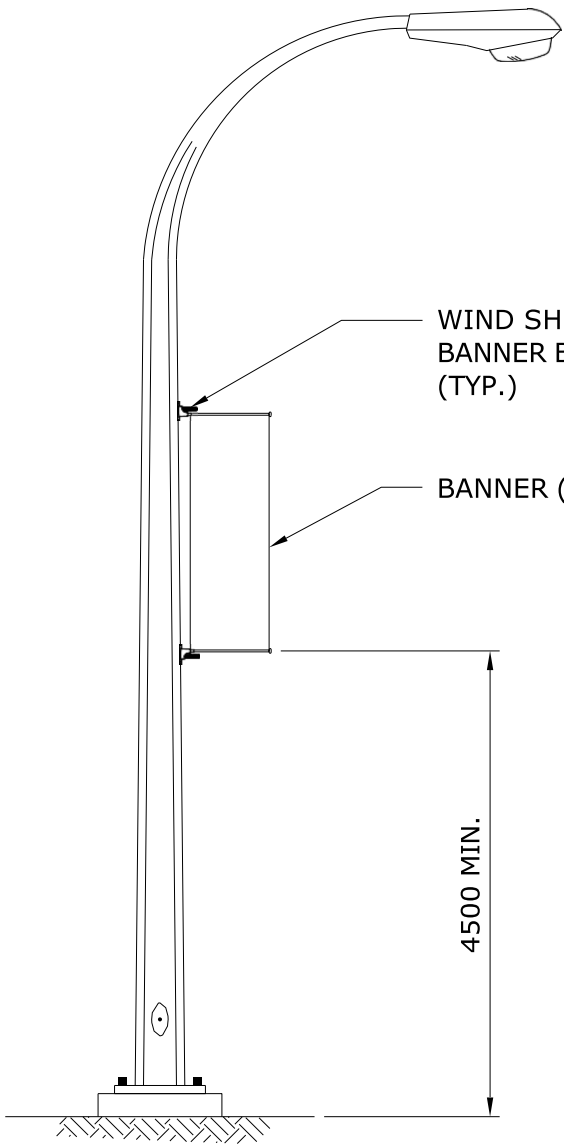
APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		13-01 1 ADDED SHEET 2		<b>DECORATIVE LIGHTING RECEPTACLE INSTALLED ON STEEL POLE</b>		
						DRAWN W.B./CAD





**TYPICAL CONNECTION DIAGRAM**

APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY D.R. ORR 13-02-12				<b>DECORATIVE LIGHTING RECEPTACLE INSTALLED ON STEEL POLE</b>					
DRAWN C.A.	CHECKED L.D.	DATE 13-01	<b>CD 315-24</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0002 of 2</td> <td>00</td> </tr> </table>	SHT	REV	0002 of 2	00
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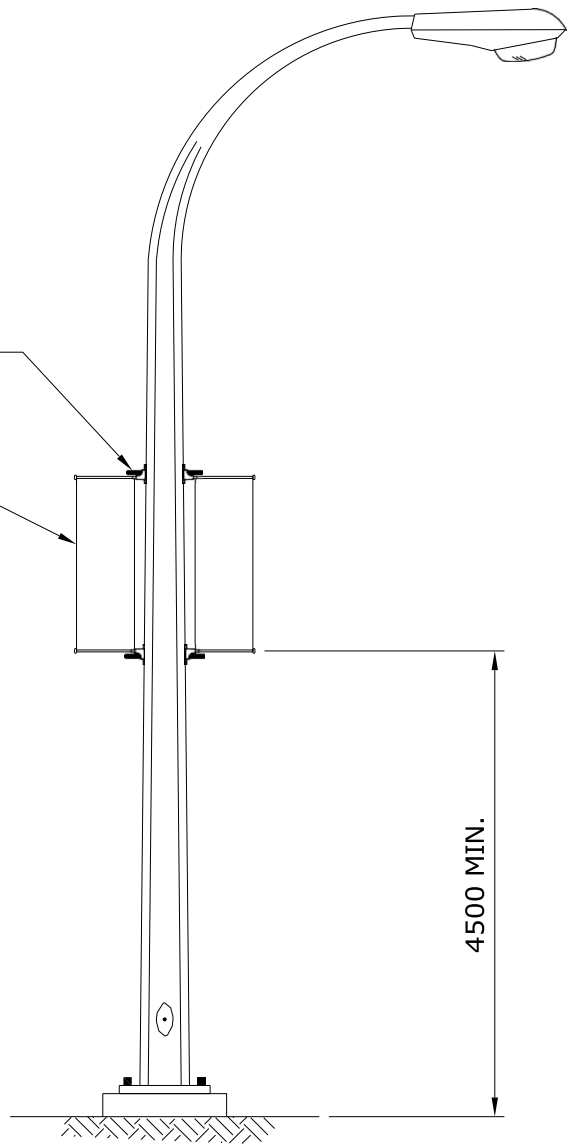


WIND SHEDDING  
BANNER BRACKET  
(TYP.)

BANNER (TYP.)

4500 MIN.

**SINGLE BANNER INSTALLATION**  
(762mm X 2286mm MAXIMUM  
DIMENSION)



**DOUBLE BANNER INSTALLATION**  
(559mm X 1676mm MAXIMUM  
DIMENSION)

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETRES.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 07-06-29			<b>BANNER INSTALLATION DETAILS</b>	
	13-01	1		
DRAWN C.A.	CHECKED L.D./D.O.	DATE 07-06	<b>CD 315-25</b>	
			SHT 0001 of 3	REV 01

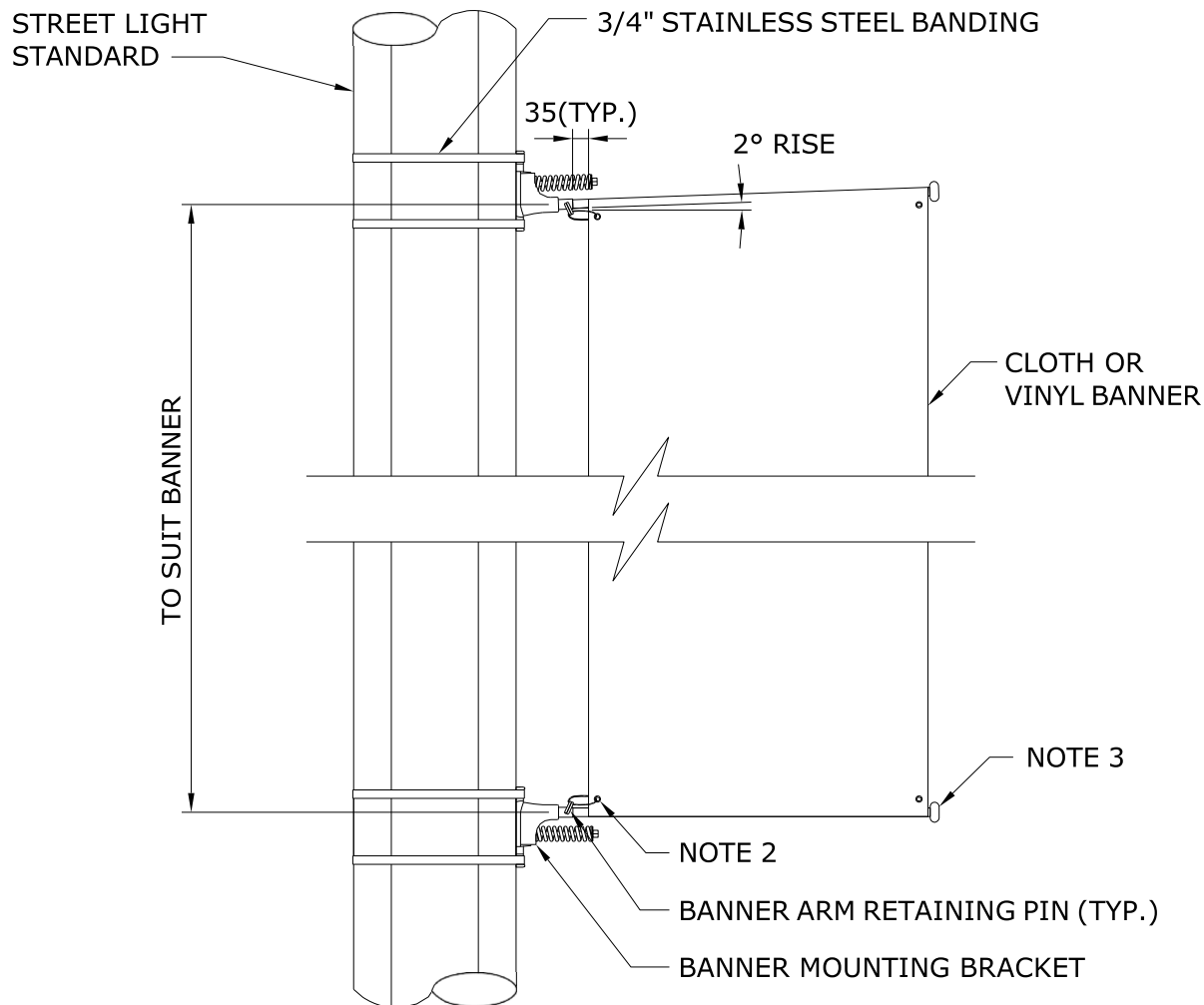
**BANNER CRITERIA:**

1. BANNER INSTALLATION TO CONSIST UP TO A MAXIMUM SIZE OF EITHER ONE 762mm x 2286mm (30"x90") CLOTH BANNER, OR TWO 559mm x 1676mm (22"x66") CLOTH BANNERS.
2. BANNERS CAN BE ORIENTED EITHER 90° OR 180° FROM EACH OTHER AROUND CIRCUMFERENCE OF STANDARD FOR DOUBLE BANNER INSTALLATIONS.
3. BANNER INSTALLATION SHALL NOT IMPEDE WIND SHEDDING CHARACTERISTICS OF BANNER MOUNTING BRACKET.
4. APPROVAL OF STANDARDS FOR BANNER MOUNTING TO BE BASED UPON:
  - a. A SATISFACTORY ASSESSMENT OF THE STANDARDS STRUCTURAL INTEGRITY AND IT'S FOUNDATION PER CORPORATE POLICY P348-4, "MAINTAINING OUTDOOR LIGHTING - ORNAMENTAL LIGHT STANDARDS REPLACEMENT GUIDE", AND P348-5, "MAINTAINING OUTDOOR LIGHTING - REPLACING OR RESETTING CONCRETE FOUNDATIONS".
  - b. TIGHTENING OR REPLACING ANY LOOSE OR MISSING ANCHOR NUTS OR BOLTS.
  - c. AN UNIMPEDED DRIVER'S VIEW OF TRAFFIC SIGNALS OR TRAFFIC CONTROL SIGNAGE.
  - d. NOT EXCEEDING THE STANDARD'S MAXIMUM ALLOWABLE SIGNAGE SURFACE AREA WHERE STANDARD HAS EXISTING SIGNAGE, SEE NOTE 5.
5. IF BANNER(S) ARE TO BE INSTALLED ON STANDARDS WITH EXISTING SIGNAGE, THE MAXIMUM ALLOWABLE BANNER SIZE (SURFACE AREA) MOUNTED WITH WIND-SHEDDING BRACKETS CAN BE CALCULATED WITH THE FOLLOWING FORMULA:

