# hand and any support to an addition to any state the 1. Scope This standard covers the requirements for secondary handhole installations. This standard addresses open bottom and closed bottom handholes. Streetlight handholes are outside the scope of this standard. See Seattle City Light (SCL) 1716.07. 2. Application This standard provides direction to SCL crews and contractors regarding proper installation of secondary handholes owned and maintained by SCL. For handhole and conduit clearances and orientation, see SCL 0214.00. 3. Definitions Heavy traffic: constant vehicular loading (i.e. roadway) **Medium traffic:** occasional vehicular loading (i.e. driveway) Light traffic: rare vehicular loading (i.e. sidewalk) 4. Requirements 4.1 Grounding Grounding of secondary handholes shall conform to requirements of this standard and SCL 0461.10.

# Secondary Handhole Installation and Grounding

Standard Coordinator Curtis Lu

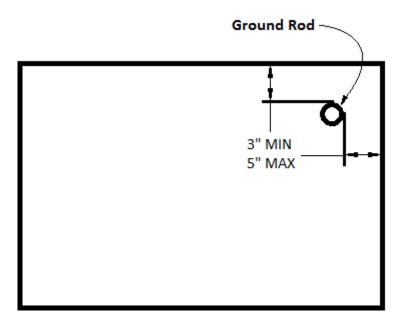


Standards Engineering Supervisor Brett Hanson Division Director Bob Risch

## 4.1.1. Ground Rod Locations

Ground rod shall be located in the corner of the handhole and shall not interfere with conduits and wires. See Figure 4.1.1.

# Figure 4.1.1 Ground Rod Location, Plan View



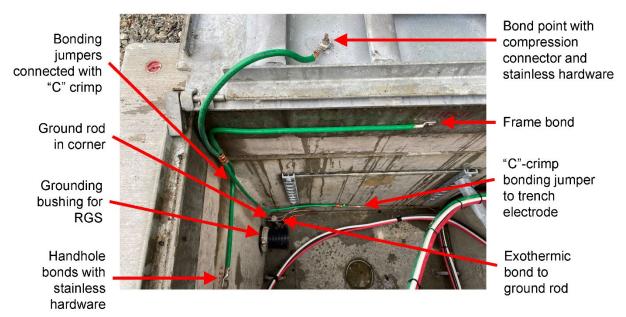
#### 4.1.2. Grounding Connections

Al bolted connections shall use stainless steel hardware.

Stacked connections are prohibited.

See Figure 4.1.2. Bond any metal conduits with bushings (Stock No. 013270).

# Figure 4.1.2. Handhole Wiring



#### 4.1.3. Lid Grounding

Choose appropriate method based on traffic load. See Table 4.1.4.

#### Table 4.1.3. Lid Grounding

Traffic Load	Method
Heavy	А
Medium	А
Light	В

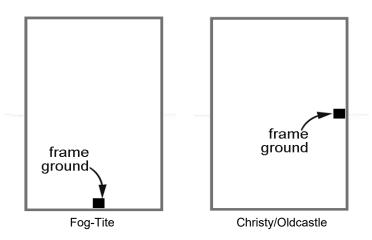
## 4.1.4. Grounding Method A (Example: 17" x 28" Handhole, Heavy or Medium Traffic)

Use precast handhole (Stock No. 720391) with lid that has factory installed ground strap.

Connect factory ground strap from lid to frame as follows:

- 1. Install and test grounding electrodes per SCL 0461.10.
- Install green #6 AWG THWN ground wire (Stock No. 612288) from frame using factory bolt and crimp-on lug (Stock No. 677065) to trench electrode using connector per SCL 6773.5 or 6773.61.
- 3. For streetlight service points only, bond neutral conductor to a green #6 AWG THWN ground wire (Stock No. 612288) with an irreversible connection. Connect ground wire to ground rod electrode with an exothermic connection listed for direct burial use.

## Figure 4.1.5. Frame Ground Locations



#### 4.1.5. Grounding Method B (Example: 17" x 28" Handhole, Light Traffic)

Use composite fiberglass, reinforced plastic, polymer mortar/concrete handholes (Stock No. 720393) and lid (Stock No. 720397).

This handhole and lid do not require bonding.

Rigid steel conduits shall be bonded.

#### 4.2 Conduits

Rigid steel conduit ends shall be protected with plastic bushings and furnished with a ground bushing or grounding clamp.

