

## Precast Reinforced Concrete Panel Vaults



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## 2. Scope

This standard covers the requirements for precast reinforced concrete panel vaults.

Panel vaults are custom designed to any size and configured to each job requirement. Access openings, duct bank knockouts and blockouts, and embedded accessories are configured as required per job.

All panel vault designs shall be submitted to Seattle City Light (SCL) Civil Engineering for review prior to production.

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## 3. Application

Precast reinforced concrete panel vaults are used to construct the underground electric system. Panel vaults may be used to house equipment, cables, service connections and splices for the distribution system.

Panel vaults are intended to be used in the network system areas.

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## 4. Industry Standards

Precast reinforced concrete panel vaults shall meet the requirements of the latest revision of the following industry standards:

**ACI 318**; "Building Code Requirements for Structural Concrete and Commentary"

**ANSI/AWS D1.4/D1.4M**; "Structural Welding Code – Reinforced Steel"

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

**ASTMA1064/A1064M**; "Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement Plain and Deformed, for Concrete"

**ASTM A615/A615M**; "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"

**ASTM A706/A706M**; "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement"

**ASTM C39/C39M**; "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"

**ASTM C150/C150M**; "Standard Specification for Portland Cement"

**ASTM C478/C478M**; "Standard Specification for Circular Precast Reinforced Concrete Manhole Sections"

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

**ASTM C858**; "Standard Specification for Underground Precast Concrete Utility Structures"

**NESC C2-2012, Rule 094B6**; "Concrete-Encased Electrodes"

## 5. Structural Design

Structural design of the precast vault shall conform to ACI 318, "Building Code Requirements for Structural Concrete" and ASTM C857, "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures," with the following clarifications:

- Top of vault shall be assumed to be at a minimum of 2 ft and a maximum of 5 ft below grade (unless otherwise noted on the drawing).
- Live load: AASHTO HS-25 truck, P=20 kips. Traffic can approach the structure from any direction. Load distribution per AASHTO LRFD Bridge Design Specifications.
- 30 percent live load impact load factor for soil cover less than or equal to 2 ft.
- 100 lb per square ft live load surcharge above 8 ft soil depth.
- Soil density shall be 120 lb force per cubic ft.
- 40 lb force per cubic ft equivalent fluid pressure lateral soil pressure above water table.
- 80 lb force per cubic ft equivalent fluid pressure lateral soil pressure below water table.
- The groundwater table shall be assumed to be 5 ft below grade or higher as shown in project drawings or soil boring.
- Panel vault shall be designed for a single controlled density fill pour from the base to the vault roof with vehicle surcharge load.
- Buoyancy: The weight of the vault (without equipment) plus weight of soil cover shall be greater than 1.1 times the hydrostatic uplift force on the base of the vault. It cannot rely on skin frictional resistance between backfill and vault wall surfaces. If the gravity load is insufficient, then the vault shall be designed with restraints to withstand the buoyant force. The restraint design shall be submitted for review and approval.

All panel vaults with inside plan dimensions of 8 ft by 14 ft and larger shall have walls, floors, and top sections (ceilings) with a minimum thickness of 6 inches.

10 ft by 20 ft panel vaults shall be fabricated with a single panel floor with built-in slope toward the sump.

A single panel floor with built-in slope is also preferred for other sizes of panel vault.

A 10' x 20' panel vault shall be used if possible since the manufacturer has fabricated a built-in slope floor form.

If multiple floor panels are required, provide positive mechanical connections between the panels to ensure against differential settlement at the floor panel joint.

Multiple floor panels shall be reviewed and approved by SCL prior to final design.

Duct terminators (also known as "term-a-ducts"), knockouts, blockouts, and sumps shall be designed to carry the loads imposed upon them. The basic structure shall be designed to carry all imposed loads with knockouts and blockouts removed.

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## 6. General Requirements

All panel vaults and accessories, including special order (non-stock) materials shall be manufactured in accordance with the requirements herein.

Panel vaults shall be reinforced precast concrete with features shown on the submittal drawings.

Panel vaults shall be designed and constructed to be watertight.

Structural components, including, but not limited to, grout, gasket, and joint hardware shall be provided with vault wall, top section (ceiling), and floor components.

Design changes shall require the prior written approval of an SCL standards engineer, civil engineer, or network engineer.

For all other precast reinforced concrete structures, including vaults, vault cover slabs, and pads or slabs, please refer to SCL 7203.21, "Precast Reinforced Concrete Structures – General."

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## 7. Order Information

Seattle City Light orders will provide the following minimum information:

- Vault size and description
- Access, blackout, knockout, and ladder requirements
- Exterior waterproof coating requirements
- Vault seam wraps requirements
- SCL general material standard number citing revision date
- SCL detailed material standard number citing revision date
- Total order quantity
- Delivery date
- Delivery location

All panel vault design detailed requirements shall be reviewed by SCL Civil Engineering prior to production.

