

Application

This standard provides installation requirements for outdoor below-ground in-vault BC Hydro-owned equipment located on private property. See ES55 B2-05 for more on BC Hydro-owned switchgear access, placement, and general requirements for space allocation.

Revision Notes

New standard, released concurrently with Standards and Equipment Advisory Information Bulletin 2026-025
Released ES54 Section S Service Standards for BC Hydro-Owned Switchgear on Private Property.

References

BC Hydro Distribution Standards

ES54 F3-06	BC Hydro Transformer Pad on Top of Soil on Private Property Inside Building Alcove
ES54 F3-07	BC Hydro Pad-Mounted Transformer on Private Property Next to Customer Building
ES54 F3-08	BC Hydro Transformer on Top of Building Slab or Inside Building Alcove on Private Property
ES54 R1-02	Grounding Pad-Mounted Equipment on Private Property
ES54 R2-02	Grounding URD and UD Subsurface Structures on Private Property
ES54 S0-05	General Notes Service Ducts and Trenches
ES54 S0-06	BC Hydro-Owned Equipment on Private Property General Notes
ES54 U2-02	Concrete Pad Protection Bollards
ES55 B2-05	Customer Guide: BC Hydro-Owned Switchgear Placement and Requirements

Other BC Hydro Documents

Requirements for Customer-Owned Primary Services Supplied at 4 kV to 35 kV

External Documents

BCEC	Canadian Electrical Code, Part 1 (CSA C22.1) adopted for BC and endorsed by Technical Safety BC (TSBC)
------	--

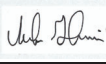
Notes

1. General Requirements

1.1 Use Case and Installation Types

BC Hydro's over-pad above-ground outdoor switchgear design is the preferred configuration (see ES54 S6-01). The in-vault below-ground outdoor option is acceptable and may be required by local government when above-ground options are not accepted. The available installation options for in-vault below-ground outdoor switchgear are:

- BC Hydro-owned switchgear on suitable backfill outside a building footprint; and
- BC Hydro-owned switchgear on top of building sublevels or inside alcove within building envelope.

Designed: T. Ismagilov, P. Eng		Professional of Record 2026-04-01  Permit to Practice 1002449	In-Vault Below-Ground Outdoor Switchgear Installation	
Checked: M. Kelvin, P. Eng				
Reviewed: M. Stevens, P. Eng			DISTRIBUTION STANDARDS 	ES54 S6-02 R0
Approved: H. Giesbrecht, P. Eng		Issued: 2026-04-02 Effective: 2026-06-01		

Installation requirements are provided in notes 2 and 3. Typical general arrangements for BC Hydro-owned in-vault below-ground switchgear are illustrated in Figure 1.

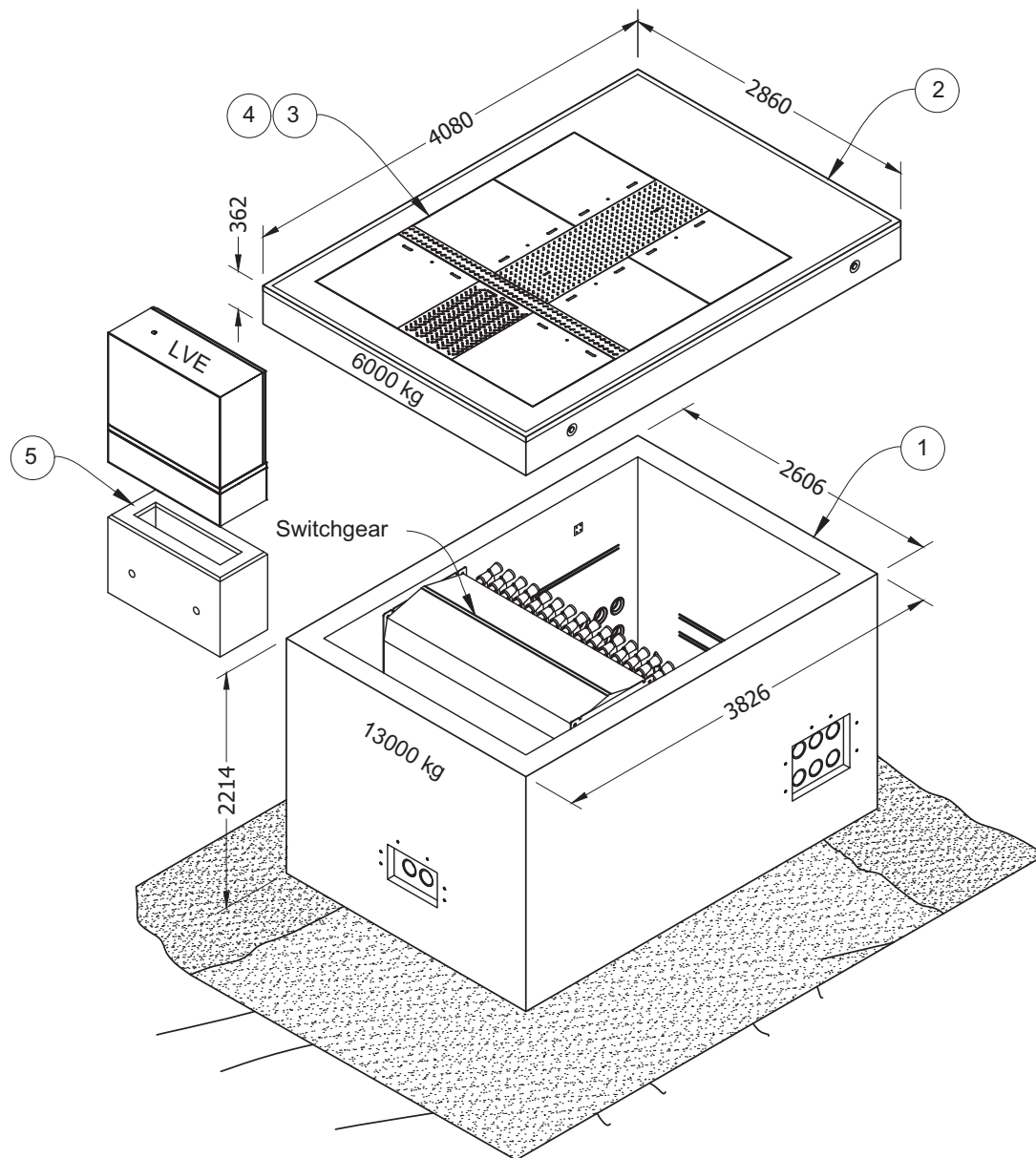


Figure 1 – BC Hydro in-vault switchgear general arrangement

1.2 Duct and Equipment Arrangement

The general duct and equipment arrangements are shown in Figure 2. The BC Hydro designer will advise the customer on the required size, quantity, and configuration of BC Hydro feeder and customer service ducts and duct drainage connection, subject to approval by the local building department.

The customer shall provide a copy of a site plan showing the location of the building essential loads electrical panel supplying a low-voltage enclosure (LVE). The plan shall be stored inside the LVE. Supply circuits for the LVE shall provide 24/7 power year round. See ES54 S0-06 for details and duct and trench requirements.

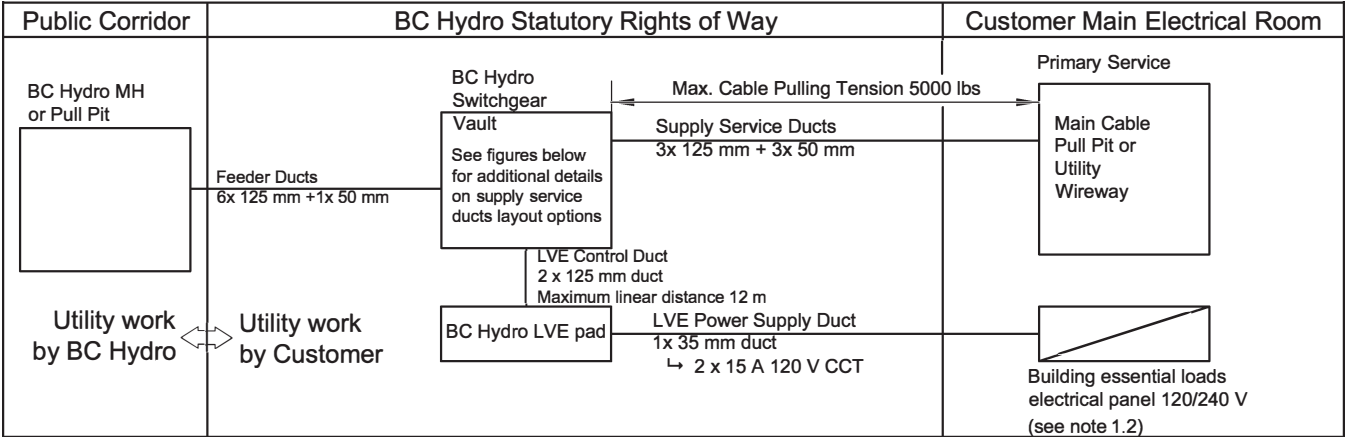


Figure 2 – BC Hydro switchgear in-vault duct block diagram and equipment arrangement

