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REVISIONS: UPDATED LEGAL ACKNOWLEDGEMENT FORM. FD MAR '16

DESIGNED J. AGNOLIN	RECOMMENDED  F. DENNERT	ACCEPTED  G. REIMER	ENGINEER OF RECORD 	NOTICE FROM THE EXECUTIVE VICE PRESIDENT TRANSMISSION AND DISTRIBUTION AND CUSTOMER SERVICE	
DISTRIBUTION STANDARDS 		ISSUED: MAR 2016 REPLACES: MAY 2004 ORIGINALLY ISSUED: NOV 1980		PAGE 1 OF 2	ES43/53/54/55/65 A1-01.01 ^R 4

Scope

This manual is one of a series containing standards for construction of the BC Hydro electrical distribution plant within the service area of BC Hydro. A new distribution plant shall be designed, constructed, owned, operated, maintained and repaired to these standards.

Purpose of Standards

BC Hydro objectives require standardization to:

- Ensure uniform safety requirements comply with BC statutes and regulations.
- Provide uniform system reliability.
- Provide uniform operating practices.
- Permit economic bulk purchasing of materials.
- Achieve optimum life cycle cost of plant construction.
- Effect efficient quality assurance.

Responsibility

The Distribution Standards Department prepares these standards and verifies that specified plant and procedures will perform adequately under all normally expected conditions encountered throughout the province of British Columbia. These standards are approved by Professional Engineers. It is the responsibility of BC Hydro Managers to ensure that the standards are followed unless abnormal conditions are encountered that require variations. These variations should be kept to a minimum and their performance shall be the responsibility of the Professional of Record in charge of the project, who will record and seal the variation based on satisfactory qualifications and experience to do so. As per the latest revision of the BC Hydro Distribution Owner's Engineer Guide, these variations must be accepted by BC Hydro's Owner's Engineer.

Use of Stock Materials

The electrical distribution plant covered by these standards is built using stock materials approved by a Professional Engineer as required by law. The use of non-stock materials for special and unusual situations must be approved by Distribution Standards or the BC Hydro Engineer responsible for the project.

Revisions to Manual




These standards are revised from time to time to improve the safety, performance, workability, cost effectiveness or appearance of the plant. The existing plant built to previous standards need not be updated unless so specifically advised by BC Hydro. When maintenance or other work, such as voltage conversion or conductor change is being done, updating plant to current standards is encouraged.

Mailing Addresses

The manual has been issued to a corporation or firm rather than to an individual. The corporation or firm is responsible for the safekeeping of the manual, and for keeping it current. Changes of address or in number of copies required must be reported promptly.

Suggestions for changes in the manual, or required changes of address may be made on the pre-addressed comment sheet included in the Manual and with each issue of revision.

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DISTRIBUTION STANDARDS BC Hydro		ISSUED: MAR 2016 REPLACES: MAY 2004 ORIGINALLY ISSUED: NOV 1980		PAGE 2 OF 2	ES43/53/54/55/65 A1-01.02	R 4



Information Bulletin:

Concrete Encasement of Customer Service Ducts inside Customer-Owned Buildings

1.0 Items Covered

- ES54 S1-01 R8 Secondary Single-Phase Services 120/240 V Up To 600 A
Revenue Meter Socket Installation
- ES43 N2-05 R5 Service Connections Parallel Multiplex Connections and/or
Parallel Customer Masts

2.0 Overview

This bulletin covers details of the connection of underground residential services, and clarifies the BC Hydro and BC Safety Authority requirements for:

- concrete encasement of customer-owned electrical service ducts, and
- the location of large 400 and 600 A 120/240 V electrical services.

BC Electrical Code Rule 6-208 states that raceways or cables containing service conductors shall be located outside the building, unless they are embedded in, and encircled by, no less than 50 mm (2") of concrete or masonry. BC Hydro installation experience has shown that a 50 mm (2") encasement has a relatively short life expectancy and is not adequate. Therefore, BC Hydro stipulates a minimum of 75 mm (3") of concrete encasement inside the building. This apparent conflict has caused challenges for BC Hydro customers.

For underground services, BC Hydro's jurisdiction ends at the meter socket or the utility cable compartment inside the customer's service box. To mitigate the code conflict with the BC Safety Authority, BC Hydro will harmonize its requirement with the BC Electrical Code, specifying a 50 mm (2") minimum concrete encasement inside the building for 120/240 V services up to 600 A.

For overhead services, BC Hydro jurisdiction on private property ends at the point of the customer service connection, namely the service mast "drip loops". Accordingly, BC Hydro cannot request concrete encasement.

BC Electrical Code Rule 6-206 specifies various requirements for the customer service location. However, the past history of BC Hydro legal disputes to gain access into single family dwellings has forced BC Hydro to reject all installations of customer residential services up to 600 A located inside customer-owned building.

3.0 Action

- 1) For overhead supply service, BC Hydro has no authority to stipulate the type of concrete encasement inside the customer's building walls, because that portion of the installation is under BC Safety Authority jurisdiction. Nevertheless, BC Hydro highly recommends that the customer keeps the utility supply service conductors outside the building walls or has them concrete-encased. This recommendation stems from the lack of adequate overcurrent protection of utility service conductors, which could overheat and cause a fire.

ES43 N2-05, Note 1, has therefore been revised, removing the mandatory concrete encasement requirement.

- 2) For underground residential services, single-phase 120/240 V up to 600 A, BC Hydro shall adopt BC Electrical Code Rule 6-208, stipulating a minimum of 50 mm (2") of concrete encasement.

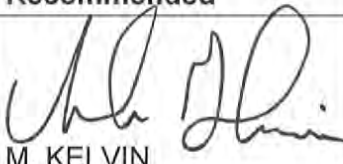


Note: the BC Hydro designer may specify 4"dia duct for longer service runs or cumulative bends exceeding 135°.

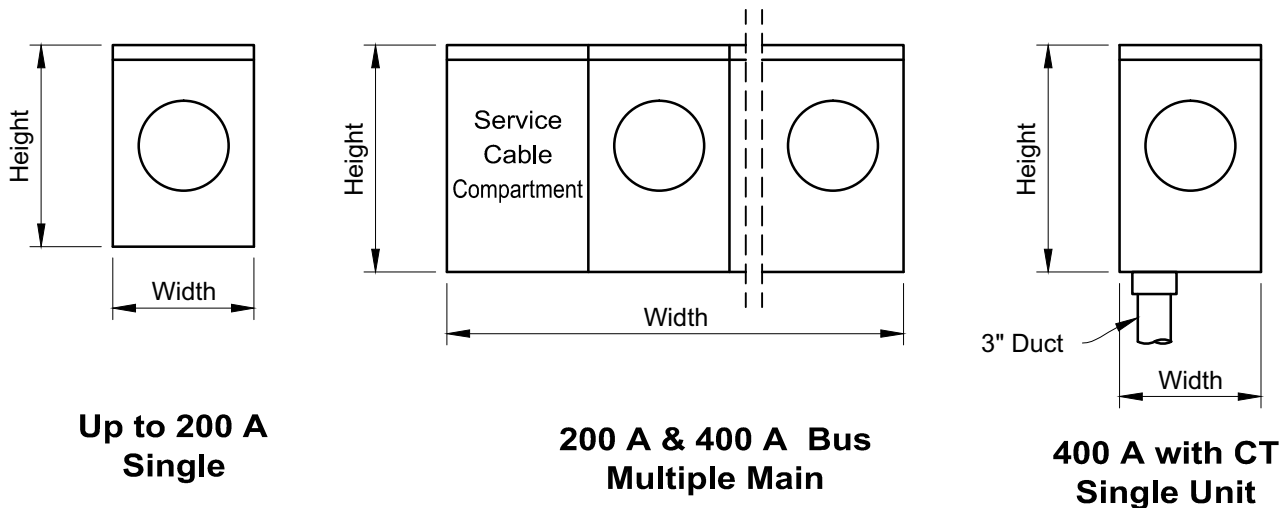
- 3) For underground three-phase 120/208 V and 347/600 V low voltage services, and all underground primary voltage services, BC Hydro shall continue with the requirement of a minimum of 75 mm (3") of concrete encasement inside the customer building.
- 4) All residential 400 A and 600 A 120/240 V services shall be installed inside a detached power shed, an outdoor type power kiosk, or a power closet attached to a dwelling. For all such installations, BC Hydro shall have unrestricted access directly from outside. BC Hydro shall not accept residential services installed inside an electrical room that is located inside a dwelling, regardless of any unrestricted access for BC Hydro personnel.
- 5) Commercial and industrial type 400 A and 600 A 120/240 V service equipment located inside a customer building is acceptable.

