

Application

This standard describes BC Hydro requirements for customer civil work on private property for supply service ducts and trenches for all services (primary, secondary, single-phase, and three-phase). See ES54 sections H *Duct* and W *Construction Specifications* for BC Hydro requirements for all other civil work on private property and public corridors. This standard also applies to supply service ducts for BC Hydro primary equipment installed inside customer buildings per ES54 section E *Switchgear Vaults and Pads* and F *Transformer Pads and Vaults*.

Revision Notes

Added to *Application* section. Added new documents to *References*. Updated note 2.c to reference Table 1. Added new Table 1. Added new note 2.o. Updated note 3.2.g to accept alternative design by the customer's professional of record and avoid placing duct under foundations and footings. Updated note 3.2.h to clarify customer responsibilities for duct foundation wall penetration design. Added new note 3.2.i to expand on duct wall penetration and transition requirements. Removed 1:20 and 1:30 scale from figure titles. Added a 5" duct to Figure 8. Changes are marked by green vertical revision lines in the left margin. This revision released concurrently with Standards and Equipment Advisory Information Bulletin 2025-022 *Revised ES54 S0-05 General Notes Service Ducts and Trenches*.

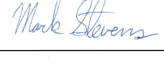
References

BC Hydro Distribution Standards

ES54 S0-02 Services General Notes

External Documents

ASTM D2122	Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
BCBC	British Columbia Building Code
BCEC	Canadian Electrical Code, Part I (CSA C22.1) adopted for BC and enforced by Technical Safety BC (TSBC)
CSA A23.3	Design of concrete structures
CSA B137.0	Definitions, general requirements, and methods of testing for thermoplastic pressure piping
CSA C22.2 No. 211.0	General requirements and methods of testing for nonmetallic conduit
CSA C22.2 No. 211.1	Rigid types EB1 and DB2/ES2 PVC conduit
CSA C22.2 No. 211.2	Rigid PVC (unplasticized) conduit
CSA C22.3 No. 7	Underground systems

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Approved: M. Stevens, P. Eng				
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Notes

1. Types of Installation

Direct burial of supply service ducts on private property. BC Hydro does not accept direct burial of supply service cables.

2. Materials

- a. Materials from the stub-off on private property shall be supplied, installed, and maintained by the customer.
- b. Minimum burial depth for supply service ducts should be 900 mm below finished grade. Sections of secondary services that cannot meet minimum burial depth shall be mechanically protected using methods described in note 2.n. The cover layer shall not be reduced, and the burial depth shall not be less than 450 mm without the local BC Hydro distribution engineer's acceptance. Service ducts for primary services and 400 A and greater secondary services that cannot meet minimum burial depth require a local BC Hydro distribution engineer's acceptance prior to installation. See note 2.l.
- c. Underground and concrete encased ducts and fittings shall be CSA-certified grey rigid-type DB2/ES2 PVC CSA C22.2 No. 211.1 or grey rigid PVC duct CSA C22.2 No. 211.2 (Schedule 40 PVC). See Table 1 for a summary of engineering parameters for CSA-certified ducts.
- d. Above ground exposed ducts and fittings shall be grey rigid PVC duct CSA C22.2 No. 211.2 (Schedule 40 PVC).
- e. A drainage tee is required to drain water from the supply service duct before it enters service equipment or penetrates a building envelope. A drainage tee is not required when the installed drainage tee will be higher than the finished grade of the supply ducts at the property line.
- f. The minimum nominal bending radius of ducts and fittings is 900 mm for 75 mm (3") and 100 mm (4") ducts and 1050 mm for 125 mm (5") ducts.
- g. Pull string shall be #8 polypropylene string or greater.
- h. Cover and base fill material shall be screened sand or earth with a maximum partial size of 4.75 mm as per ASTM D2487, compacted to 95% modified proctor density to ensure adequate heat dissipation, drainage, and compaction, and to prevent mechanical damage to the direct buried ducts. See Figures 2, 4, 5, and 6.
- i. Backfill material shall be selected native material for non-traffic areas compacted to 85% modified proctor density. Selected native material shall be granular material free from frozen lumps, ashes, refuse, vegetable, organic or foreign matter, granular material over 100 mm in any dimension, or other deleterious materials. See Figures 2, 4, 5, and 6.
- j. Surface restoration is the customer's responsibility. 100 mm of surface layer material is recommended when matching existing grade.
- k. For traffic areas such as driveways and parking lots, backfill and road surface preparation or restoration shall be per the local regulatory authority having jurisdiction (AHJ) specifications, such as the MMCD or a city's design criteria manual. A permit from the local regulatory AHJ is likely required for road surface restoration work.
- l. Service trenches shall have 150 mm wide "Caution Buried Electrical Line Below" tape or board installed along the centreline of the trench. Caution boards are required for primary services and reduced depth secondary services. See Figures 2, 4, 5, and 6.
- m. 15M concrete rebar inserts are required on zero lot line clearance applications for BC Hydro to join reinforced concrete duct bank to the building foundation wall. The customer shall supply the corresponding threaded splice bar to the insert, minimum length 200 mm (8"), to BC Hydro. See Figure 7.