1.3 Typical Supply Service Duct Configuration and Clearance

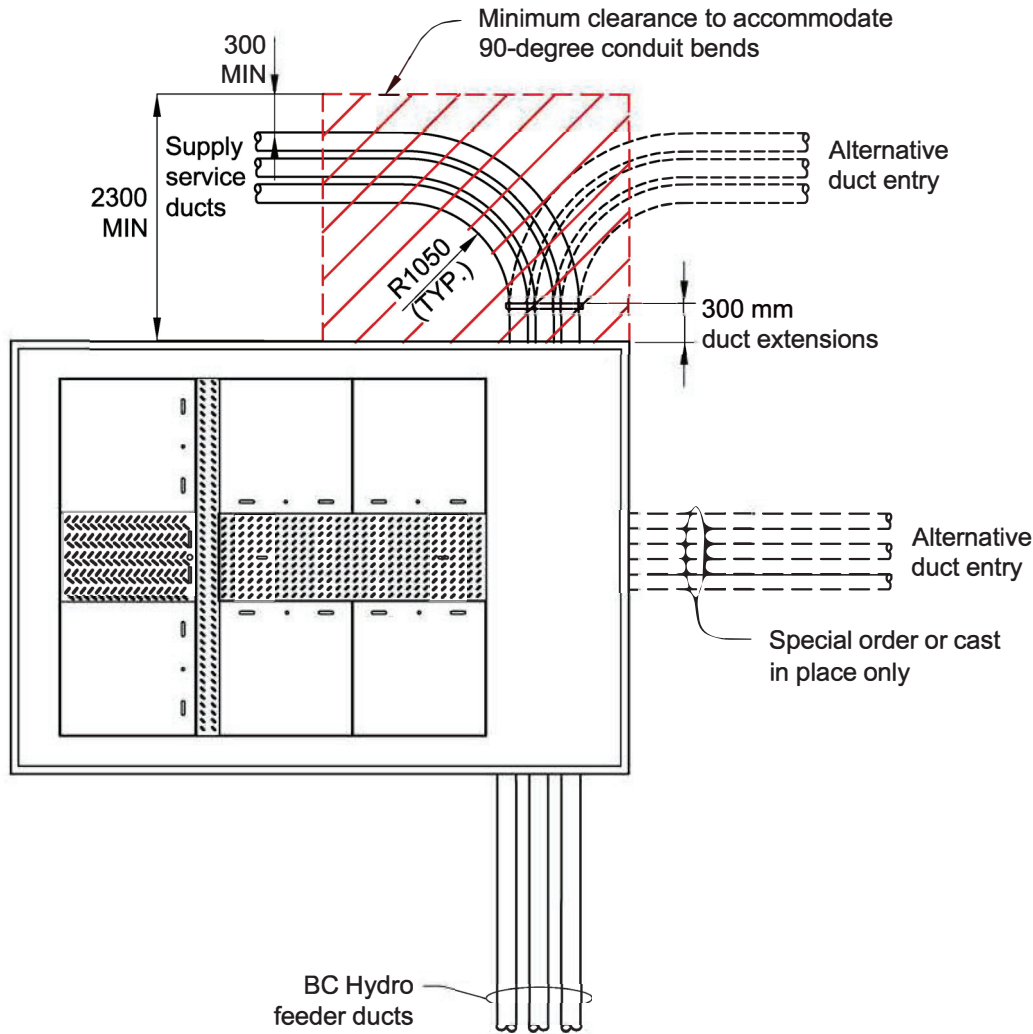


Figure 3 – Supply service duct configuration and clearance

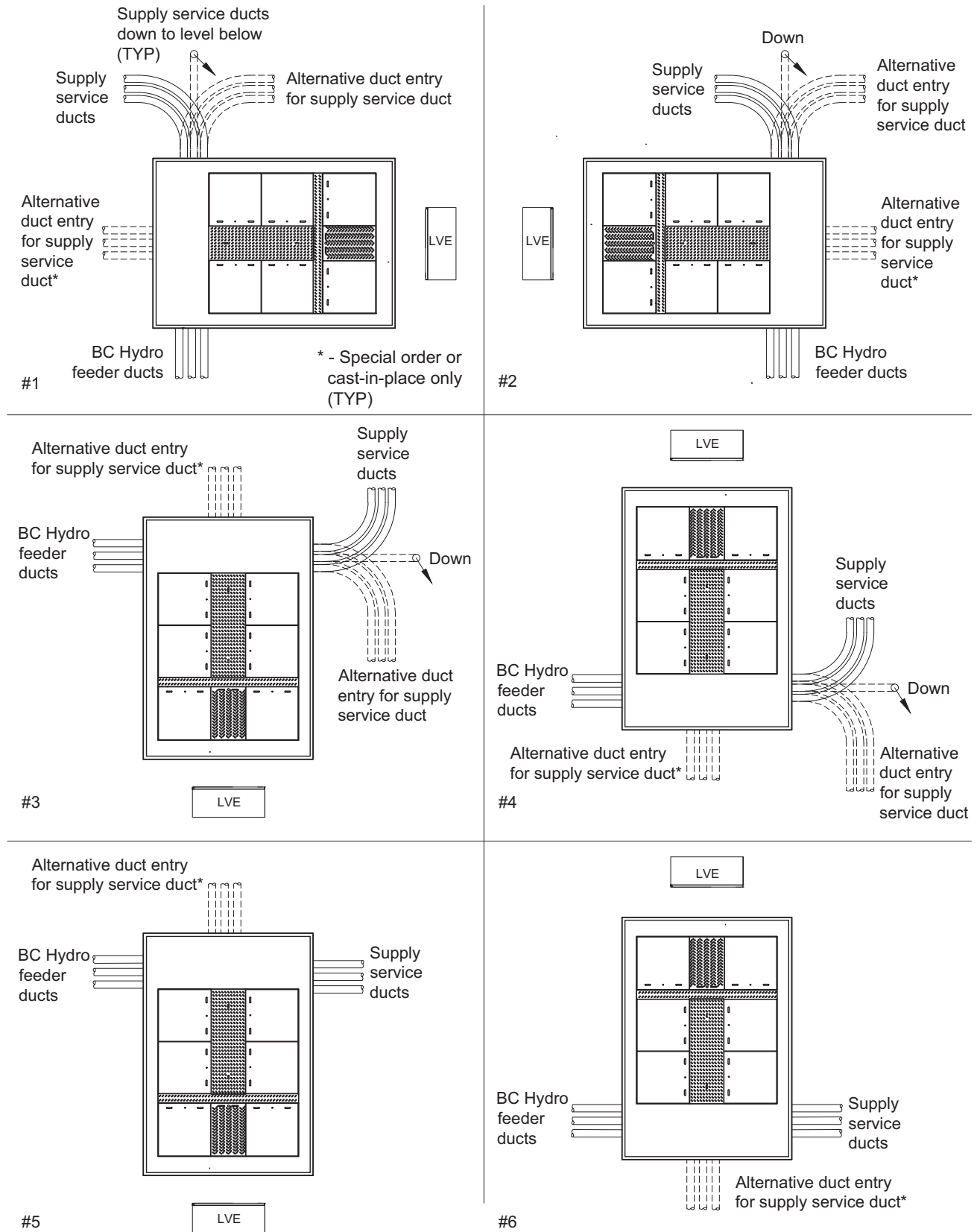


Figure 4a – Alternative duct entry options (1 through 6)

