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BC Hydro notes that the Standard may be revised from time to time and recommends that any person using the Standard in accordance with this Legal Acknowledgement Form confirm it is using the most recent version. BC Hydro is not liable for reliance on past versions of the Standard that may be stored electronically.

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:

a) Ensure uniform safety requirements comply with BC statutes and regulations.
b) Provide uniform system reliability.
c) Provide uniform operating practices.
d) Permit economic bulk purchasing of materials.
e) Achieve optimum life cycle cost of plant construction.
f) 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.

Information Bulletin:

Revised ES53 S1-01 for 120/240 V Single-Phase Secondary Services up to 600 A

1.0 Items Covered

ES53 S0-01 R6 Services Table of Contents

ES53 S1-01 R11 Secondary Services Single-Phase up to 600 A 120/240 V Wiring and Revenue Metering Connections

2.0 Overview

This bulletin presents changes to ES53 S1-01 (revision 11) for single-phase 120/240 V services up to 600 A. The intent of the changes is to eliminate inconsistencies with the latest ES54 S1 standards and include applicable portions of the *Requirements for Secondary Voltage Revenue Metering (750 V and less)*.

Technical Safety BC (TSBC) issued directive D-EL 2017-01 *Exemptions to public utilities* in late 2017 (after BC Hydro issued ES53 S1-01 R10), extending the utility exemption on private property to the point of utility connection. TSBC also adopted CSA 22.1 (2018) (*Canadian Electrical Code, Part I*) as the BC Electrical Code (BCEC) with revised service grounding connections per BCEC Rule 10-210. These two documents affected BC Hydro practice for secondary service installations and connections.

See the latest ES54 S1 standards and advisory EA2022-023 for more on changes to the installation and construction of underground single-phase 120/240 V services.

ES53 S0-01 R6 has been updated with the new title for ES53 S1-01. Changes in ES53 S1-01 R11 are described in the following table. ES53 S1-01 R11 does not contain revision lines (vertical green lines in the left margin marking the changed content) as almost the whole document would be marked as revised due to the numerous changes affecting most of the content. ES53 S1-01 R11 has been released and posted online. The previous revision of the standard (R10) is appended to this advisory for reference to make it easier to understand the changes. This advisory is referenced by number in the *Revision Notes* sections of ES53 S1-01 R11

Page	Section	Changes
1	Application Revision Notes References	• New standards format • Scope increased to include wiring schematics and revenue metering requirements • Changed title of standard • Increased number of reference standards • Added BC Hydro internal distribution instruction (DI) documents, BCEC, and TSBC directive and bulletin as references
2	Note 1 General	• Introduced Table 1 as a road map for all wiring diagrams contained in the standard
2-3	Note 2 Service in Duct	• New section clarifying that service trench and duct installation on private property shall comply with new ES54 S0-05 • Expanded Table 2 for service cable sizes and added new 320 A service cables • Added new Table 3 for service cable clamps supplied by BC Hydro. Table 3 was previously part of ES54 S1-03 and ES54 S0-04.
3-6	Note 3 BC Hydro Supply Transformers	• New section title • Reformatted drawing and information contained in previous revision (R10) • Moved service bonding and gradient control installation diagrams to ES54 S0-04 • Moved CL fuse protection criteria and Table A for service cable length to ES55 S5-03 • CL fuse installation details for existing low-profile transformer upgrade remain in ES53 S1-01
7	Note 4 Meter Socket and Service Requirements	• New section containing previous requirements for service cable entry and cable lug sizes
7	Note 5 Revenue Metering Requirements	• New section containing revenue metering requirements stated in *Requirements for Secondary Voltage Revenue Metering (750 V and less)*
7-10	Note 6 Meter Socket for Self-Contained Revenue Meters	• New section • Added three new wiring schematics including service grounding connection per BCEC (2018) • Introduced new 320 A meter socket with integral bypass switch – HOLD FOR FUTURE
11-12	Note 7 400 A Services with Integral CT Test Block	• New section • New schematics diagram Figure 6 for Hydel service assembly with integral 400 A circuit breaker • New schematics diagram Figure 7 for field-assembled 400 A service comprising separate component enclosures

Page	Section	Changes
13	Note 8 Grouped Subservices up to 600 A Field Assembled	• New section • To compliment *Requirements for Secondary Voltage Revenue Metering (750 V and less)* and provide connection and grounding details
14-15	Note 9 Service Kiosk up to 600 A	• New section • Added schematics diagram for single service kiosk • Introduced new schematics diagram for multiple metering kiosk having up to twelve 200 A revenue meters with integral service disconnect breakers

3.0 Action

The effective date for the ES53 S1-01 R11 electrical wiring standard is July 31, 2023, to consolidate with the corresponding new and revised ES54 section S civil construction and installation standards. Applications for work approved by the local BC Hydro design office on or after July 31, 2023 shall meet the requirements of ES53 S1-01 R11. Work approved prior to July 31, 2023 may comply with ES53 S1-01 R10 or may choose to comply with R11.

Designers and Engineers

Designers and engineers should familiarize themselves with the revisions to ES54 S0-04, the new ES54 S1 standards, and the revised *Requirements for Secondary Voltage Revenue Metering (750 V and less)*.

Civil Inspectors

Civil inspectors should familiarize themselves with the revisions to ES54 S0-04 and the new ES54 S1 standards.

