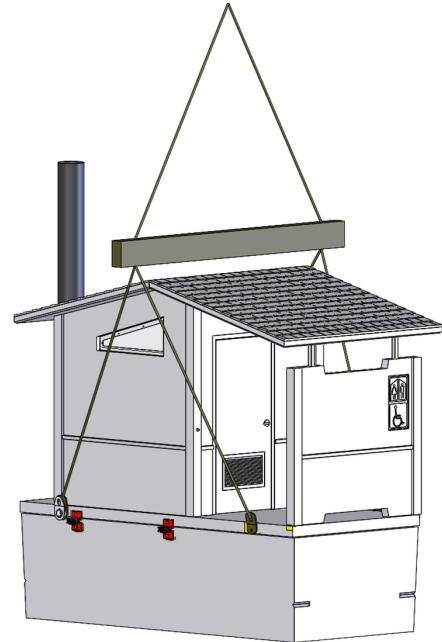


DESIGN STANDARDS → TECHNICAL SPECIFICATIONS

# Vault Toilet Specifications

Below you'll find our technical specifications and design standards for vault concrete toilets, ensuring consistency, durability, and compliance with public sanitation requirements.



## GSA Multiple Award Schedule Contract

GSA Contract Number: 47QSWA18D0041

SIN's Offered: 36-10H & 361-32

DUNS: 079712352

Cage Code: 1RL31

NAICS: 238120, 327390

Montana Contractor Registration: 12255

BC Concrete dba. Missoula Concrete Construction

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## **1.0 SCOPE**

This specification covers the construction and placing of the Aspen Style precast concrete vault toilet as produced by Missoula Concrete Construction.

## **2.0 SPECIFICATIONS**

ASTM C33	Concrete Aggregates
ASTM C39	Method of Test for Compressive Strength of Cylindrical Concrete
Specimens	ASTM C143 Method of Test for Slump of Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C192	Method of Making and Curing Test Specimens in the Laboratory
ACI 1211	Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete
PCIMNL 116	Quality Control for Plants and Production of Precast Prestressed Concrete Products
AWS D1.1	Structural Welding Code

### **3.1 MANUFACTURER CRITERIA**

1. PCI Certified Plant
2. ISO 9001 Certified

### **3.2 DESIGN CRITERIA**

The Aspen has been designed to meet the following criteria. Calculations and Engineer's stamped drawings are available upon request by the customer and are for their sole and specific use only. The design criteria are to ensure that the Aspen not only will withstand the forces of nature listed below but to provide protection from vandalism and other unforeseen hazards.

#### **A. Roof Snow Load**

1. The Aspen will withstand a snow load of 250 pounds per square foot.

#### **B. Wind Load**

1. The Aspen will withstand the effects of 120 miles per hour wind load (fastest mile) or 180 mph (3 second gust) Exposure C.

#### **C. Earthquake**

1. The Aspen will withstand the effects of zone 4 earthquakes.

#### **D. Additional Design Standards**

1. The Aspen vault toilet is designed to meet the requirements of the Americans with Disabilities Act Requirements and Uniform Federal Accessibility Standard including as of the date of these specifications.
2. The Aspen incorporates all design aspects of Sweet-Smelling Technology as outlined by Brian Cook for the U.S. Forest Service. ("In Depth Design and Maintenance Manual for Vault Toilets" - July 1991 - Publication No. 9123 1601)
3. The Aspen has a one-piece vault unit to support the building, screen area and snow loads evenly. The Aspen has a one-piece prestressed floor unit with a 250 psf load capacity to withstand transportation stresses.
4. Vault toilet buildings shall have a minimum 4" wall, 4-1/2" roof, and 5" floor.
5. All vault toilet buildings have a 3/12 roof pitch.

## **E. Tolerances**

1. Tolerances will be within the limits as dictated by the PCI Quality Control and Assurance Manual.

## **4.2 MATERIALS**

### **A. Concrete - General**

This concrete mix design is designed to ACI 211.1 to produce concrete of good workability.