$\text{MAXIMUM SURFACE AREA OF BANNER(S) (m}^2\text{)*} = 1.75 \times \left( 1 - \frac{\text{SURFACE AREA OF SIGNAGE (m}^2\text{)}}{\text{SURFACE AREA OF SIGNAGE (m}^2\text{)}} \right)$
---

\* DIVIDE BY 2 FOR DOUBLE BANNER INSTALLATION.

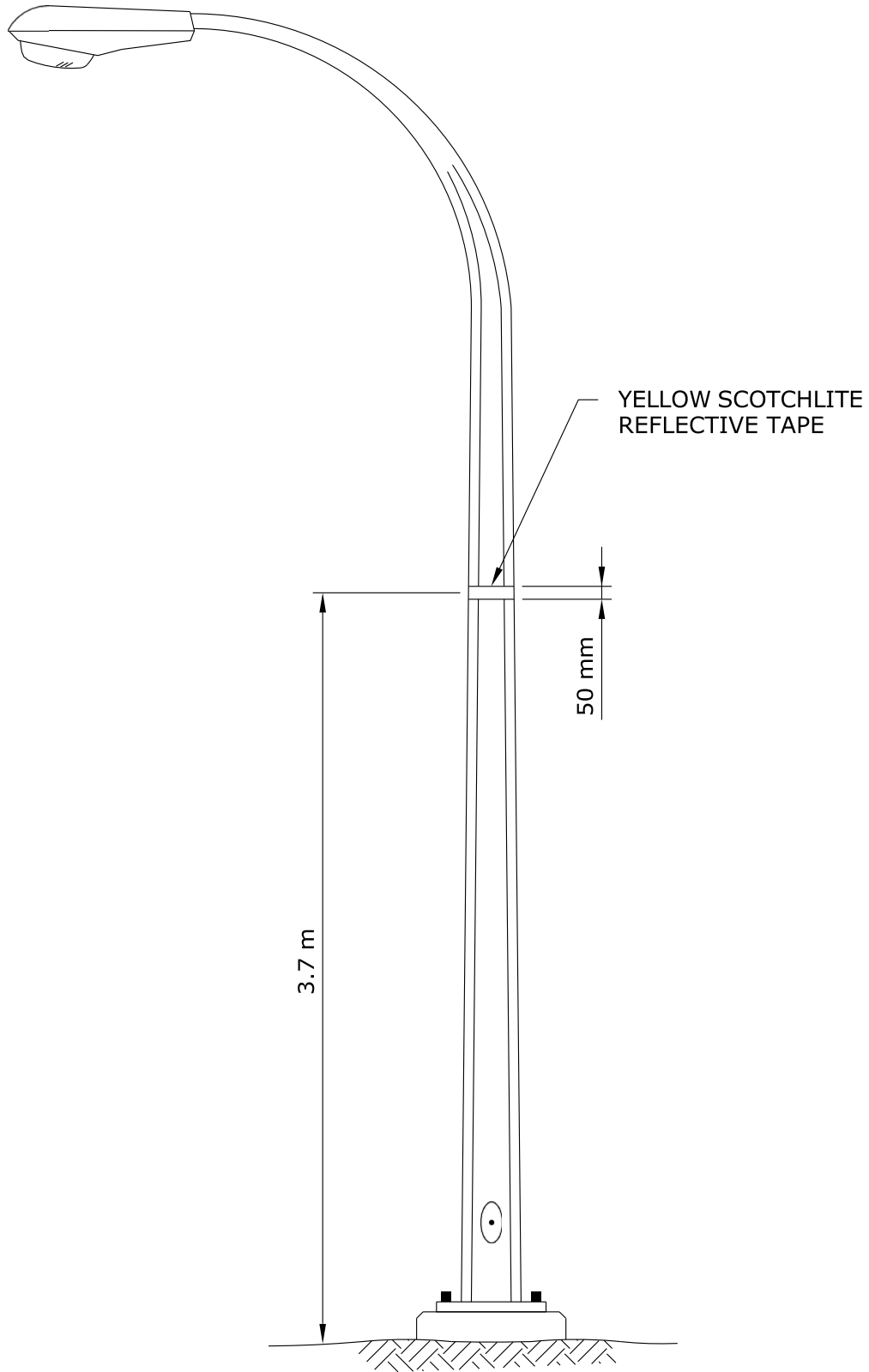
APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 07-06-29			<b>BANNER INSTALLATION DETAILS</b>	
	13-01	1	REVISED TITLE	
DRAWN C.A.	CHECKED L.D./D.O.	DATE 07-06	<b>CD 315-25</b>	
			SHT 0002 of 3	REV 01



**NOTES:**

1. CUSTOMER TO COMPLETE AN APPLICATION FOR USE OF MANITOBA HYDRO UTILITY POLES (EFORM #H1900) AND HAVE FORM APPROVED PRIOR TO INSTALLATION OF BANNERS AND ASSOCIATED EQUIPMENT.
2. BANNER TO HAVE REINFORCED HOLES. SECURE BANNER TO BRACKET WITH U.V. RESISTANT TY-RAPS (2 LOCATIONS PER BANNER). LOOP TY-RAP THROUGH REINFORCED HOLE AND EYELET OF BANNER ARM RETAINING PIN.
3. 3/4"Ø FIBREGLASS ROD. CUT TO SUIT BANNER.
4. BANNER MOUNTING BRACKET AND ARM TO BE WIND SHEDDING TYPE.
5. INSTALL BANNER MOUNTING BRACKETS SO BANNER IS TAUT ACROSS LENGTH OF BANNER ROD.
6. DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS	
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 07-06-29			<b>BANNER INSTALLATION DETAILS</b>	
	13-01	1		
DRAWN C.A.	CHECKED L.D./D.O.	DATE 07-06	<b>CD 315-25</b>	
			SHT 0003 of 3	REV 01



APPROVED		REVISIONS		MANITOBA HYDRO DISTRIBUTION STANDARDS					
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				<b>IDENTIFICATION OF FIRST STREET LIGHT STANDARD CONNECTION TO CIRCUIT</b>					
DRAWN W.B./CAD	CHECKED W.C.	DATE 88-09	<b>CD 315-35</b>		<table border="1"> <tr> <td>SHT</td> <td>REV</td> </tr> <tr> <td>0001 of 1</td> <td>00</td> </tr> </table>	SHT	REV	0001 of 1	00
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# Safe Excavation & Safety Watch Guidelines



For your **SAFETY**

**ClickBefore**  
 **YouDigMB.com**

 **Manitoba  
Hydro**

Or call 1-800-940-3447

# RELEASE OF NATURAL GAS

In the event of any damage to a natural gas pipeline (regardless of whether it is steel, plastic or aluminum) or to its protective pipe coating or tracer wire, however minor, call Manitoba Hydro immediately 204-480-5900 or 1-888-624-9376. In most cases there is no charge for minor repairs.

In case of damage causing a release of natural gas:

- Call 911 and Manitoba Hydro immediately.
- Clear people from the vicinity and prevent people from approaching the area of the leak.
- Shut off all vehicles and equipment. Remove or extinguish all sources of ignition. **DO NOT** smoke or allow open flame in the presence of natural gas.
- If a gas line has been punctured, do not remove the tool or equipment that punctured the line. This could result in a larger gas leak and pose a greater hazard.
- **DO NOT** attempt to backfill over a leaking natural gas line or attempt to stop the leak; it is safest to allow the gas to vent into the atmosphere.

Before you start to dig, contact [ClickBeforeYouDigMB.com](http://ClickBeforeYouDigMB.com) to request to have underground lines located. Manitoba Hydro will be notified and will contact you within three business days to advise of the date we will locate our electric and natural gas lines.

- Once the lines are marked we will provide you with a Facilities Locate form with specific instructions. You must obtain this form prior to excavation.
- If work has not started within 14 calendar days after the locate was provided by Manitoba Hydro, you must contact us to have the lines re-marked and receive an updated Facilities Locate form.
- Contractors must ensure that everyone on the worksite is aware of the presence of all gas and electric facilities and ensure that the Facilities Locate form is kept at the excavation site until the excavation and backfill are complete.
- The location markings must be maintained and kept visible by the person or contractor doing the excavation. Be careful that site operators do not remove the line location markings.

**In addition to contacting [ClickBeforeYouDigMB.com](http://ClickBeforeYouDigMB.com) be sure to contact any other underground services that may be in the area.**

This guideline applies to the crossing of Manitoba Hydro electrical conductors and natural gas pipelines only. When Manitoba Hydro fibre optic cables are present contractors will be referred by the Manitoba Hydro Facilities Locator to the Manitoba Hydro communications department for more information.