PVC conduit ends shall be protected with end bells.

Unused conduits shall be plugged and protected.

Used conduits shall be sealed with duct seal or foam.

Conduits shall enter the handhole perpendicular to the walls.

Conduit entrances into the handhole shall be offset to allow cables to wrap in the same direction. See Figure 4.2.

Conduits entering the handhole shall have a minimum cover per SCL 0224.07.

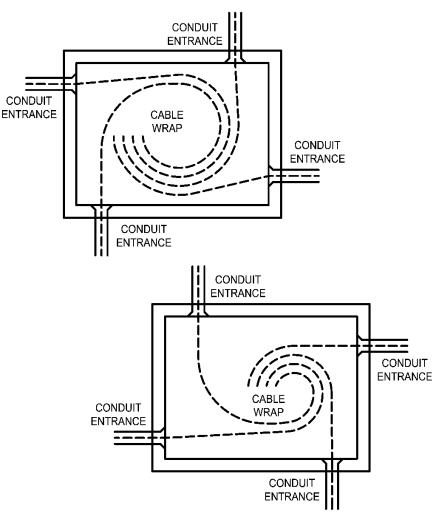
Furnish and install all risers up to 12 inches maximum in order to maintain minimum conduit cover. Risers shall not exceed 12 inches in order to maintain crew hand access to handhole. When site conditions require more than 12 inches of rise, a Type 6 handhole or larger is required. Type 6 is limited to a maximum of 30 inches of risers.

Conduits entering bottomless handholes shall be limited to 3 inches in diameter.

#### Table 4.2 Handhole Types and Allowed Conduits

Conduit Diameter Allowed (III)		
2	3	4
Yes	Yes	No
Yes	Yes	No
Yes	Yes	No
Yes	Yes	Yes
Yes	Yes	Yes
	2 Yes Yes Yes Yes	23YesYesYesYesYesYesYesYes

#### Conduit Diameter Allowed (in)



## Figure 4.2. Offset Conduit, Plan View

#### 4.3 Handholes

Handholes rated H-20 or Tier 22 shall only be installed in planting strips and pedestrian sidewalks where an occasional car or light truck may inadvertently traverse. Handholes in driveways shall be Type 5 or 6 and have an H-30-rated lid.

In backfill, aggregate, and planted areas, handholes shall be installed with a 1-inch reveal above grade. In paved areas, handholes shall be installed flush with grade.

All handhole covers shall have a slip resistant surface that meets the requirements of SCL 7203.01.

Handholes shall be easily accessible and not hidden among planned landscaping that will obscure it over time.

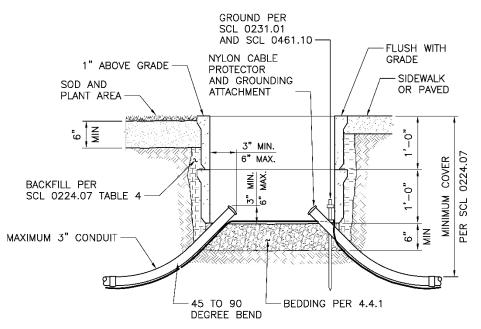
Handholes shall not be located in an area subject to heavy traffic.

Handholes shall be placed to avoid collecting surface water.

#### 4.3.1 Open Bottom Handhole

Typical open bottom secondary handhole installation shall conform to Figure 4.3.1.

## Figure 4.3.1. Open Bottom Handhole, Elevation View



Note: Bends entering bottomless handholes shall be permitted to be standard (STD) radius.

#### 4.3.2 Closed Bottom Handhole

All penetrations shall be located in the wall knockout areas and performed by core drill.

Core drill diameter shall be 1 inch larger than trade size of conduit. For example, a 3-inch conduit requires a 4-inch hole.