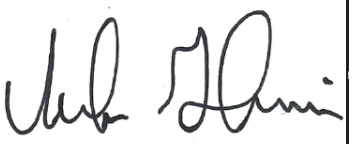
Customers and Customer Representatives

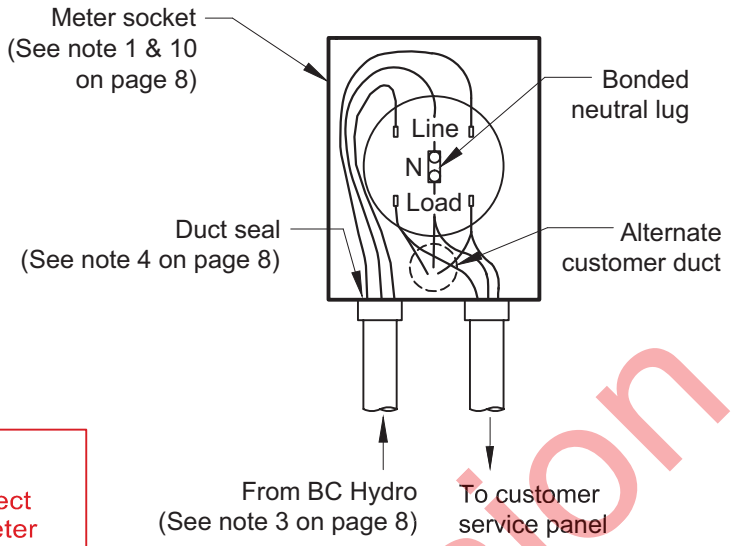
Customers and customer representatives, including electricians, project managers, consultants, and contractors, should familiarize themselves with the revisions to ES54 S0-04, the new ES54 S1 standards, and the revised *Requirements for Secondary Voltage Revenue Metering (750 V and less)*. Please direct any questions or concerns to your local BC Hydro representative.

4.0 Distribution Standards Contact

Name: Mark Kelvin	Email: mark.kelvin@bchydro.com
Phone: 604-529-5679	Mobile: 604-220-3905

5.0 Approval

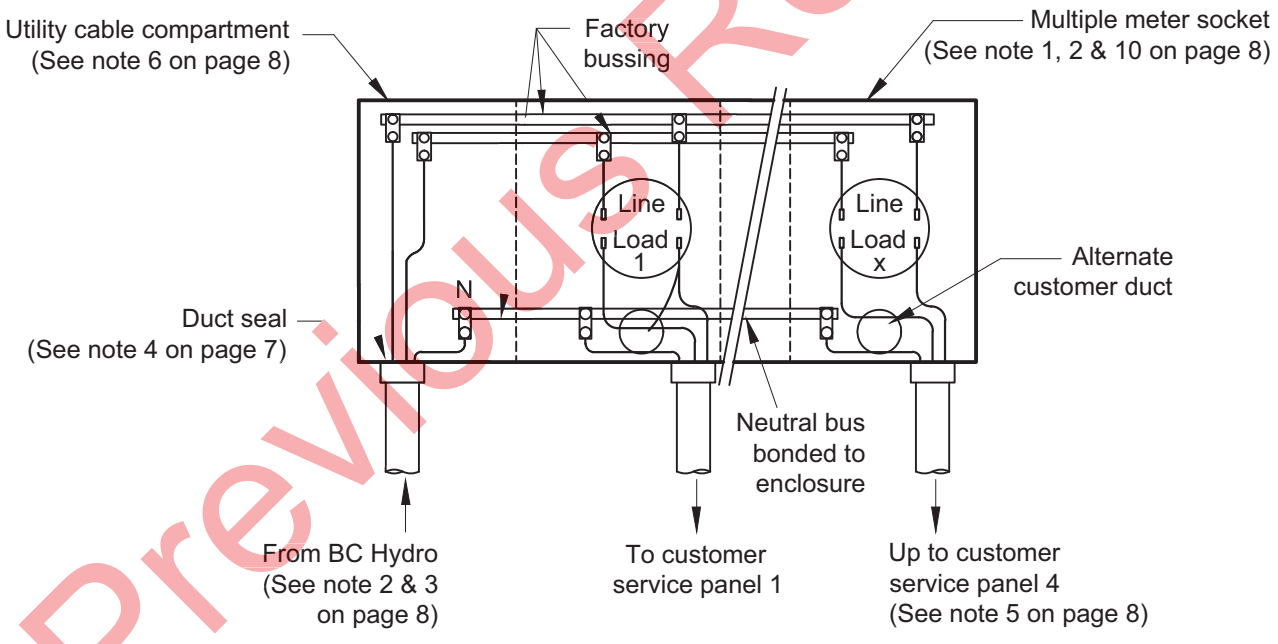
Recommended		Reviewed		Approved	
 M. Kelvin		 M. Stevens		 H. Giesbrecht	
Date:	2023-06-30	Date:	2023-06-30	Date:	2023-06-30



CAUTION

Remotely operated disconnect switch inside BCH smart meter does not provide safety isolation per BCEC Rule 2-304

Up to 200 A - Single Service
(See Table B)