- n. Riser sections above the minimum burial depth shall have adequate mechanical protection per BCEC rule 12-102 (3) or CSA C22.3 No. 7 rule 7.3.2. See Figures 5 and 6. This is not required for surface mounted risers visible from the exterior of the building. See Figure 4.
- o. Supply service cable operating temperature is 90°C maximum. Cable dead weight is 15 kg/m for 4" duct and 20 kg/m for 5" duct.

Table 1 – Engineering parameters for primary or secondary service duct

Parameter	CSA C22.2 No.211.1 DB2 duct		CSA C22.2 No.211.2 Schedule 40 duct	
Trade size	Inside diameter (mm nominal)	Outside diameter (mm nominal)	Inside diameter (mm nominal)	Outside diameter (mm nominal)
3 inch	76.20	82.35 to 82.75	76.20	88.52 to 89.28
4 inch	100.10	106.85 to 107.30	100.10	113.92 to 114.68
5 inch	126.35	134.35 to 134.85	125.85	140.54 to 142.06
Wall thickness				
3 inch	2.03 mm nominal		5.49 to 6.15 mm nominal	
4 inch	2.67 mm nominal		6.02 to 6.73 mm nominal	
5 inch	3.81 mm nominal		6.55 to 7.34 mm nominal	
Pipe stiffness	Clause 6.8		N/A	
	Minimum stiffness per ASTM D2412 at 5% deflection 300 kPA		Minimum stiffness per ASTM D2412 at 5% deflection 300 kPA	
Impact strength	Clause 6.2		Clause 6.4	
	61 J at 23°C and 34 J at -18°C. Test method A in CSA C22.2. No.211.0 clause 6.3.1.		12 J at -34 ±2°C. Test method B in CSA C22.2. No.211.0 clause 6.3.2	
Tensile strength	Clause 6.6.2		Clause 6.7	
	Per CSA B137.0		The length of a specimen of conduit shall change by no more than 3.5 % when tested per method B in CSA C22.2. No.211.0 clause 6.12.2	
Variations tolerance	Clause 4.1.3		Clause 4.1	
	Deviations from straightness shall not exceed 10 mm/m when measured per ASTM D 2122		Diameter and wall thickness shall meet requirements of CSA C22.2 No. 211.2 table 1 when measured per ASTM D 2122	
Chemical resistance	Clause 6.6		Clause 6.6	

3. Installation Requirements

3.1 General

- a. BC Hydro civil work requirements are based on 50-year service life expectancy.
- b. Civil work, materials, and maintenance related to this standard are the customer's responsibility.
- c. The service duct trench shall be in direct line-of-sight from the property line stub-off to the service duct entry into the building. The base of the trench shall be graded to the depth of the BC Hydro duct stub-off, typically 900 mm to the top of the BC Hydro duct.

- d. The minimum separation from service ducts to other underground systems shall be 300 mm, except for roof / auxiliary drains or when the service duct is concrete encased or otherwise mechanically protected per CSA C22.3 No. 7, in which case the minimum separation may be reduced to 50 mm. See Figures 3 and 4.