1. SCC Mix Design – One Cubic Yard
  - a. Cement: 752 Lbs (Holcim Type III)
  - b. Water: 34 Gallon (Not to Exceed 36 Gallon)
  - c. Coarse aggregate  $\frac{3}{4}$ ": 1,420 Lbs (1% moisture)
  - d. Sand: 1,420 Lbs (SSD)
  - e. BASF MASTERGLENIUM 7920: 68 OZ.
  - f. BASF MASTERSET AC 534: 2-12 OZ./100 Lbs. Cement (as required)
  - g. BASF MASTER X-SEED 44: 2-12 OZ/100 Lbs. Cement (as required)
  - h. BASF MASTERMATRIX VMA 362 (if required)
  - i. Water / Cement ratio (max.): 0.399
  - j. Transfer Strength: 2,500 PSI
  - k. Final Strength: 5,000 PSI
  - l. Average 28-day strength 5,500 PSI (Air 4-7%)
  - m. Concrete Aggregate: Supplied by Knife River
2. Cement will be low alkali type I-II or type III conforming to ASTMC-150
3. Coarse aggregates used in the concrete mix design will conform to ASTM C33 with the designated size of coarse aggregate #67.
4. Spread will range from 22" – 26".
5. Air-entrained admixtures will conform to ASTM C260. Water reducing admixtures will conform to ASTM C494, Type A. Plasticizing admixtures will conform to ASTMC 1017.

### **B. Colored Concrete**

1. Color additives will conform to ASTM C979. A 6"x12"x2" color sample will be available for customer approval.
2. The following will contain colored concrete:
  - a. Toilet building roof panels.
  - b. Building walls
  - c. Screen panels
  - d. The sample brand and type of color additive will be used throughout the manufacturing process.
  - e. All ingredients will be weighed, -and the mixing operation will be adequate to ensure uniform dispersion of the color.
3. Color pigments will be by Solomon Colors, Inc.

### **C. Cold Weather Concrete**

1. Cold weather concrete placement will be in accordance with ACI306.
2. Concrete will not be placed if ambient temperature is expected to be below 35 degrees F. during the curing period unless heat is readily available to maintain the surface temperature of the concrete at least 45 degrees F.
3. Materials containing frost or lumps of frozen materials will not be used.

### **D. Hot Weather Concrete**

1. The Temperature of the concrete will not exceed 80 degrees F. at the time of placement and when the ambient temperature reaches 90 degrees F. The concrete will be protected with moist covering.

#### **E. Concrete Reinforcement**

1. All reinforcing steel will conform to ASTM A615. All welded wire fabric will conform to ASTM A185.
2. All reinforcement will be new, free of dirt oil. Paint, grease, and loose mill scale and loose or thick rust when placed.
3. Details not shown on drawings or specified will be to ACI318.
4. Steel reinforcement will be centered in the cross-sectional area of the walls and will have at least 1" of cover on the under surface of the floor and roof.
5. The maximum allowable variation for center-center spacing of reinforcing steel will be 1/2".
6. Full lengths of reinforcing steel will be used when possible.
7. Reinforcing bars will be bent cold.
8. Diagonal reinforcement will be placed around all openings.

#### **F. Sealers and Curing Compounds**

1. Curing compounds, if used, will be odorless, complying with ASTM C309 type I or I-D.
2. Weatherproofing sealer for exterior of building will be clear, low gloss, water based acrylic sealer (Dayton-Superior UltraSealEF)

#### **G. Caulking, Grout, Adhesive and Sealer**

1. All caulking will remain flexible and non-sag at temperatures from 50 to 140 degrees Fahrenheit
2. Interior joints will be caulked with white TITEBOND Ultimate MP
3. Exterior joints will be caulked with a siliconized acrylic caulk that closely matches the exterior concrete color (by SASHCO). Roof ridge will be black TITEBOND Ultimate MP
4. Epoxy concrete adhesive will be two components: rigid and non-sag gel adhesive for bonding to dry or damp surfaces, moisture insensitive.
5. Portland cement mortar will consist of one part Portland cement, two parts sand and enough water to make a workable mixture.