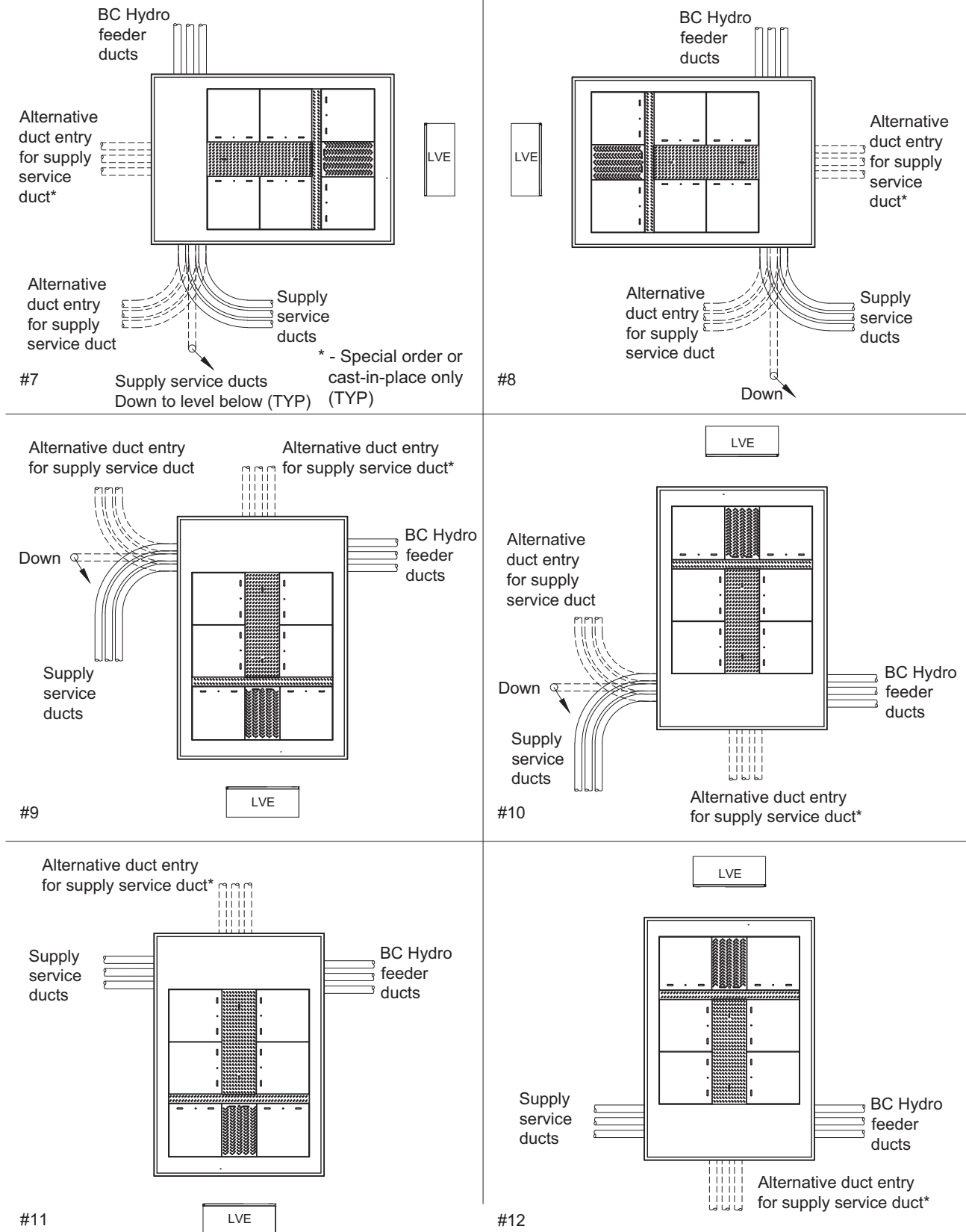


Figure 4b – Alternative duct entry options (7 through 12)

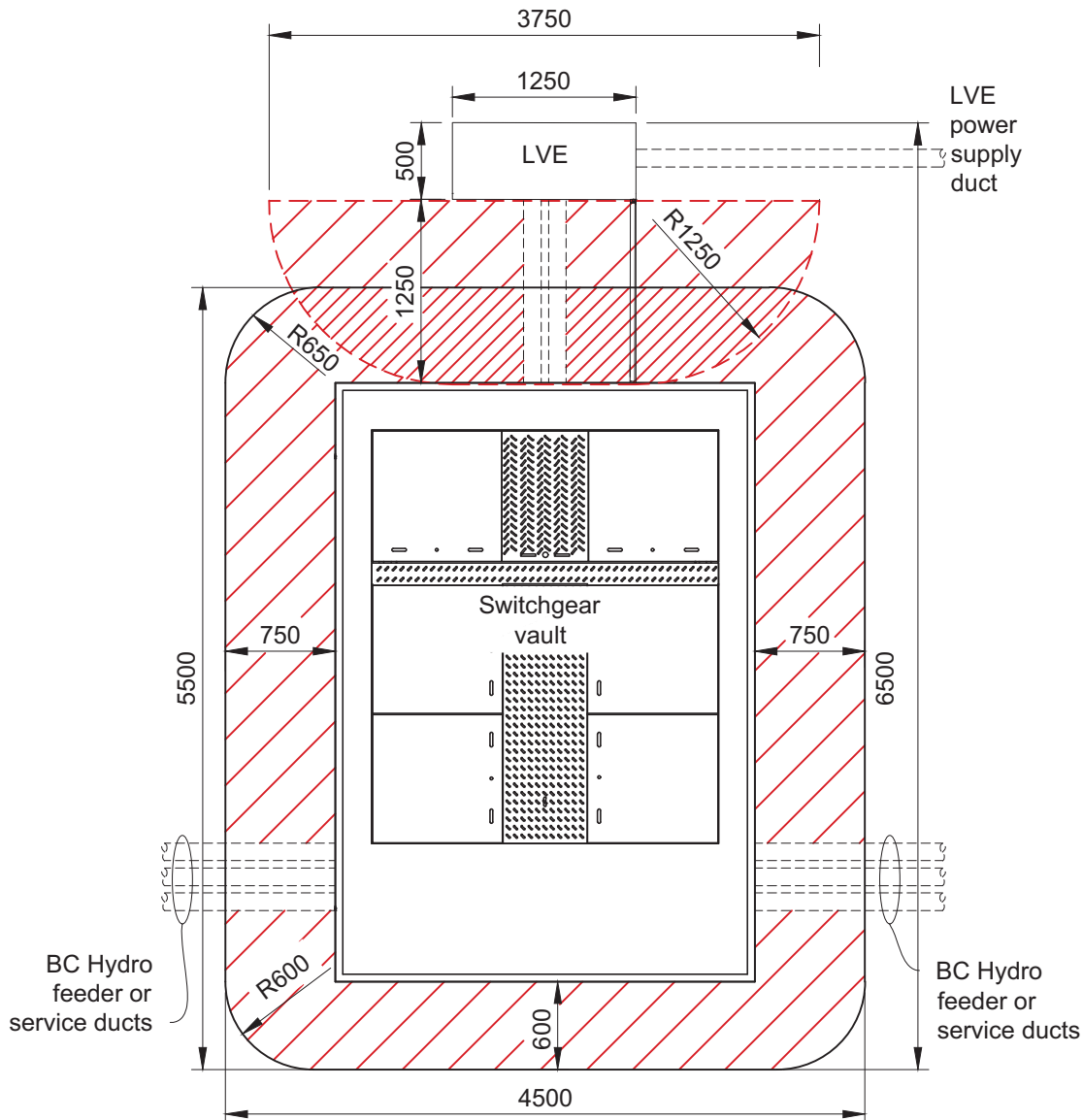


Figure 5b – Minimum unobstructed clearance requirements, compact layout

1.5 Grounding Requirements

Grounding and bonding shall meet the minimum requirements shown in Figures 6 and 7 and the provisions in Tables 1 and 2. These requirements ensure equipotential grounding, mitigate touch-potential hazards, and comply with BC Hydro standards.

High-voltage safety grounding inside the building and around the BC Hydro-owned switchgear area shall be constructed according to BC Hydro standards, ensuring equipotential grounding and mitigating hazardous touch potential. This standard provides the minimum BC Hydro grounding requirements for equipotential grounding. The customer could install additional grounding and bonding conductors and connections in compliance with BCEC section 36.

BC Hydro does not supply grounding materials unless explicitly noted. Customer-installed grounding components shall be rated for direct burial and be supplied, installed, and maintained by the customer.