4.0 Distribution Standards Contact

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Phone #: 604-529-5679	Cell #: 604-220-3905

5.0 Approval

Recommended		Reviewed		Approved	
					
M. KELVIN		C. PICASSI		F. DENNERT	
Date:	2017-04- 27	Date:	2017-04- 27	Date:	2017-04- 27



Minimum Requirements of Enclosures for Meter Sockets
Services up to 600 A 120/240 V

Type of Enclosure	Sockets	Minimum Outside Dimensions (mm)			Minimum K.O. and Duct Size	Minimum Line Side Connector Range
		Height	Width	Depth		
Up to 200 A Single Service	1	430	240	130	3"	#2-3/0 Cu #2-250 kcm Al
200 A Main Bus Multiple Main	2	380	435	130	3"	#2-3/0 Cu #2-250 kcm Al
	3	380	650	130		
	4	380	870	130		
400 A Main Bus Multiple Main	2	508	665	140	3"	#4/0-500 kcm Cu/Al
	3	508	880	140		
	4	508	1110	140		
400 A with Integral CT Single Service	1	915	520	210	3"	#4/0-500 kcm Cu/Al
400 A with CT and Breaker	1	1067	660	133	3"	#4/0-500 kcm Cu/Al
600 A with Integral CT Single Service	1	Meter Socket: Wall mount Outdoor Kiosk: Pad-mounted			2 x 3"	#4/0-500 kcm Cu/Al 2 Lugs/Phase

DESIGNED
M. KELVIN

RECOMMENDED
C. PICASSI

ACCEPTED
F. DENNERT

ENGINEER OF RECORD



2017-04-27

SECONDARY SINGLE-PHASE SERVICES
120/240 V UP TO 600 A
REVENUE METER SOCKET INSTALLATION

DISTRIBUTION STANDARDS
BC Hydro

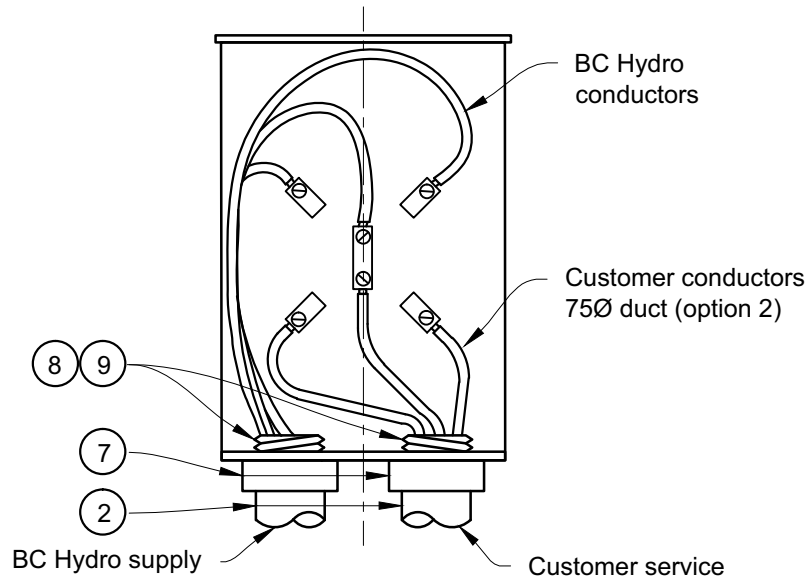
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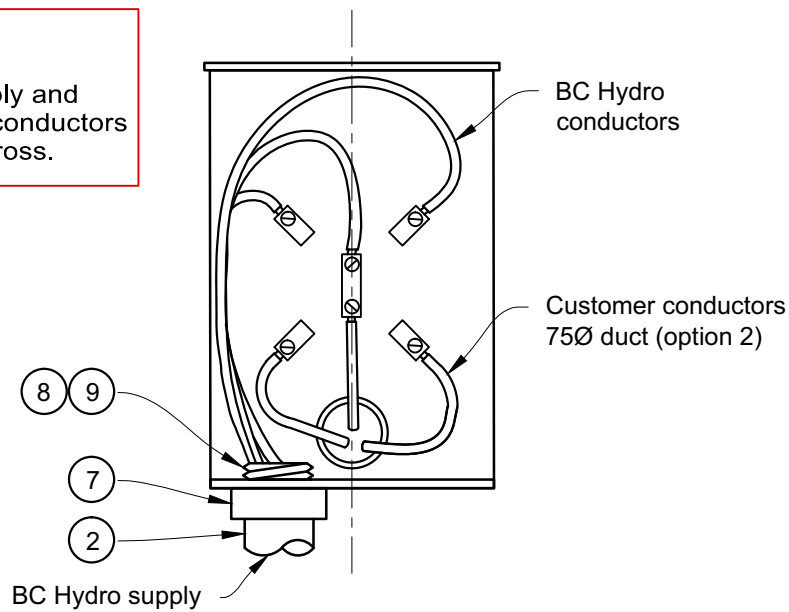
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**Figure 1 - 200 A Meter Socket
Customer Bottom Exit**