#### **H. Paint**

1. All paints and materials will conform to all Federal specifications or be similar "top-of-the-line-components". Paints will be lead free.
  - a. Inside concrete surfaces:
    - I. Interior Floors will be Rust-Oleum, Industrial Coatings 9100 series 2-part solvent based epoxy, Color: Gray ([www.roddapaint.com](http://www.roddapaint.com))
    - II. Interior walls and ceiling will be Rodda Master Painter Zero, White Base 4536015 Interior semi-gloss, Color: White. ([www.roddapaint.com](http://www.roddapaint.com)) Followed by anti-graffiti sealer (if requested).
  - b. Metal surfaces both inside and out:
    - I. Door will be Rodda Porsalite Semigloss Interior/Exterior Alkyd Enamel, Neutral Base 74 5004 1 custom matched to Rust-Oleum 7754 Anodized Bronze ([www.roddapaint.com](http://www.roddapaint.com)). Door frame, window frames, and rear clean-out will be Rust-Oleum 7754 Anodized Bronze
  - c. Exterior concrete surfaces:
    - I. Exterior walls will be Rodda CoverCoat XL Premium Acrylic Latex, Neutral Base 41 1104 5, Velvet Flat Latex Color: Varies. ([www.roddapaint.com](http://www.roddapaint.com)) Followed by anti-graffiti sealer (if requested).
    - II. Simulated shake roof will be boiled linseed oil thinned 10% with paint thinner.

**I. Grab bars**

1. Grab bars will be 18-gauge, type 304 stainless steel with 1-1/2" clearance. Grab bars will each be able to withstand 300 pounds of loading.

**J. Toilet Paper Dispenser**

1. Dispenser will be constructed of 1/4" type 304 stainless steel with an enamel finish. Dispenser can hold three (3) standard rolls of toilet paper. Toilet paper holder fastening system will be able to withstand 300-pound top loading.

**K. Toilet Riser**

1. Toilet riser will be 18" high, white cross-linked polyethylene, with heavy duty seat and lid, manufactured by Romtec, Roseburg, OR.

**L. Steel Doors**

1. Doors will be flush panel type 1-3/4" thick, minimum 16-gauge prime coated steel panels, level 3 Extra Heavy-duty, by STEELCRAFT.
2. Door frames will be knockdown or welded type, single rabbet, minimum 16-gauge prime coated steel width to suit wall thickness. Three (3) rubber door silencers will be provided on latch side offrame.

**M. Door Hinge**

1. Door hinges will be 3 per door with dull chrome plating 4 1/2"x 4 1/2", adjustable tension automatic closing for each door.

**N. Lockset**

1. Lockset will meet ANSI AI 56.2 Series 4000, Grade 1 cylindrical lockset for exterior doors.
2. Lever handle both inside and out.
3. Either handle operates latch unless outside handle is locked by inside push-button.
4. Push-button will automatically release when inside lever handle is turned, or door is closed.
5. Emergency slot on exterior so door can be unlocked from the outside with a coin, screwdriver, etc.
6. Inside lever always active.
7. U.S. 26D finish.

**O. Deadbolt (if requested)**

1. Certified ANSI/BHMA A156.5-2001 Grade 1. Heavy duty tamper resistant. 2-3/4" backset. U.S. 26D finish.

**P. Door or Wall Louvers**

1. Door louver will be fixed, inverted split Y, non-vision, 18 gauge cold rolled steel with factory prime coat equal to FDLS series.
2. Wall louver (if requested) will be HEAVY DUTY KICK PROOF Vent by METALWORKS OF MONTANA, Missoula, MT
3. Wall louver (if requested) will be 14-gauge, type 304 stainless steel painted DTM and anchored into concrete wall with tamper-proof drive-in fasteners.