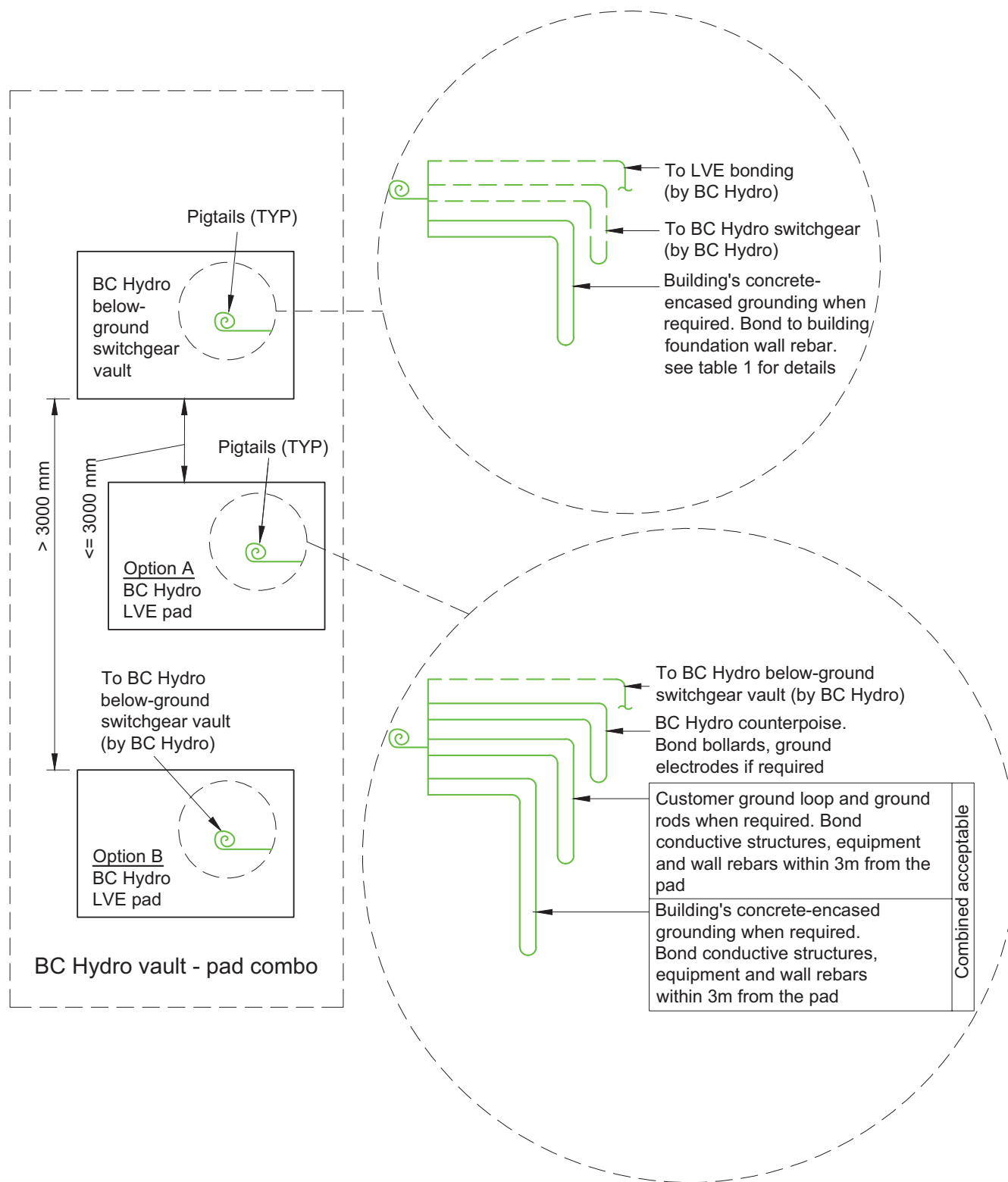


Figure 6 – Grounding and bonding schematics for installation on suitable backfill outside building footprint on private property

Table 1 – Key requirements for grounding and bonding in-vault below-ground equipment for installation on suitable backfill outside building footprint on private property

Item	Key requirements	Special case	ES54 reference standards
BC Hydro counterpoise for in-vault switchgear	No grounding kit is supplied with the BC Hydro in-vault design. The vault is self-grounding (vault with integral concrete-encased ground electrode).	The customer shall provide two remote grounding connections to the building foundation wall rebar when a BC Hydro subsurface concrete vault is placed on top of a building structure that has inadequate soil depth for an effective earth connection.	R2-02
BC Hydro counterpoise for pad-mounted LVE located 3000 mm or less from the vault	LVE pad located 3000 mm or less from the vault shall have BC Hydro counterpoise installed. BC Hydro will provide a grounding kit with a wire rope to be used as the counterpoise for pad-mounted equipment. Install 300 mm below grade with a maximum offset of 900 mm from the pad unless otherwise noted.	900 mm clearance from the pad may be reduced up to half the distance between the pad and above-ground wall or fence when in proximity to the structure, such as an alcove installation, and 900 mm clearance requirements cannot be met due to construction constraints and site-specific conditions. Subject to review and acceptance by a BC Hydro designer.	F3-06 F3-07 R1-02
Customer ground loop for pad-mounted LVE located 3000 mm or less from the vault	Maintain 300 mm minimum and 900 mm maximum separation from BC Hydro counterpoise. Customer ground loop shall not be connected to BC Hydro ground rods or counterpoise.	The building concrete-encased grounding may be used as part of a customer ground loop in areas where the minimum clearance between the BC Hydro counterpoise and customer ground loop cannot be maintained.	F3-06 F3-07 R1-02
Pigtail provision	Pigtails at least 600 mm in length inside pad window or vault. Grounding termination by BC Hydro crew.		F3-06 F3-07 R1-02 R2-02
Bonding of nearby structures within 3 m of the LVE pad when located 3000 mm or less from the vault	Exposed conductive structures within 3 m of the LVE pad shall be bonded to the customer ground loop with a minimum of two conductors. LVE protective bollards, if installed, shall be bonded to the BC Hydro counterpoise.	For rebar grounding and exceptions, remote connections and bollard bonding details refer to details outlined in referenced standards.	F3-06 F3-07 R1-02 U2-02
Customer grounding components and materials	Materials and components shall be CSA (or equivalent) certified for direct burial		F3-06 F3-07 R1-02

Item	Key requirements	Special case	ES54 reference standards
Requirements for customer grounding and bonding conductors	Minimum 2/0 AWG Cu bare stranded for customer ground loop. 2/0 AWG Cu insulated 1 kV green stranded for pigtails.		F3-06 F3-07 R1-02
Installer declaration	Grounding and ducting installations shall be inspected by a BC Hydro civil inspector before pouring concrete or placing backfill. The contractor shall complete an installer's declaration (see referenced standards) before the inspection and provide it to the BC Hydro civil inspector		F3-06 F3-07 R1-02

See referenced standards in Table 1 for full lists of items required (bill of materials) to complete grounding and bonding installation.

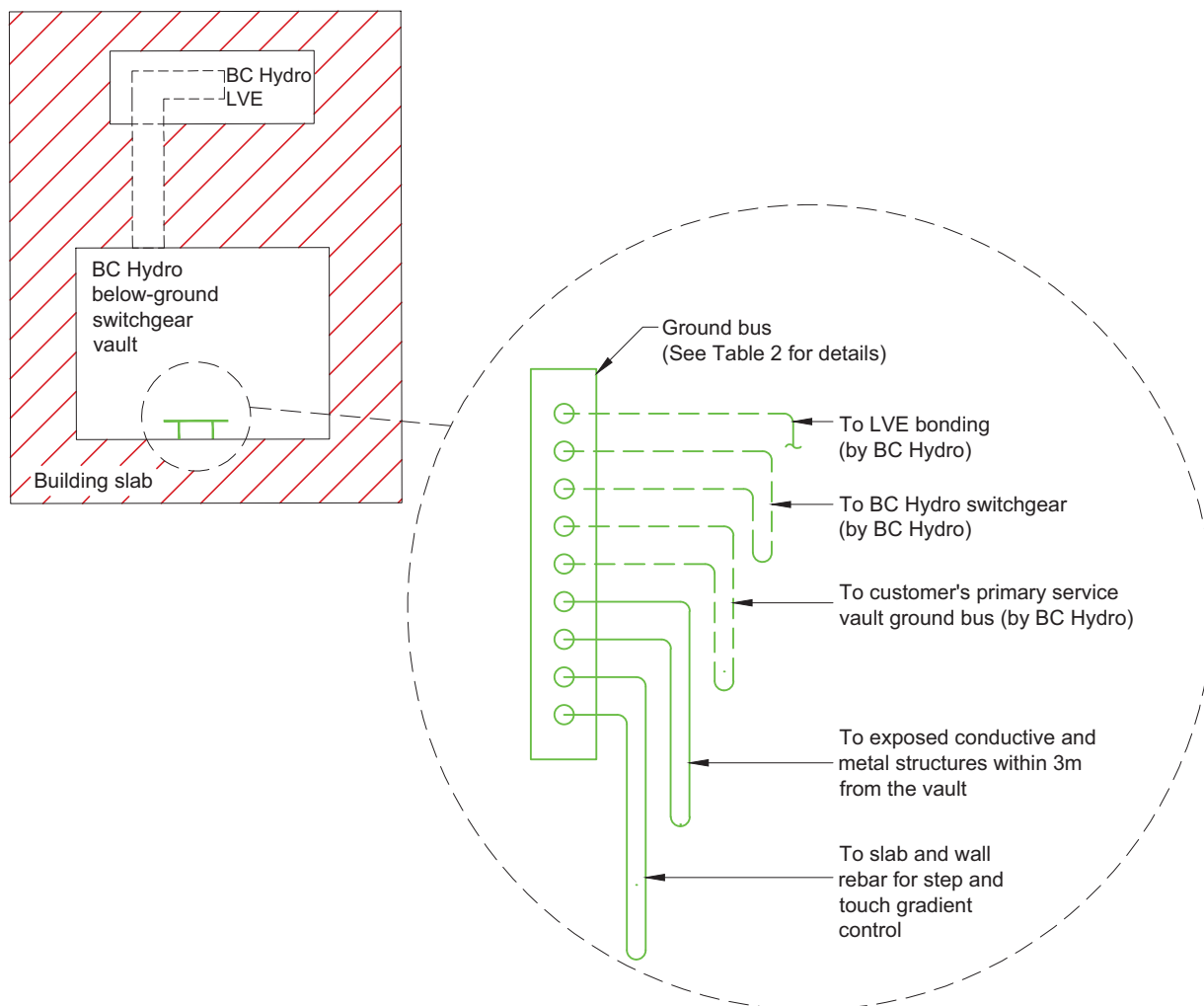


Figure 7 – Grounding and bonding schematics for installation on top of building sub-levels or inside an alcove within the building envelope on private property

Table 2 – Key requirements for grounding and bonding in-vault below-ground equipment for installation on top of building sublevels or inside an alcove within the building envelope on private property

Item	Key requirements	Special case	ES54 reference standards
Ground bus	Ground bus 24" x 4" x ¼" NEMA spacing, comes with support insulators, wall mount Burndy BBB424UD, Erico EGBA14424 or BC Hydro approved equivalent. Install inside the vault 450 mm above the vault floor. Position on the wall adjacent to incoming BC Hydro feeder ducts (see Figure 13).		
Bonding nearby structures	Exposed conductive structures within 3 m of the vault shall be bonded to the ground bus with a minimum of two conductors	For rebar grounding, remote connections and bollard bonding details refer to details outlined in referenced standards	F3-08
Step-and-touch gradient control loop around LVE	Install in-slab gradient control loop around LVE with a maximum offset of 900 mm from the LVE unless otherwise noted. Bond to the vault ground bus with a minimum of two conductors.	Building concrete-encased grounding may be used as part of the gradient control loop	F3-08
Customer grounding components and materials	See Table 1		F3-08
Requirements for customer grounding and bonding conductors	Minimum 2/0 AWG Cu bare stranded		F3-08
Installer declaration	See Table 1		F3-08

See referenced standards in Table 2 for full lists of items required (bill of materials) to complete grounding and bonding installation.