200 A & 400 A Main - Multiple Services
(See Table B)

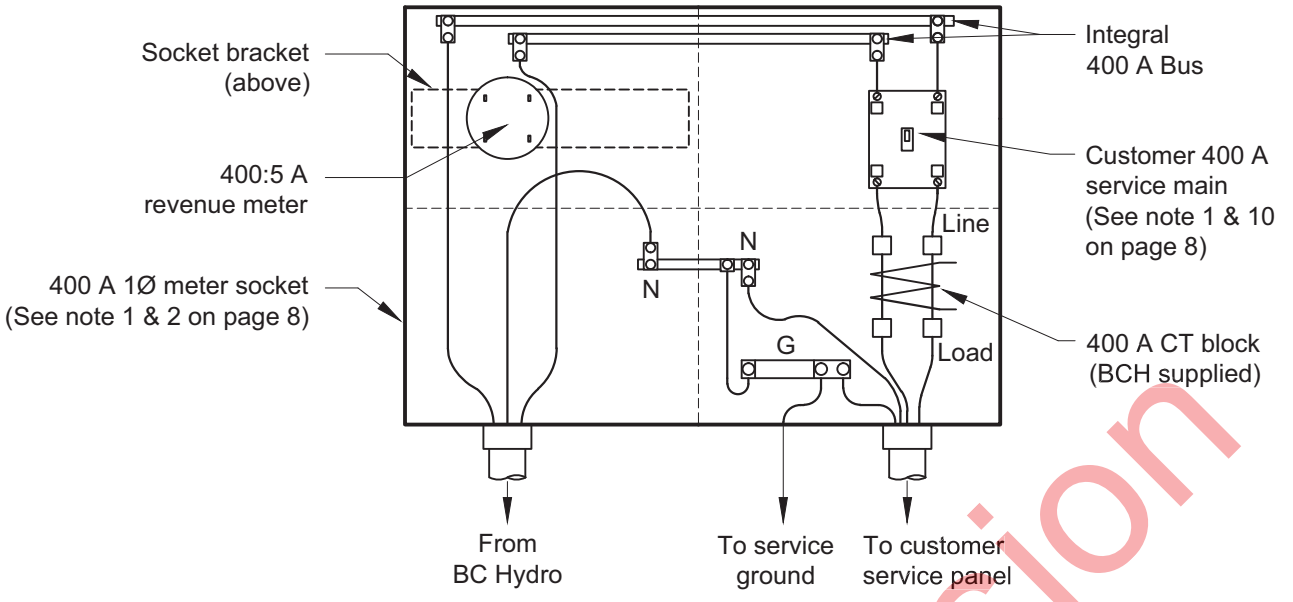
REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD
M. KELVIN	C. PICASSI	F. DENNERT	2017-07-10