**Q. Doorstop**

1. Doorstop will have a cast metal base, U.S. 26D finish with gray rubber 2-3/8" diameter bumper with a 1" projection.

## **R. Double Coat Hook**

1. Coat hooks will be constructed of solid brass with a brushed chrome finish. Hooks will be side by side “ram horn” style with minimal projection for safety.

## **S. Door Sweep**

1. Door sweep will be provided at the bottom of door and will be an adjustable brush type.

## **T. Windows and Vault Cleanout Cove**

1. Windows and cleanout cover frames will be constructed from steel.
2. Window glazing will be .177 thick LEXAN polycarbonate.
3. Plate for vault cleanout cover will be 1/4" thick diamond plate steel. Lid will be configured so that it can be locked with a padlock. Lid will be designed to resist surface runoff penetration into the vault. A neoprene gasket will be provided around the entire perimeter of the lid to provide an airtight seal.

## **U. Vault Liner & Sealer**

1. Vaults will be coated with *conceal* CS 1200, a cement based waterproofing treatment rated for sealing septic tanks. Vaults coated with *conceal* CS 1200 shall be warranted against leaks for a period of 7 years.

## **V. Vent Stack**

1. Vent stack will be 12" HDPE DR 32.5 (MIN) and extended ~4' higher than the roof peak and will be covered with a TRC vent screen by Teton Raptor Center.

## **5.1 MANUFACTURE**

### **A. Mixing and Delivery of Concrete.**

1. Mixing and delivery of concrete will be in accordance with ASTM C94, section 10.6 through 10.9 with the following additions.
2. Aggregate and water will be adjusted to compensate for differences in the saturated surface-dry conditions.
3. Concrete will be discharged as soon as possible after mixing is complete. This time will not exceed 30 minutes.

### **B. Placing and Consolidating Concrete**

1. Concrete will be consolidated using mechanical vibrators. Vibrations will be sufficient to accomplish compaction but not to the point that segregation occurs.

### **C. Finishing Concrete**

1. Interior floor and exterior slabs will be floated and troweled until all marks are removed. A light broom finish will be applied to the exterior and interior slabs for a non-slip finish.
2. All exterior building walls and exterior screen walls will be a barnwood texture, unless otherwise specified.
3. All exterior surfaces of the roof panels will be cast to simulate a cedar shake roof, unless otherwise specified. The underside of the overhang will have a smooth finish.

#### **D. Cracks and Patching**

1. Cracks in concrete components that are judged to affect the structural integrity of the building will be rejected.
2. Small holes, depressions and rock pockets will be patched with a suitable material. The patch will match the color, finish, and texture of the surrounding surface.
3. Patching will not be allowed on defective areas if the structural integrity of building is affected.

#### **E. Curing and Hardening Concrete**

1. Concrete surfaces will not be allowed to dry out from exposure to hot, dry weather during the initial curing period.
2. Curing compounds will not be used on interior walls as they will prevent paint adhesion.

### **6. FINISHING AND FABRICATION**

#### **A. Structural Joints**

1. All welding will be by Certified Welders only (in accordance with AWS D1.1).
2. Wall components will be joined together with 2 welded plate pairs at each joint. Weld plates will be anchored into the concrete panels and welded together with a continuous weld.
3. Walls and roof will be joined with weld plates, 2-1/2" x 5", at each building corner.
4. The joint between the floor slab and walls will be joined with a grout mixture on the inside. A matching-colored caulk on the outside and two weld plates 6" long per wall.