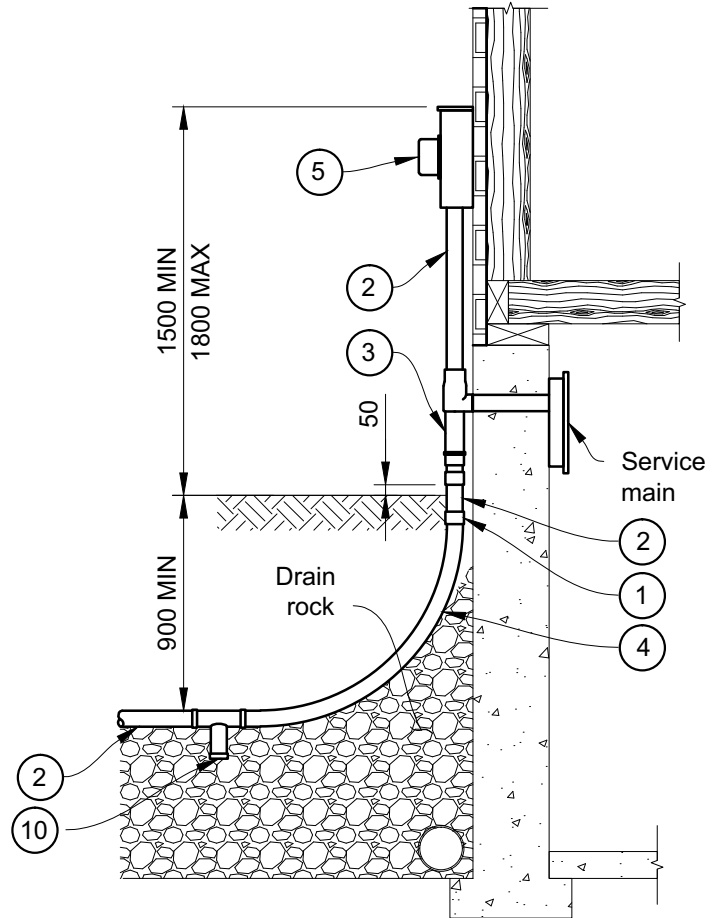
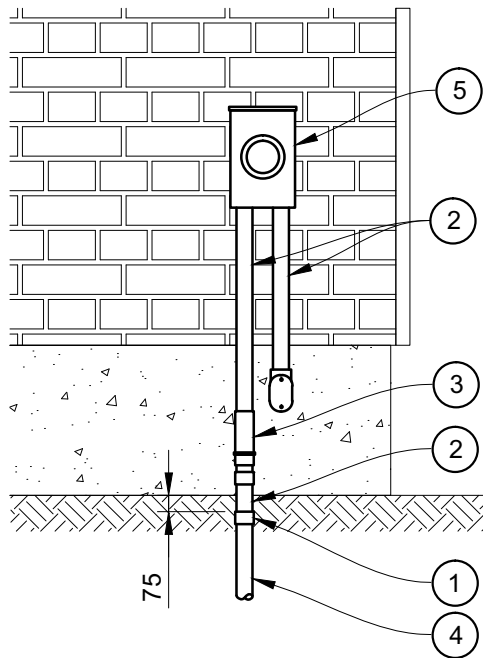
CAUTION
Utility supply and customer conductors shall not cross.








**Figure 2 - 200 A Meter Socket
Customer Back Exit**

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DISTRIBUTION STANDARDS 		ISSUED: APR 2017 REPLACES: FEB 2017 ORIGINALLY ISSUED: OCT 1979		PAGE 2 OF 13	ES54 S1-01.02 R 8

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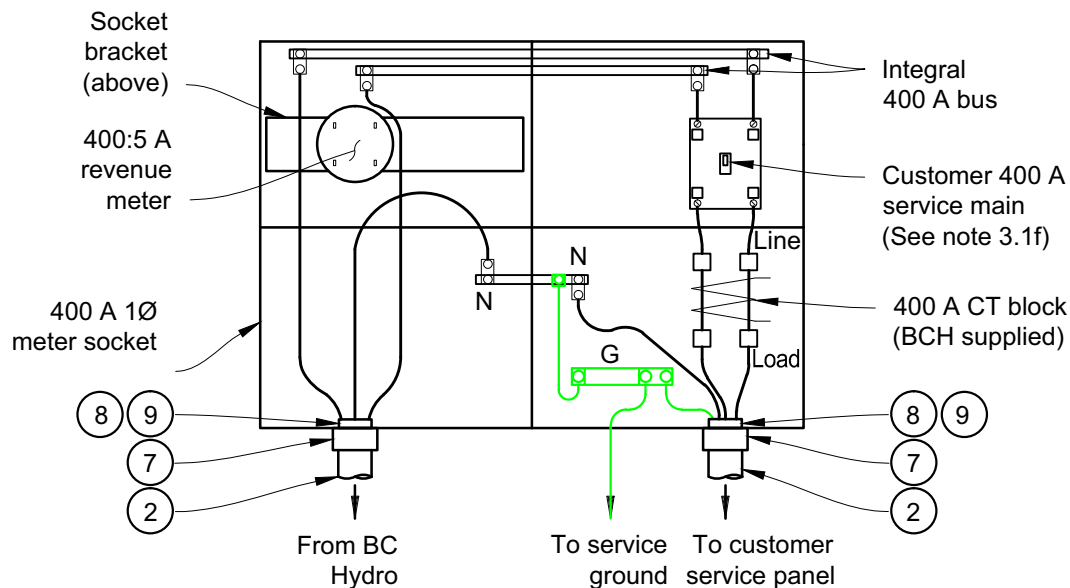