*Manitoba Hydro only locates facilities that it owns and has no knowledge of or responsibility for privately owned facilities. Electric conductors or gas pipes installed past the meter are owned privately by the property owner, and at times are installed below ground before entering the building. Outbuildings that are heated or have electric power, wells, septic systems, pumps, pools and hot tubs are examples where privately owned buried facilities may exist.*

*This booklet has been prepared by Manitoba Hydro for Manitoba Hydro staff, contractors and homeowners involved with excavation and is available at [hydro.mb.ca](http://hydro.mb.ca). Information on excavation and safety watch is included to inform excavators about basic requirements for excavation in the vicinity of buried electric power lines and gas pipelines. Unless otherwise indicated, gas pipelines and underground power cables will be called “lines”.*

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# WHY YOU SHOULD PLAN AHEAD

When you contact ClickBeforeYouDigMB.com before you dig, we can identify buried lines so you can dig safely. This prevents injury or death, costly repairs, equipment damage, service outages, and environmental pollution.

**It is YOUR responsibility to contact all owners of buried underground services.**

## PLANNING LARGE PROJECTS

Determining the location of existing Manitoba Hydro Underground Structures within the work area should be one of the first priorities of any work. Knowing the location of all utilities infrastructure allows the third party to plan work proactively, mitigating the need for costly design changes or delays during construction.

### **Gas**

Manitoba Hydro requests that drawings be submitted for review for all projects involving ground disturbance. Drawings shall be submitted to: [gasdesign@hydro.mb.ca](mailto:gasdesign@hydro.mb.ca).

Drawings will be reviewed by Manitoba Hydro at no cost and a letter providing details of any work restrictions, specific requirements or costs will be provided to the contractor.

Drawings should be submitted a minimum of 4 weeks before the start of any excavation work. Drawings shall include the details of the proposed work and include any gas or electrical line in the work area.

### **Electric**

Contact Manitoba Hydro in Winnipeg at 204-480-5900 or outside Winnipeg at 1-888-MBHYDRO (1-888-624-9376)

You will be referred to the local district office for further instruction.

# REGULATIONS

There are several federal and provincial agencies overseeing the operation of and around natural gas pipelines and electric cables. The following regulations and safe practice guides specify requirements for both the contractor and the utility:

- Manitoba Gas Pipeline Act, Regulation 140/92 – Provides the legal definition of an excavation and outlines Excavator and Utility responsibilities.
- National Energy Board Pipeline Damage Prevention Regulations: Authorizations, SOR/2016-124; Obligations of pipeline companies, SOR/2016-133
- Manitoba Workplace Safety and Health Act and Regulation M.R. 217/2006 including Part 26, Excavations and Tunnels - Describes legal responsibilities in regards to excavating safely.
- Guideline for Excavation Work, Manitoba Workplace Safety & Health Division.
- CSA Z247 Damage Prevention Standard.

# DEFINITIONS

**Daylighting** – A term used to describe the uncovering and exposing of underground utilities to daylight without the use of mechanical excavation.

**Excavation** – includes digging, boring, pushing, ploughing, trenching, grading, post installation and breaking and displacement of soil or other material below the existing level of the ground that will disturb more than the top 150 mm (6 inches) of the ground.

**High Pressure gas line** – A natural gas line that operates in excess of 700 KPa (100psi).

**Hydrovac** – A truck or trailer that injects pressurized water from an onboard reservoir tank into the ground through a handheld wand. As the soil cover is liquefied, the resulting slurry is simultaneously extracted by a powerful vacuum and stored in an onboard debris tank for later disposal.

**Large diameter pipeline** – A natural gas pipeline that is 168.3 mm (6 inches) in diameter or larger, regardless of operating pressure.

**Safety Watcher** – A person designated by Manitoba Hydro to ensure that workers are not put at risk as a result of special hazards on the work site.

**Sonde** - A transmitter behind the bore head which registers angle, rotation, direction and temperature data.

**Tolerance Zone** – The space in which a line or facility is located, and in which special care is to be taken.

**White lining** – Designating the route and/or work area of the excavation using white paint, stakes and/or flags to outline the work area prior to the locator arriving on the site.

# EXCAVATOR PRE-MARKING

Pre-marking your proposed work site allows excavators to accurately communicate to Manitoba Hydro's facility locators where the excavation is to occur. This may be accomplished either electronically or by white lining.

For excavator pre-marking, contact [ClickBeforeYouDigMB.com](http://ClickBeforeYouDigMB.com) or call 1-800-940-3447 to communicate where the excavation is to occur and:

- Attach a sketch or map that clearly identifies the excavation area via email or
- Pre-mark the excavation area by white lining

In either scenario you will be issued a reference number and notified of the day the locator will be on site.

*When a project is too large for or not conducive to pre-marking, face-to-face meetings between Manitoba Hydro's facility locator and the excavators will be arranged at the proposed work site.*

## **White Line**

The excavator designates the route and/or area of the excavation using white paint, stakes and/or flags to outline the work area prior to the locator arriving on the site.

White paint, white stakes or white flags with the excavator's company identifier on them are permissible methods of marking.

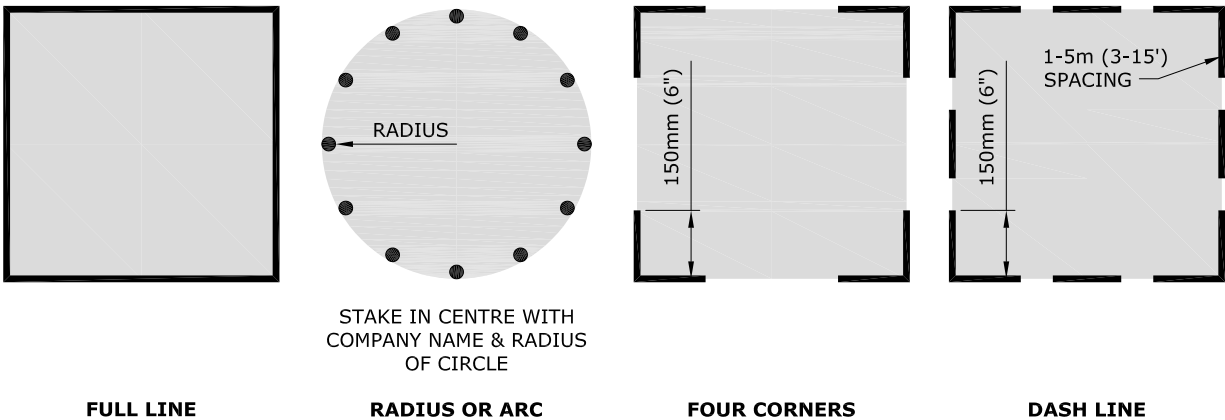
When using stakes or flags to mark the excavation work area, do not drive them into the ground deeper than 150 mm (6 inches). Any activity which disturbs more than 150 mm (6 inches) must have the facilities located.

# Guidelines for excavation marking

The following marking illustrations are examples of how excavators may choose to mark their area of proposed excavation. The use of white marking products (e.g. paint, flags, stakes, or a combination of these) may be used to identify the excavation site.

Mark in white paint the proposed area of excavation through the use of a continuous line, dots marking the radius or arcs, dashes marking the four corners of the project, or dashes outlining the excavation project. The recommended size of each dash is approximately 150 – 300 mm (6-12 inches) in length and 20 mm (3/4 inch) in width with interval spacing approximately 1 – 5 metres (3-16 feet) apart. The maximum separation of excavation marks is to be reduced to a length that can be reasonably seen by the operator's locators when the terrain or excavation site conditions warrant it. Dots of approximately 20 mm (3/4 inch) diameter are typically used to define arcs or radii and may be placed at closer intervals in lieu of dashes.

### SINGLE POINT EXCAVATION MARKINGS



If an excavation is contained within a 5 metre (16 feet) maximum radius then it can be marked with a single white stake at the centre of the excavation. The stake must clearly state the company identifier and the radius of the excavation in black lettering. This information must be conveyed to Manitoba Hydro.

## **After the area is Pre-Marked**

On the appointed date, the locator will identify the Manitoba Hydro facilities that are located in the designated work area. They will document it using a sketch or map attached to the Electric and/or Natural Gas Facilities Locate Form.

When the locator has completed locating the facilities, they will advise the excavator and indicate whether there is a conflict. The Facilities Locate form will be available and must be on site prior to excavating.









The Manitoba Gas Pipeline Act, Regulation 140/92 and the Workplace Safety and Health Act, regulations M.R.217/2006, part 26.6 require that a valid Facilities Locate form be on the work site at all times until the project is complete.

If an excavation takes place without a current locate form on site, the locate is not valid. The excavator could face consequences which may include fines and/or sanctions by Manitoba Workplace Safety and Health and Manitoba Hydro.



# APWA UNIFORM COLOUR CODE

## Underground utility marking

	<b>WHITE</b> – Proposed Excavation
	<b>PINK</b> – Temporary Survey Markings
	<b>RED</b> – Electric Power Lines, Cables, Conduit and Lighting Cables
	<b>YELLOW</b> – Gas, Oil, Petroleum, or Gaseous Materials
	<b>ORANGE</b> – Communication, Alarm or Signal Lines, Cables or Conduit
	<b>BLUE</b> – Potable Water
	<b>PURPLE</b> – Reclaimed Water, Irrigation and Slurry Lines
	<b>GREEN</b> – Sewer and Drain Lines

## GUIDELINES FOR EXCAVATION NEAR ELECTRICAL AND NATURAL GAS LINES

### Hand Digging to Expose Lines

Mechanical excavation cannot be used within 1 metre (39 inches) of an electrical or gas line until the line is physically exposed by hand. Hand exposing means exposing a buried facility, whose location has been marked by Manitoba Hydro, using non-powered tools such as a Spade or shovel (hand augers are not acceptable). A water pressure/vacuum system (hydrovac) is an acceptable alternative.

There are several things to remember when hand exposing:

- No one should ever jump on or use their entire body weight on a shovel when digging.
- Use a prying (rather than striking) motion to loosen hard dirt.
- Never probe for the facility using a sharp pointed tool such as a pick axe or pointed bar.
- Dig on an angle if possible, such that any contact with the facility is a glancing blow rather than a direct hit.

Once the line is visible, mechanical excavation equipment can be used in accordance with the guidelines for mechanical excavation.