#### **B. Painting**

1. An appropriate curing time will be allowed before paint is applied to concrete.
2. Some applications may require acid etching. A 30% solution of hydrochloric acid will be used, flushed with water, and allowed to thoroughly air dry.
3. Painting will not be done outside in cold, frosty, or damp weather.
4. Painting will not be done outside in winter unless the temperature is 50 degrees Fahrenheit or higher.
5. Painting will not be done in dusty areas.
6. Schedule of finishes:
  - a. Inside concrete surfaces
    - I. Inside floors will be 2 coats of 2-part solvent-based epoxy.
    - II. Interior walls and ceiling will be one coat primer / filler and 2 coats of white water based acrylic emulsion.
  - b. Metal surfaces both inside and out
    - I. 1 coat primer and 2 coats of enamel
  - c. Exterior concrete surfaces
    - I. Stained enhanced exterior walls will be 1 coat of pure acrylic water repellent penetration stain in the same color as the walls or roof followed by 1 coat of clear acrylic sealer.

### **7.1 QUALITY CONTROL AND INSPECTION**

#### **A. Pre-pour inspection.**

1. Check all panel measurements including diagonals (must be within  $\frac{1}{4}$  inch).
2. Check rebar spacing and clearance.
3. Check location of all embeds.

#### **B. Concrete Testing**

1. The following tests will be performed on concrete used in the manufacture of toilets. Testing will

only be performed by qualified individuals who have been certified ACI Technician Grade 1. Sampling will be in accordance with ASTM C172.

- a. The spread of the concrete will be performed on the first batch of concrete. This spread will be in the 22"-26" range.
- b. The compressive strength of the cylinders will be tested to ASTMC39.
- c. Test cylinders will be taken from each other batch.
  - 1 cylinder will be tested prior to removal of forms and must be at 2,500 psi or higher.
  - 1 cylinder represents 7-day strength.
  - 2 cylinders will represent 28-day strength and must be 4,500 psi or greater.

### **C. After Form Removal Inspection**

1. Recheck panel dimensions.
2. Verify that all embeds remained in place.
3. Look for all cracks or blemishes that may cause rejection.
4. Assure that panels are properly yarded and blocked.

## **8.1 INSTALLATION (by others)**

### **A. Scope of Work**

1. Work specified under this Section includes excavation, backfill and placement of precast concrete vault toilet.

### **B. Materials**

1. Bedding material to be sand or 3/8" minus crushed or screened aggregate.
2. Sealant between vault and toilet floor to be 1.5" x 1.5" Butyl Rubber Sealant. (Supplied by Missoula Concrete)

### **C. Location and Access to the Site**

It is the responsibility of the customer to locate the vault toilet in area that provides safe and reasonable access for trucks and equipment.

1. The area must be free of overhead or underground obstructions.
2. Care must be taken to not place excavated material in the area where the crane must sit.
3. Verify that bridges/culverts in route to the site are rated for HS-20 loading.
4. Deliveries may be delayed if road conditions are hazardous or unsuitable for normal trucks and trailers.
5. Trucks must be able to reach the site under their own power.

### **D. Excavation and Elevation**

1. Comply with all applicable OSHA Standards for excavation.
2. The "Aspen" vault toilet requires a hole that is 8ft wide and 16ft long as long as measured at the bottom. Depth should be 4'-5" below desired finished floor elevation.
3. Finish floor elevation will be 4-6 inches above natural grade measured at the front (entrance) of the exterior slab unless otherwise approved by the customer. The customer may specify a finish floor elevation for buildings at some sites. The contractor will install buildings at these sites with the floor elevation within  $\pm 0.05$  feet of the specified floor elevation. It is very important that the installation provides drainage away from the structure.

### **F. Bedding and Compaction**

1. Compact the natural ground at the bottom of the vault excavation with a minimum of three passes with a whacker-type mechanical compactor or equivalent approved by the customer.

2. Install sand or aggregate bedding material for leveling course. Compact leveling course with one pass with a whacker-type mechanical tamper or equivalent approved by the customer. Grade leveling course so there will be no high spots in the middle of the vault bottom. Compact with a second pass with a whacker or approved equivalent tamper.
3. Set vault in place. Backfill around structure. Use excavation material for backfill except that rocks larger than six inches in maximum dimensions shall not be placed within six inches of the exterior vault walls.
4. Fill, adjacent to the building entry, will have excavated material placed in eight-inch loose lifts and compacted with a minimum of two passes with a whacker-type mechanical compactor or equivalent approved by the customer.