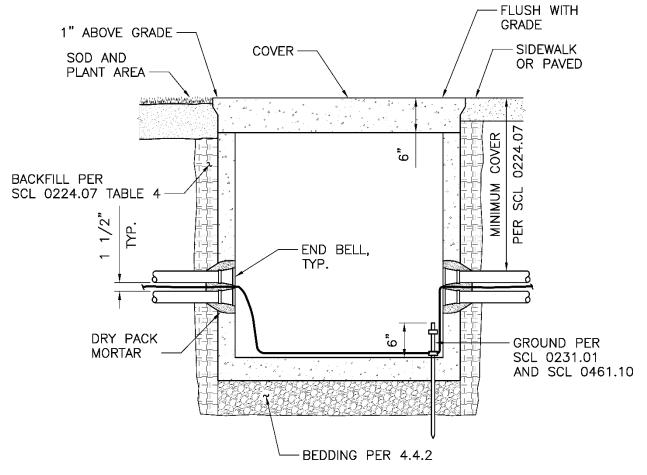
End bells shall be PVC Type DB-120 conduit and installed flush with the inside wall of the handhole.

Closed bottom secondary handhole installation shall conform to Figure 4.3.2.

Conduit shall be grouted both inside and outside of the handhole.

If minimum cover shown in Figure 4.3.2 exceeds what can be met with a single 12-inch riser, the next size larger handhole shall be installed.

#### Figure 4.3.2. Closed Bottom Handhole, Elevation View



#### 4.4 Bedding

#### 4.4.1. Open Bottom Handholes

Handholes shall be bedded on a minimum of 6 inches of 3/8-in washed gravel, mineral aggregate Type 9.

#### 4.4.2. Closed Bottom Handholes

The bedding material shall consist of 4 inches to 12 inches of stable base material.

If the excavation bottom is saturated prior to placing bedding material, then over-excavate area as directed by SCL engineer and place cobbles (3 inches to 8 inches stone – no broken concrete).

If excavation is not saturated prior to placing bedding material, compact bottom of excavation with two full compacting operations at right angles to each other with a mechanical compactor.

Place a layer of crushed rock (aggregate grade of 1-1/4 inches minus), screed and compact to a minimum thickness of 4 inches.