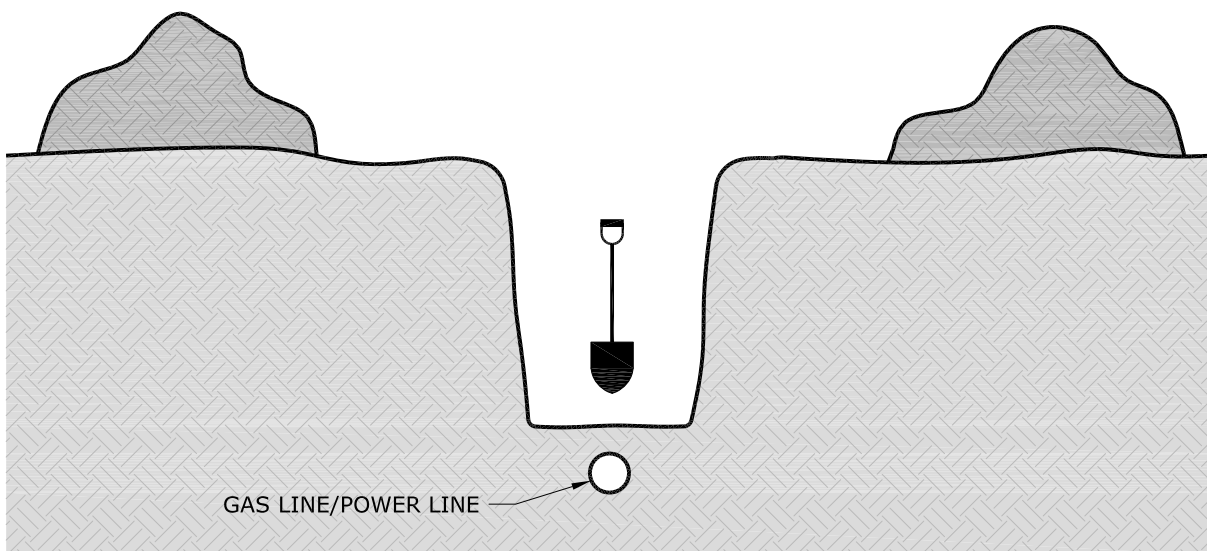
## **Water Pressure/Vacuum System (Hydrovac)**

An alternative to exposing cables by hand digging is to use a water pressure/vacuum system capable of exposing Manitoba Hydro facilities without damage.

Only oscillating head type nozzles are to be used for the water wand. When excavating within 1 metre of a marked line the maximum setting of 38°C (100°F) water temperature and 10,342 Kpa (1,500 psi) must not be exceeded. The end of the vacuum tube shall be neoprene or equivalent. Expose the buried line by using a sweeping motion only, perpendicular to the locate markings, until the line is sighted. *IMPORTANT: After sighting, the line shall not be contacted by spray or vacuum to avoid damage to wraps and coatings.*

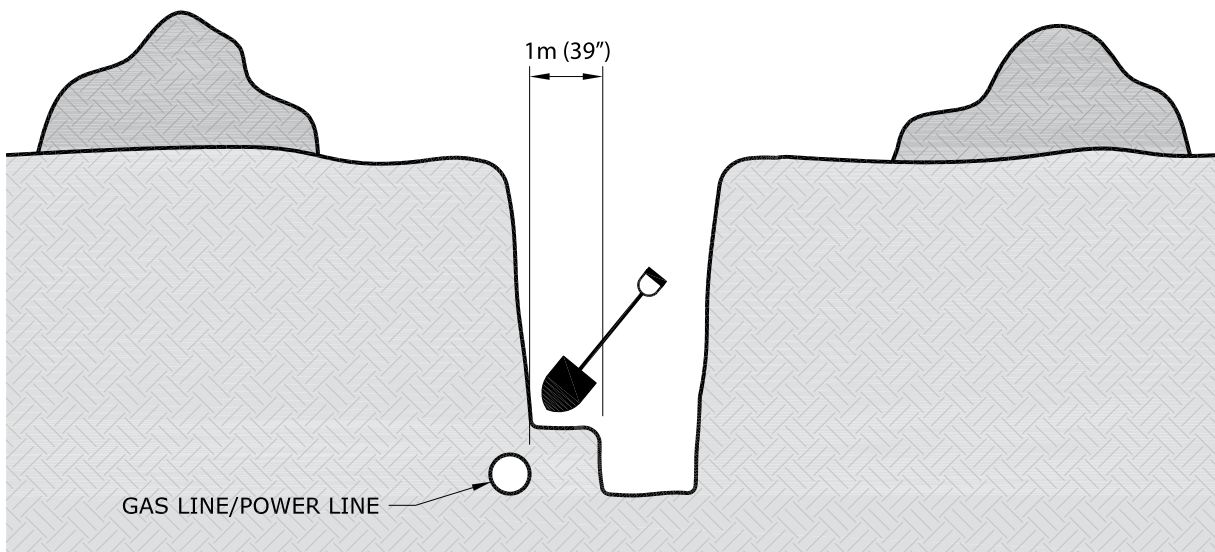
Some acceptable excavation methods:

### **a) Dig Vertically**



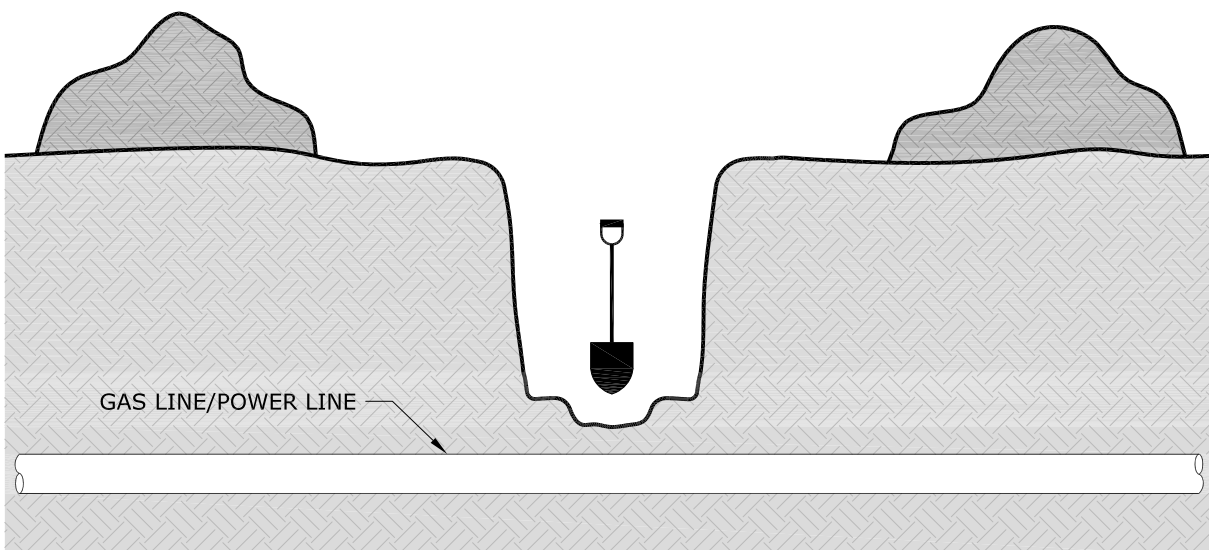
Dig a hole with a shovel directly above the line location until the line is exposed. Take care not to damage the line or coating. Mechanical excavation equipment **MUST NOT** be used to widen or deepen the hole before exposing the line.

## b) Dig Laterally



Dig a trench or bell hole 1 metre (39 inches) from the line location, parallel to the line, then hand dig laterally to expose the line.

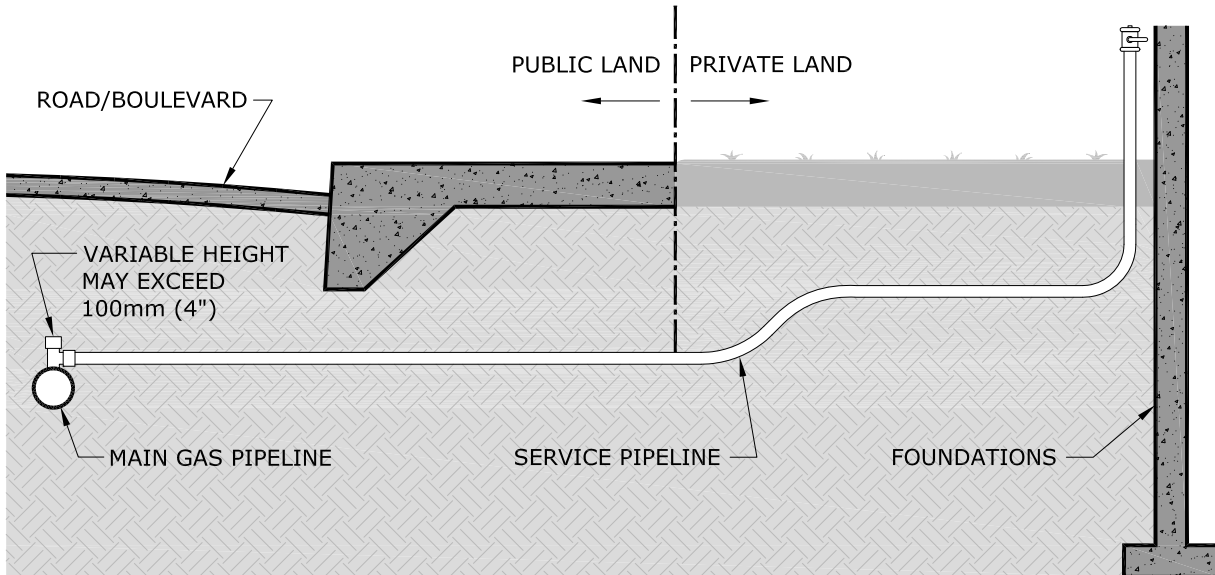
## c) Dig Trench and excavate



Dig a trench by hand across the full width of the excavation (perpendicular to or “across from” the line). If the line is not uncovered, mechanically excavate to one half the depth of the trench. Repeat this process until the line is exposed.