1.6 Bollard Requirements

Protective bollards shall be installed in accordance with ES54 U2-02. Bollards may be required when the LVE is located within 3 m of a roadway, driveway, or parking area. The number and placement of bollards shall be sufficient to prevent vehicle contact with the LVE. Bollards are typically spaced 1.2 m apart and placed just outside the unobstructed area.

1.7 Alcove Requirements

Figure 8 illustrates typical general arrangements for BC Hydro-owned in-vault below-ground switchgear inside an alcove in a customer-owned building. A removable gate or removable bollards shall be installed on the access side and shall comply with ES54 S0-06 equipment location and access requirements. See ES54 F3-06 and ES54 F3-08 for removable gate or removable bollard list of items materials (bill of materials) and minimum installation requirements.

The alcove shall have a minimum height of 4600 mm. If an I-beam lift trolley is installed to place the switchgear and LVE, the alcove height may be reduced so the bottom of the I-beam lift trolley hook is

2800 mm above grade. See ES54 S0-06 and notes 1 and 3 for additional clearance requirements and installation details.

A building canopy, balcony, or any other part of the building shall not project over the switchgear below if height above switchgear is less than 4600 mm.

The customer primary service vault shall be located close to the alcove to limit the service cable run and duct length to 10 m (see *Requirements for Customer-Owned Primary Services Supplied at 4 kV to 35 kV.*)

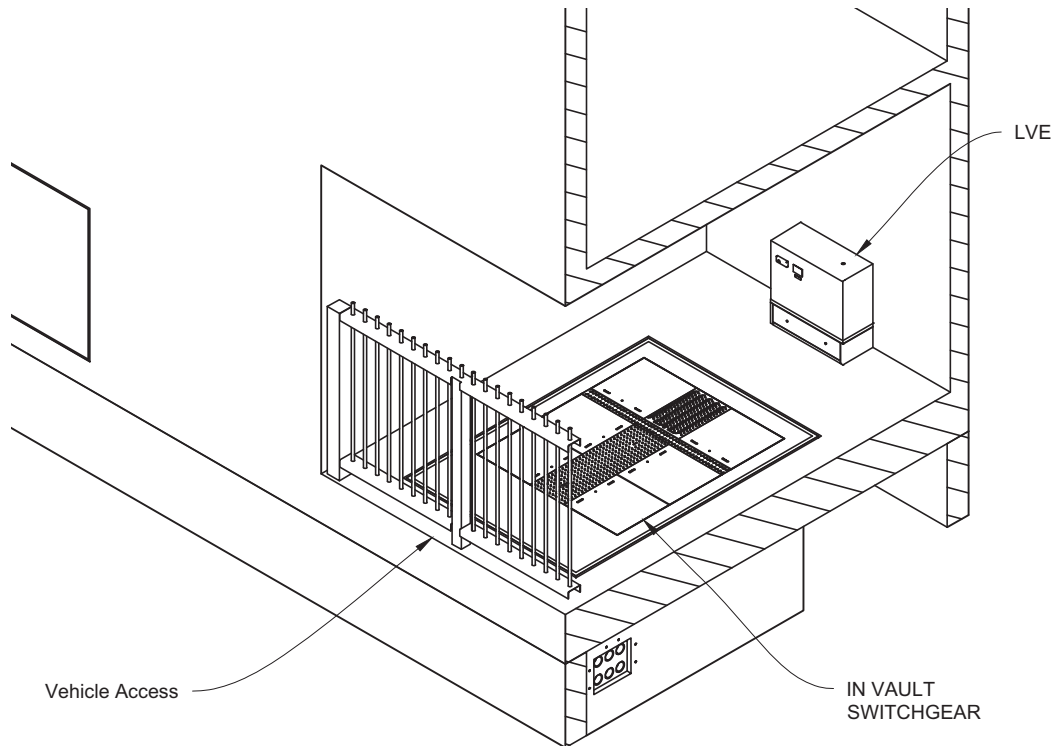


Figure 8 – General arrangement for BC Hydro-owned in-vault below-ground switchgear inside an alcove in a customer-owned building

2. Precast Component Assembly

The in-vault design consists of three precast parts:

- Vault;
- Collar with lids; and
- LVE pad.

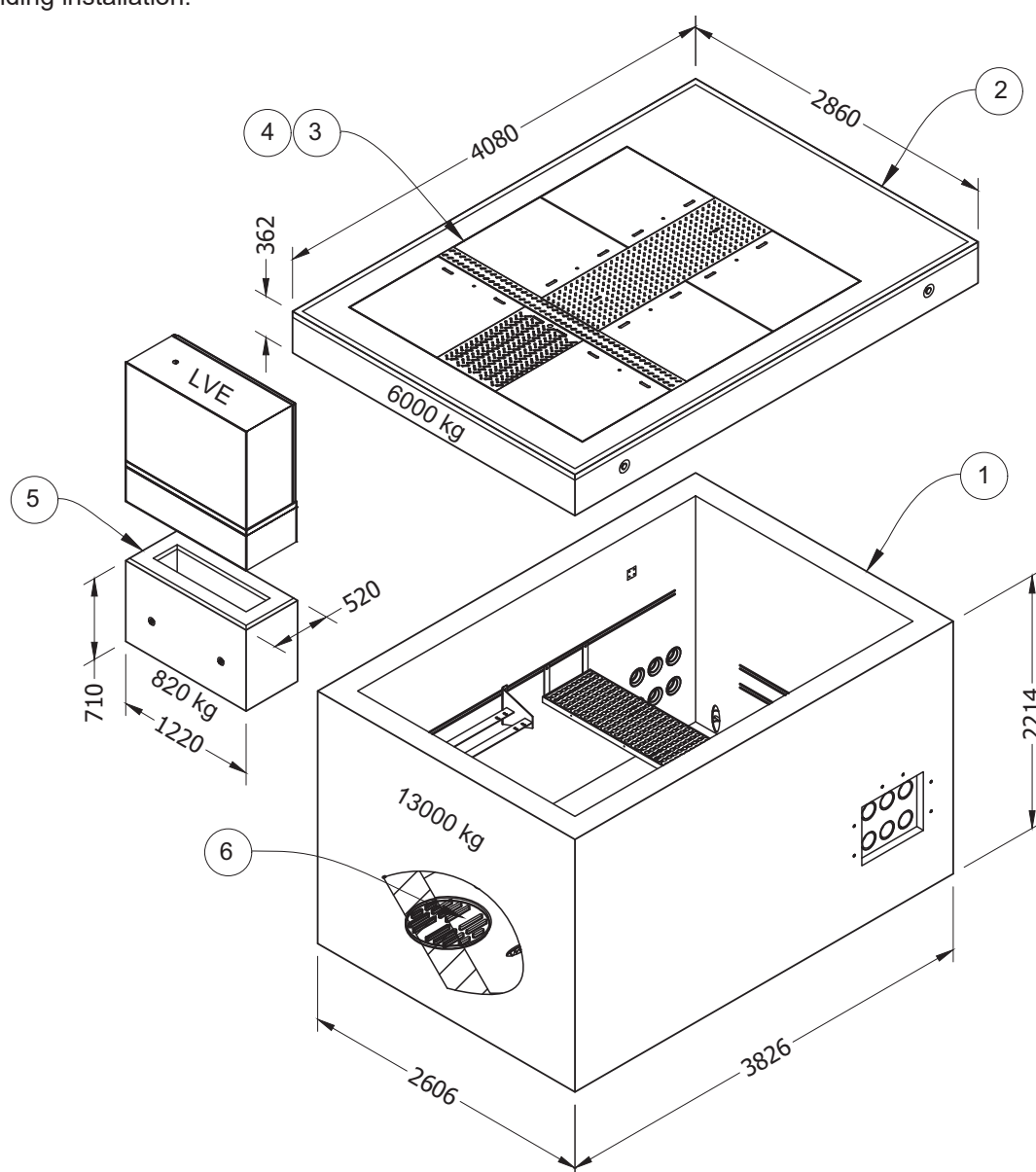
BC Hydro precast components are recommended for all three parts of the installation. The vault component may be cast in place by the customer. See note 3 for the cast-in-place option.

The collar shall be properly aligned with the vault to ensure the final elevation is level and meets BC Hydro installation tolerances.

