APPENDIX C

Note: This Appendix is for reference only. Contractor is responsible to coordinate with Newfoundland Power Representative and use the latest edition of this document.

General

This section deals with the location and installation of underground primary and secondary distribution circuits. Cables may be installed in direct buried duct, or installed in concrete encased duct, depending on the location and protection required. Before any installations started, the site must be graded to within 150mm of final grade.

Trenching

The trench profiles, as outlined in section 21-5, shall be used in the following locations:

1. Direct Buried Duct: In areas where future excavation is not likely to occur such as paved areas, driveways, along sidewalks, service trenches, etc.

2. Concrete Encased Duct: Road crossings and areas where future digging is expected to occur.

The trench profiles as outlined in sections 21-6 and 21-7 show the installation details for main trunk feeders. Generally, main trunk feeders shall be in duct buried directly in sand, except at critical locations such as road crossings and substation yards, where they shall be installed in concrete encased duct.

The trench shall be as straight as possible with the bottom clean and free of any projecting stones, ridges or sharp changes in grade which could cause a "pressure point" on the conduit.

Depth of Burial

The depths of burial, as shown on the drawings, are CSA minimums and are measured below final grade. In general, cables shall be buried a minimum of 750mm below the surface of the earth or 1000mm below the bottom of ditches. For trenches containing secondary and communications cable only, this may be reduced to 600mm. The minimum depth for all cables crossing roadways shall be increased to 1000mm.

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Joint use

Joint use trenches involve primary and or secondary power cables and communication cables (telephone or catv cables) in the same trench. A separation of at least 300mm of well tamped backfill shall be maintained between the power and communication ducts.

Installation of cable

Care must be exercised during installation of cable to avoid damage to the concentric neutral, cable jacket and insulation. The cable shall not be dragged across the ground or sharp projections. Protective wood sheets or cable rollers should be used to prevent this. Also the cable reel should be suspended directly over the trench during pulling. Care shall be exercised to avoid excessive bending of the cable. The bending radius of all cables shall not be less than eight times the outside diameter of the cable. These radii are for static bends and do not apply to bends around which the cable may be pulled under tension. Refer to sections 24 and 25 for more information on cable pulling.

The direct buried duct shall be laid in a bedding of sand 150 mm above and below the duct. Once duct has been placed in trench, it must not be walked upon or abused in any way.

Sufficient slack shall be left in the cable at all risers, transformer pads, terminal points and ducts so that movement of cable after backfilling will not cause strain on the cable or terminals.

All exposed ends of duct shall be plugged during construction to prevent the entrance of foreign matter and moisture into the duct. Burrs or sharp projects at the entrance of ducts which might injure the cable shall be removed.

All cut ends of cable must be sealed against moisture unless it is to be properly terminated immediately.

Mechanical Protection

Mechanical protection in the form of treated plank at least 38mm thick shall be placed over direct buried duct in any application where minimum burial depth cannot be achieved. It may also be used for direct buried duct applications where both supplies for the same loop are in the same trench. Mechanical protection can also be placed between ducts. Used or salvaged crossarms or other suitable material may be used for this purpose.

Backfilling

All trenches shall be backfilled by hand to the grade line in layers of backfill not exceeding 150mm, except at road crossings where the backfill shall be the same material as the roadbed in layers not exceeding 150mm. Each layer shall be thoroughly compacted with mechanical tampers until no further settling is apparent. The maximum size rock permitted in the select backfill must be less than 70mm.

Warning Tape

Warning tape, warning digger of the presence of underground cable shall be installed in all trenches a minimum of 225mm below final or existing grade, whichever is lower.

Duct Bank Size

The maximum load capacity per feeder will decrease as the number of feeders in the duct bank or trench increases, Check to ensure that the cable size is co-ordinated with the particular duct bank or trench configuration.