# Typical Gas Service Installation

(example only does not represent all installations)

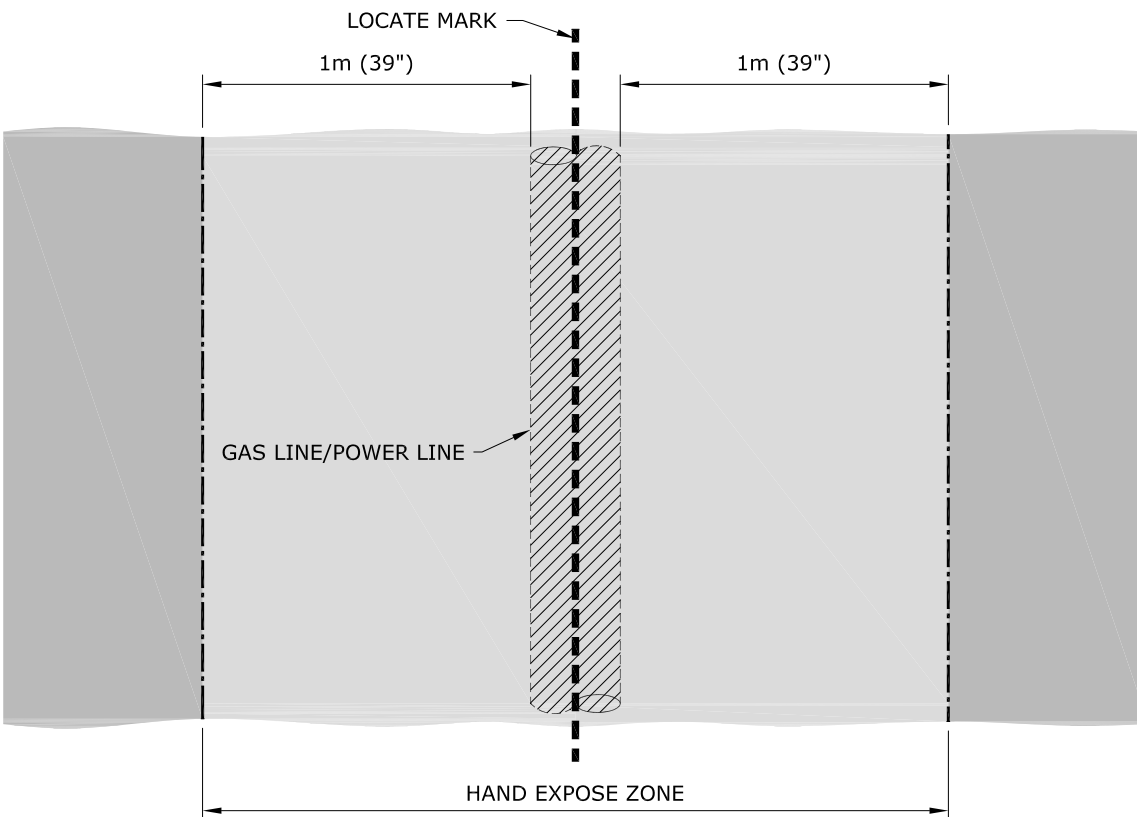


Fittings such as active or abandoned service tees may be present on gas pipelines, exercise care when excavating.

## General Approach

- When the line is not visible, mechanical excavation shall not be used within 1 metre (39 inches) of an electrical or gas line.
- When the line is visible, mechanical excavation can be used no closer than 450 mm (18 inches) to natural gas lines and 600 mm (24 inches) to electrical lines.
- When soil conditions permit, a smooth edge bucket is preferred when excavating near gas and electrical lines.
- An observer (excavator staff) located near the line must maintain communication and control of the operator at all times by the use of hand signals and verbal communication. The observer is responsible for maintaining the minimum distance from the pipe. If at any point the observer or operator is unclear of the location or orientation of the line, no digging shall occur until this is confirmed and agreed upon by all on the worksite.

## Before line is exposed



## Crossing Lines

- When crossing a line, the line is to be exposed for the width of the excavation.
- After the line is daylighted, and provided there is space for excavator access, it is recommended that excavation near the line be performed parallel to the line.

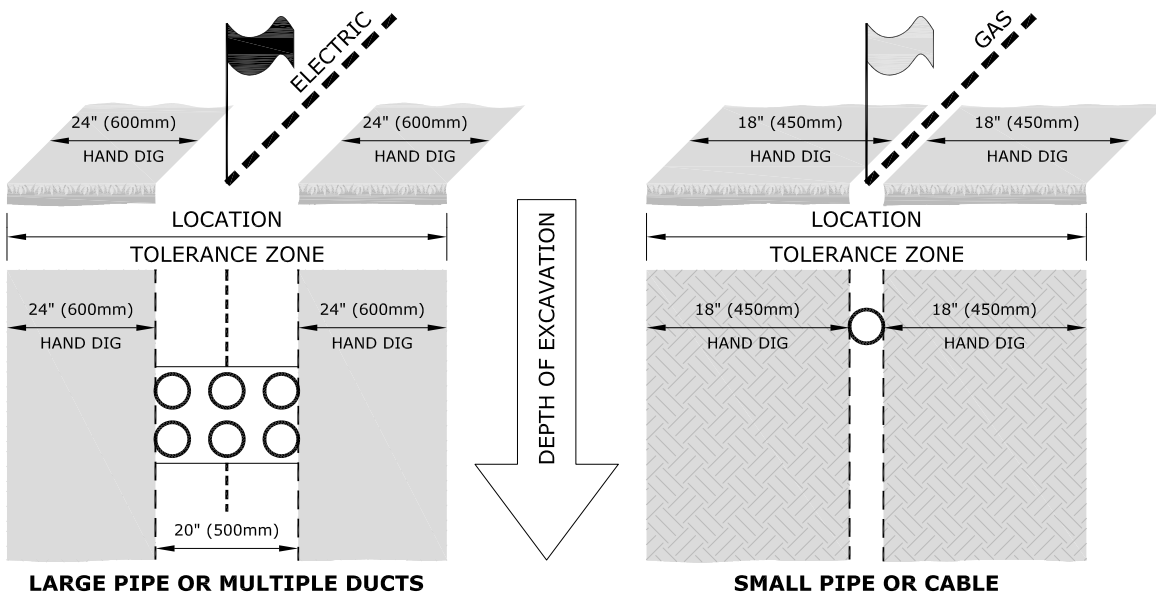
## Working Parallel to Lines

- When working parallel to a line it is not necessary to expose the full length of the line to reduce the acceptable mechanical excavation separation. A series of daylight holes along the line is acceptable. The distance between daylight holes will be a maximum of 10 metres (33 feet) or as required to define the location of the line. Daylight holes must be large enough to expose the full width of the line or lines.
- After daylighting and previewing of the line, marks shall be placed a minimum of 450 mm (18 inches) from the outside of the line at each daylight hole for gas and 600 mm (24 inches)

for electrical lines. This tolerance zone should be marked along the entire length of the work area to ensure that the operator maintains proper alignment with the line. With the line daylighted and the tolerance zone marked, it is acceptable to use mechanical excavation on the outside of the marked line of the tolerance zone.

- If at any point the line becomes obscured, it shall be remarked immediately. The observer is responsible for maintaining the minimum distance from the pipe by confirming the machine's distance and alignment with the line. The operator will orient his machine parallel to the line so their bucket remains more than 450 mm (18 inches) away for gas and 600 mm (24 inches) away for electric lines. They must preview the work prior to entering their machine and prior to any trenching.

### Once line is exposed



### Hard Surface Removal

- Mechanical equipment can be used to remove the asphalt or concrete road/sidewalk surface and should only be used to the depth of that surface.
- Avoid starting the pavement break directly over the marked facility.
- Start a few feet away from the marks and attempt to "peel off" the pavement or break it into small chunks for removal.

## **Line Exposed**

When a length of line is exposed consult the utility for proper handling procedures. The line may need to be supported to prevent settling or sagging.

## **No Relocation**

The line shall not be moved or relocated. No operation or work shall be done that would put stress on the line.

## **Inspect for Damage**

Electric Power Lines – If you suspect a power cable has been damaged, contact Manitoba Hydro to inspect the cable. Do not contact the cable as it may be energized.

Gas Pipelines – Thoroughly clean (with water only) and inspect the exposed gas line for damage to the pipe, yellow plastic pipe covering or tracer wire (used on plastic pipe). If damage is found, notify Manitoba Hydro. They will repair minor damage to the pipe coating or tracer wire at no charge.

Report Contact or Damage – Any contact with or damage to any line or underground cable must be reported immediately to Manitoba Hydro.

## **Backfilling**

To prevent settling or stress, the contractor is required to place clean fill under the power or gas line and compact the fill. The backfill material must be free of rocks, sharp objects or other material that could damage the line.

If the backfill material is frozen, it should be free of large frozen lumps of soil. The backfill material must be gradually placed, not dumped, on the line. Alternatively, the line may be hand padded with 300 mm (12 inches) of screened sand or soft fill before backfilling.

If mechanical protection is required, or if the backfill contains rocks, the cable or pipeline must be enclosed in a 150 mm (6 inches) envelope of screened sand.

## **Access**

Manitoba Hydro utility personnel shall have access to the excavation to inspect the underground line at any time during construction.

## **Project Closeout**

When the excavation project has been completed all flags and stakes used to mark gas and electric lines shall be removed from the site.

# **SAFETY WATCH**

Safety Watch is a program where an employee qualified by Manitoba Hydro observes the excavation work in progress and determines actions to be taken by the contractor to prevent injury, property damage or damage to Manitoba Hydro facilities.

Safety Watch personnel work with the excavator to check that:

- the excavation is done safely;
- rules and procedures related to the excavation are followed;
- the plant is located accurately;
- all documentation is accurate and complete;
- Hydrovac guidelines are followed.

**Safety Watch personnel shall be recognized as an authority on site with the ability to shut the job down.**

## **When is a Safety Watch required?**

Any excavation within 3 metres (10 feet) of a cable or pipeline may require a Safety Watch. The need for a safety watch will be assessed and identified on the Facilities Locate form. The decision to provide a Safety Watch will be based on the excavation proposed, the type of cable or pipeline, and the proximity of the excavation to the cable or pipeline.



## **Why is a Safety Watch done?**

Safety Watch service is provided to ensure the safety of customers and their contractors when working in close proximity to either energized electrical or pressurized gas lines. In addition, this protects the integrity of the utility lines minimizing the chance of an outage.