Table 3 – Precast component items required (bill of materials)

Item	Qty	Description	Material no.	Length (mm)	Width (mm)	Depth (mm)	Weight (kg)	Supplied by
1	1	Vault	9600-5803	3830	2630	2215	13000	BC Hydro
2	1	Collar and frame	9600-5803	4080	2860	365	6000	BC Hydro
3	6	Lid	9600-7598	890	880	70	33	BC Hydro
4	7	Lid hardware	412-0042					BC Hydro
5	1	LVE pad	9601-9917	1220	520	750	800	BC Hydro
6	1	Sump cover	400-0426	600	600	25	44	BC Hydro

See referenced standards in Table 1 to find lists of items required (bill of materials) to complete grounding and bonding installation.

**Figure 9** – Vault and LVE precast components

2.1 BC Hydro-Owned Switchgear on Suitable Backfill Outside Building Footprint

2.1.1 Installation on Native Soil More than 3m from Customer Building Structure

Figure 10 shows minimum installation requirements for in-vault outdoor below-ground BC Hydro-owned switchgear with precast vault located on private property on native soil outside the footprint of a building and more than 3 m from a customer building structure.

See ES55 B2-05, ES54 S0-06, and note 1 for minimum general requirements and typical assembly arrangements. See note 1 for minimum clearance and grounding requirements.

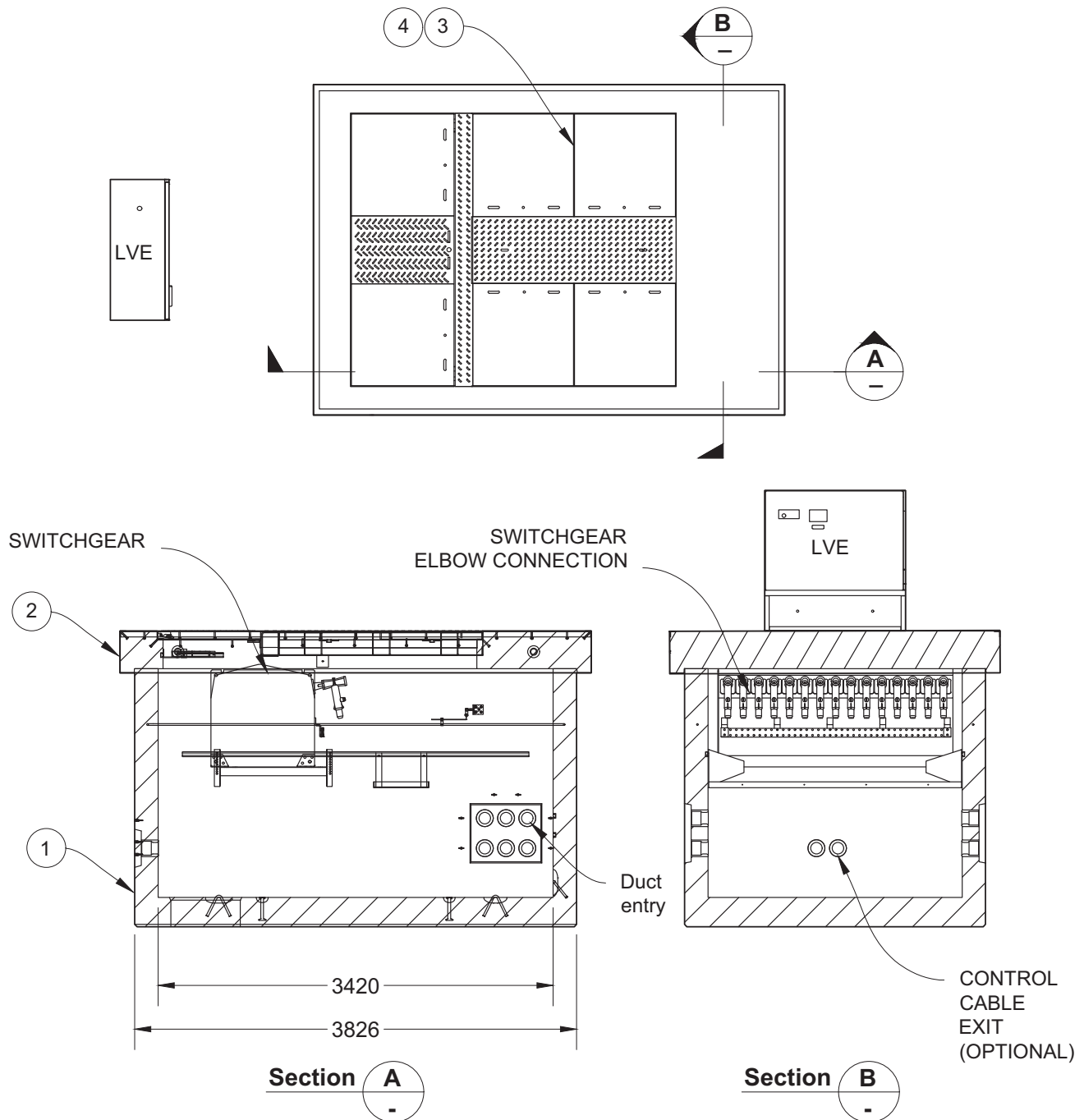


Figure 10 – In-vault below-ground outdoor switchgear plan and section view

2.1.2 Installation on Native Soil Within 3 m of Customer Building Structure

Figure 11 shows a typical installation for in-vault outdoor below-ground BC Hydro-owned switchgear with precast vault located on private property on native soil, outside the footprint of a building but within 3 m of a customer building structure.

A building canopy, balcony, or any other part of the building shall not project over the switchgear vault below if height above switchgear is less than 4.6 m.

See ES55 B2-05 and ES54 S0-06 for minimum general requirements and note 1 for typical assembly arrangements. See note 1 for general grounding and clearance requirements.

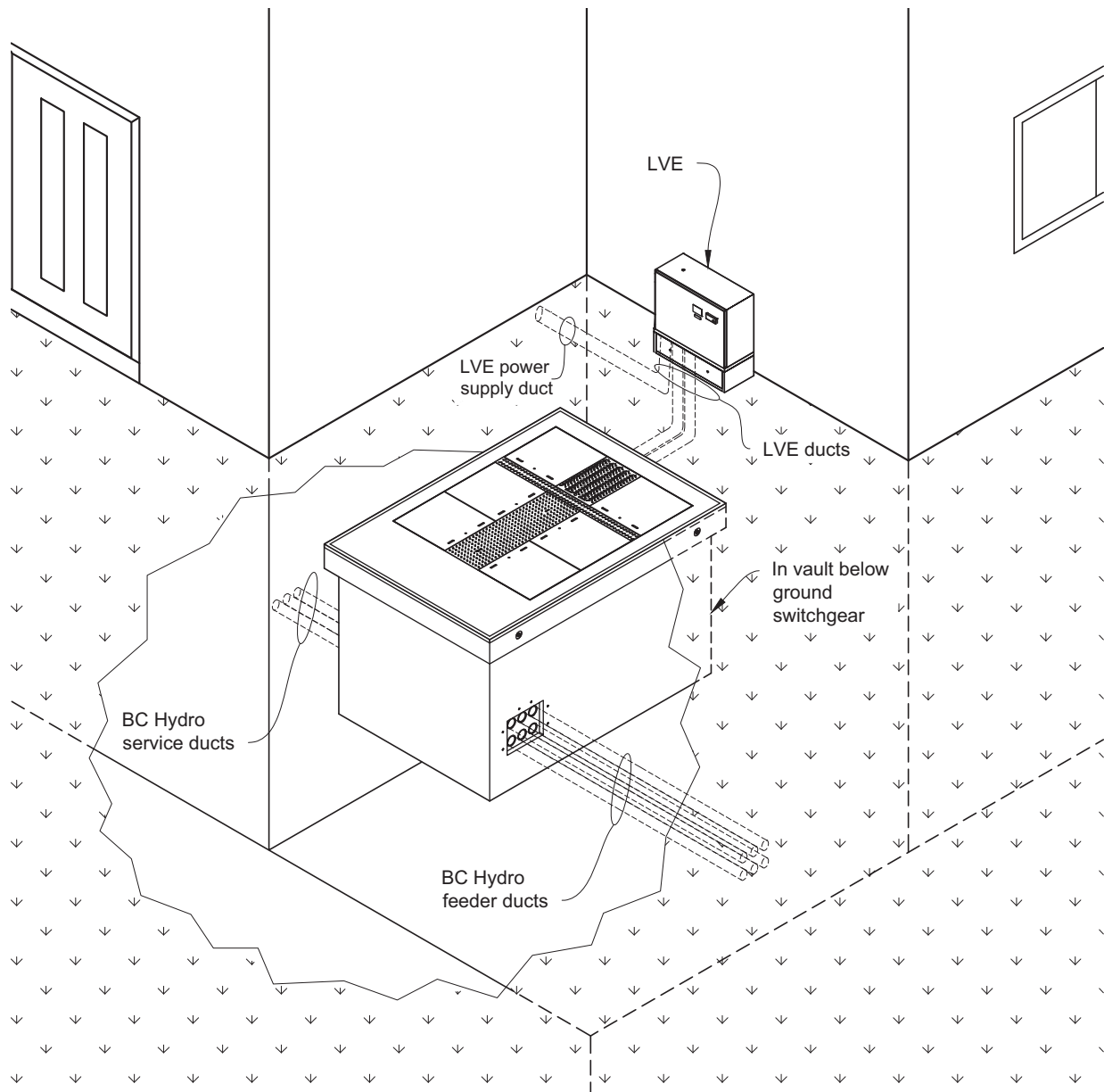


Figure 11 – BC Hydro-owned in-vault below-ground switchgear on suitable backfill within 3 m of building structure

3. Cast-in-Place Vault Requirements

The in-vault design for cast-in-place assembly consists of three parts:

- Cast-in-place vault;
- Collar with lids; and
- Cast-in-place cable channel between switchgear vault and control panel (LVE) mounting base.

