Precast Reinforced Concrete Handholes
General Requirements

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1. Scope

This material standard covers the general requirements for precast reinforced concrete handholes used at Seattle City Light (SCL).

Specific requirements shall be according to the detailed material standards and purchase orders issued.

2. Application

These precast handholes are intended for use in the construction of underground electric systems. The precast concrete handhole may be used to house equipment, cables, service connections, fuses and splices for the secondary distribution system and streetlight system. Precast handholes are not intended to be placed in locations subjected to continuous traffic loading.

3. Definitions

Handhole as defined by National Electrical Safety Code (NESC): An access opening, provided in equipment or in a below-the-surface enclosure in connection with underground lines, into which personnel reach but do not enter, for the purpose of installing, operating, or maintaining equipment or cable or both.

Handhole as defined by SCL: An enclosure that is used for secondary service and/or streetlight system. Enclosures 233 or smaller.

Handhole Assembly/Assemblies as defined by SCL: A handhole, frame, and cover (or any combination thereof) that is assembled together to form a single unit.

4. Industry Standards

Handholes shall meet the applicable requirements of the following industry standards:

ACI 318-11; “Building Code Requirements for Structural Concrete and Commentary”

ANSI/AWS D1.4/D1.4M-11; “Structural Welding Code – Reinforced Steel”

ASTM A123/A123M-08; “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”

ASTM A153/A153M-16a; “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”

ASTM A185/A185M-07; “Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete”

ASTM A497/A497M-07; “Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete”

ASTM A615/A615M-09b; “Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”

ASTM A706/A706M-09b; “Standard Specification for Low-Alloy Deformed and Plain Bars for Concrete Reinforcement”

ASTM C39/C39M-10; “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens”

ASTM C150/C150M-12; “Standard Specification for Portland Cement”

ASTM C478-09; “Standard Specification for Precast Reinforced Concrete Manhole Sections”

ASTM C857-11; "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"

ASTM C858-10e1; "Standard Specification for Underground Precast Concrete Utility Structures"

AWS D1.4; "Structural Welding Code– Reinforcing Steel"

National Electric Safety Code (NESC) C2-2012, Rule 094B6; "Concrete-Encased Electrodes"

5. Conflict

Where conflict exists, the following order of precedence shall apply:

1. Seattle City Light purchase order (PO)
2. Seattle City Light General Terms and Conditions
3. Detailed material standards
4. This standard
5. ASTM standards
6. Other industry standards

6. Dimensions

Manufacturers, the Washington State Department of Transportation (WSDOT) and the City of Seattle Standard Plan No 550A may refer to the different sizes of handhole by name and type. Table 6 summarizes the agreed-upon dimensions.

Table 6. Handhole Names, Types and Dimensions

		Overall Dimensions Nominal (in)			Inside Dimensions Nominal (in)		
Name	**Type**	**Width**	**Length**	**Height**	**Width**	**Length**	**Height**
1419	1	17	22	12	14	19	12
1728	2	21	32	12	17	28	12
3030	None	30	30	25.5	23.5	23.5	24
231	3	32	44	18.75	24	36	12
233	5	32	44	42	24	36	31.5
444	6	48	48	50	40	40	37

7. Requirements

7.1 Structural and Construction

7.1.1. General

Handholes shall be precast concrete, reinforced, and of the type and size indicated on Seattle City Standard Plan no. 550, SCL detailed material standards and this standard.

Design changes shall require the prior written approval of an SCL Standards Engineer or Civil Engineer.

7.1.2. Reinforced Concrete

Minimum compressive strength of concrete shall not be less than 4,000 pounds per square inch in 28 days as determined by the ASTM Method C39.

Cement shall conform to ASTM C150.

No additives containing calcium chloride or any other material that will produce corrosive ions shall be used in the concrete.

Welded wire fabric shall conform to ASTM A185 or A497.

Steel Reinforcing Bars shall conform to ASTM A615, Grade 60 or ASTM A706, Grade 60.

Welding of reinforcing steel shall conform to the Structural Welding Code, Reinforcing Steel (AWS D1.4) of the American Welding Society.

The concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) for reinforcement shall be 1-1/2 in minimum for main reinforcing bars and 3/4 in for stirrups and ties.

The concrete finish shall be free of rock pockets and honeycombed areas.

The interior walls, ceiling and exterior surfaces exposed shall be smooth.

Rock pockets over 3/8-in deep and other imperfections on all surfaces shall be patched and troweled to match the surrounding surface.

7.1.3. Structural Design

Structural design of the precast handhole shall conform to ACI 318 – “Building Code Requirements for Structural Concrete,” and ASTM C857, “Minimum Structural Design Loading for Underground Precast Concrete Utility Structures,” with the following clarifications:

- Live Load: AASHTO HS-20 truck, P=16 kips. Traffic can approach the structure from any direction.
- 30% Live load impact load factor for soil cover less than or equal to 2 ft
- No live load surcharge for soil cover greater than 8 ft
- Soil density = 120 pcf
- 40 pcf Equivalent Fluid Pressure Lateral Soil Pressure Above Water Table
- 80 pcf Equivalent Fluid Pressure Lateral Soil Pressure Below Water Table
- 80 psf Live Load Surcharge

7.2 Grounding and Bonding

All handhole bodies shall be supplied with a grounding connector; 1/4-in ground insert/bolt.

Grounding connector shall be electrically bonded to the frame of the handhole.

Type 1 and Type 2 handhole bodies shall have a 5/16-in ground insert or a grounding pad.