Figure 1 - 400 A Single Service Integral Meter Socket

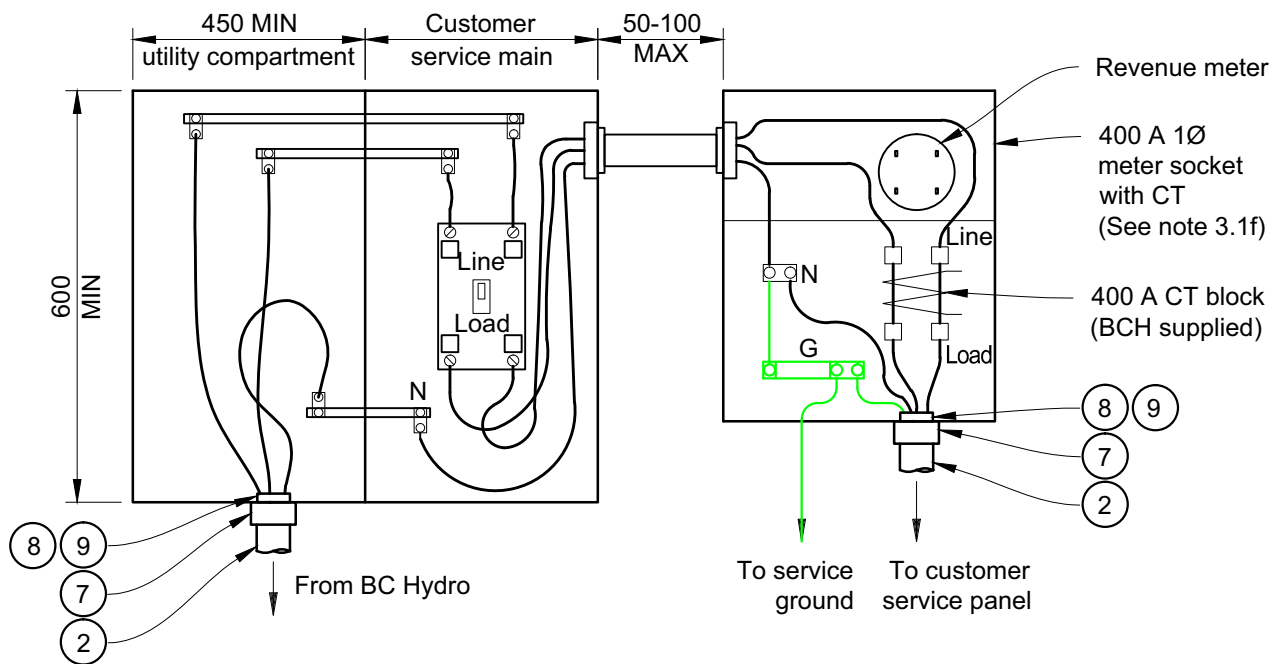





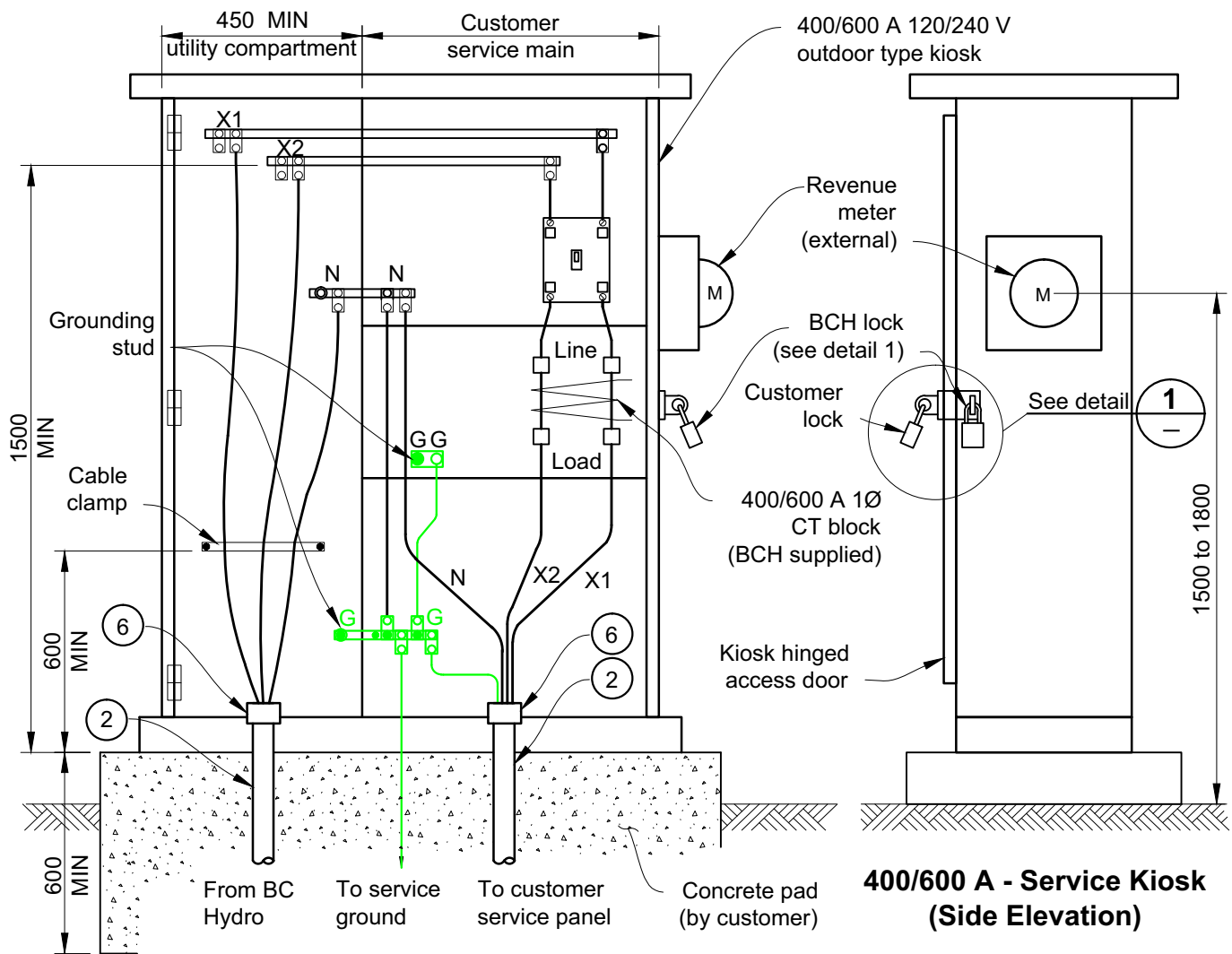


Figure 2 - 400 A Single Service Field Assembled Main/Meter Socket

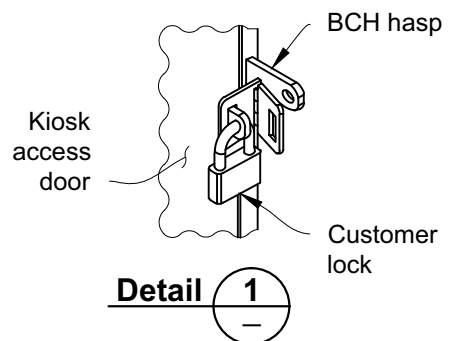
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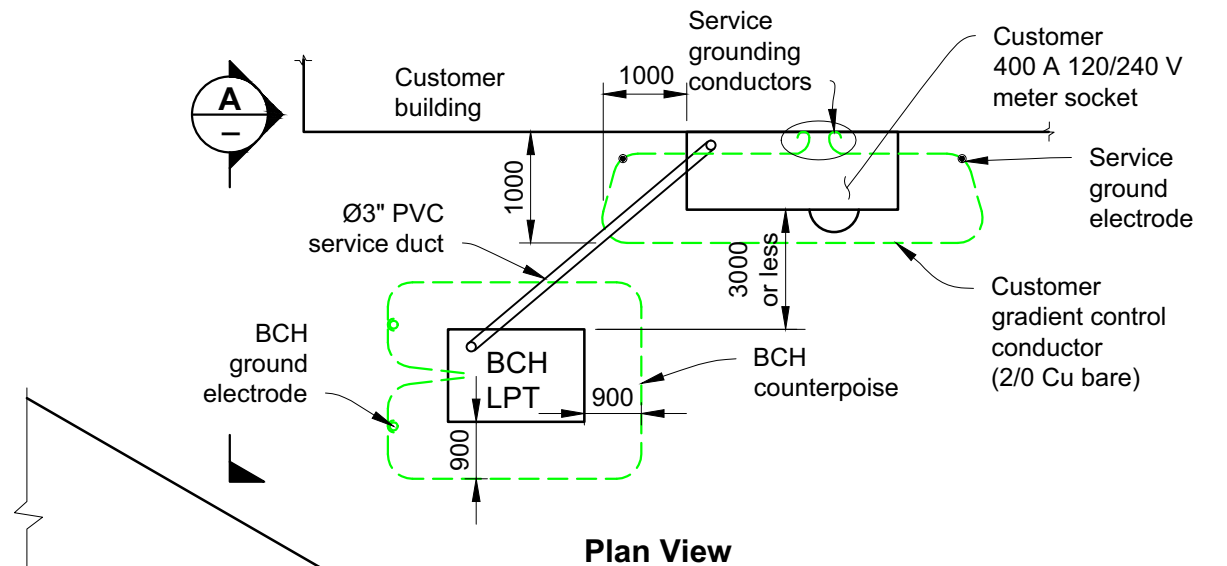
**400/600 A - Service Kiosk
(Front Elevation)**

