

## ZG 311 Concrete Requirements

### 1. Scope

This specification outlines the minimum material requirements for concrete equipment bases and enclosures to be used in conjunction with company owned primary-rated equipment. The specification applies whether the equipment base or enclosure is to be installed by company personnel, contractors, customer, or the supplier.

### 2. Applicable Documents

The latest revisions of the documents listed below, in effect on the date of invitation to bid, apply to the extent specified herein.

#### 2.1. Company Documents

ZG 301 *General Equipment Base and Enclosure Requirements*

ZG 501 *Padvault—Single-Phase Residential, 4' × 4' (48" × 48")*

ZG 521 *Padvault—Three-Phase Transformer*

ZG 531 *Padvault—Three-Phase Sectionalizing Cabinet*

ZG 532 *Flat Pad—Three-Phase Transformer*

ZG 541 *Single-Phase Fusing Cabinet Padvaults*

ZG 551 *Padvault—Three-Phase Fusing Cabinet*

ZG 562 *Padvault—7' × 12' (94" × 155"), for 600-Amp, Dead-Front Switchgear*

ZG 571 *Padvault—Metering Cabinet Lid*

ZG 616 *Padvault—4' × 6' (48" × 72")*

ZG 621 *Padvault—5' × 7' (56" × 84"), for Three-Phase Sectionalizing Cabinets and Metering Equipment*

ZG 622 *Padvault—7' × 9' (84" × 108"), for Three-Phase 15 kV Pad-Mounted Switchgear*

ZG 631 *Manhole—7' × 7' (84" × 84")*

ZG 641 *Padvault—Shallow, 7' × 7' (84" × 84")*

ZG 701 *Manhole—7' × 12' (94" × 155")*

ZG 711 *Vault—Shallow, 7' × 12' (94" × 155")*

ZG 715 *Sleeve—15, 25 and 35 kV, 600-Amp, Dead-Front Switchgear, Padvault*

ZG 811 *Full Traffic Cover and Frame Assembly*

#### 2.2. Codes and Standards

Western Underground Committee Guide 2.13 *Security for Padmounted Equipment Enclosures*

Western Underground Committee Guide 2.15 *Flat Single Phase Transformer Pads*

ANSI/SCTE 77, 2007 *Specification for Underground Enclosure Integrity* (Greater side wall strength may be specified for some projects.)

ASTM C33 *Standard Specification for Concrete Aggregates*

#### Material Specification

Page 1 of 6

Published Date: 19 Mar 19

Last Reviewed: 19 Mar 19



ASTM C150 <i>Standard Specification for Portland Cement</i>	█
ASTM A 615 <i>Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement</i>	█
ACI 211 <i>Standard Practice for Selecting Proportions for Normal Heavyweight, and Mass Concrete</i>	
ACI 212 <i>Report on Chemical Admixtures for Concrete</i>	█
ACI 237 <i>Self-Consolidating Concrete</i>	
ACI 304 <i>Guide for Measuring, Mixing, Transporting, and Placing Concrete</i>	█
ACI 305 <i>Guide to Hot Weather Concreting</i>	█
ACI 306 <i>Guide to Cold Weather Concreting</i>	█
ACI 318 <i>Building Code Requirements for Structural Concrete</i>	█
ACI 347 <i>Guide to Formwork for Concrete</i>	
AWS D1.4 <i>Structural Welding Code—Steel Reinforcing Bars</i>	█

### 3. Definition

Company refers to PacifiCorp.

PacifiCorp refers to Pacific Power and Rocky Mountain Power.

### 4. General

This specification states material and construction requirements which are applicable only to all concrete equipment bases or enclosures.

### 5. Design and Manufacturing Requirements

The purpose of a concrete equipment base is to support the weight of primary-rated pad-mount equipment. Enclosures are used to contain primary rated equipment below grade or provide an area for cable pulling or splicing.

#### 5.1. Concrete Materials

Cement used shall be a standard brand of Portland cement, Type II or III conforming to ASTM C150, latest edition. Aggregates shall consist of natural sands and gravels, crushed rock, crushed slag, or other inert materials having clean, uncoated grains of strong durable material that conforms to ASTM C33 and ACI 318-89.

Concrete strength at twenty-eight days shall be at least 4000 lbs. per square inch.

#### 5.2. Forms

Forms may be of wood or metal selected to produce a smooth surface finish. They shall be constructed sufficiently tight to prevent leakage of concrete, and securely braced and shored to prevent displacement and safely support construction loads. Forms shall be removed in a manner and at a time which will ensure the complete safety of the structure.

### 5.3. Cold Weather Requirements

When the ambient air temperature is below forty degrees Fahrenheit, concrete shall be at least sixty (60) degrees Fahrenheit when poured, and shall be maintained at least a minimum of fifty (50) degrees Fahrenheit for seventy-two (72) hours. All forms shall be frost free.

### 5.4. Surfaces

The finished surface shall be flat and free of aggregate pockets and honeycomb. Where minor defects occur, they shall be painted with cement grout, patched with a one-to-one cement / sand mixture, and finished to match adjacent surfaces while the concrete is still green.