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## 8. Submittals

A submittal is a group of required project documents typically assembled by a contractor and given to SCL for review. For a panel vault project, a submittal shall include:

- Design drawings
- Design calculations
- Shop drawings

Design calculations and shop drawings shall be prepared and stamped by (or prepared under direct supervision of) a Licensed Professional who holds a current license under Title 18 RCW, State of Washington. The Licensed Professional must be registered and qualified in an applicable branch of engineering.

Sections 8.1 through 8.3 describe the submittal and the review process.

### 8.1 Design Calculations

Design calculations shall include the following:

- Material specification notes
- Design loading notes
- Live Load: AASHTO HS-20 or HS-25 truck (per project requirement)
- Load case for 2 ft and 5 ft of soil cover for panel vaults or design depth shown on the drawing
- Load case for pulling iron in use with 100 psf surcharge load
- Load case for a single controlled density fill pour
- Floor and ceiling design.
- Wall design
- Riser design
- Hatch and cover design with impact load factor:
  - Round covers shall be designed for 26 kips wheel load (HS 25 truck + 30% impact load) with 8 lug round frames
  - Equipment (rectangular or square) hatches shall be design for minimum of 20.8 kips wheel load (HS20 truck + 30% impact load)
- Buoyancy check
- Project information such as customer and vault number
- Professional Engineer stamp

## 8.2 Shop Drawings

Shop drawings shall include the following:

- Plan and section views, dimensioning to all features
- Reinforcement placement plan, rebar bend details and cut list
- Bill of material
- Structural design notes
- Cover and hatches detail
- Duct bank knockouts and blockouts
- Pulling iron detail
- Sump detail
- Wall and Floor connection details (mechanical and sealing material)
- Product weight
- Vault transporting, handling, storing and installation guidelines.
- Manufacturing dwg template with Project information (vault ID, vault purchase order number, customer) and drawing date.
- Professional Engineer stamp

## 8.3 Submittal Review Process

Although each panel vault project is different, most projects include the roles and deliverables shown in Table 8.3.1 and follow the steps shown in Section 8.3.2.

### 8.3.1 Roles and Deliverables

In most cases, SCL uses a general contractor to construct a panel vault. The general contractor works closely with the manufacturer on behalf of SCL, prepares the required submittal documents, and installs the finished vault.

If SCL does not use a general contractor, SCL shall conduct a similar submittal review process for panel vault design and construction work done by SCL personnel.

An SCL project manager oversees most panel vault projects and works with all project contributors to facilitate communication and resolve issues. Table 8.3.1 describes the roles and deliverables for typical panel vault projects.

**Table 8.3.1. Roles and Deliverables**

Role	Deliverable
Design engineer (SCL network engineer, SCL distribution engineer, or the project consultant) <sup>a</sup>	<ul style="list-style-type: none"> <li>▪ Order information</li> <li>▪ Design criteria</li> <li>▪ Design drawings</li> </ul>
SCL project manager <sup>a</sup>	
Project consultant (hired by SCL) <sup>a</sup>	
General contractor (hired by SCL) <sup>a</sup>	
Manufacturer (approved by SCL)	<ul style="list-style-type: none"> <li>▪ Design calculations<sup>b</sup></li> <li>▪ Shop drawings<sup>b</sup></li> <li>▪ Vault</li> </ul>
SCL Electrical reviewer or inspector	
SCL Civil engineer <sup>a</sup>	
SCL Civil inspector	
WSDOT	
SDOT	

a. Member of the review committee.

b. Design calculations and shop drawings shall be prepared by (or prepared under direct supervision of) a Licensed Professional who holds a current license under Title 18 RCW, State of Washington. The Licensed Professional must be registered and qualified in an applicable branch of engineering.

### 8.3.2. Steps

#### **Step 1: SCL initiates the project**

- a. The design engineer (the SCL network engineer, SCL distribution engineer, or project consultant) determines the vault configuration and design criteria (knockout-duct bank entrance locations and hatch locations) and provides the vault order information for the project. (See Section 7.)
- b. The project is sent out for bid to general contractors.

#### **Step 2: The general contractor and manufacturer create the submittal**

- a. The successful bidder/general contractor contacts the manufacturer, sends the design criteria and order information, and requests shop drawings and design calculations for each vault. See Section 8.2 for shop drawing requirements and Section 8.1 for design calculation requirements.
- b. The manufacturer creates the shop drawings and design calculations and sends them to the general contractor.
- c. The contractor shall endorse all shop drawings and mark them with the SCL project location/identification and the manufacturer's shop order number.
- d. The general contractor submits the required documents for the submittal to SCL for review. The submittal shall include the panel vault design drawings, design calculations, and shop drawings for each vault used in the project. (See Sections 8.1 and 8.2.)

#### **Step 3: SCL reviews the submittal**

- a. The SCL design engineer, SCL civil engineer, SCL electrical reviewer, and SCL civil inspector review the submittal.
  - For WSDOT projects, a WSDOT engineer also reviews the submittal.
  - For SDOT projects, a SDOT design engineer also reviews the submittal.

NOTE: The engineer shall review the submittal to ensure compliance with SCL requirements. The engineer's review shall not include the contractor's means, methods, techniques, sequences, construction procedures, or safety precautions or programs. The contractor is responsible for confirming and correlating fabrication and construction techniques, and all dimensions.