3.2 Service in Duct

- a. The customer shall couple their duct onto the BC Hydro duct stub-off at the property line and discard any markers or duct caps. Customer ducts shall not cross the property line nor enter BC Hydro's service box directly. The customer duct may only be coupled to the designated BC Hydro service duct.
- b. BC Hydro may require a customer-owned BC Hydro standard pull box if the service duct length between the BC Hydro duct stub-off and the service entrance exceeds 50 m. Please consult with your BC Hydro designer.
- c. BC Hydro may require a customer-owned BC Hydro standard pull box if the total sum of duct bends in the service duct between the BC Hydro duct stub-off and the service entrance (including any 90° vertical riser) exceeds 135°. Please consult with your BC Hydro designer.
- d. The customer is responsible for installing adequate service duct drainage per BCEC rules.
- e. A pull string shall be installed in the service duct and tied securely at the service entrance and to the string in the BC Hydro duct stub-off. If no string is found in the stub-off, the customer shall contact BC Hydro for further instructions.
- f. The service duct shall be kept free of obstructions and foreign material, including sand and gravel, throughout its length. The duct shall be proved by mandrel test before the final connection is made to the BC Hydro duct stub-off and before a pull string is installed.
- g. Protect the service duct from damage caused by foundation settlement and excavation backfill. Use fill material specified in note 2, compacted in 150 mm layers, unless an alternative method is designed by the customer's professional of record. Avoid placing service ducts under structural foundations and footings unless absolutely necessary.
- h. The customer is responsible for designing duct foundation wall penetrations for both primary and secondary service cables. The design shall comply with BCEC, BCBC, and local bylaws and regulations (see notes 3.1.a and 3.1.b).
- i. BC Hydro requires site-specific designs ensuring protection of primary service ducts to safely transition primary service ducts from the trench to the foundation wall penetration. The transition region design shall be authenticated by the customer's professional of record and made available to BC Hydro upon request. Secondary service duct penetrations are exempt from this requirement. The design shall include provisions for:
 - i. Expansion and contraction due to temperature changes;
 - ii. Soil movement;
 - iii. Building shrinkage; or
 - iv. Structural settlement.
- j. The BC Hydro service duct may be concrete encased to the property line for zero lot line buildings. In such cases the customer will be required to provide the connection between the reinforced duct bank and the foundation wall at the point of duct penetration. The duct bank rebar shall be joined with a CSA approved rebar connection or splice system. Cast-in anchors/inserts, post-installed expansion (torque-controlled and displacement-controlled), undercut, and adhesive anchors are permitted to be part of the mechanical rebar connection or splice system provided they meet the requirements of CSA A23.3 Annex D. The minimum size of the rebar connection or splice system is 15M and shall meet the spacing requirements shown in Figure 9. Contact the BC Hydro designer to determine if BC Hydro service ducts are concrete encased.



Figure 1 – Service ducts sheared due to settlement and lack of rebar reinforcement