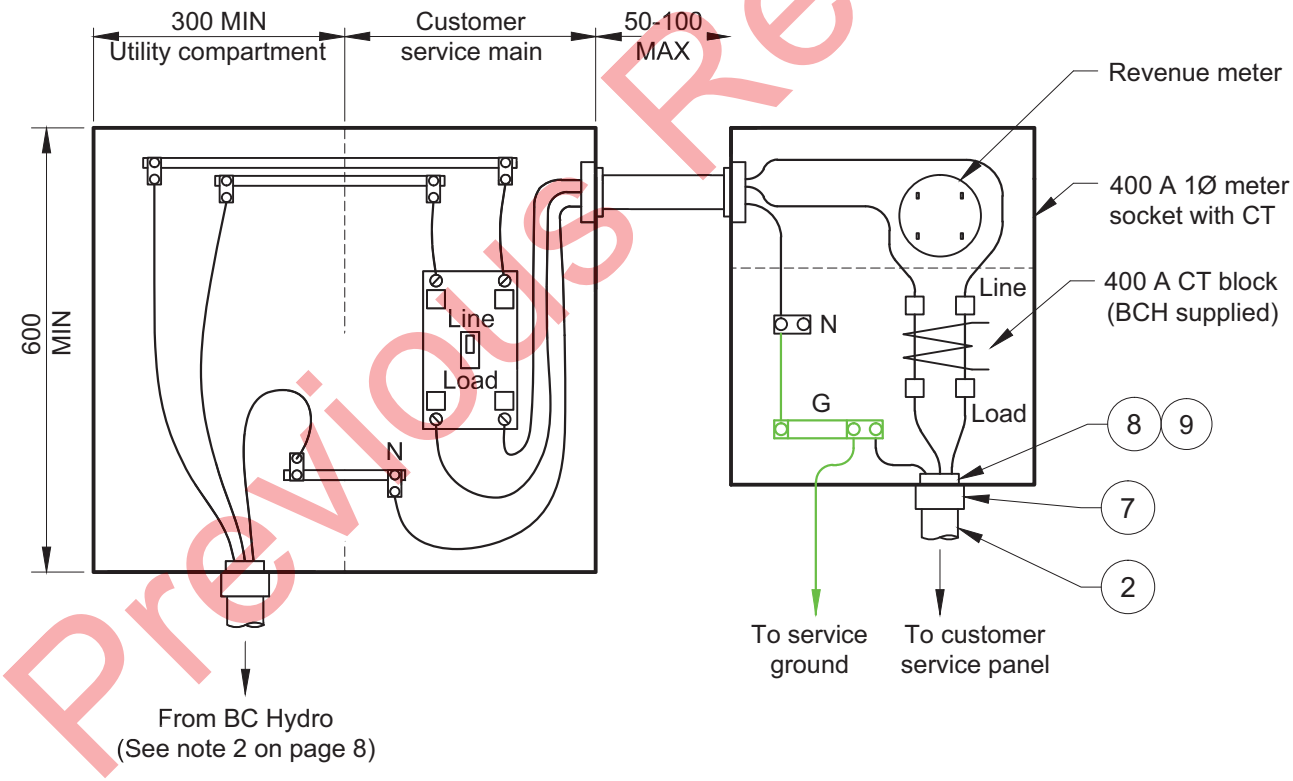
DISTRIBUTION STANDARDS
BC Hydro

ISSUED:JUL 2017
REPLACES:NOV 2014
ORIGINALLY
ISSUED: OCT 1979

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



400 A - Single Service
Integral Main / Meter Socket



400 A - Single Service
Field Assembled Main / Meter Socket

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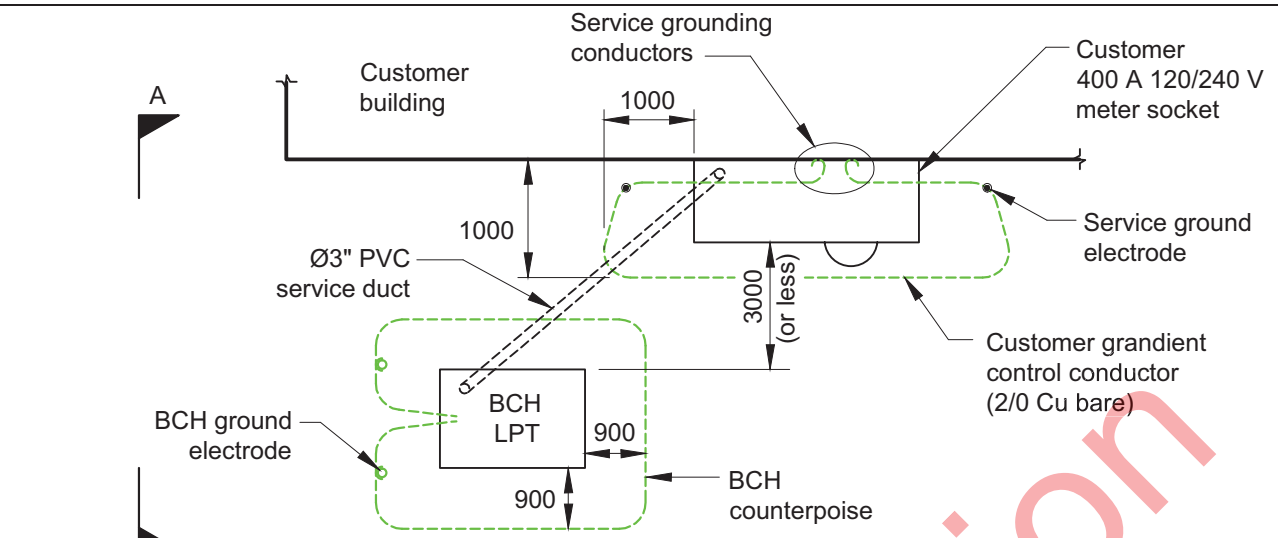
SECONDARY CUSTOMER SERVICES
SINGLE-PHASE UP TO 600 A, 120/240 V
REVENUE METER SOCKET CONNECTIONS