- b. SCL Civil Engineering will check with the responsible electrical engineer(s) to determine whether the vault layout shows the latest design (since design changes often occur for long and complicated projects).

#### **Step 4: SCL responds to the submittal**

- a. SCL gives a transmittal letter to the review committee that summarizes SCL comments and the results of the submittal review. The following notations shall be interpreted as follows:
  - *No Exception Taken*  
Submittals returned and marked “No Exception Taken” authorize the contractor to proceed with the portion of the work or fabrication, or to obtain materials or equipment as contained in the submittal.
  - *Make Corrections Noted*  
Submittals returned and marked “Make Corrections Noted” authorize the contractor to proceed with the portion of work covered by the submittal as long as the corrections noted are followed. For submittals prepared by the professional engineer, the contractor shall provide a return copy showing the noted corrections.
  - *Submit Specified Item*  
Submittals returned and marked “Submit Specified Item” indicate an incomplete submittal. This means the contractor is not authorized to perform that portion of the work. The “specified item” shall be resubmitted.
  - *Rejected or Revise and Resubmit*  
Submittals returned and marked “Rejected” or “Revise and Resubmit” indicate the submittal is incomplete or does not comply with SCL requirements, and shall be resubmitted with appropriate changes before proceeding with that portion of the work. Vaults may also be rejected if they do not meet SCL 7201.00, “Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities,” and ASTM C858, “Standard Specification for Underground Precast Concrete Utility Structures.”
- b. If the submittal requires changes, the contractor sends the submittal review result back to the manufacturer to make the proper corrections or modifications.
- c. The SCL review committee will review all revised and resubmitted drawings and documents and return one copy of each, together with a transmittal letter, to the contractor within 10 working days after receipt. Drawings and documents shall bear a revised revision date. Revised areas of the submittal shall be circled.
- d. The contractor shall present a complete and acceptable submittal package to SCL not later than the second submittal of an item.

#### **Step 5: SCL signs off**

- a. When the vault design submittal review is acceptable and no changes are required, the SCL engineers and civil and electrical reviewers sign off on the drawings using the phrase “no exception taken.”
- b. SCL project manager or civil engineer informs the various stakeholders.

#### **Step 6: The manufacturer produces and ships the vault**

- a. The contractor will inform the approved panel vault manufacturer to start production. This gives the manufacturer a greenlight to start production.
- b. The manufacturer produces the vault.
- c. The manufacturer ships the vault to the SCL work site.

**Step 7. SCL and other stakeholders inspect the vault**

- a. The SCL Civil inspector shall inspect the panel vault for cracks, defects, features, and production tolerances. A decision is made whether to accept the vault. If the vault has minor, repairable defects, the vault may be accepted. See Section 19 for rejection and repair criteria.
  - For critical projects, SCL will sometimes inspect these vaults at the manufacturing plant for compliance prior to concrete pour or delivery.
  - For WSDOT projects, the WSDOT inspector may inspect the panel vaults at the manufacturing plant and at the delivery site.
- b. The contractor shall inspect the vault for damages, cracks, defects, features, and production tolerances incurred prior to off-loading the vault components.

**Step 8. The general contractor installs the vault**

Once the vault is accepted and off loaded, the vault is installed by the contractor.

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**9. Reinforced Concrete**

Minimum compressive strength of concrete shall not be less than 5000 pounds per square inch in 28 days as determined by the ASTM Method C39, Standard Test Method for Compressive Strength of Cylinder Concrete Specimens.

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 A1064.

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.

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 inch for stirrups and ties.

Concrete finish shall be free of rock pockets and honeycombed areas.

Interior walls, ceiling, and exposed exterior surfaces shall be smooth.

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

Reinforcement of the concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) shall comply with ACI 318.

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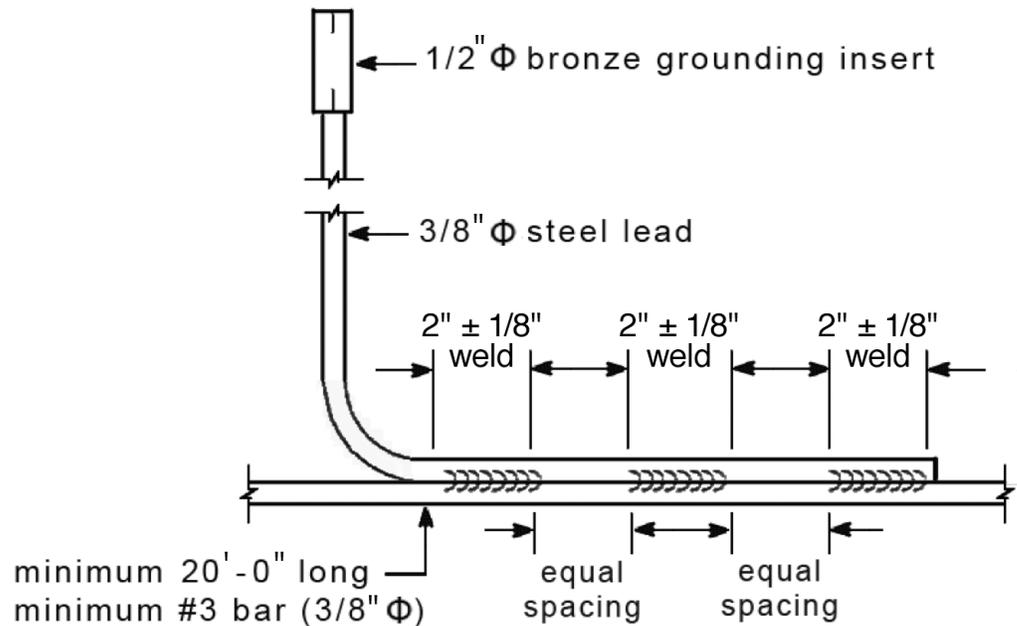
**10. Ground Insert Connectors**