*NOTE: Typically, Safety Watch personnel are not provided for low voltage conductors (under 750 volts) or distribution pressure gas mains and services under 168.3 mm (6 inches) diameter. However, Manitoba Hydro staff may assess the situation and choose to provide Safety Watch personnel where conditions warrant.*

## **Who pays for a Safety Watch?**

Generally, Safety Watch service is provided at no cost to the homeowner for minor projects. For larger projects, the contractor may be charged at a cost shared rate. Contact the local district office for further information.

## **How to arrange for a Safety Watch.**

When an underground line is located in response to a Click Before You Dig request, the Manitoba Hydro employee will indicate whether a Safety Watch is required. Call Manitoba Hydro to arrange for a Safety Watch appointment a minimum of three business days before any excavation is to occur.

# DIRECTIONAL BORING – CONTRACTOR GUIDELINES

As with all ground disturbance activity, the excavator must first obtain a facilities locate from Manitoba Hydro.

The distance measured to Manitoba Hydro electrical conductor or gas pipeline must always be measured from the **outside** diameter or wall of the Manitoba Hydro facility to the outside diameter of the back reamer. The same measuring methodology must be used when paralleling Manitoba Hydro facilities.

When boring within the tolerance zone of a high pressure or large diameter gas pipeline or any critical distribution gas pipeline or electrical conductor, as identified by Manitoba Hydro's Facilities Locate personnel, qualified natural gas or electric Safety Watch personnel are required.

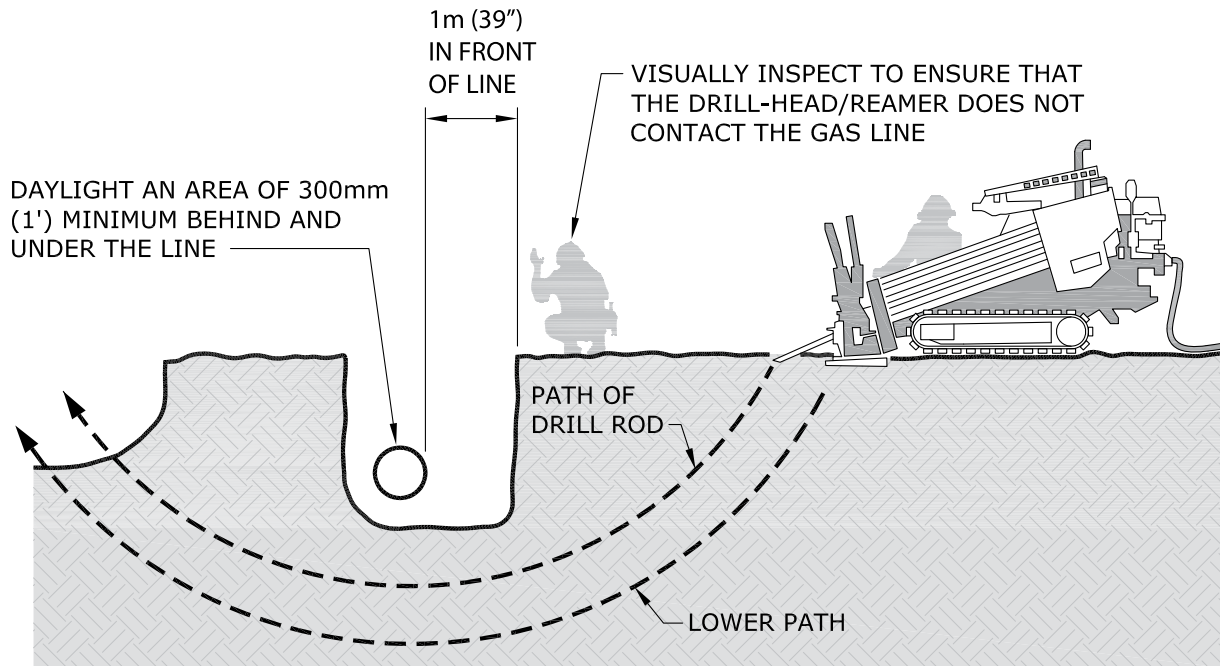
## Electrical Conductors and Gas Pipelines

Prior to directional boring across Manitoba Hydro gas and electrical lines, the buried depth must be confirmed. Acceptable practice to verify line depth is to:

- Expose the line by hand digging, or
- Expose the line by water pressure/vacuum excavation; or
- Locate on the side wall of a trench that has been excavated 1 metre (39 inches) on either side of the surface locates; or
- Use reference measurements that are known to be accurate, for example: electrical duct lines.

The drill head and/or back reamer should at all times maintain a minimum of 1 metre (39 inches) clearance from all Manitoba Hydro lines.

Where underground facility congestion does not effectively allow a 1 metre (39 inches) clearance/separation from Manitoba Hydro lines, the contractor may consult with Manitoba Hydro Engineering for site specific direction. Any deviations in clearances/separations must be provided in writing and must be present on-site when the work is being performed.



## Observation Hole Required When Crossing Any Manitoba Hydro Facility

The accuracy of the drill head location and depth must be visually verified 1 metre (39 inches) prior to crossing Manitoba Hydro facilities. An observation or discovery hole is required.

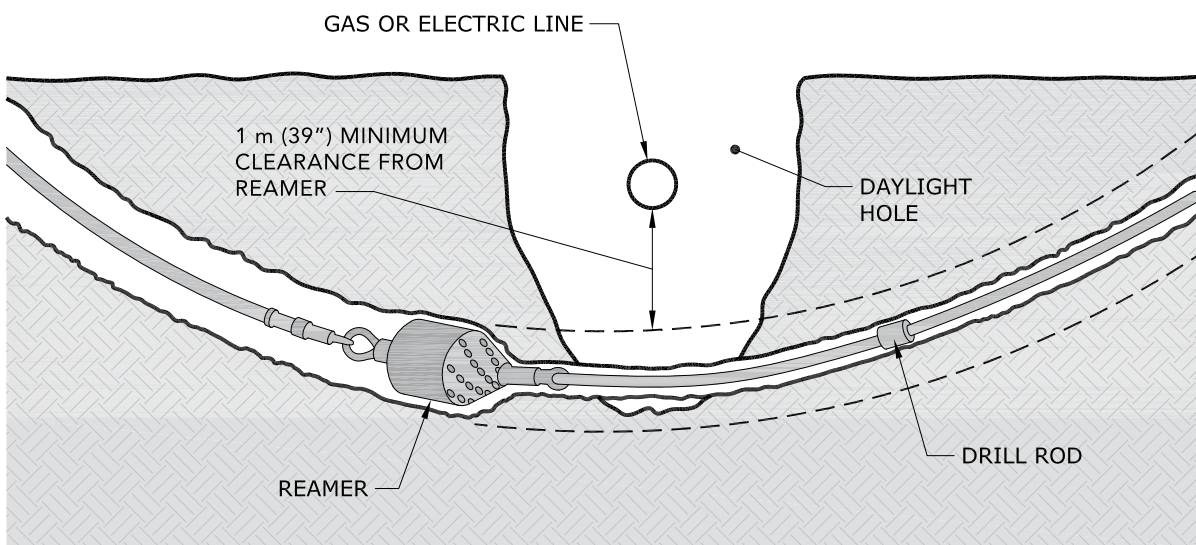
Acceptable practice for opening up the observation hole is using water pressure/vacuum or hand digging.

When boring head and/or back reamers path is crossing above a natural gas pipeline or electrical conductor the boring head and/or back reamer must be visually observed crossing the facility.

When the boring head and/or backreamer's path is crossing below a gas pipeline or electrical conductor an observer must verify that the bore head and/or reamer does not enter the observation hole within 1 metre of the line.

The minimum dimensions of the observation/discovery hole MUST BE:

- 1 metre (39 inches) in front of the gas pipeline or electrical conductor on the near side of the bore path;
- 300 mm (12 inches) on the far side of the bore path;
- 300 mm (12 inches) on each side of the bore path;
- 300 mm (12 inches) below natural gas pipeline or electrical conductor.



## Drilling Parallel to Manitoba Hydro Facilities

### Paralleling Electrical Conductors & Natural Gas Pipelines

There must be 1 metre (39 inches) of separation between the outside diameter of the back reamer assembly and the outside diameter of any Manitoba Hydro electrical conductors or natural gas pipelines.

*NOTE: When drilling within 1 metre (39 inches) horizontally, the drill must be kept at a depth either deeper or shallower than the existing electrical conductor or natural gas pipeline to maintain 1 metre (39 inches) separation when measured diagonally.*

If 1 metre (39 inches) horizontal separation cannot be maintained, the electrical conductor or natural gas pipeline adjacent to the bore path must be exposed. When it is not possible to de-energize electrical conductors, a Safety Hold-Off must be in place and qualified Safety Watch personnel must be on site.

When suspected of drilling within 1 metre (39 inches) of any gas or electrical lines determined by the boring head (sonde) position readings and the proximity to the locate marks, the location of the conductor or pipeline shall be verified; the electrical conductor or natural gas pipeline adjacent to the bore path must be hand exposed or exposed by water pressure/vacuum excavation as determined by Manitoba Hydro. The frequency of exposures depends on the consistency of the alignment of the existing facility.

Manitoba Hydro facilities must be exposed a minimum of once every 10 metres (33 feet), to confirm alignment. Where there is an alignment change indicated by the locator marks, the Manitoba Hydro facility shall be visually confirmed at each alignment deviation.

## **UNPLANNED CONTACT WITH ELECTRIC OR NATURAL GAS LINES**

This guideline applies to people who come in contact with or simply expose a buried utility line while excavating.

Anyone who comes in contact with buried utility lines should contact the utility owner immediately. Although there may be no apparent external damage, the impact of striking a line can cause internal structural damage that can only be determined and repaired by qualified utility personnel. Generally, we do not charge for this inspection and coating repair.

### **Abrasions**

Even if contact does not cause the utility line to stop working, a nick or cut to the outer, protective sheath of the utility line can allow ground water, laden with salts and other caustic substances, to corrode the line. Abrasions may compromise the sidewall strength of a plastic, steel or aluminum gas line.