PAGE 2
OF 9

ES53 S1-01.02

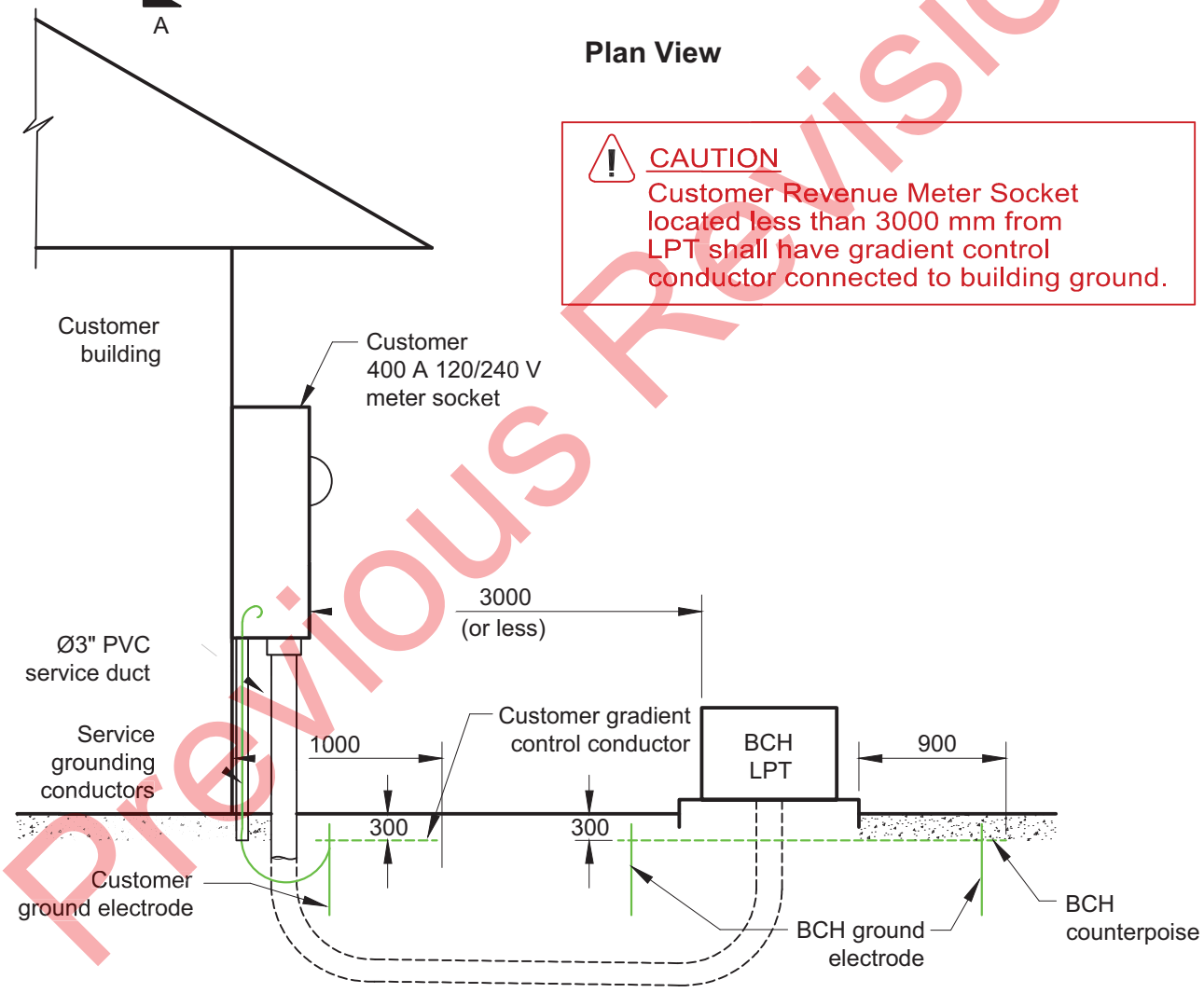
R
10

REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK



Plan View

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



Section A-A

REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK

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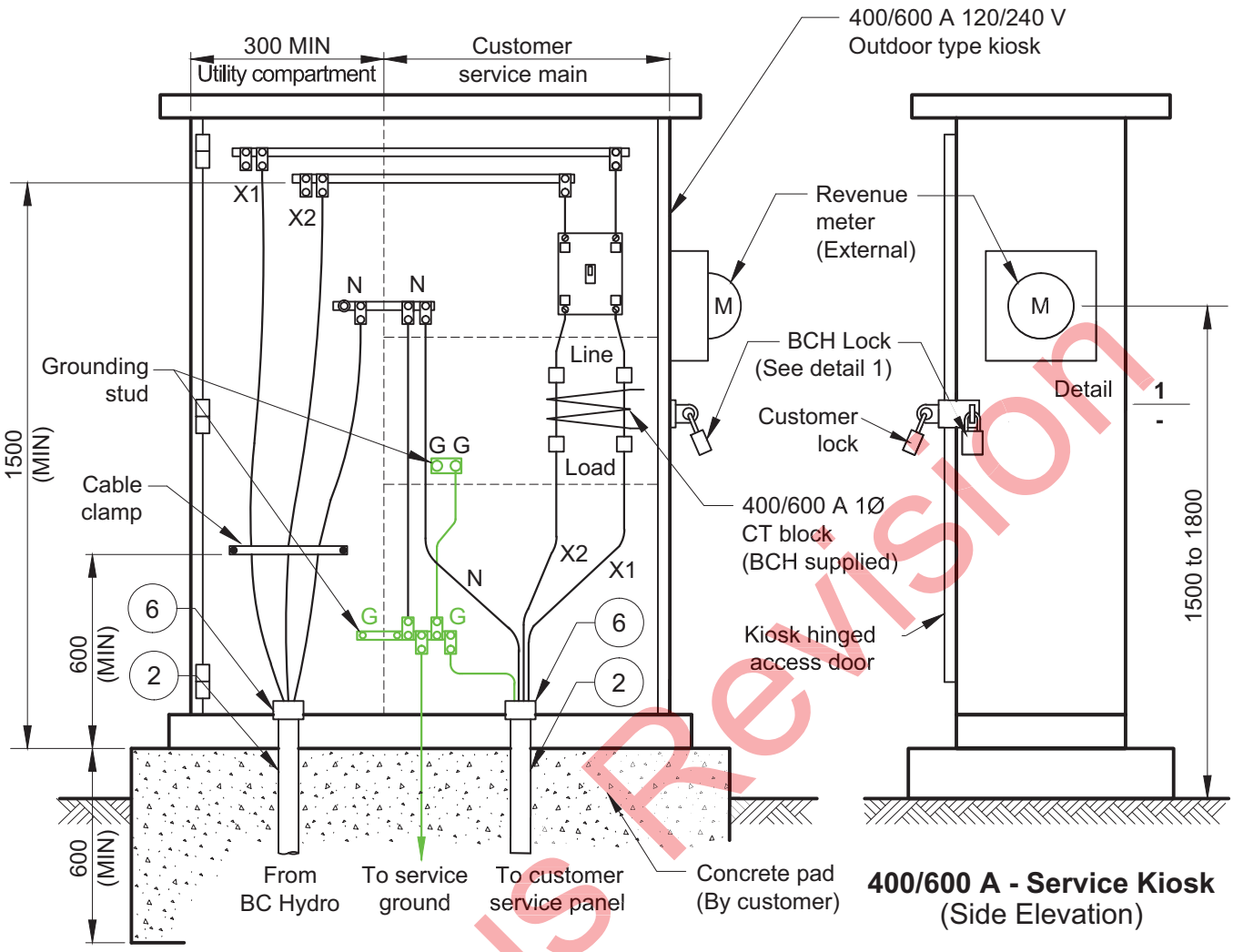
SECONDARY CUSTOMER SERVICES SINGLE-PHASE UP TO 600 A, 120/240 V REVENUE METER SOCKET CONNECTIONS

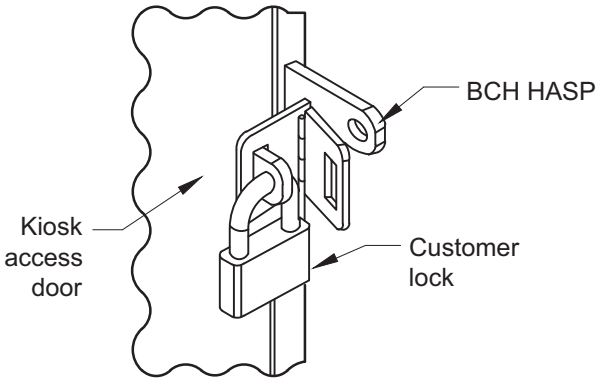
ES53 S1-01.03

R 10



400/600 A - Service Kiosk
(Front Elevation)

400/600 A - Service Kiosk
(Side Elevation)



Detail 1
(BCH Open Kiosk)

REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK

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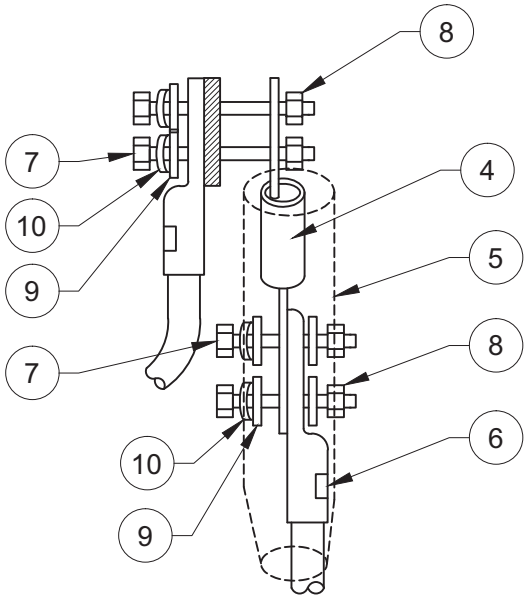
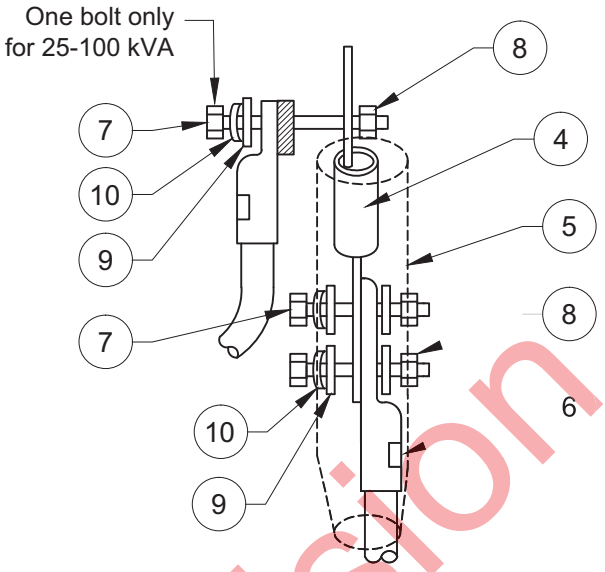
SECONDARY CUSTOMER SERVICES
SINGLE-PHASE UP TO 600 A, 120/240 V
REVENUE METER SOCKET CONNECTIONS

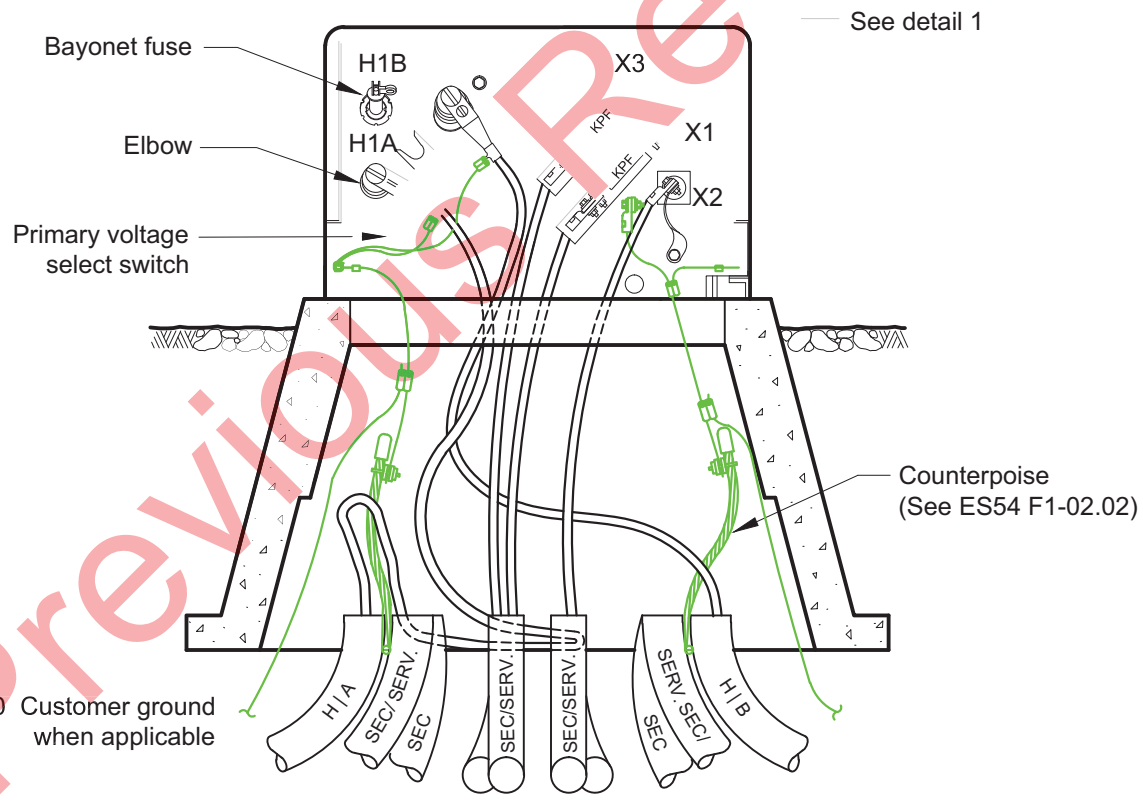


167 kVA LPT



50-100 kVA LPT

Detail 1



Fault Limiting Fuses Installed on 50-100 kVA LPT

(See Note 9 on Page 8)

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SINGLE-PHASE UP TO 600 A, 120/240 V
REVENUE METER SOCKET CONNECTIONS