Each bronze insert shall have a minimum surface contact area of 0.58 sq in.

Each bronze insert shall be tapped for 1/2-in 13 bolts and located on the lower corner of each wall panel.

The lead rod, a 3/8-in steel or bronze rod, shall be connected to the ground electrode with arc or Cadweld (Exothermic Connection) at a minimum of three points as shown in Figure 10.

**Figure 10. Lead Rod and Ground Electrode Weld Details**



Each panel vault wall and floor shall be supplied with ground inserts.

Ground inserts shall be accessible internally and externally on vault walls.

The ground insert connector shall be installed flush (neither recessed nor protruding) with the vault wall.

Inserts shall be plugged to prevent contamination from entering threads.

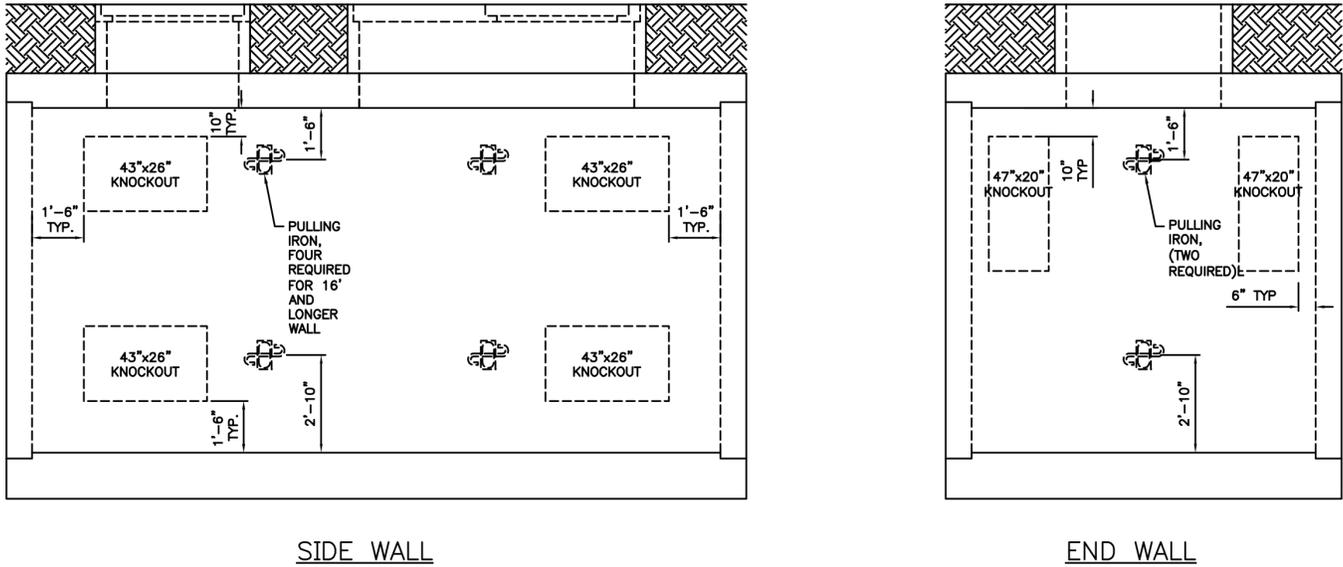
## 11. Knockouts and Vault Openings

Vaults 8 ft x 14 ft (inside dimensions) and larger shall have two, 42-in-diameter access entries and a 10 ft x 20 ft vault shall have one, 42-in diameter access and one 5496 equipment hatch with a 42-in access unless specified otherwise by SCL.

Knockouts for new duct banks shall be beveled in the interior surface. A blockout is a notched opening to intercept existing duct banks that must remain in place. Size, shape, quantity, and location of knockouts and blockouts shall be as specified in the design submittals.

Panel walls shall include default knockouts on the end and side walls as shown in Figure 11. These default knockouts are for ease of connecting possible future duct banks. These default knockouts shall be omitted, or adjustments made in their size and locations if the project design knockout, blockout, or term-a-duct are required at or near these default knockouts.