**400/600 A - Service Kiosk
(Side Elevation)**



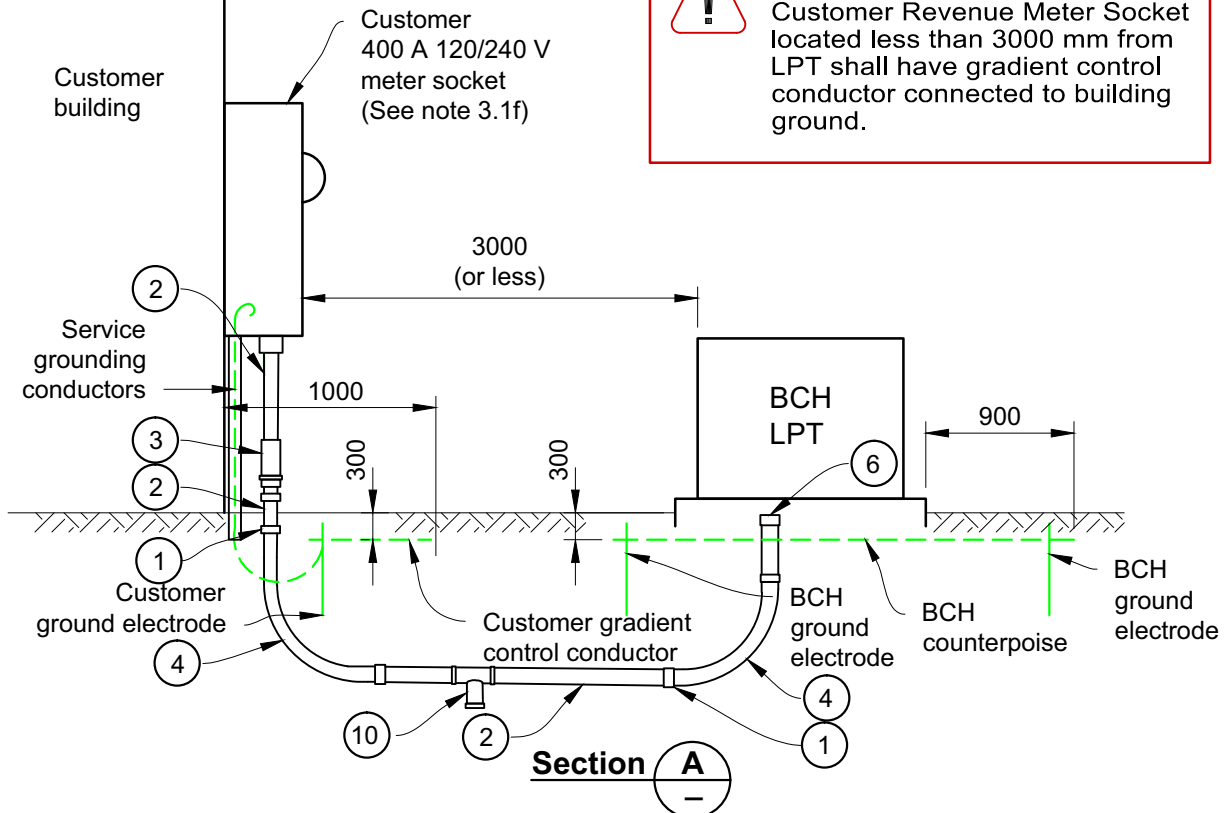
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CAUTION

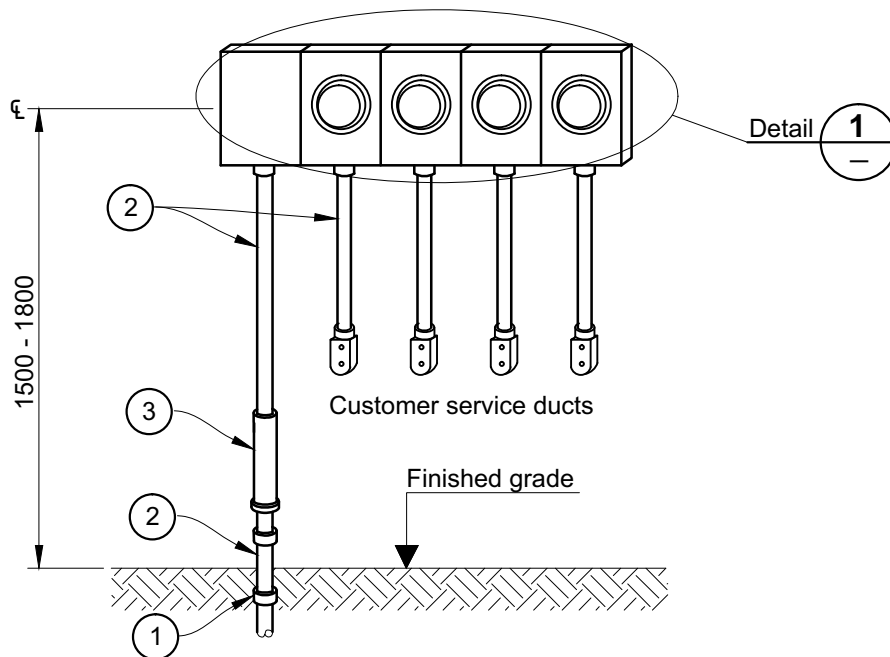
Customer Revenue Meter Socket located less than 3000 mm from LPT shall have gradient control conductor connected to building ground.



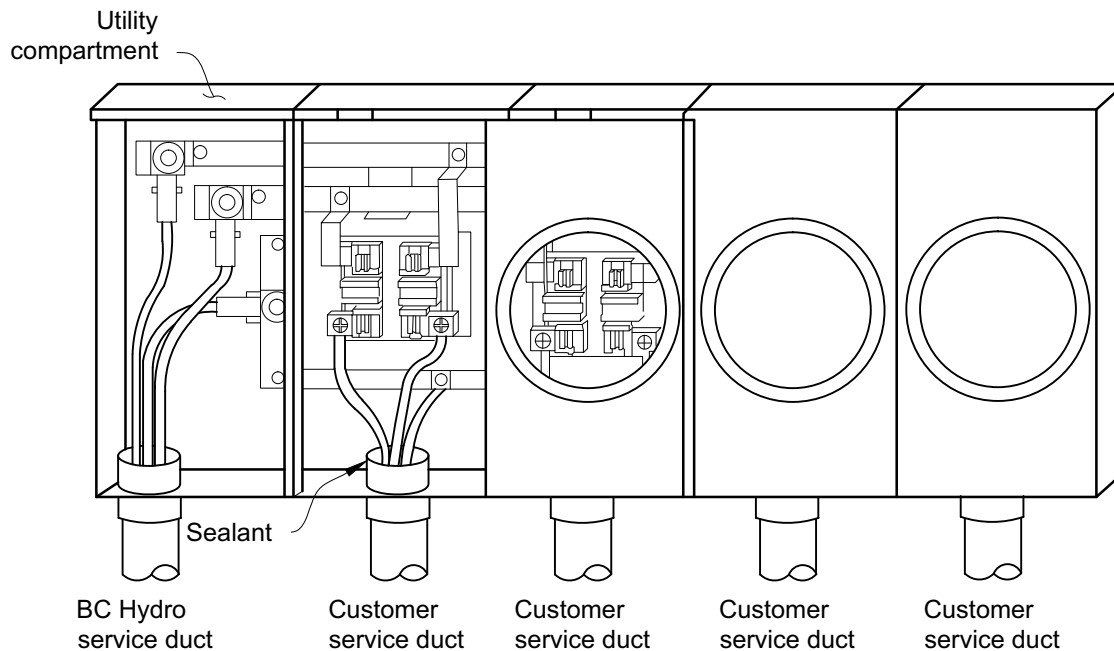
**400/600 A 120/240 V
Single or Multiple Meter Socket**