### 5.5. Curing

All concrete shall be cured for not less than seven (7) days by keeping the surface wet by sprinkling. Membrane compound may be used in lieu of water curing. The component parts must be poured at least seven (7) days prior to shipment to stores or installation at the site, as required in individual equipment base and enclosure specifications.

### 5.6. Air Entrainment

Approved air entraining agents shall be used to provide an air content at 6 %, + or – 1.5%.

### 5.7. Reinforcement

The supplier shall determine the proper placement of steel reinforcement to ensure compliance with strength requirements. Reinforcement shall consist of 4 × 4 - 6/6 steel reinforcing mesh and #4 through #6 steel rebar, placed as required to meet the load requirements of individual equipment base and enclosure specifications. Mesh shall meet the requirements of ASTM A-185. Rebar shall be Grade 60, and shall meet the requirements of ASTM A-615.

The supplier shall ensure that the holding strength of pulling eyes and irons meets the requirements description in each of the company's specifications.

Some pads require a plastic board (or boards) for securing the cabinet onto the pad. Plastic boards shall have a holding strength of 1000 lbs. per linear foot.

### 5.8. Concrete Test Reports

The company has the right to request certified concrete compressed air test reports.

### 5.9. Certifying Suppliers Quality Assurance Program

The vendor shall be required to provide details of their Quality Compliance program before being added as a qualified supplier. Included in the audit will be documents showing that the vault designs are certified by a Licensed Professional Engineer.

## 5.10. Vault Manufacturing Inspection

Observation by a company representative of the vault manufacturer, including inspection of the facility, testing and/or a vault tear-down, is the option of company.

### 5.11. Marking

The manufacturer shall provide the following marking on an internal wall:

1. Manufacturer's name.
2. Date of construction (showing month and year).

### 5.12. Grounding Grid

Each vault shall be constructed with an encased electrode meeting NESC 094.B.6. The  $\frac{3}{8}$ " steel rebar shall be 20 continuous feet in length, embedded in concrete at least 24" below finished grade when the vault is set. The grounding system shall be attached to a connection insert of high-strength bronze alloy, threaded to  $\frac{1}{2}$ " 13 UNC. The vertical rebar attaching to the bronze connection shall be welded or connected by a minimum of a copper-clad  $\frac{5}{8}$ " ground clamp.

Each padvault shall have five grounding inserts: two on opposite side walls and one at the cover. Two inserts on opposite side walls shall be available for connection on the inside and outside of the vault. The outside grounding inserts shall be centered on the side walls. The inside inserts shall be centered on the side wall or located no less than 6" from diagonal corners. The cover pad grounding insert shall be accessible from inside the vault.

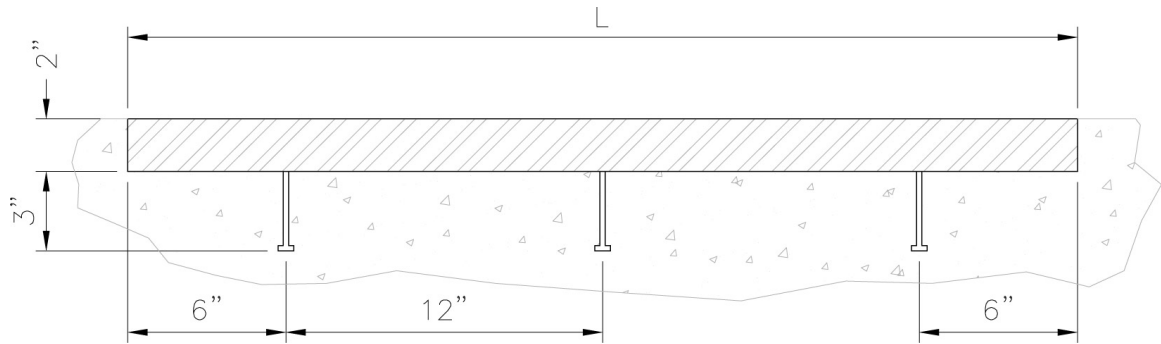
The company may request the viewing of the ground grid prior to the vendor's acceptance as a supplier. The viewing may be a visit to the plant to see the different steps in the manufacturing process. Alternative to a plant visit are electronic pictures of the reinforcing cage, showing how the grounding grid is integrated into the structure, and a Licensed Professional Engineer's stamp on the design documents.

### 5.13. "C"-Channel Material

C-channels shall be galvanized or fiberglass  $1\frac{5}{8}$ " x  $1\frac{3}{16}$ ". See the vault specification for length and rotation.

### 5.14. Composite Board Lumber

The composite board lumber shall be 2" x 4" winchester gray color with high-quality and 200 psi or higher shear strength design value. The composite plate shall be attached to the concrete by using the  $\frac{5}{16}$ " x 4" zinc bolts. The attachments shall be strong enough to have a solid bond with concrete and shouldn't be pulled off when installing enclosures to the composite board.



**Figure I—Composite Board Lumber**

## 6. Material Specification Issuing Department

The T&D standards engineering department of PacifiCorp wrote this material specification. This material specification shall be used and duplicated only in support of company projects.

This page is left blank intentionally.