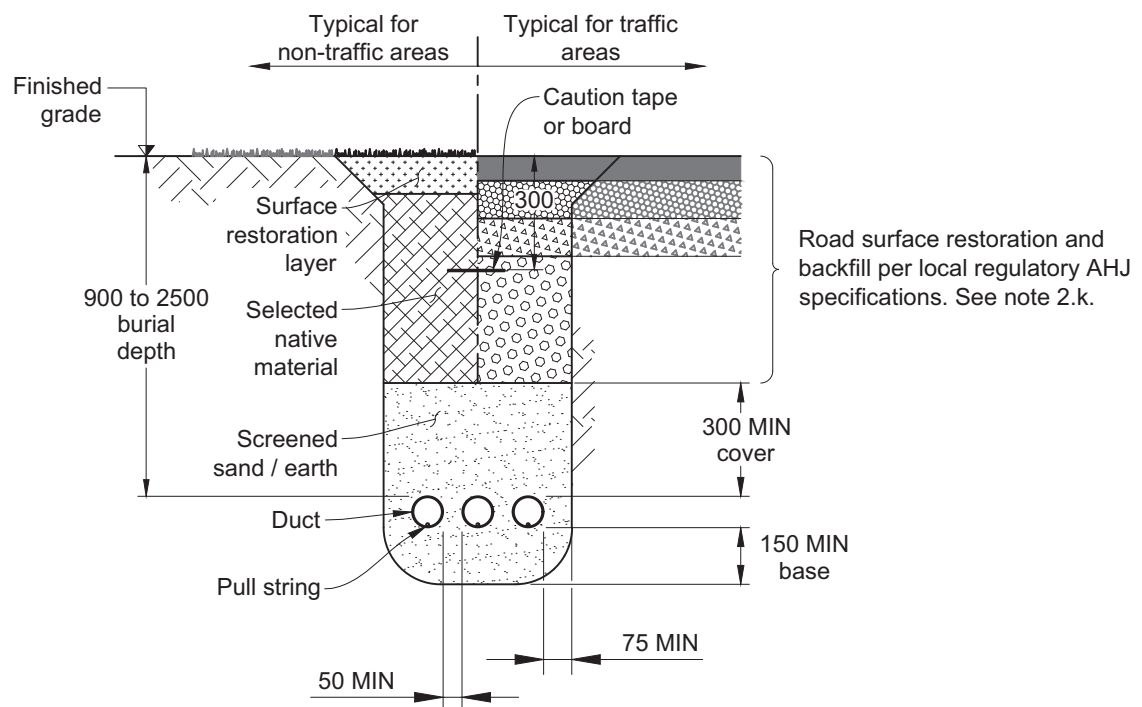


Figure 2 – Section A, supply service trench

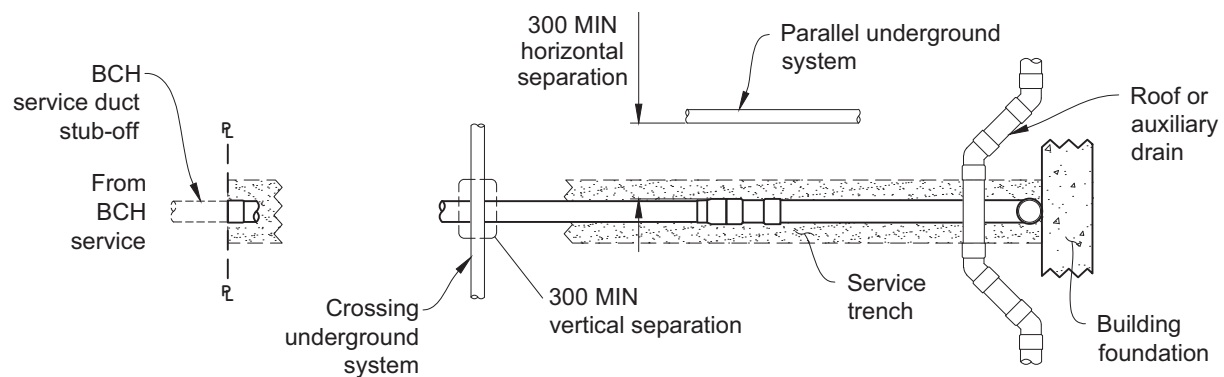


Figure 3 – Adjacent and crossing underground systems

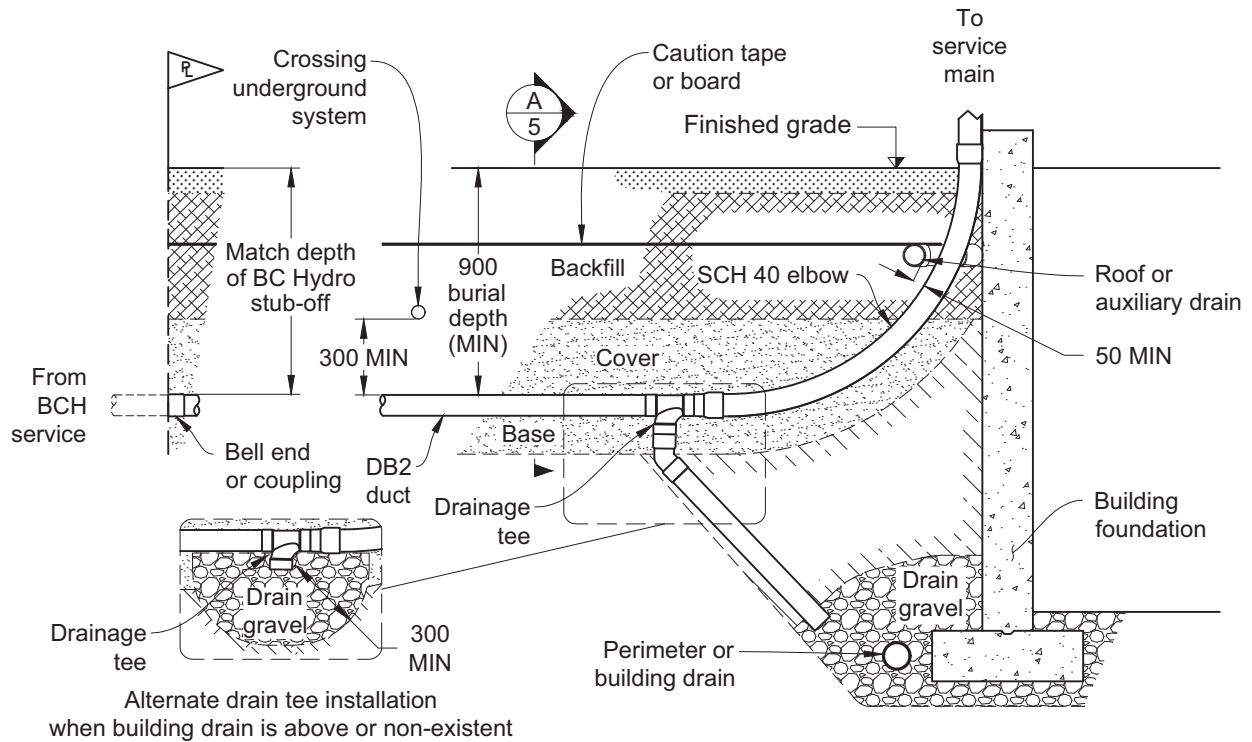