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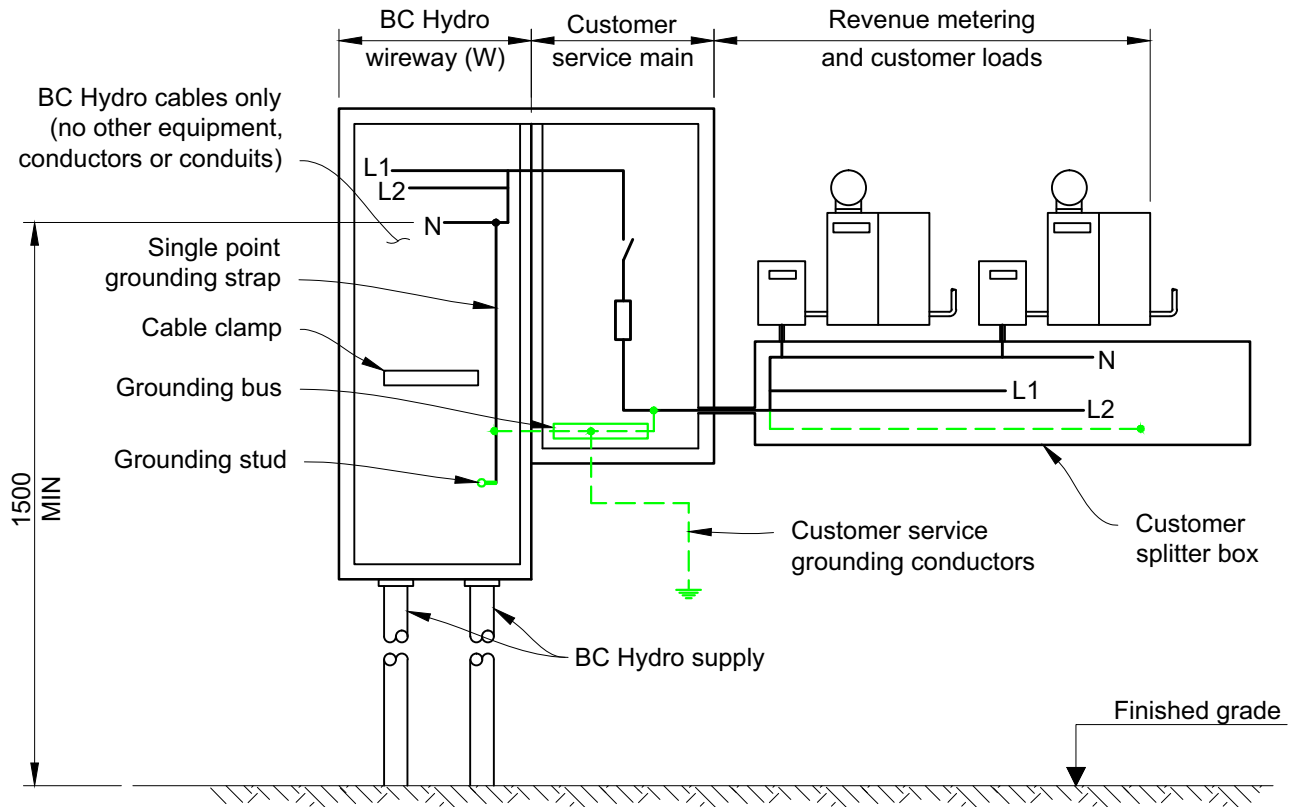
200 A or 400 A Multiple Main Meter Socket



Detail 1

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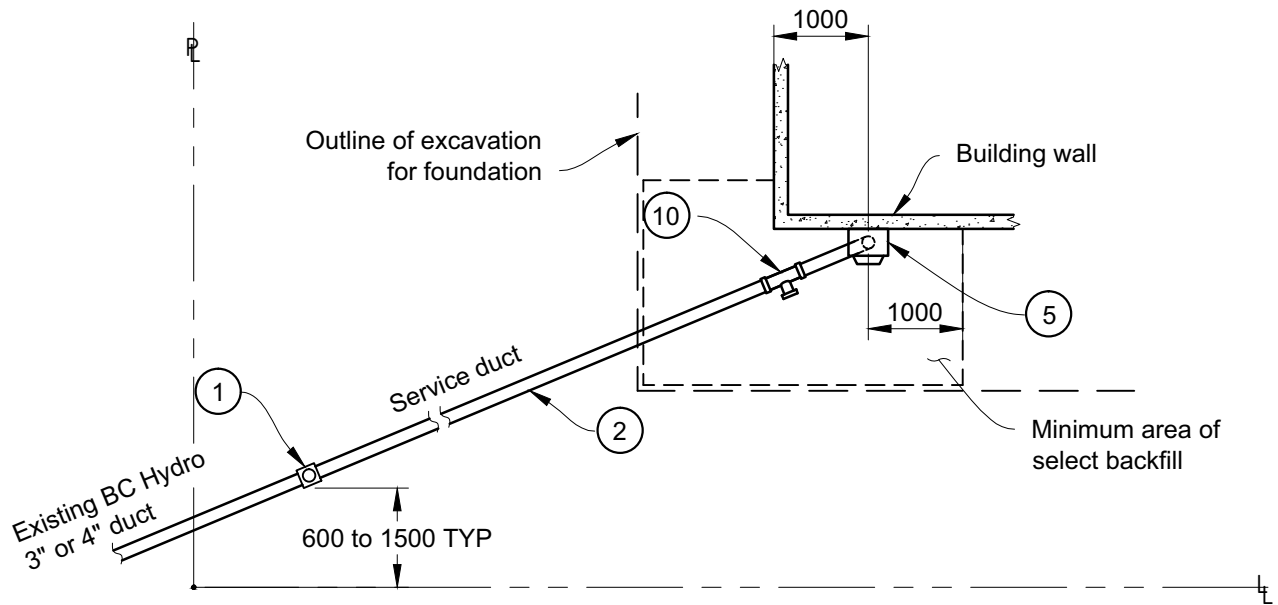
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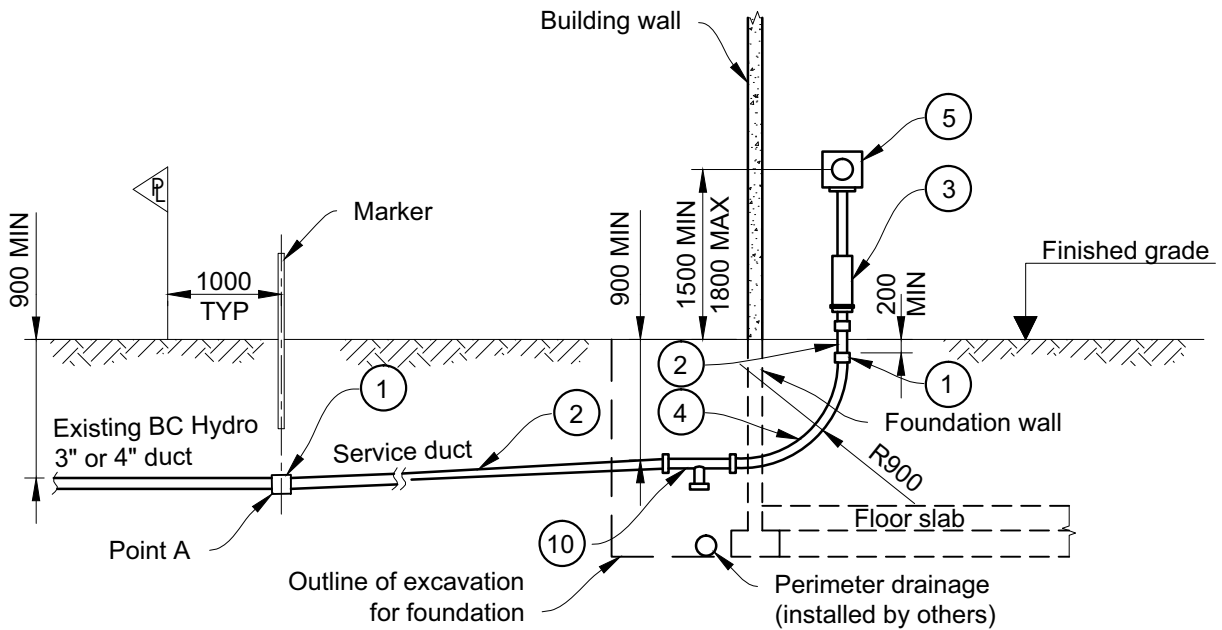
**Multiple Main Splitter Box
Single-Phase up to 600 A**