**Figure 11. Panel Vault Default Knockouts**



**12. Duct Bank Knockout and Blockout Threaded Inserts and Rebar**

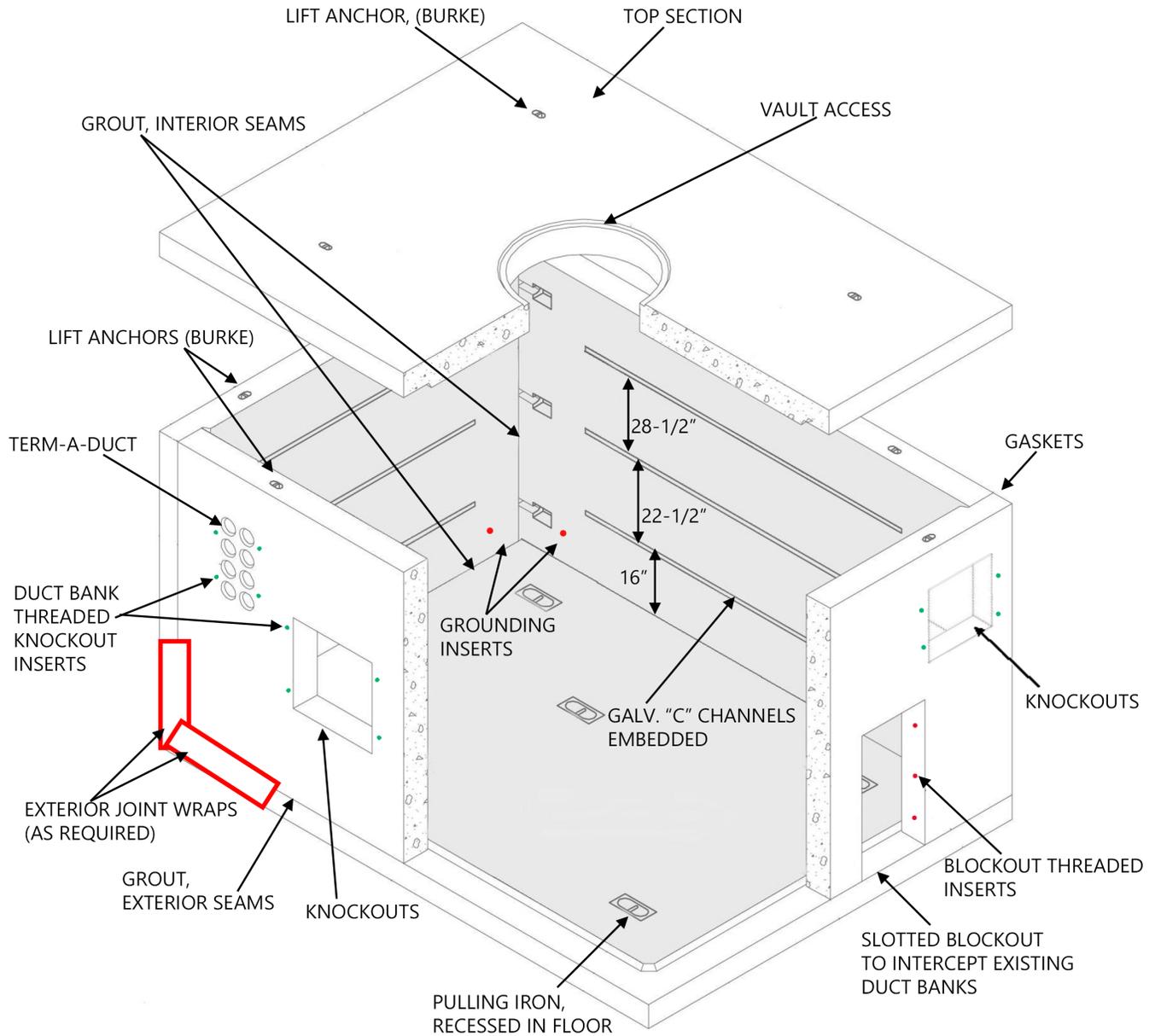
Panel vaults shall be provided with a 1/2-in diameter ferrule threaded insert at 12 inches around each knockout on the exterior face along with #4 x 24-in long rebar with a 1-in thread. These threaded inserts are to allow the duct bank rebar to dowel into the vault wall to provide shear connection at that interface. See Figure 13.

Panel vaults with blockouts shall be provided with a 3/4-in diameter ferrule threaded insert at 12 inches around each blockout seam along with #6 x 24" long rebar with a 1-in thread. These rebars are used to reinforce and tie in the blockout that will be filled with structural grout or concrete. See Figure 13.

**13. Panel Vault Accessories**

Panel vaults shall include components and accessories as shown in Figure 13.

**Figure 13. Panel Vault Assembly Components**



NOTE: SUMP NOT SHOWN  
LADDER NOT SHOWN

### 13.1 Pulling Irons

Pulling irons shall be according to the requirements of Table 13.1.

Pulling irons' maximum working tension shall be stenciled onto the wall or ceiling surfaces next to each pulling iron.

**Table 13.1. Pulling Iron Specifications**

Pulling Iron Ultimate Strength (lb)	Maximum Working Tension (lb)	Maximum Allowable Tension (lb)	Size (in)	Steel
40,000	20,000	10,000	7/8	Stainless

### 13.2 Cable and Equipment Support

Panel vaults shall be provided with a minimum of three rows of embedded "C" channels on each wall, unless obstructed by knockouts, duct terminations, or blockouts.