Figure 4 – Surface mount service riser

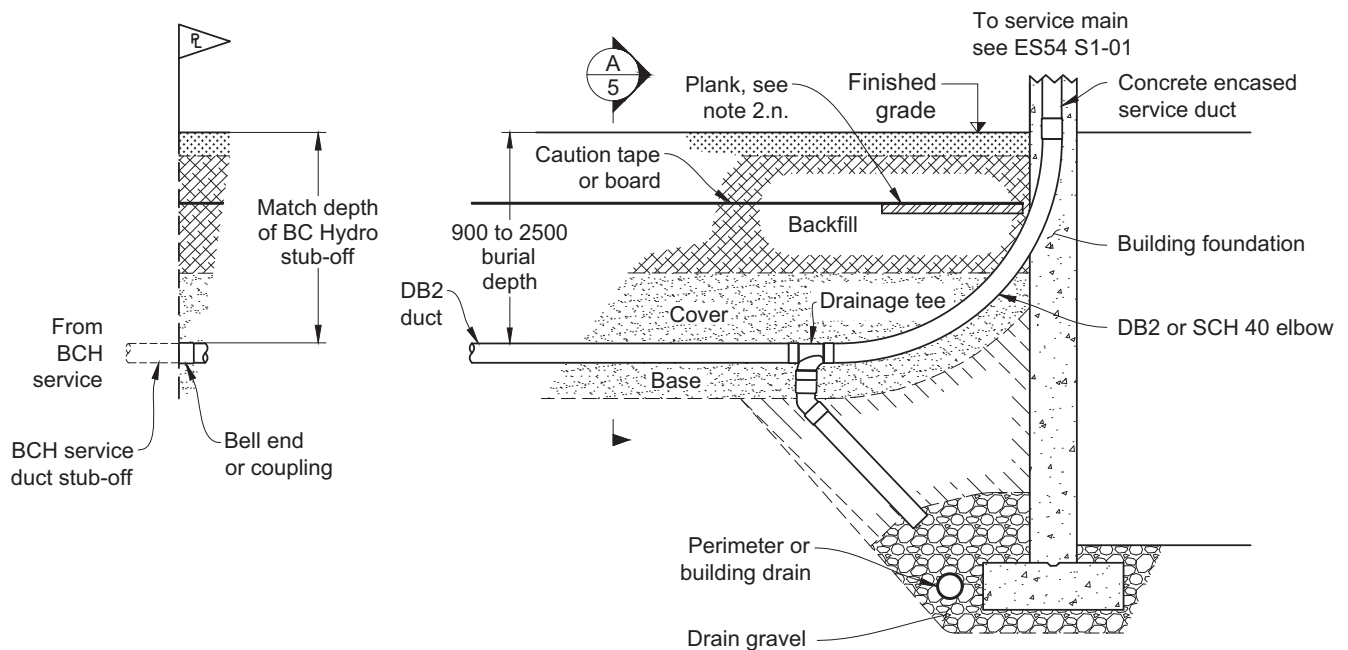


Figure 5 – Concrete encased 400 A or less secondary service

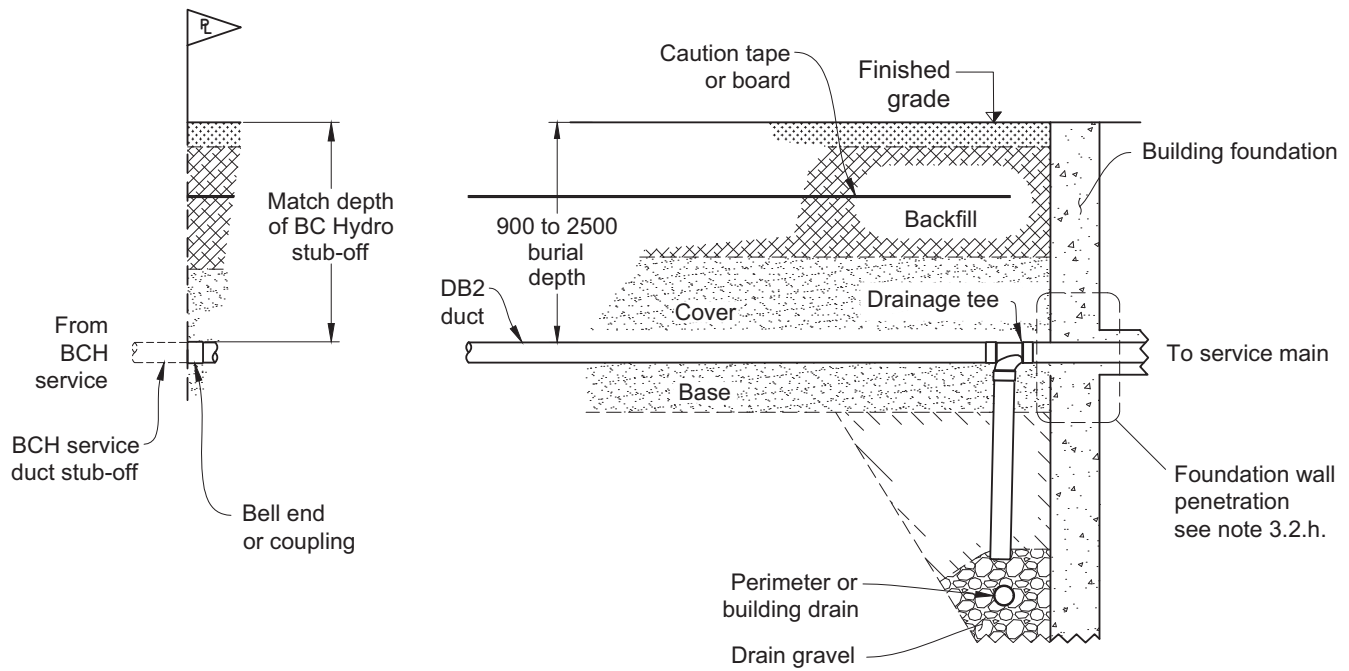


Figure 6 – Horizontal foundation wall penetration