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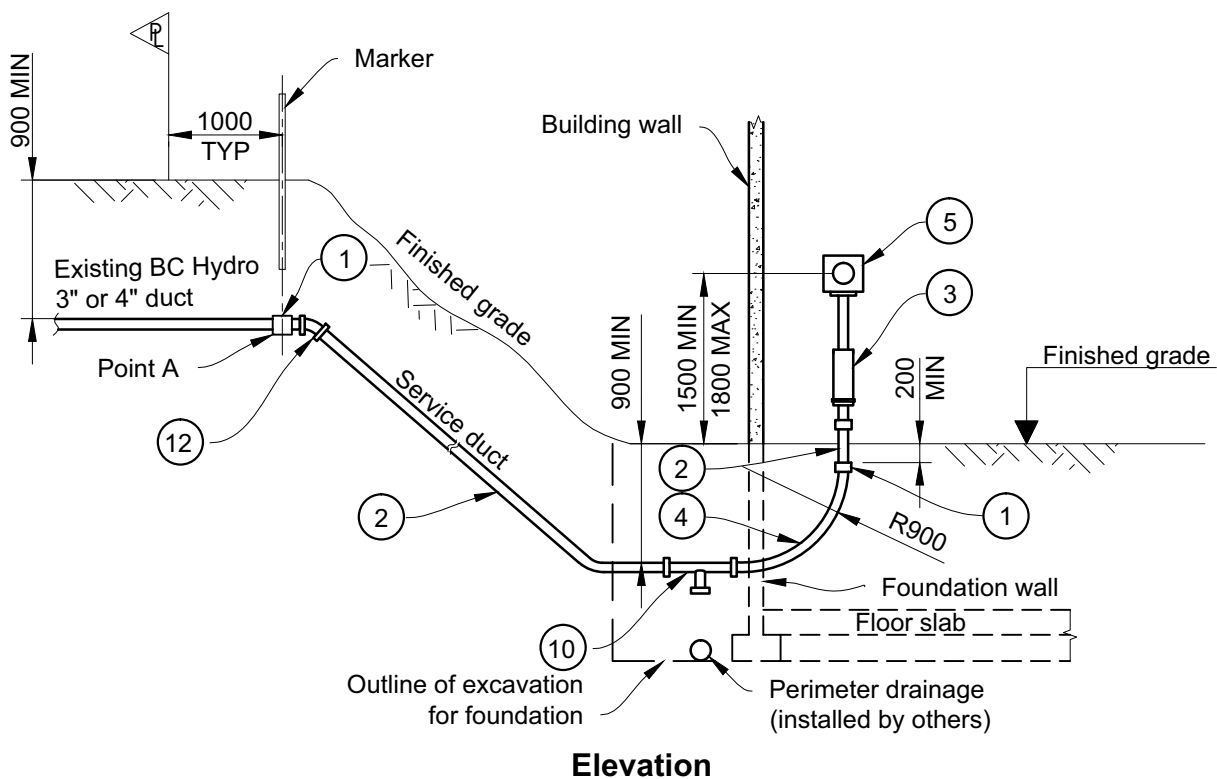
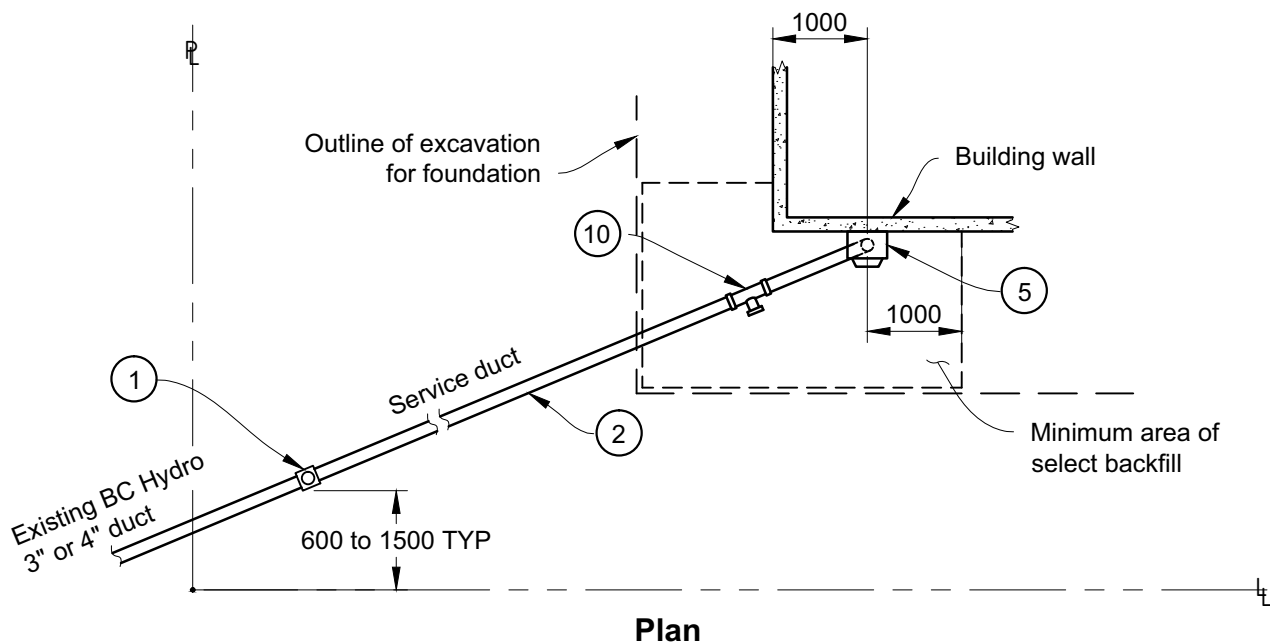
Plan








Elevation

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Notes

1. Types of Installation

- 1.1 Conductor in conduit is the standard installation method.
- 1.2 Direct burial of service cables shall not be used for new installations.

2. Materials






- 2.1 All materials from the stub-off on private property shall be supplied and installed by the customer.
- 2.2 All materials installed on private property, including the meter socket, shall be CSA certified. However, all material and electrical equipment, up to the utility's point of connection to the customer-owned equipment, is exempt from the BC Electrical Safety Regulation, including all grounding, duct work, etc. This equipment is not within the jurisdiction of the electrical inspection authorities, and permits are not required for this work.

3. Installation Requirements

3.1 General

- a. All civil work and grounding installations shall be the responsibility of the customer.
- b. All civil and grounding installations shall comply with BC Hydro standards, the BCEC and applicable bulletins issued by the BCSA.
- c. The trench shall be in a 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.
- d. The service location on the building shall be on the wall closest to Point A, or within one metre back from that wall on either side.
- e. The service location on the building and the location of the trench shall be coordinated with other utilities to avoid crossovers and dig-ins, and to maintain clearances.
- f. All residential type 400 A and 600 A 120/240 V services shall be installed inside a detached power shed, or an outdoor type pad-mounted power kiosk, or an external closet attached to a dwelling. For all such installations, BC Hydro personnel shall have unrestricted access directly from outside. However, BC Hydro shall not accept 400 A and 600 A residential services installed in an electrical room inside a dwelling, regardless of any unrestricted access for BC Hydro personnel.
- g. Commercial and industrial type 400 A and 600 A 120/240 V service equipment located inside a customer building is acceptable.