Channels shall be 12-gauge Unistrut P3200 Series Concrete inserts (1-5/8 in x 1-3/8), or equal, with hooks for racking.

Channel spacing shall be as shown in Figure 13.

A fourth row of "C" channel is required for vaults with an inside height of 9 ft and greater with 22-1/2-in channel spacing.

### 13.3 Drainage and Sump

All panel vault floors shall have a 26 in x 51 in blockout to accommodate a rectangular, flanged drop-in sump at one end wall, measuring 44-in long by 18-in (minimum) deep by 14-in wide at the top and 12-in (minimum) wide at the bottom.

Sump shall have a positive mechanical connection to the vault floor to prevent uplift due to hydrostatic pressure from the design water table or the CDF backfill pour.

Panel vaults shall be supplied with galvanized grating for the sump.

The floor shall be sloped to drain toward the sump.

Provide a 3-in diameter hole for the sump drain in the vault roof (directly above the sump).

### 13.4 Lifting Inserts (Burke Lift Anchors)

All metal lifting devices cast into the internal or external surfaces of vaults for handling purposes shall be hot-dip galvanized or made from stainless steel.

### 13.5 Ladders

A vault ladder shall be provided where the vault floor is 14 ft-5 in or more below grade for network vaults and 12 ft-6 in for non-network vaults.

Where a ladder is required, it shall conform to the following requirements:

- Ladders shall be corrosion resistant.
- Ladders shall be made according to SCL Drawing D-28304, Rev 5, "Retractable Ladder, Vault and Manhole Access," with the following clarifications:
  - Retractable upper ladder length shall be 7 ft-8 in
  - The upper ladder's 3/4-in square rungs shall extend 5/16-in minimum beyond the outer rail wall to ensure it will not come loose if the weld fails.
  - Both the upper and lower ladder sections shall be permanently marked with the fabricator name and production date

Ladder substitution shall be submitted to SCL civil engineer for approval.

### **13.6 Joint Gasket, Seam Grout, and Exterior Joint Wrap**

Joint gaskets and grout shall be provided by the vault manufacturer.

All interior and exterior seams shall be grouted by installer.

Exterior joint wrap and primer (if required by SCL) shall be provided by the vault manufacturer.

Two rows of gaskets shall be used between floor, walls, and roof joints.

Gaskets shall be Controlled Expansion Hydrophilic waterstop sealant (such as ConSeal CS-231 or equal).

Fast-setting cement grout with a minimum compressive strength of 2500 psi at 24 hours (Such as Speed Crete Red Line Rapid Setting Repair Material or equal) shall be used at interior and exterior seams between all precast sections, including wall, floor, and roof sections' hatch riser rings and sump.

Vault exterior face joint wrap (if required by SCL) shall be ConSeal CS-212 Polyolefin Backed Exterior Joint Wrap or equal. Wrap shall be 12" wide and minimum 0.065" thick. Primer for the wrap shall be ConSeal CS-75 or equal.

Exterior coating shall be Tnemec Series 46H-413 H , Polyamide Epoxy-Coal Tar

### **13.7 Duct Terminators**

Duct terminators, also known as Term-a-Ducts, shall be provided as required by project vault design and shop drawings.

Size, shape, quantity, and location of duct terminators shall be a specified in the design submittals.

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## **14. Metal Doors and Access Cover Plates**

All lids, hatches, and frames shall be provided with a grounding lug or pad.

### **14.1 Frames and Covers**

All frames and hatch covers for shall be designed for at least 26 kips wheel load (HS25 + 30% impact) applied in any direction.

All frames and lids shall have a non-slip surface. Refer to Section 15.

Vaults 8 ft x 14 ft or larger shall have two, 42-in diameter access and a 10 ft x 20 ft vault shall have one 42-in diameter access and one 5496 equipment hatch with a 42-in access unless specified in project submittal drawings.

The 42-in round cover and frames shall also comply with requirements in SCL 7204.70, "Frames and Covers, 42-in Round, Iron."

### **14.2 Doors**

All doors shall 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 in from the hinged edge.

All doors shall be designed for at least 26 kips wheel loading (H25 + 30% impact).

Aluminum doors for 36 in x 36 in and 36 in x 74 in opening access shall be designed for at least 26 kips wheel loading (H25 + 30% impact or equivalent H30 + 8% impact).

All steel doors and access cover plates shall be hot dipped galvanized in accordance with ASTM A123.

All equipment doors/hatches used in the Network area shall be of the drop-in/lift-off type. Hinged equipment doors/hatches are not allowed in the Network area.

All doors shall have a non-slip surface. Refer to Section 15.

All doors shall have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access. Locking mechanism shall not protrude above the door surface.

Square or rectangular doors shall open along the lengthwise of the access opening.

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## 15. Non-Slip Surfaces

Non-slip coating shall be either SlipNot Grade 3 or Thermion TH604.