## **Aerial**

Cables suspended along utility poles can easily be damaged if struck by a vehicle or a mechanical implement like a hydraulic lift. Cable clamps and other attachments can be pulled apart and component housings may hide damage to the electronic equipment inside.

## **Stop Work**

If any equipment is snared in the utility lines, it should be left in place. Trying to extract, flex or manipulate the line can compound the damage. Operations at the site shall stop immediately. Operators should stay in the equipment unless it is not safe (as in the case of a fire) and all others should be kept clear of the equipment as it may have become energized. If you must leave the equipment, jump clear with both feet together so you are not in contact with the equipment and the ground at the same time. Continue to hop or shuffle with your feet close together until you are a safe distance away.

## **Call It In**

The person involved in the incident should call Manitoba Hydro immediately and report the location of the hit. (In Winnipeg at 204-480-5900 or outside of Winnipeg at 1-888-624-9376.) The exact address, or street intersection, along with what type of contact occurred, will help the utility respond in an appropriate manner.







**Click**  **Before**  
**YouDigMB.com**<sup>®</sup>

**Or call 1-800-940-3447**

In addition to contacting  
[ClickBeforeYouDigMB.com](http://ClickBeforeYouDigMB.com)  
be sure to contact other  
underground services in the area.

For more information visit  
[hydro.mb.ca](http://hydro.mb.ca)



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## GELCAP-SL-2/0-3HOLE(B10) Product Details

Share Print Email



**GELCAP-SL-2/0-3HOLE (B10)**

TE Internal Number: F40658-000

Active

### Power Cable Splices, Repair Sleeves and End Seals

Always EU RoHS/ELV Compliant (Statement of Compliance)

#### Product Highlights:

- Cable Splice
- Splice Type = Stub Splice
- Splice Style = Cap
- GelCap-SL Series
- Motor Connections Application, Street Lights Application

[View all Features](#)

### Quick Links

- [Pricing & Availability](#)
- [Search for Tooling](#)
- [Product Feature Selector](#)
- [Contact Us About This Product](#)

[Add to My Part List](#) [Request Sample](#) [Find Similar Products](#) [Buy Product](#)

Documentation & Additional Information	
<p><b>Product Drawings:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul> <p><b>Catalog Pages/Data Sheets:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul> <p><b>Product Specifications:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul> <p><b>Application Specifications:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul> <p><b>Instruction Sheets:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul> <p><b>CAD Files:</b></p> <ul style="list-style-type: none"> <li>• None Available</li> </ul>	<p><b>Additional Information:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Product Line Information</a></li> </ul> <p><b>Related Products:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Tooling</a></li> </ul>

Product Features (Please use the Product Drawing for all design activity)	
<p><b>Product Type Features:</b></p> <ul style="list-style-type: none"> <li>• Product Type = Cable Splice</li> <li>• Splice Type = Stub Splice</li> <li>• Splice Style = Cap</li> <li>• Series = GelCap-SL</li> <li>• Cable Type = Polymeric</li> <li>• Retention Type = Clamp</li> <li>• Armored Cable = No</li> <li>• Jacketed Cable = With</li> </ul> <p><b>Mechanical Attachment:</b></p> <ul style="list-style-type: none"> <li>• Installation Type = Cold Applied</li> </ul> <p><b>Configuration Features:</b></p> <ul style="list-style-type: none"> <li>• Conductor (Wire) Size = #14 - 2/0</li> <li>• Cable Shielding = Without</li> </ul>	<p><b>Industry Standards:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">RoHS/ELV Compliance</a> = RoHS compliant, ELV compliant</li> <li>• <a href="#">Lead Free Solder Processes</a> = Not relevant for lead free process</li> <li>• <a href="#">RoHS/ELV Compliance History</a> = Always was RoHS compliant</li> </ul> <p><b>Printer/Label Features:</b></p> <ul style="list-style-type: none"> <li>• Voltage Rating (kV) = 0.6</li> </ul> <p><b>Operation/Application:</b></p> <ul style="list-style-type: none"> <li>• Application = Motor Connections, Street Lights</li> </ul> <p><b>Other:</b></p> <ul style="list-style-type: none"> <li>• Brand = Raychem</li> <li>• Comment = Clear cap to allow visual inspection.; Port B - power port to light - #14-6 AWG; Kits include connectors</li> </ul>

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### Keep Me Informed





**TERMS AND CONDITIONS:**

Wherever used herein, Utility refers to Manitoba Hydro and any employees or agents of the Utility.

You, by signing the front of this Electric and/or Natural Gas Facilities Locate, acknowledge that you are the owner, or an authorized agent for the owner of the location(s) of the excavation ("You") and You agree as follows:

1. The Utility shall not be liable for any claims, damages, costs, liability, damage to property, or injury or death arising from, or caused by the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein;
2. You agree to indemnify the Utility, its successors and assigns, from and against all causes of action, claims, damages, costs, liability, demands, damage to property, and injury or death which may be alleged, claimed or brought against the Utility by You, your heirs, successors, assigns, employees, contractors, invitees, or by any other third party, in respect or arising out of the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein;
3. You are responsible to provide supervision and safety watching services in respect of any work or excavation, unless it is otherwise indicated herein that the Utility shall provide same, in which case You are responsible to arrange for same with the Utility as outlined herein;
4. You shall immediately upon demand reimburse the Utility for any losses, claims, costs, or damages to the facilities of the Utility caused by or arising out of the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein.

**INSTRUCTIONS:**

**Do not excavate (including digging, boring, pushing, ploughing, or trenching the ground) without first hand digging to expose lines at a number of locations sufficient to determine their exact position and depth. If any location appears not to coincide with the markings or stakes, contact the Utility for confirmation of the location. If exposed by the excavation, cable or pipe must be inspected by the Utility for damage or safety hazards.**

**Do not attempt to locate lines by probing the ground with any pointed tool or object.**

**Stakes and markings are provided only for the work area specified by you. If work has not started within 14 days after the locate is completed by the Utility, you must again notify the Utility to re-mark the work area and provide an updated Electric and/or Natural Gas Facilities Locate form. Notify the Utility of any changes in the nature of work or work area at least two business days before beginning excavation. This form must be kept at the work area until all work has been completed. Any changes in the work or work area that was originally specified by you may require additional staking. Work should not proceed until you have received a new Electric and/or Natural Gas Facilities Locate and all facilities are located and marked.**

During the course of the work on any excavation, the excavator shall maintain, and keep in a visible condition, any markings placed there by the Utility. Do not proceed if the stakes or marks have become obliterated or are displaced. From the start of the excavation and until work and backfilling is completed, you must take every precaution to ensure that no damage will result to the lines, their coatings, protective wrapping or cathodic protection devices and no stress will be applied to the lines.

**Do not move lines or other installations, dangerous conditions may result at this or other locations.**

**Safety Watch and High Pressure excavations (as indicated on the front of this form) must be supervised by the Utility.**

**CAUTION:**

Notify the Utility of any damage, or gas and power line disturbances immediately at 480-5900 or 1 888 MB HYDRO (1-888-624-9376) outside Winnipeg.

**If natural gas leaks, you must do the following:**

- Notify all persons in any premises that may be affected
- Keep traffic and pedestrians out of the area; and
- Do not backfill any damaged facilities until the damage has been inspected by the Utility and the Utility has authorized the backfill.

**Leaking natural gas must be allowed to dissipate into the air.**

**BACKFILLING PRECAUTIONS:**

When backfilling, ensure that the cables or pipes will remain in their original position during settlement by thoroughly tamping the backfill under them; and keeping them supported.

Manitoba Hydro only locates facilities that it owns and has no knowledge of or responsibility for locating facilities owned by others.

These instructions are provided as an on-site reference. All excavations must adhere to the current Department of Labour Workplace Safety and Health Regulations and Manitoba Gas Pipe Line Excavations Regulations of the Gas Pipe Line Act. Copies of these acts can be obtained from the Utility or the Queen's Printer.

**CONDITIONS GÉNÉRALES**

*Dans les présentes, chaque fois que le terme « Entreprise » est utilisé, il fait référence à Manitoba Hydro, ainsi qu'à tout employé ou agent de l'Entreprise.*

*En signant au recto le présent formulaire de demande de localisation des conduites d'électricité et de gaz naturel, vous reconnaissez que vous êtes le propriétaire de l'emplacement (des emplacements) de l'excavation ou un agent autorisé de ce dernier (« vous ») et vous convenez de ce qui suit :*

1. *L'Entreprise ne doit pas être tenue responsable de toute réclamation ou responsabilité, ou de tous dommages-intérêts, coûts ou dommages causés à la propriété, ou de toute blessure ou tout décès découlant de l'excavation ou causés par cette dernière, ou par tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*
2. *Vous acceptez de garantir l'Entreprise, ses successeurs et ayants droit, contre toute cause d'action, réclamation, responsabilité ou obligation, ou contre tous dommages-intérêts, coûts ou dommages causés à la propriété, ou contre toute blessure ou tout décès qui peuvent être présumés, réclamés ou déposés contre l'Entreprise par vous-même, vos héritiers, successeurs, ayants droit, employés, entrepreneurs ou invités, ou par toute tierce partie, relativement aux travaux ou à l'excavation ou à tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*
3. *Il vous incombe de fournir une supervision et des services de surveillance de sécurité en rapport avec vos travaux ou votre excavation, sauf s'il est indiqué ailleurs dans la présente demande que l'Entreprise est responsable de fournir une telle supervision et de tels services de surveillance. Dans un tel cas, vous êtes responsable de prendre les dispositions appropriées avec l'Entreprise pour assurer une telle supervision et de tels services de surveillance.*
4. *Sur demande, vous devez rembourser immédiatement à l'Entreprise toutes les pertes ou sommes réclamées, ou tous les coûts, dommages-intérêts ou dommages causés aux installations de l'Entreprise qui découlent des travaux ou de l'excavation ou qui sont causés par ces derniers ou par tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*