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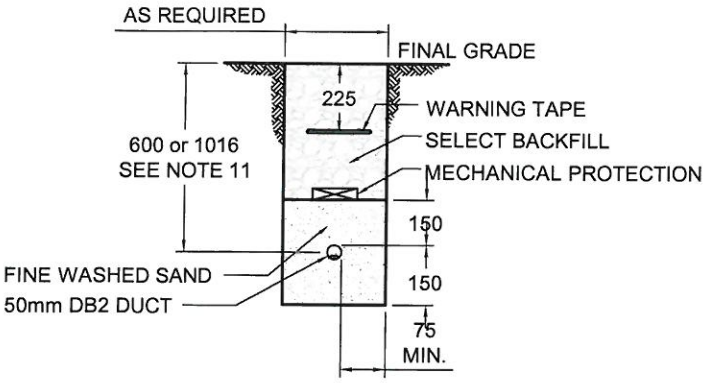
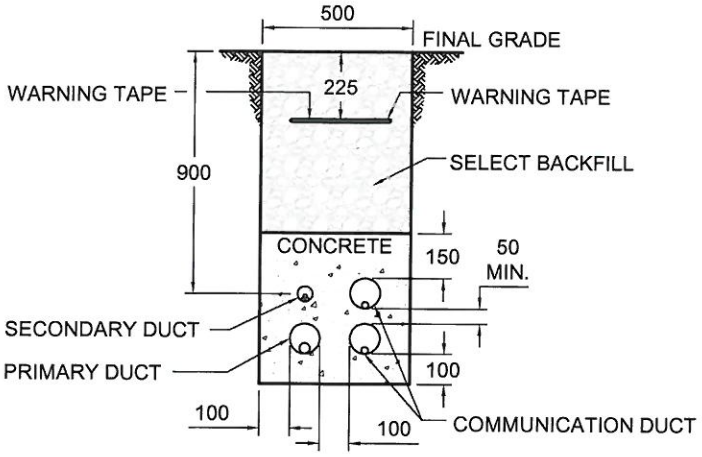
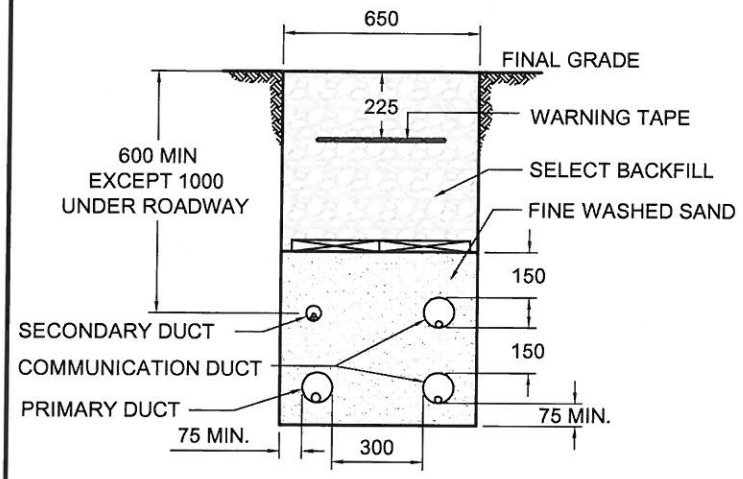


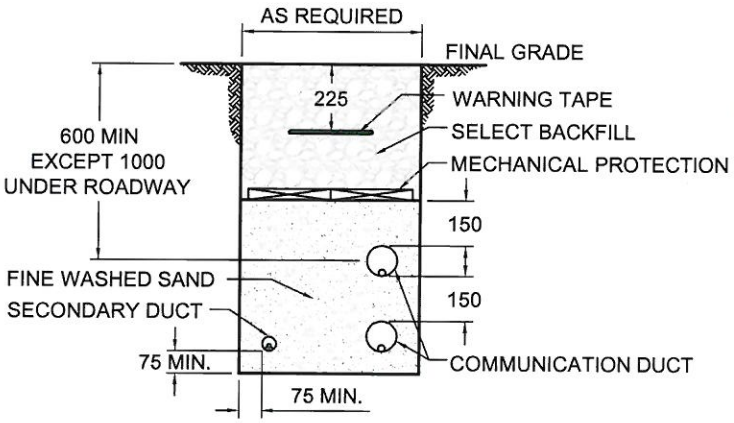
STREET LIGHT CONDUCTOR TRENCH DETAILS



CONCRETE ENCASED DUCT



DIRECT BURIED DUCT



SERVICE & TELEPHONE TRENCH DETAILS

NOTES:

1. CONCRETE TO HAVE A 28 DAY SPECIFIED STRENGTH OF 20 mpa WITH MAXIMUM AGGREGATE SIZE OF 20mm AND MAXIMUM SLUMP OF 75mm.
2. CONCRETE ENCASED DUCTS SHALL BE SUPPORTED BY APPROVED SPACERS PLACED AT 1200mm INTERVALS. NO WIRES OR METAL TIES ARE TO BE USED.
3. USE 100mm DIA. DUCT FOR EACH RUN OF PRIMARY CABLE AND 50mm MIN. DIA. DUCT FOR EACH RUN OF SECONDARY CABLE.
4. INSTALL MINIMUM #12 FISH WIRE IN EACH DUCT AND SECURELY CAP BOTH ENDS.
5. ALL FITTINGS, COUPLINGS, ETC. ARE TO BE SOLVENT WELD.
6. SPARE DUCTS SHALL BE INSTALLED AS REQUIRED.
7. ELECTRICAL DUCT SHALL BE PVC TYPE DB-2 OR APPROVED EQUIVALENT.
8. FOR MAXIMUM PULLING TENSION FOR PRIMARY AND SECONDARY CABLES SEE SECTION 25.
9. THE DIMENSIONS FOR TRENCH WIDTH AND DEPTH ARE TYPICAL DIMENSIONS AND MAY CHANGE DUE TO EXCAVATING EQUIPMENT, FIELD CONDITIONS AND NUMBER OF CIRCUITS REQUIRED.
10. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.
11. WHERE THE INSTALLATION OF FENCING IS LIKELY TO OCCUR IN THE VICINITY OF NEWFOUNDLAND POWER'S UNDERGROUND STREET LIGHT CONDUCTOR, THE DEPTH OF THE CONDUIT SHALL BE INCREASED TO 1016mm, FOR ALL OTHER INSTALLATIONS A DEPTH OF 600mm IS ADEQUATE.
12. WHERE THE MINIMUM BURIAL DEPTH CAN NOT BE OBTAINED MECHANICAL PROTECTION SHALL BE USED. MECHANICAL PROTECTION SHALL EXTEND 50MM BEYOND EACH SIDE OF DIRECT BURIED DUCT.