All non-slip surfaces shall have the following properties:

- Minimum coefficient of friction of 0.8
- Bond strength to the plate of 3000 psi or greater
- Surface hardness of 55 minimum on the Rockwell "C" scale

Type of non-slip surface ("TH604" for Thermion TH604) and the year of manufacture shall be identified on the underside of the door, e.g., "TH604 2016." The identification shall be bead welded or clearly stamped into a metal surface on the underside of each lid, or labeled with an adhesive, metallic foil-backed label.

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## 16. Identification

All lids and doors shall be permanently marked with 3-in high letters "Electric" clearly visible on the top where distribution cables occupy the enclosure.

All panel vaults shall have a permanent identification plate installed inside the vault wall. The identification plate shall include the following information:

- Manufacturer name
  - Date of manufacture
  - Vault design load, e.g., "HS-25"
  - Pulling iron capacity
- 

## 17. Panel Vault Floors

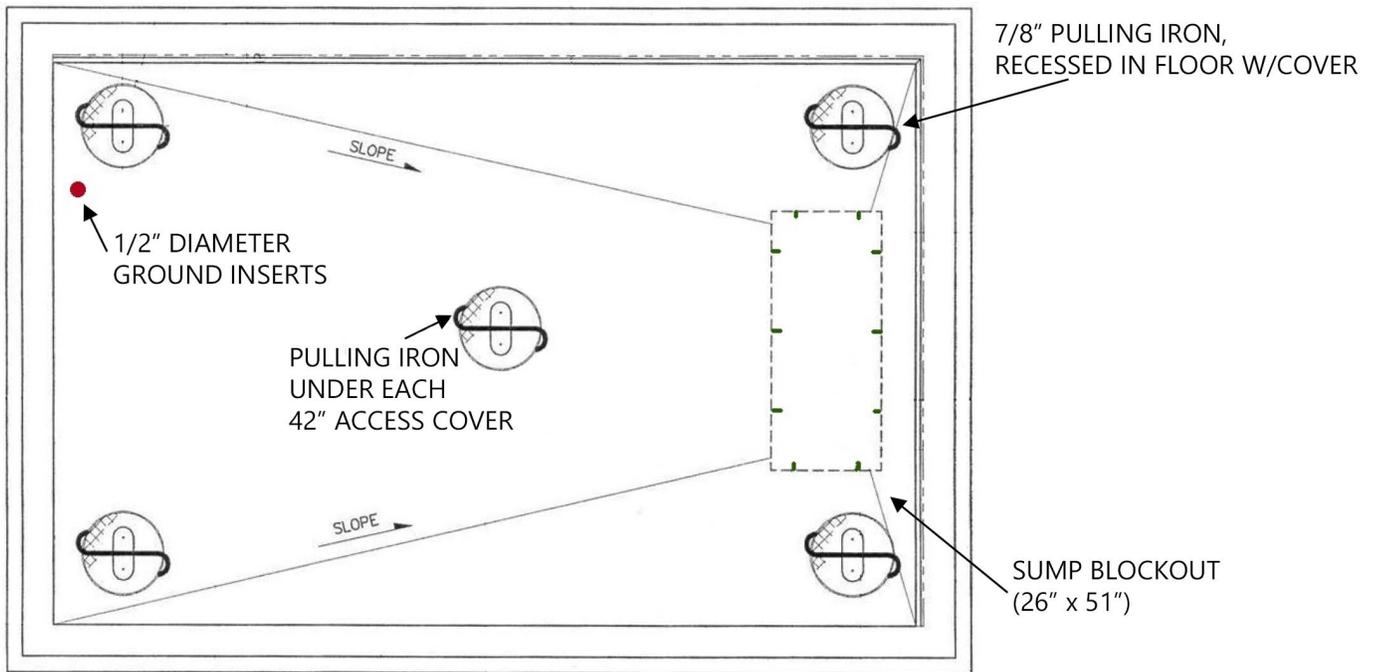
Panel vault floors shall be poured as one piece when possible. If multiple pieces are required, floor pieces shall be mechanically joined.

The 1020 panel vault floor shall be sloped at least 1/2 in per 10 ft along the length of the vault toward the sump. Other panel vault sizes shall be sloped when possible.

Panel shall have the following attributes:

- Blockout for a cast-in-place or precast sump; located 6 inches from inside edge of short wall, at bottom of sloped floor; refer to Section 13.3 and Figure 17
- Pre-casted sump or cast-in sump; refer to Section 13.3
- Pulling iron; one (1) shall be located at each corner of base floor (typical), as required, recessed in floor; one (1) each shall be located below each 42-inch round personnel hatch. See Figure 17. Refer to Section 13.1.
- Pulling iron cover plate, located over each pulling iron
- Lift anchors; size and location as required by project submittal drawings
- Ground inserts
- Ladder (if required)