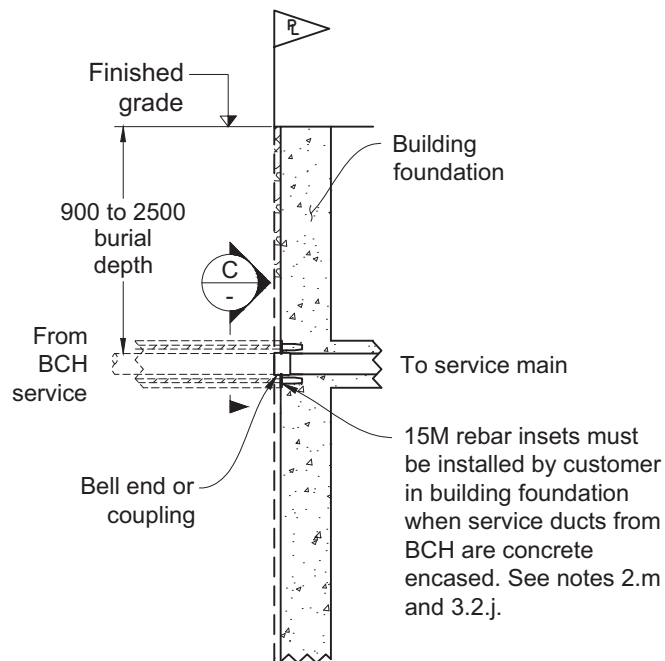


Figure 7 – Zero property line foundation wall penetration

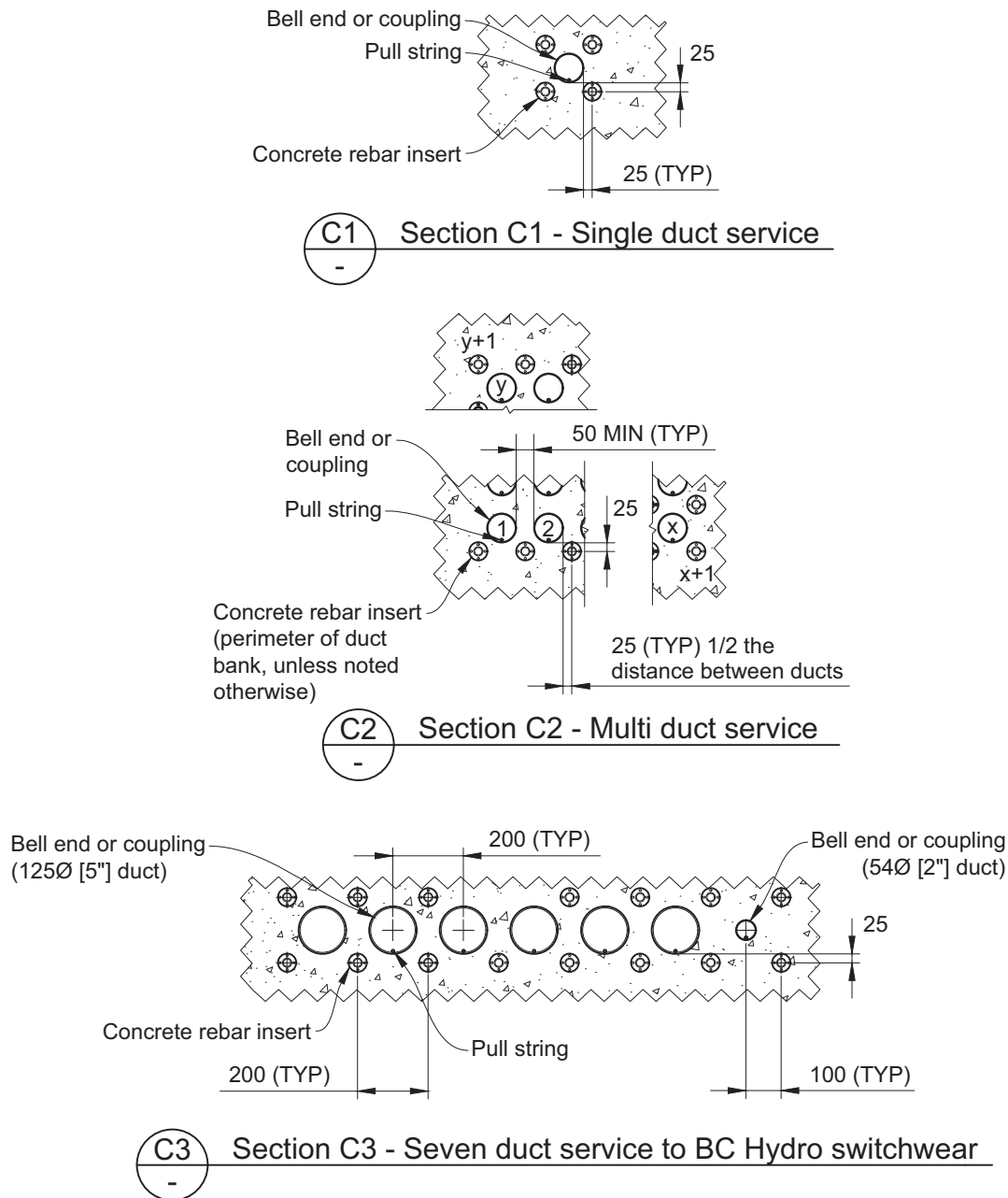


Figure 8 – Concrete rebar inserts for BC Hydro service ducts to zero property line buildings

4. Drawing Notes

- Dimensions are in millimetres unless noted otherwise.
- Ducts shown are 75 mm nominal (3") unless noted otherwise.
- Figures show BC Hydro's minimum requirements. Alternative installations that exceed these requirements are acceptable.