The cast-in-place vault and collar shall be properly aligned to ensure the final elevation is level and meets BC Hydro installation tolerances.

Table 4 – Cast-in-place assembly items required (bill of materials)

Item	Qty	Description	Material no.	Length (mm)	Width (mm)	Depth (mm)	Weight (kg)	Supplied by
1	1	Cast-in-place vault						Contractor
2	1	Collar and frame	9600-5803	4080	2860	365	6000	BC Hydro
3	6	Lid	9600-7598	890	880	70	33	BC Hydro
4	7	Lid hardware	412-0042					BC Hydro
5	5	Pulling iron						Contractor
6	As req'd	C-channel Unistrut P-3270						Contractor
7	As req'd	75 mm bell ends						Contractor
		100 mm bell ends						Contractor
		125 mm bell ends	9602-1455					BC Hydro or contractor
8	1	Drain cover						Contractor
9	As req'd	Checker plate floor panels, Al or steel, removable						Contractor

See referenced standards in Tables 1 and 2 for lists of items required (bill of materials) to complete grounding and bonding installation.

See ES54 F3-08 for removable gate and removable bollard items required (bill of materials).

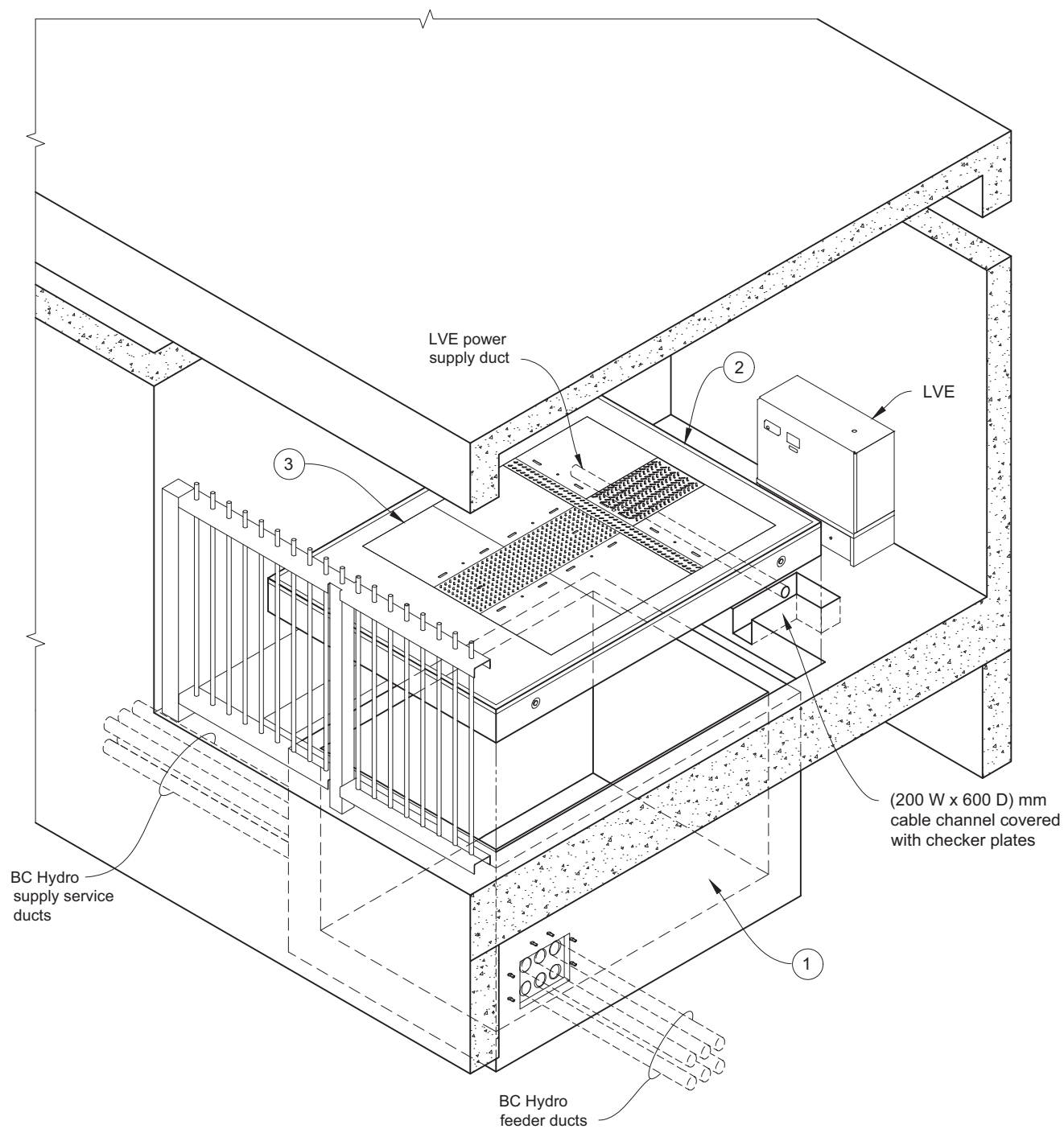


Figure 12 – Cast-in-place assembly

3.1 BC Hydro-Owned Switchgear on Top of Building Sublevels or Inside Alcove Within Building Envelope

Figures 13, 14, and 15 show minimum installation requirements for in-vault outdoor below-ground BC Hydro-owned switchgear with cast-in-place vault located on private property on top of building sublevels (parkade or storage) or inside an alcove in a customer-owned building.

See ES55 B2-05, ES54 S0-06, and note 1 for minimum general requirements and typical assembly arrangements.

The customer shall provide an engineered building structure inside the building to support the weight of the BC Hydro-owned switchgear and cables and account for pryout and pullout strength control requirements for BC Hydro pulling anchors. See ES54 S0-06 for BC Hydro equipment data information.