**Figure 17. Panel Vault Floor**



## 18. Panel Vault Walls

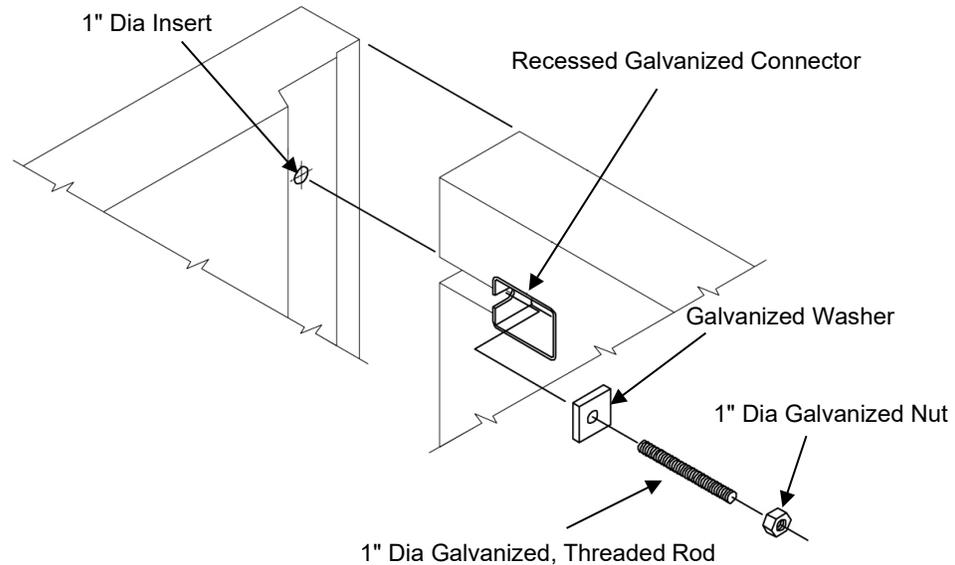
Each wall panel section of the panel vault may have some or all of the following features as specified and approved by SCL engineers. Size and location of each feature shall be as described in project submittal drawings:

- Knockouts and vault openings: Refer to sections 11 and 12, and figures 11 and 13
- Pulling irons: Refer to Section 13.1 and figures 11 and 13
- Cable and equipment support: Refer to Section 13.2 and Figure 13
- Ground insert connectors: Refer to Section 10
- Duct bank knockout and blockout threaded inserts and rebar: Refer to Section 12 and Figure 13
- Lift inserts: Minimum of 2 on the top of each wall panel. Refer to Section 13.4 and Figure 13.
- Identification: Refer to Section 16
- Joint gasket and seam grout, and exterior joint wrap: Refer to Section 13.6 and Figure 13

For wall corner connections:

- Locations of all component pieces shall be as required in project submittal drawings. See figures 18 and 13.
- A recessed, galvanized connection box shall be embedded in the edge of wall. See Figure 18.
- Wall connection inserts, as well as galvanized threaded rods or coil bolts, nuts, channel washers, and flat washers, shall measure 1 inch in diameter. If a square washer is used, that dimension shall be 2 inches square, or of a sufficient diameter to accommodate a 1-in bolt.

**Figure 18. Panel Vault Wall Corner Connection Details**



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## 19. Panel Vault Top Sections

The interior of the top section shall have pulling irons mounted on each corner. Refer to Section 13.1.

The exterior of the top section shall have lift anchors embedded in the top surface at each corner. See Figure 13.

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## 20. Quality Control

Precast concrete vaults shall be manufactured in accordance with ASTM C858.

Vaults may be rejected if they fail to conform to construction and dimensional tolerances specified in ASTM C858.

Vaults may also be rejected if they do not meet SCL 7201.00, "Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities."

Minor defects that can be repaired in accordance with SCL material standards shall be done in accordance to SCL U2-6/NVH-20, "Inspection and Repair Procedures for Precast Vaults and Manholes."

Prior to panel vault delivery, vault manufacturer may be required to provide information such as concrete mix proportion, type and source of cement, aggregates, admixtures, and reinforcement steel mill certification.

Panel vaults shall be warranted for one year against design and manufacturing defects, including those resulting from poor workmanship and materials.

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## 21. Approved Manufacturers

Oldcastle Precast/Utility Vault

## 22. References

**SCL Drawing D-28304**; “Retractable Ladder Vault and Manhole Access”, Rev 5 (April 2020)

**SCL Construction Guideline U2-6/NVH-20**; “Inspection and Repair Procedures for Precast Vaults and Manholes”

**SCL Material Standard 7201.00**; “Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities”

**SCL Material Standard 7203.21**; “Precast Reinforced Concrete Structures – General”

**SCL Material Standard 7204.70**; “Frames and Covers, 42-inch Round, Iron”

**SCL Design Standard 9246.10**; “Pulling Irons – Fundamentals and Detailed Requirements, Looped Radial and Network Systems”

**Vault Standard Specifications**; Ng, Sharon; SCL Civil Engineer,

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## 23. Sources

**Ng, Sharon**; SCL Senior Civil Engineer and subject matter expert for 7203.81

**Pacheco, Lulu**; SCL Associate Civil Engineer and subject matter expert for 7203.81

**Wang, Quan**; SCL Standards Engineer, originator, and subject matter expert for 7203.81

**www.oldcastleinfrastructure.com**

**Youngs, Rob**; SCL Electrical Reviewer and subject matter expert for 7203.81