#### **G. Finish Grading**

1. Spread excess excavated material from the vault around structure. Intended final grade is flush with the top of the front slab. Allow for placement of topsoil to reach that grade. Grade backfill away from structure from structure at maximum slope of five (5) percent unless otherwise approved by the customer.
2. Spread stockpiled topsoil as final layer after rough grading is completed. Areas disturbed by excavation, backfilling, and stockpiling of excavated materials will be hand raked to remove exposed rocks over one inch in maximum dimension. Oversized rocks removed from the surface shall be disposed of in a designated area within 200 feet of the site.

#### **H. Vault Toilet Riser and Accessories**

1. Apply 1.5" Butyl rubber adhesive sealant to the top surface of the concrete vault before placing the structure on the vault.

#### **I. Exhaust Pipe Installation**

1. After exhaust pipe is installed, seal around pipe at top and underside of roof with silicone caulk. Seal around pipe at top of slab will be accomplished by using silicone caulk.

### **9.1 MISSOULA CONCRETE CONSTRUCTION WARRANTY**

Missoula Concrete Construction warrants that all goods sold are manufactured with the best of industry standards and that all materials and workmanships are as set forth in the specifications.

For a period of 3 years from the date of delivery, Missoula Concrete construction will repair or replace, free of charge, any of its structures which are determined to be structurally unsound due to poor workmanship or material. Determination must be in writing by a licensed structural engineer. Missoula Concrete Construction must be given the opportunity to inspect the site.

After inspection by a structural engineer, if damage incurred is NOT deemed to be the responsibility of Missoula Concrete poor workmanship, contractor / owner will be responsible for the cost of any 3<sup>rd</sup> party opinions obtained to reach said verdict.

Missoula Concrete Construction will be held harmless from any damage due to site location. Accessories are warranted to the extent of the individual accessory manufacturer's warranty.

This warranty shall not apply to:

1. *Goods which have been improperly handled or improperly installed by others;*
2. *Goods which have been poorly sited (such as areas subject to flooding or high water tables.)*
3. *Good which have been repaired or altered without Missoula Concrete Construction's written consent;*

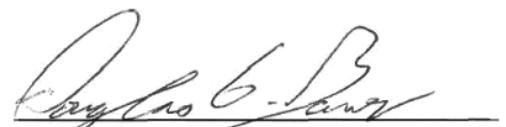
4. Goods which have been damaged by forces of nature in excess of design criteria, to include fire, flood, avalanche, landslide, tornado, falling trees, vehicle collisions, and any and all acts of God, etc.
  - The above includes excessive water to include, but not limited to, rain, flooding, snow melt, runoff.
5. Minor hairline cracks due to shrinkage, thermal expansion/contraction, or shipping.
6. Efflorescence bleeding through the concrete.
  - Pressure washing/onsite work is excluded in Missoula Concrete's Scope of work.
  - Efflorescence is a "byproduct" of concrete and is not covered under warranty.
7. Damage due to accidents, vandalism, or improper maintenance.
8. Minor paint/rust repairs due to weather exposure
9. All hardware and after market items installed in latrine except when the item is deemed "nonfunctional" due to Missoula Concrete Workmanship.

## **10.0 DISCLAIMER OF OTHER WARRANTIES**

THE WARRANTY SET FORTH ABOVE IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ALL OTHER WARRANTIES ARE HEREBY DISCLAIMED. MISSOULA CONCRETE CONSTRUCTION MAKES NO OTHER WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE OR USE.

## **11.0 LIMITATION OF REMEDIES**

In the event of any breach of any obligation hereunder; breach of any warranty regarding the goods or any negligent act or omission of any party, the parties shall otherwise have all rights and remedies available at law; however, in no event shall Missoula Concrete Construction be subject to or liable for any incidental or consequential damages.



Douglas G. Bauer, President