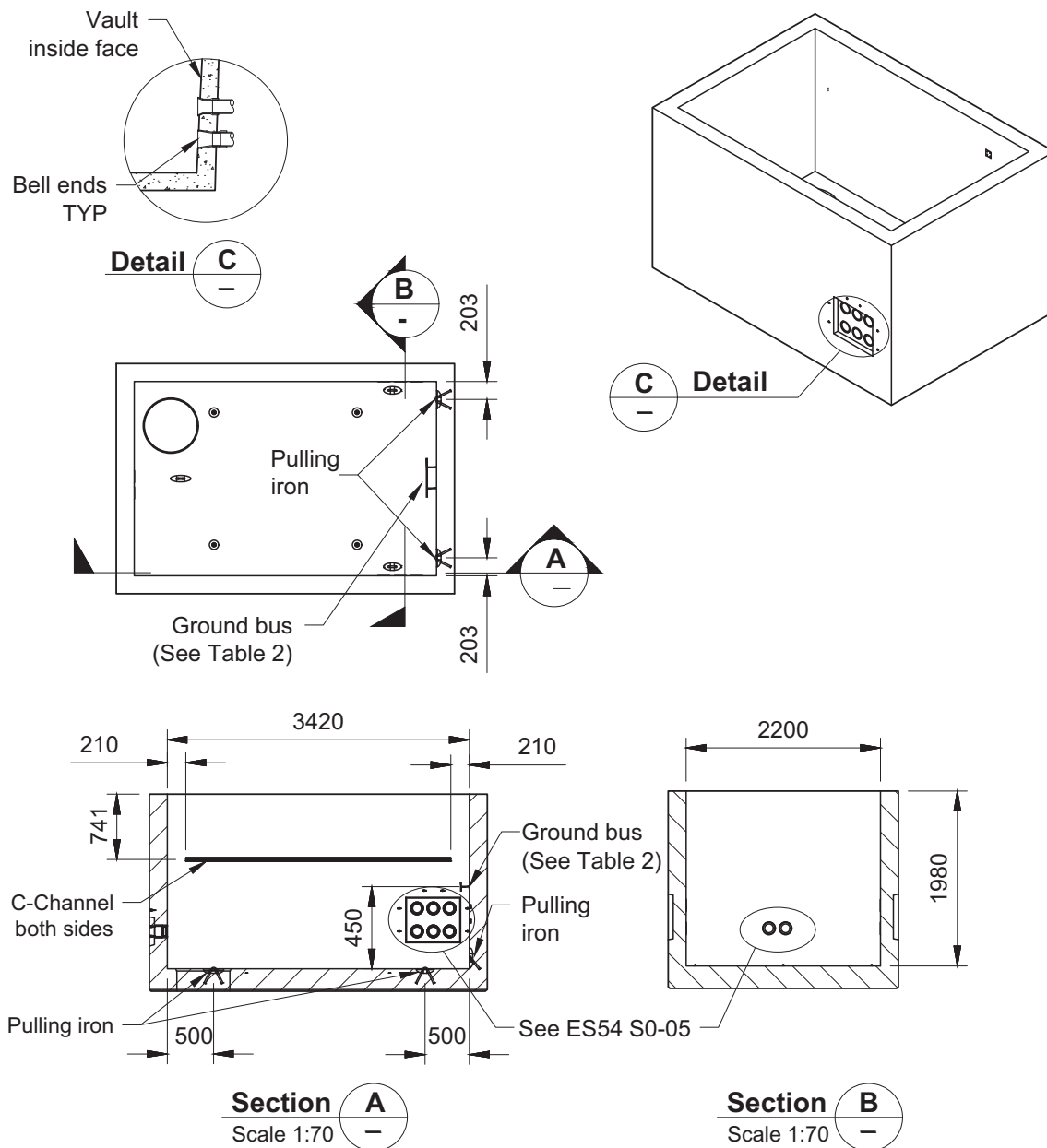


Figure 13 – Cast-in-place vault details

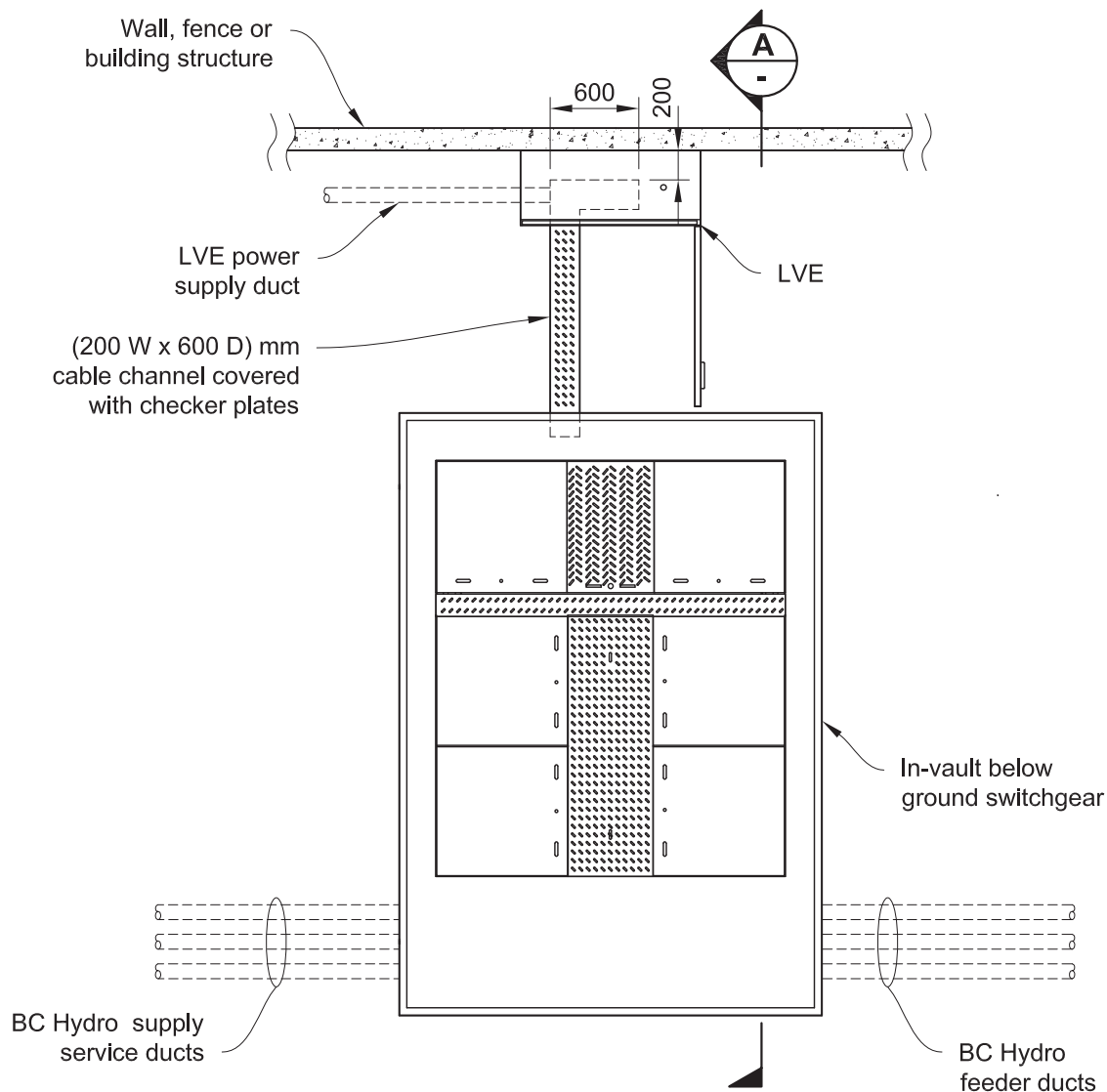


Figure 14 – Switchgear vault to LVE cable channel details

The BC Hydro switchgear and control panel require a recessed cable trough 200 mm wide x 600 mm deep, covered with a removable steel or aluminum 6 mm ($\frac{1}{4}$ ") thick checker plate less than 40 lb in weight (less than 80 lb hinged), with drop-down lifting handles mechanically interlocked or bolted down to the support floor joists, installed between the switchgear vault and control panel (LVE) mounting base. The recessed cable trough widens below the control panel (LVE), as shown in the figures.

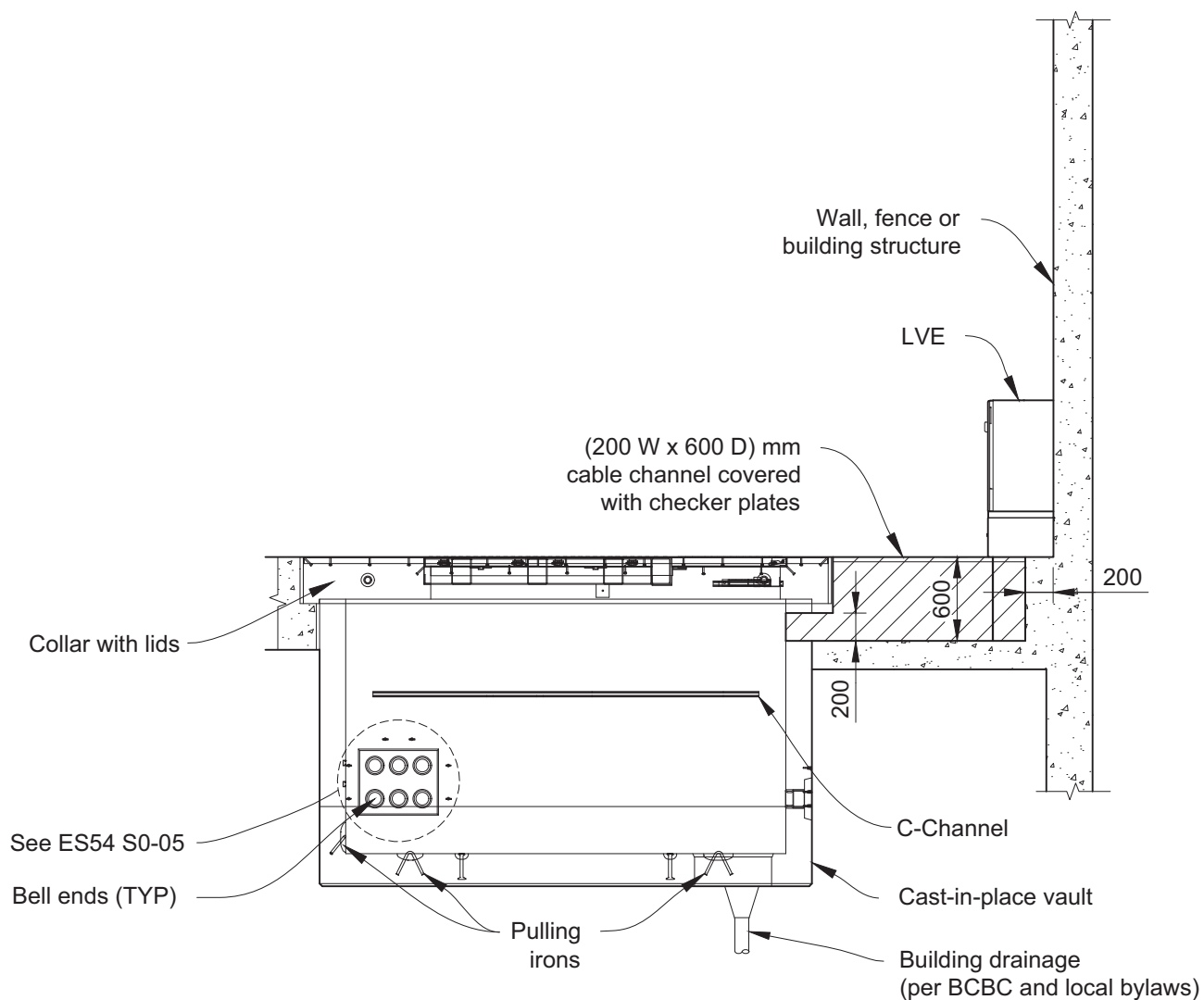


Figure 15 – Cast-in-place vault section view