676286

#### 5. Material List

Handhole, without cover         Type 2 precast       012978         Type 2 handhole stacking riser       720402         Fiberglass       720393         233       013183         444       013093         Conduit, entering handhole         Straight - Schedule 40 PVC         2 in       734530         3 in       734532         4 in       734523         Straight - Steel       2         2 in       734741         3 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734938         3 in       734938         3 in       734938         3 in       734930         4 in       734931         3 in       731531         3 in       013270         4 in       012857 <t< th=""><th>Description</th><th>Stock No.</th></t<>	Description	Stock No.
Type 2 handhole stacking riser         720402           Fiberglass         720393           233         013183           444         013093           Conduit, entering handhole         13183           Straight - Schedule 40 PVC         2 in           2 in         734530           3 in         734532           4 in         734532           2 in         734741           3 in         734743           4 in         734743           4 in         734743           4 in         734745           Elbow - Steel, 90°         2           2 in         734820           3 in         734820           3 in         734820           3 in         734820           3 in         734824           End Bell – DB120 PVC         2           2 in         734938           3 in         734940           4 in         734940           4 in         734931           3 in         731531           3 in         013270           4 in         012857           Grounding clamp         2           2 in         676283 <th>Handhole, without cover</th> <th></th>	Handhole, without cover	
Fiberglass       720393         233       013183         444       013093         Conduit, entering handhole         Straight - Schedule 40 PVC         2 in       734530         3 in       734532         4 in       734523         Straight - Steel       2         2 in       734741         3 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734822         4 in       734824         End Bell - DB120 PVC       2         2 in       734938         3 in       734940         4 in       734940         4 in       734942         Steel conduit grounding       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Type 2 precast	012978
233       013183         444       013093         Conduit, entering handhole         Straight - Schedule 40 PVC         2 in       734530         3 in       734532         4 in       734533         Straight - Steel       734741         3 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       734820         3 in       734820         3 in       734820         3 in       734824         End Bell - DB120 PVC       2         2 in       734938         3 in       734940         4 in       734940         4 in       734940         4 in       734932         Steel conduit grounding       Grounding insulated bushing         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Type 2 handhole stacking riser	720402
444         013093           Conduit, entering handhole         734530           Straight - Schedule 40 PVC         2 in           2 in         734530           3 in         734532           4 in         734533           Straight - Steel         734741           3 in         734743           4 in         734743           4 in         734745           Elbow - Steel, 90°         734820           3 in         734820           3 in         734820           3 in         734824           End Bell - DB120 PVC         2           2 in         734938           3 in         734940           4 in         734940           4 in         734940           4 in         734940           4 in         731531           3 in         013270           4 in         012857           Grounding insulated bushing         2           2 in         676283	Fiberglass	720393
Conduit, entering handhole           Straight - Schedule 40 PVC           2 in         734530           3 in         734532           4 in         734533           Straight - Steel         2           2 in         734741           3 in         734743           4 in         734743           4 in         734745           Elbow - Steel, 90°         2           2 in         734820           3 in         734820           3 in         734820           3 in         734824           End Bell – DB120 PVC         2           2 in         734938           3 in         734940           4 in         734942           Steel conduit grounding         734942           Steel conduit grounding         731531           3 in         013270           4 in         012857           Grounding clamp         2           2 in         676283	233	013183
Straight - Schedule 40 PVC         2 in       734530         3 in       734532         4 in       734523         Straight - Steel       734741         3 in       734743         4 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734820         3 in       734820         3 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding       734932         Grounding insulated bushing       2         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	444	013093
2 in       734530         3 in       734532         4 in       734523         Straight - Steel       734741         3 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Conduit, entering handhole	
3 in       734532         4 in       734523         Straight - Steel       734741         3 in       734743         4 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Straight - Schedule 40 PVC	
4 in       734523         Straight - Steel       734741         2 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734940         4 in       734942         Steel conduit grounding       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	2 in	734530
Straight - Steel         2 in       734741         3 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734940         4 in       734942         Steel conduit grounding       734942         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	3 in	734532
2 in       734741         3 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	4 in	734523
3 in       734743         4 in       734745         Elbow - Steel, 90°       2         2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Straight - Steel	
4 in       734745         Elbow - Steel, 90°       734820         2 in       734822         4 in       734824         End Bell – DB120 PVC       734938         3 in       734940         4 in       734940         4 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2 in         2 in       676283	2 in	734741
Elbow - Steel, 90°         2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	3 in	734743
2 in       734820         3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	4 in	734745
3 in       734822         4 in       734824         End Bell – DB120 PVC       2         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	Elbow - Steel, 90°	
4 in       734824         End Bell – DB120 PVC       734938         2 in       734940         4 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	2 in	734820
End Bell – DB120 PVC         2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	3 in	734822
2 in       734938         3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	4 in	734824
3 in       734940         4 in       734942         Steel conduit grounding         Grounding insulated bushing       731531         2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2         2 in       676283	End Bell – DB120 PVC	
4 in734942Steel conduit groundingGrounding insulated bushing2 in3 in0132704 in012857Grounding clamp2 in2 in676283	2 in	734938
Steel conduit groundingGrounding insulated bushing2 in3 in0132704 in012857Grounding clamp2 in676283	3 in	734940
Grounding insulated bushing2 in7315313 in0132704 in012857Grounding clamp2 in2 in676283	4 in	734942
2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2 in         2 in       676283	Steel conduit grounding	
2 in       731531         3 in       013270         4 in       012857         Grounding clamp       2 in         2 in       676283		
4 in012857Grounding clamp2 in2 in676283		731531
Grounding clamp 2 in 676283	3 in	013270
2 in 676283	4 in	012857
2 in 676283	Grounding clamp	
3 in 676285		676283
	3 in	676285

4 in

#### 6. References

**SCL Construction Standard 0214.00**; "Clearances Between SCL Underground Structures and Other Utility Structures in the Public Right-of-Way""

SCL Construction Standard 0461.10; "Grounding Electrodes for Handholes and Vaults"

SCL Construction Standard 1716.07; "Streetlight Handhole and Conduit Requirements"

SCL Material Standard 6773.5; "Connector, Pressure Tap, Copper"

SCL Material Standard 6773.61; "Connector, Thin-Wall, Pressure-Tap, Copper"

SCL Material Standard 7203.01; "Precast Reinforced Concrete Handholes-General"

#### 7. Sources

Lu, Curtis; SCL Standards Engineer and subject matter expert for 0231.01

**Perander, Eivind**; SCL Sr. Manager - Services, Standards & Streetlight Engineering and subject matter expert for 0231.01

**SCL Construction Standard U2-13.1/NVH-50**; "Typical Handhole with Conduit" (canceled)

**2017 City of Seattle Standard Specifications for Road, Bridge and Municipal Construction**; Section 9-03.16, "Mineral Aggregate Chart"