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R 10

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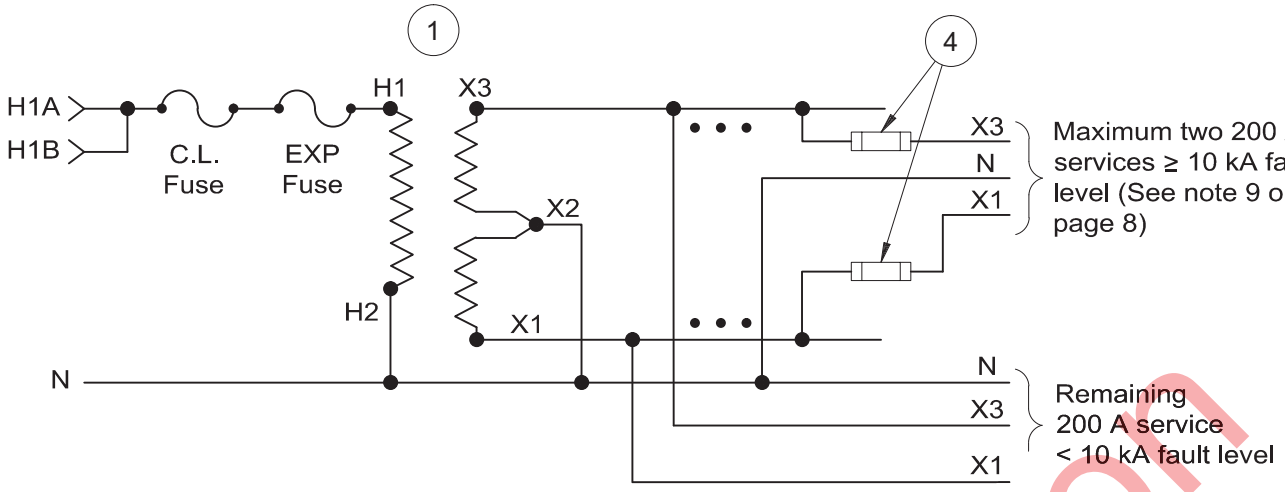

Schematic Diagram

CAUTION

Fault limiter fuses shall not be installed on flat transformer pad. Pyramid pad shall be used.

Table A – Minimum U/G Service Cable Length to Limit Fault Level < 10 kA

(see note 9 on page 8)

AC Resistance @ 25 °C				
Transformer kVA	**#1 Al Triplex (m)**	**4/0 AL Triplex (m)**	**350 kCM AL Triplex (m)**	**500 kCM AL Triplex (m)**
50	6 (20 ft)	13 (43 ft)	19 (62 ft)	25 (82 ft)
75	7 (23 ft)	17 (56 ft)	25 (82 ft)	31 (102 ft)
100	8 (26 ft)	18 (59 ft)	27 (89 ft)	35 (115 ft)
167	12 (39 ft)	29 (95 ft)	43 (141 ft)	55 (180 ft)

REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK

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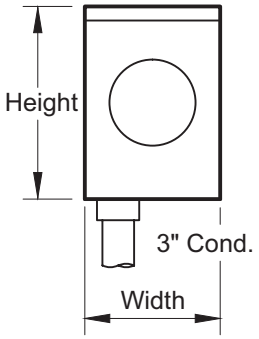
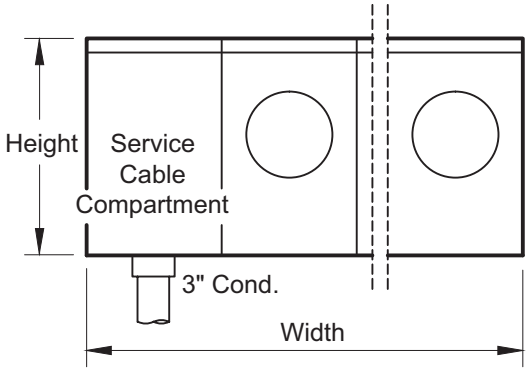
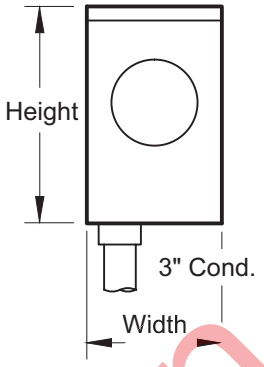
SECONDARY CUSTOMER SERVICES SINGLE-PHASE UP TO 600 A, 120/240 V REVENUE METER SOCKET CONNECTIONS



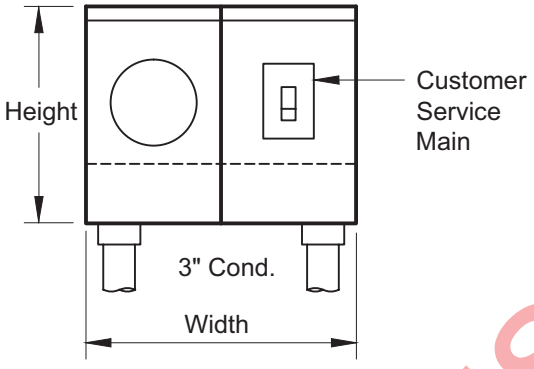
Up to 200 A Single
(See notes 1 & 2 on Page 8)



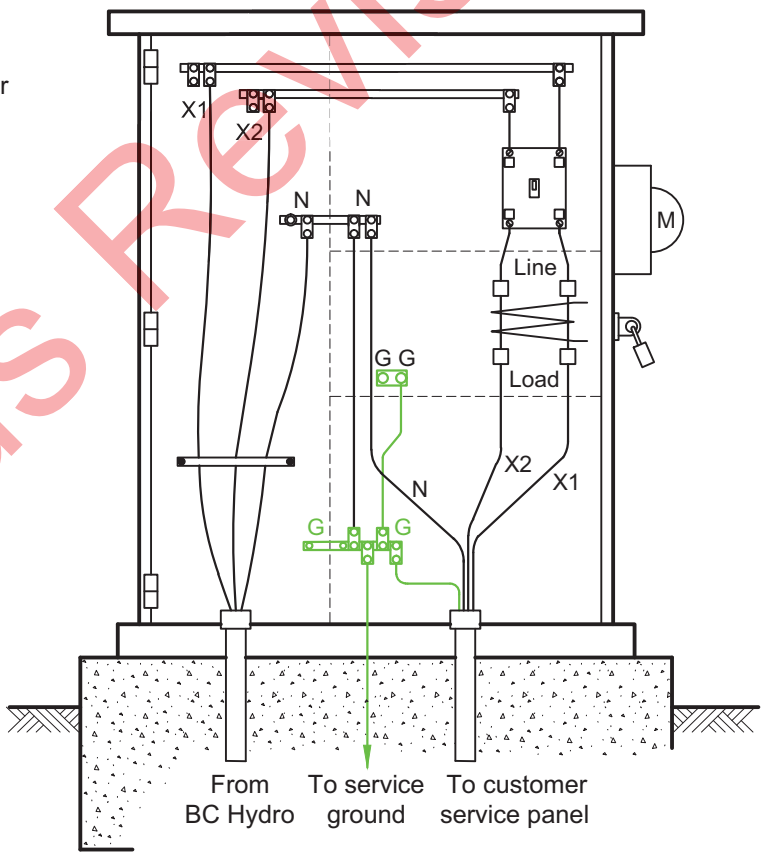
200A & 400A Bus Multiple Main
(See notes 1 & 10 on Page 8)