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UNDERGROUND TRENCH DETAILS

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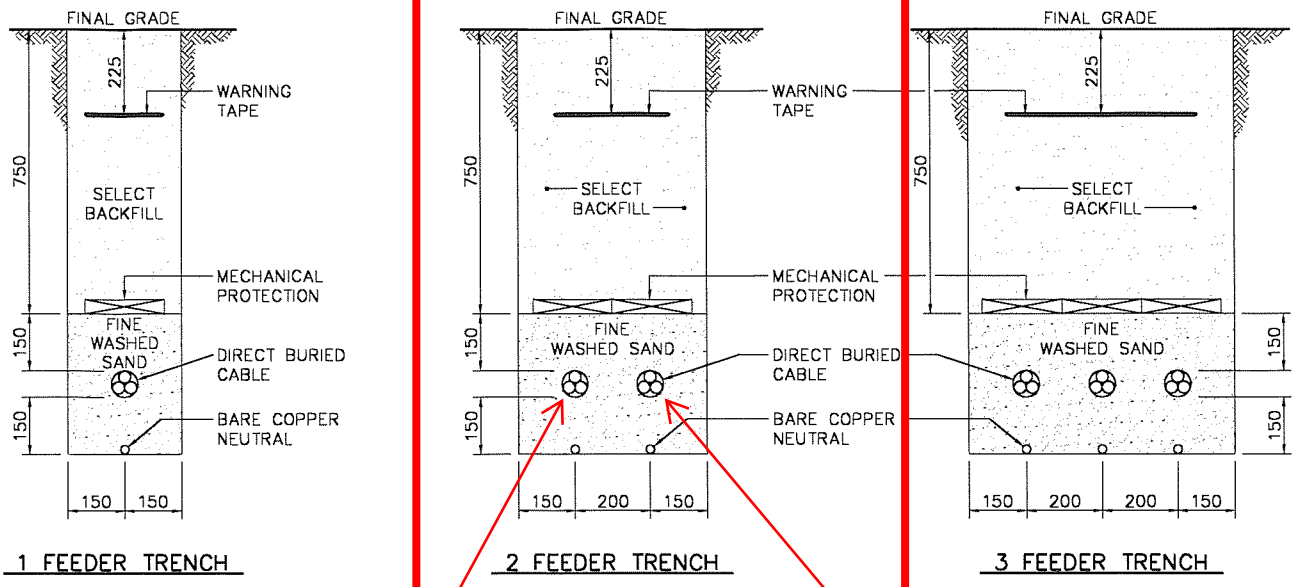

1 X 155mm spare PVC conduit installed on the same horizontal plane as other conduits.

New primary underground feeders
3 runs X 1C #1/0 Concentric neutral (15KV) all in 155mm PVC conduit.

NOTES:

1. MECHANICAL PROTECTION SHALL EXTEND A MINIMUM OF 50mm BEYOND EACH SIDE OF THE DIRECT BURIED CABLE.
2. A MINIMUM SEPARATION, HORIZONTAL OR VERTICAL, OF 200mm SHALL BE MAINTAINED BETWEEN CABLES OF DIFFERENT CIRCUITS, BUT WHERE PRACTICAL IT IS PREFERRED TO HAVE THIS SPACING AS LARGE AS POSSIBLE.
3. NEUTRALS TO BE INSTALLED AS REQUIRED.
4. INSTALL GROUND RODS AT 50 METER INTERVALS & CADWELD TO NEUTRAL. ENSURE THAT THE ROD & CADWELD DO NOT EXTEND ABOVE TRENCH BOTTOM.
5. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS.

REGISTERED PROFESSIONAL ENGINEER
R. KEITH WHITEWAY
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TRENCH DETAILS FOR DIRECT BURIED TRUNK FEEDER CABLES

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