Type 1 and Type 2 handhole lids shall be supplied with at least a 4-ft length copper braid (ground strap).

Type 3 (231), Type 5 (233), and Type 6 (444) handhole covers shall be supplied with an embedded insert for bonding the frame and lid.

All metal components (frame, hinges, and lid) shall be electrically connected to the embedded bonding insert in the cover.

Embedded bonding insert in the cover shall be labeled "BOND.”

7.3 Knockouts

All knockout edges shall be beveled.

Each enclosure with a floor shall have a ground-rod knockout at two corners of the base of the enclosure.

Size, shape, quantity and location of knockouts shall be specified in detailed material standards.

7.4 Access Covers: Hatches, Lids, and Round Covers

Handholes and enclosures use different types of access covers.

Access covers may refer to the following:

- Hatches: Hinged metal doors with support struts and recessed handles
- Lids: Unhinged rectangular metal plates
- Round covers: Unhinged, typically made of ductile iron

Access covers shall be provided with a grounding site per manufacturer standards and detailed material standards.

Access covers shall be designed for a 16 kips wheel load (H20 + 30% impact) applied in any direction.

Access covers shall have an anti-corrosion coating which shall remain durable and fracture- and delamination-free over the expected life of the product.

Hatches and lids shall have non-slip surfaces as shown in Table 10.

Table 7.4. Non-Slip Surface Requirements

Attribute	Requirement
Minimum coefficient of friction	0.8
Bond strength to the plate	3000 psi or greater
Surface hardness	55 minimum on the Rockwell "C" scale
Non-slip coating	SlipNot Grade 3 or Thermion TH604

7.4.1. 3030, 231 (Type 3), and 233 (Type 5) Access Covers: Hatches

3030, Type 3, and Type 5 handholes use hatch-type access covers.

Hatches shall:

- Be hinged
- Include one, 5/8-inch diameter bonding hole located in an underside bearing bar, approximately centered in the door and 2-1/2 to 3-1/2 inches from the hinged edge
- Fully open 180 degrees
- Be hot-dipped galvanized in accordance with ASTM A153
- Not exceed 55 pounds equivalent lift
- Have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access
- Have support struts and a recessed handle

7.4.2. 1419 (Type 1) and 1728 (Type 2) Access Covers: Lids

Type 1 and Type 2 handholes use lid-type access covers.

Lids shall:

- Be at least 5/16-inch-thick steel and shall be hot-dipped galvanized in accordance with ASTM A 153
- Have tab(s) to lock onto the non-slip frame of the handhole body
- Have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access

7.4.3. 444 (Type 6) Access Covers: (Hatches or Round Covers)

444 enclosure access covers may either be hatches (typical) or round covers (special applications).

Hatches shall:

- Be hinged
- Include one, 5/8-inch diameter bonding hole located in an underside bearing bar, approximately centered in the door and 2-1/2 to 3-1/2 inches from the hinged edge
- Be hot dipped galvanized in accordance with ASTM A153
- Fully open 180 degrees
- Not exceed 55 pounds equivalent lift
- Have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access
- Have support struts and two recessed handles

Round covers shall comply with SCL 7204.70.

7.5 Identification

Hatches and lids shall be identified clearly on the top of the lid/hatch with 3-inch-high letters.

Table 7.5. Hatch and Lid Identification Requirements

Label	Handhole Occupant/Usage
SCL	Secondary Distribution
SL	Streetlight Only
SL/SDOT	Streetlight and Seattle Department of Transportation (Traffic Control) – Joint Use
SCL COMM	Seattle City Light Communications

Marking shall be accomplished by welding, cast onto the cover, or tightly fastened label plate. Label plates and letters shall be hot-dipped galvanized.

Hatches and lids shall be identified with permanent marking on the underside with the type of surface ("S3" for SlipNOT® 3, TH604 for Thermion TH604), and the year of manufacture.

This permanent marking shall be clearly legible.

8. Delivery Requirements for Assemblies

Handhole Assemblies shall be delivered fully assembled with the frame and cover attached to each handhole base unless otherwise requested in the purchase order. For specific delivery requirements, see detailed standards.

9. Documentation

9.1 General

Documentation shall be in English and use customary inch-pound units.

Documentation shall utilize common industry terminology and well-understood abbreviations.

9.2 Bidder's Data

Bidder shall return the following technical information with their bids:

- Manufacturer name
- Manufacturing plant location (all possible)

Bid information shall be presented in a clear and consolidated manner for ease of review.

10. Approved Manufacturers

Approved manufacturers are identified in the detailed material standards.

11. References

SCL Material Standard 7204.70, "Frames and Covers, 42-Inch Round, Iron"

City of Seattle Standard Plan No. 550a; "Handholes"

12. Sources

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.01

Kim, Sunny; SCL Standards Engineer and subject matter expert for 7203.01

National Electrical Safety Code (NESC); C2-2012 Edition, Institute of Electrical and Electronics Engineers (IEEE) Inc., New York, NY, 2011

SCL Material Standard 7203.04; "3030 Handhole, Precast, Secondary"

SCL Material Standard 7203.08; "Handhole, 2″ x 3″ x 3″ Precast"

SCL Material Standard 7203.10; "Type 1 and Type 2 Handhole, Precast, Secondary and Streetlight"

SCL Material Standard 7203.21; "Precast Reinforced Concrete Structures – General"

SCL Material Standard 7203.26; "444 Enclosures, Precast"

Wang, Quan; SCL Standards Engineer and subject matter expert for 7203.01