**INSTRUCTIONS**

**N'entrez jamais des travaux d'excavation, y compris le creusage ou le forage de trous, l'entassement ou le labourage du sol, ou le creusage d'une tranchée, sans tout d'abord creuser manuellement pour exposer les conduites à suffisamment d'endroits pour établir leur position et leur profondeur exactes. Si un emplacement ne semble pas coïncider avec les marques ou les piquets, communiquez avec l'Entreprise pour confirmer l'emplacement. Toute ligne ou conduite exposée par les travaux d'excavation doit être inspectée par l'Entreprise afin de vérifier si elle présente des dommages ou des risques pour la sécurité.**

**N'essayez jamais de localiser des conduites en sondant le sol à l'aide d'un objet ou d'un outil pointu.**

**Les piquets et les marques ne sont fournis que pour la zone des travaux que vous délimitez. Si les travaux ne sont pas entrepris dans les quatorze jours qui suivent la localisation effectuée par l'Entreprise, vous devez communiquer avec l'Entreprise pour faire poser à nouveau des piquets et soumettre un formulaire de localisation de lignes électriques et de conduites de gaz naturel mis à jour. Vous devez signaler à l'Entreprise toute modification apportée à la nature ou à la zone des travaux au moins deux jours ouvrables avant d'entreprendre l'excavation. Ce formulaire doit demeurer sur le site des travaux jusqu'à ce qu'ils soient terminés. Toute modification apportée à la nature ou à la zone des travaux originalement délimitée peut exiger un piquetage additionnel. Les travaux ne devraient pas être entrepris avant que vous ne receviez un nouveau formulaire de demande de localisation de conduites d'électricité et de gaz naturel et que toutes les installations ne soient localisées et marquées.**

**Les piquets et les marques doivent demeurer visibles et en bon état. N'entrez pas les travaux si les piquets ou les marques ont disparu ou ont été déplacés. Du début de l'excavation jusqu'à son parachèvement, y compris le remblayage, vous devez prendre toutes les précautions nécessaires pour veiller à ce que les lignes, leur revêtement, leur enveloppe protectrice et les dispositifs de protection cathodique ne soient pas endommagés et à ce qu'aucune contrainte ne s'applique aux lignes.**

**Ne déplacez pas les lignes ou les autres installations, car cela peut créer des conditions dangereuses à cet emplacement ou à d'autres emplacements.**

**Toute excavation qui exige une surveillance de sécurité ou porte sur des conduites haute pression (voir le recto du présent formulaire) doit être supervisée par l'Entreprise.**

**ATTENTION**

**Vous devez signaler immédiatement à l'Entreprise tous les dommages ou toute perturbation des conduites en composant le 480-5900 ou le 1 888 MB HYDRO (1 888 624-9376) (à l'extérieur de Winnipeg).**

**En cas de fuite de gaz naturel, vous devez adopter les mesures suivantes :**

- **Avertissez toutes les personnes qui sont dans les locaux qui peuvent être visés.**
- **Éloignez les piétons et la circulation automobile de la zone.**
- **Ne remblayez jamais des installations endommagées avant que l'Entreprise n'inspecte les dommages et n'autorise le remblayage.**

**Le gaz naturel qui fuit doit avoir la possibilité de se dissiper dans l'air ambiant.**

**PRÉCAUTIONS RELATIVES AU REMBLAYAGE**

**Pendant le remblayage, vous devez veiller à ce que les conduites demeurent dans leur position originale pendant le tassement du sol en pilonnant soigneusement le matériau de remblayage sous eux et en les supportant adéquatement.**

**Manitoba Hydro n'effectue que la localisation des installations qu'elle possède. Elle n'a aucune connaissance des installations que possèdent les autres services publics et n'assume aucune responsabilité pour la localisation de ces installations.**

**Les présentes instructions sont offertes à titre de référence sur place. Toute excavation doit se conformer au Règlement sur les excavations effectuées à proximité des conduites de gaz de la Loi sur les gazoducs, ainsi qu'aux règlements pertinents sur la sécurité et l'hygiène au travail du ministère du Travail. Vous pouvez vous procurer des exemplaires des documents en vous adressant à l'Entreprise ou aux Publications officielles du gouvernement provincial.**



<b>5. HAVE WE CONSIDERED</b> (It is critical that we make note of any <b>changes</b> that may occur during the work cycle)				
<b>People</b>	<b>Procedures</b>	<b>Hardware/Equipment</b>	<b>Environment</b>	<b>Workers Affect on Environment</b>
<input type="checkbox"/> Qualification of personnel <input type="checkbox"/> Other work groups/contractors <input type="checkbox"/> Effective Communication <input type="checkbox"/> Worker fatigue <input type="checkbox"/> Pedestrian control <input type="checkbox"/> General public <input type="checkbox"/> Traffic control <input type="checkbox"/> Safety watcher	<input type="checkbox"/> Limits of approach <input type="checkbox"/> De-energize/Isolation of apparatus <input type="checkbox"/> Safety hold off/Blocking required <input type="checkbox"/> Switching orders <input type="checkbox"/> Adequate cover-up <input type="checkbox"/> Grounding apparatus and vehicles <input type="checkbox"/> Work permit/Clearance to work <input type="checkbox"/> Permit checklists (soft dig, confined space, etc.) <input type="checkbox"/> Review rescue procedures <input type="checkbox"/> Spiking/Stethoscoping <input type="checkbox"/> Cut Hazards/Cut Resistant Gloves	<input type="checkbox"/> Inspection of equipment <input type="checkbox"/> Inspection of tools & PPE <input type="checkbox"/> Inspection of vehicles <input type="checkbox"/> Condition of structures <input type="checkbox"/> Safe loads for rigging <input type="checkbox"/> Adequate cover-up <input type="checkbox"/> Specialized tools - calibrated/tested & up-to-date	<input type="checkbox"/> Environment checklist <input type="checkbox"/> Underground locates <input type="checkbox"/> Weather conditions <input type="checkbox"/> Soil conditions/Shoring <input type="checkbox"/> Lighting conditions <input type="checkbox"/> Adjacent structures/Vegetation <input type="checkbox"/> Housekeeping <input type="checkbox"/> Emergency plan/procedure <input type="checkbox"/> Open excavations/Trench <input type="checkbox"/> Distractions and Interruptions	<input type="checkbox"/> Cause erosion <input type="checkbox"/> Release/spills (liquids/gases/solids) <input type="checkbox"/> Waste disposal (liquids/solids) <input type="checkbox"/> Noise <input type="checkbox"/> Fire <input type="checkbox"/> Species at risk (plant and animal) <input type="checkbox"/> Disturbing waterways/drainage/wetlands/burial grounds <input type="checkbox"/> Wildlife Habitat <input type="checkbox"/> Bio Security
WHAT ARE THE CHANGES?			HOW WILL THIS AFFECT YOUR WORK?	

<b>6. HUMAN ERROR REDUCTION TOOLS</b> (Consider which HER Tools you need to safely execute task or Critical Steps)		
<input type="checkbox"/> <b>Stop When Unsure / Know When to Stop</b> Stop when unclear on task / outcomes	<input type="checkbox"/> <b>Procedure Use and Adherence</b> Verify correct / accurate procedure	<input type="checkbox"/> <b>Self Check STAR</b> Stop / Think / Act / Review
<input type="checkbox"/> <b>Questioning Attitude</b> Identify confusion / doubt / uncertainty	<input type="checkbox"/> <b>Effective Communication</b> Send message / paraphrase back / acknowledge	

<b>7. PERSONS WORKING ON THE JOB</b>			
Designated person in charge (Print Name):	Crew cell no.:	Designated person in charge (Signature):	Date: yyyy mm dd
Print Full Names and classification of crew members:			
yyyy mm dd	Initial/Sign off for Tailboard Discussion		

<b>8. OTHER CREWS AND VISITORS</b>		Multi-crew job coordinator	Cell phone:
Be aware of <b>all</b> work crews in the area.			
WHAT OTHER CREWS ARE ON SITE	PERSON IN CHARGE	HOW WILL THEIR JOB AFFECT YOURS	

Any visitors to your site shall read and sign your Plan.

WORKSITE VISITOR SIGN OFF	DATE yyyy mm dd	WORKSITE VISITOR SIGN OFF	DATE yyyy mm dd

# NETWORK COMMISSIONING REPORT

**FIELD INSTRUCTIONS: Preferred Best Practice**

1. Construction Foreman to contact Customer Service Center Supervisor upon completion of project.
2. Customer Service Center Supervisor to provide a delegate that will review project details with Construction Foreman in the field.
3. Delegate to identify deficiencies and record on report. If project is accepted as complete proceed to Step 5.
4. Construction to complete deficiencies and review with delegate.
5. Once project deemed acceptable delegate to sign under "Accepted as complete by Customer Service Center Representative"
6. One copy of report to be attached to working file.
7. One copy of report to be forwarded to Customer Service Center Supervisor with close out package.
8. Construction Manager to sign under "Accepted as Complete by Construction Manager" and file with final close out package.

Network number		Description			
Foreman name (line)		Foreman name (pole)		Foreman name (underground)	
IN-SERVICE DATE	yyyy mm dd	Plan attached <input type="checkbox"/> Yes <input type="checkbox"/> No	Built as estimated <input type="checkbox"/> Yes <input type="checkbox"/> No	Field Supervisor responsible for work	

**GENERAL COMMENTS**

Prepared by (Construction Coordinator/Foreman) : Network Authenticated Signature	yyyy mm dd
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Network number
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WORK CATEGORIES	APPLICABLE		STATE ALL DEFICIENCIES OR DISCREPANCIES	CORRECTIONS COMPLETED	
	Yes	No		Department	yyyy mm dd
Poles					
Primary System					
Secondary System					
Transformer					
Equipment Data					
Street Lights					
Connect/ Disconnects					
Regulator					
Capacitors					
URD Secondary					
URD Primary					
Terminals					
Materials Location/Condition					
Site Condition					
Sub Transmission System					
Transmission System					
Station System					
GPS Locations Synchronized					

<b>SIGN OFFS (Network Authenticated Signatures):</b>			
Deficiencies identified by (Customer Service Center Representative)	yyyy mm dd	Corrections completed by	yyyy mm dd
<b>WORK COMPLETION</b>			
I hereby accept the Construction and Workmanship of this Order and Consider it to be Complete.			
Accepted as complete by (Customer Service Center Representative)	yyyy mm dd	Accepted as complete by (Construction Manager)	yyyy mm dd