400 A with CT Single Unit
(See ES54 S1-01.10)



400 A with Single Service Integral Main/ Meter Socket



400/600 A - Service Kiosk

Note

For meter socket enclosure sizes, conductor range and duct knockouts, refer to ES54 S1-01.

REVISIONS: R.9 - 400 A ASSEMBLY & 10 KVA LIMITERS ADDED. BCH SWITCHES DELETED. NOV '14. MK | R.10 - PYRAMID PAD FOR 10 KA FUSES ADDED. JUL '17 MK

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	SECONDARY CUSTOMER SERVICES SINGLE-PHASE UP TO 600 A, 120/240 V REVENUE METER SOCKET CONNECTIONS	
M. KELVIN	C. PICASSI	F. DENNERT	2017-07-10		
DISTRIBUTION STANDARDS BC Hydro	ISSUED:JUL 2017 REPLACES:NOV 2014 ORIGINALLY ISSUED: OCT 1979			PAGE 7 OF 9	ES53 S1-01.07 R 10

Table B – List of Conductor Sizes and Catalogue IDs for Services to Single-Phase Services up to 600 A 120/240 V

Customer Main Switch/Breaker Size	Aluminum			Copper		
	No. of Bundles	Size	Cat. ID	No. of Bundles	Size	Cat. ID
Up to 125 A	1	#1	382-3100	N/A	N/A	N/A
200 A	1	#4/0	382-3102	1	#1/0	380-1971
400 A	1	500 kcm	382-3105	1	350 kcm	380-1973
600 A	2	350 kcm	382-3104	2	#4/0	380-1972

Notes

1. For BC Hydro acceptable meter sockets and specific dimensions, refer to *BC Hydro Requirements for Secondary Voltage Revenue Metering 750 V or Less*. For customer policy issues, refer to Distribution Instructions S10-01 and S10-03.

2. BC Hydro will not supply 120/240 V customer services larger than 600 A. Larger services shall be fed from BC Hydro 120/208 V supply or customer-owned transformation.

3. BC Hydro utility conductors shall not cross customer service conductors and BC Hydro shall not terminate service conductors onto the customer service main lugs.

4. All service runs shall be sealed thoroughly with duct deal (Cat. ID 141-1345) at the point where BC Hydro conductors enter the meter base enclosure. The BC Hydro designer may specify rayflate duct sealant, Cat. ID 141-1383, for earth gases and downward sloping services.

5. For multiple main services, the maximum number of meter sockets is 4. For multiple main installations in excess of 4 meter sockets, BC Hydro requires a service switch ahead of the multiple service main, according to the BC Hydro requirements for secondary voltage revenue metering.

6. All multiple main enclosures shall have a separate utility cable compartment for the BC Hydro U/G service cable connection.

7. Cable ampacities are calculated using 0.8 load factor and conduits per ES53 U1-01.

8. 400 A services with 80% rated service main supplied from padmounted transformers may use 350 kcm aluminum triplex.

9. The BC Hydro designer shall calculate the voltage drop and fault level for each service to determine the conductor and duct sizes and requirement for fault limiting fuses. No more than two services (200 A single or 400 A multiple main) per LPT may have current limiting fuses and they shall be installed on a pyramid pad only.

10. All unmetered cables and buswork to the point of connection shall have sealable covers for restricted access for BC Hydro personnel only. BC Hydro shall not accept any residential service installation up to 600 A 120/240 V 1 Ph located inside single family dwellings or a building.

Table C – Recommended Size of Transformers for a Single Customer Service 120/240 V Supply

Customer Main Switch/Breaker Size	O/H Unit	LPT
Up to 125 A	25	25
200 A	50	50
400 A	75	75
600 A	100	100

Notes

1. The above table is based on 80% demand with sustained peak loads up to 110% of transformer kVA, as per note 2.

2. BC Hydro supplied transformers were deemed to be rated for 110% of the nameplate kVA for a maximum duration of 8 hours within a 24 hour period, with a continuous preload of 80% and a maximum temperature rise of 65 °C over 30 °C ambient.

Bill of Material for 50 to 167 kVA

Item	Description	Catalogue ID	Quantity
1	Transformer 50-167 kVA 7.2/14.4 kV - 120/240 V	BC Hydro	1
2	Bussman cable limiter fuse	96022507	2
3	Rubber sealing sleeve	388-2008	2
4	Compression connector	388-0458	3
5	Capscrew zinc plated ½" x 64 mm Capscrew zinc plated ½" x 38 mm	100-6630 100-6626	12
6	Nut hex zinc plated ½"	102-1225	12
7	Washer flat zinc plated ½"	102-4136	24
8	Washer disc spring ½"	102-4131	12

Reference Document

Distribution Standards ETR046 *Presence of High Fault Currents on 120/240 V Customer Services and Proposed Mitigation*

Reference Standards

ES53 F1-02 Transformer Single-Phase LPT

ES54 S1-01 Secondary Single-Phase Services 120/240 V Up To 600 A