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3.2 Service in Duct

- The **customer shall couple their duct** onto the BC Hydro duct stub-off at Point A, except as stated in note 3.2 (f), and discard any markers and/or duct caps.
- If the **length of service run** between Point A and the meter base enclosure exceeds 50 m, a pull box may be installed in consultation with the BC Hydro Designer - see Note 4.1.
- If the aggregate bends installed on private property to the meter socket exceed 135°, a pull box may be installed in consultation with the BC Hydro designer - see Note 4.1.
- The **minimum radius** of any conduit bend shall be 900 mm.
- The customer is responsible for the installation of adequate conduit drainage, according to the BCEC, and duct sealing to prevent ingress of dangerous earth gases.
- A #8 minimum diameter polypropylene **pull string** shall be installed in the service conduit and tied securely at the meter base enclosure and to the string in the BC Hydro duct stub-off. **If no string** is found in the stub-off, the customer shall **notify BC Hydro** for further instructions.
- Throughout its length, the service conduit shall be kept free of any obstructions and foreign material, including sand and gravel. The conduit shall be proved by **mandrelling, before the final connection** is made to the BC Hydro duct and before a pull string is installed.
- The service conduit shall be protected from damage caused by settlement of the foundation and excavation backfill. To minimize settlement and subsequent damage to the service conduit and conductor, select backfill shall be used per Section W and compacted in 150 mm layers.






3.3 Residential Supply Service inside a Building Wall

Residential service duct inside a building wall shall be enveloped in, and encircled by, a minimum of 50 mm of concrete up to the meter base.

4. 400 A and 600 A Services

CAUTION: Due to liability and restricted access, BC Hydro will no longer terminate utility supply conductors directly onto a customer-owned service main switch or breaker lugs.

- Larger size enclosures may be used, if the customer so desires.
- Multi-unit enclosures shall have one extra compartment for service entry.
- The load-side lug range must meet BCEC requirements.
- Line-side lugs must accept the conductors tabulated in BC Hydro standard ES53 S1-01. All conductors have compact stranding.
- Install the U/G service duct on the left-hand side to accommodate the bending radius of the BC Hydro large incoming service cables.
- For a right-handed connection, please contact the BC Hydro local Design Representative.

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- 4.7. The U/G service conduit must be installed outside the foundation walls, and run on the surface of the finished exterior building walls, unless they are encased in concrete, 50 mm minimum.
- 4.8. Minimum dimensions shown are required for adequate working space for BC Hydro personnel.
- 4.9. For all supply connections which require the installation of a supply isolation assembly on private property, the property owner's permission is required.
- 4.10. The minimum depth of burial for all ducts shall be 900 mm below the finished grade.

Bill of Material





Item	Description	Quantity
1	Coupling, PVC, 3" dia. (or 4") CSA DB2	1
2	Conduit, PVC, 3" dia. (or 4") CSA grey Sched40	As Required
3	Expansion joint, PVC, 3" dia. (or 4") CSA grey Sched40	1
4	90° bend, 900 mm radius, PVC, 3" dia. CSA DB2	1
5	Meter socket, CSA certified, acceptable for BC Hydro revenue meter	1
6	Bell end, PVC duct, 3" dia. (or 4") CSA DB2 part of Item 2	1
7	Terminal adapter, PVC, 3" dia. (or 4") CSA DB2	1
8	Locknut, 3" (or 4") rigid PVC conduit	1
9	Bushing, 3" (or 4") rigid PVC conduit	1
10	Drainage tee, PVC, 3" dia. (or 4") CSA DB2	As Required
11	Warning tape, "CAUTION ELECTRIC LINE BELOW", orange or yellow, 150 mm wide	As Required
12	Coupling, PVC, 5°, 3" dia. (or 4") CSA DB2	As Required

Reference Documents

Secondary Metering	Secondary Voltage Revenue Metering – 750 V and Less
DI S10-4	Electric Service Connections - Voltages
CSA C22.1	Canadian Electrical Code, Part I

Reference Standards

ES54 H1-05	Service Duct Stub-Off Marker Installation
ES53 S1-01	Secondary Customer Services, Single-Phase up to 600 A, Revenue Meter Socket Installations
ES54 Section W	Construction Specifications

DESIGNED  M. KELVIN	RECOMMENDED  C. PICASSI	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  2017-04-27	SECONDARY SINGLE-PHASE SERVICES 120/240 V UP TO 600 A REVENUE METER SOCKET INSTALLATION	
DISTRIBUTION STANDARDS BC Hydro				ISSUED: APR 2017 REPLACES: FEB 2017 ORIGINALLY ISSUED: OCT 1979	PAGE 13 OF 13
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TIE WRAP
CAT. ID 388-4072

SEE NOTES
6 AND 8

SEE NOTE 4

TO GRADE

BCH CONDUCTOR
15 cm MAX.

SEE NOTE 3

SEE NOTE 2

SEE NOTE 7

150 mm-300 mm

SEE NOTE 1

CUSTOMER WIRE
LENGTH EXAGGERATED
FOR CLARITY

FIG. 1

Quadplex to Two Mast Connection

BC HYDRO

CUSTOMER

TWO RUNS
OF MULTIPLEX

SEE NOTE 5

FIG. 2

Two Multiplex to Two Masts

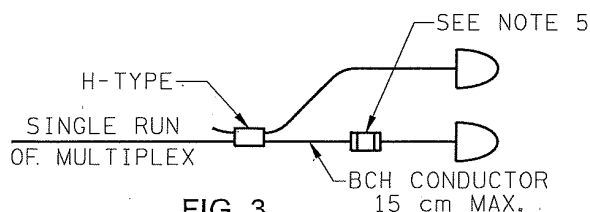


FIG. 3

Single Multiplex to Two Masts

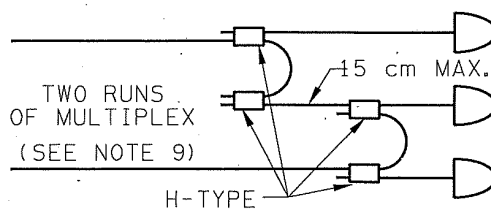


FIG. 4

Two Multiplex into Three Masts



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ORIGINAL ISSUE DATE: MARCH 2001

SERVICE CONNECTIONS PARALLEL MULTIPLEX SERVICES AND/OR PARALLEL CUSTOMER MASTS

BChydro DISTRIBUTION STANDARDS

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ES43 N2-05.01

R. 5

NOTES:

1. Customer masts shall be installed in compliance with BC Electrical Code Section 6 Rules.
2. For neutral conductor use partial tension compression splice shown on ES43 F5-09. Do not tape the connection.
3. Use H-Type AL compression tap connectors per ES43 F5-05. Tape all phase conductor connections.
4. For clearance to ground see ES43 B1-11.
5. Use pre-insulated service entrance splices per ES43 F5-07. Stagger connectors by minimum one connector length.
6. Multiplex conductors are to be used whenever possible in preference to open wire services. Refer to ES43 N1-01.03.
7. Wire holder(s) at the customer service entrance are to be supplied by the customer and must meet the requirements outlined on ES43 N1-01.03.
8. Sag service conductors in accordance with the sag chart on ES43 F2-25.
9. For triple runs contact Distribution Engineering.

ES43 N1-01.03 Secondary Entrance Conductor Sizes and Configurations
 ES43 F5-09 Tap Connectors for Secondary Conductors
 ES43 F4-01 Connectors - General Notes
 ES43 F2-25 Stringing Sags for Service Conductors
 ES43 B1-11 Clearances above Ground for Low Voltage Services
 REFERENCE DRAWINGS

DRAFTER: DM	DESIGNER  M. KELVIN	RECOMMENDED  C. PICASSI	APPROVED  F. DENNERT	SERVICE CONNECTIONS PARALLEL MULTIPLEX SERVICES AND/OR PARALLEL CUSTOMER MASTS		
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