

Easi-Set® Precast Concrete Vault Restrooms

Pre-Assembled

Section 13120

1.01 SCOPE

Contractor to furnish a precast concrete transportable building. Building to be delivered and placed on owner's prepared stone foundation in accordance with manufacturer's recommendations. Precast building to be EASI-SET® brand Vault Restroom Models Blue Ridge, Sierra, or Shenandoah as manufactured by Easi-Set Industries (ESI), Midland, Virginia, or licensed manufacturer of Easi-Set Buildings. Building to be provided by manufacturer with all necessary openings as specified by contractor in conformance with manufacturer's structural requirements.

The work of this section consists of prefabrication, on-site delivery, off loading and placement of precast concrete vault restrooms.

This section includes specifications for the construction of precast concrete Pump-Out (Dry) vault buildings. Roof styles available are Gabled LR (standard) with optional styles of Flat, Gabled FB, and OutBack®.

2.0 SPECIFICATIONS

IBC 2006 International Building Code
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 1211.1 Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete
PCI MNL 116 Quality control for Plants and Production of Precast Pre-stressed Concrete Products
AWS D1.1 Structural Welding Code

1.03 DESIGN CRITERIA

Vault restrooms have 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 vault restrooms not only will withstand the forces of nature listed below but to provide protection from vandalism and other unforeseen hazards.

- A. Snow Load: The vault restroom will withstand a snow load of 100 pounds per square foot.
- B. Wind Load: The vault restroom will withstand the effects of 130 mile per hour wind load (3 second-gust), Exposure C.
- C. Earth Quake: The vault restroom will withstand the effects of a zone 4 earthquake.
- D. Additional Design Standards

1. The vault restroom 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 vault restroom incorporates all design aspects of Sweet Smelling Technology (SST) 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) SST equals Fresh Air Naturally (FAN) by Easi-Set Industries.
 3. The vault restroom has a one-piece vault unit to support the building, screen area and snow loads evenly. The vault restroom has a one piece floor unit with a 150 psf load capacity to withstand transportation stresses.
- E. Tolerances: Tolerances will be within the limits as dictated by the PCI Quality Control and Assurance Manual.

4.0 MATERIALS

- A. Concrete – General, This concrete mix design is designed to ACI 211.1 to produce concrete of good workability. Mix #7.25 R – 1 cubic yard. Ave. 28 day strength 5,000 psi
1. Cement will be low alkali type I-II or type III conforming to ASTM C-150
 2. Coarse aggregates used in the concrete mix design will conform to ASTM C33 with the designated size of coarse aggregate #67
 3. Minimum water/cement ratio will not exceed 0.40. Slump will not exceed 5".
 4. Air-entrained admixtures will conform to ASTM C260. Water reducing admixtures will conform to ASTM C494, Type A. Plasticizing admixtures will conform to ASTM C1017. Other admixtures will not be used without customer approval.
- B. Colored Concrete: Concrete colored by proprietary methods. Color additives, if required will conform to ASTM C979. A 6" x 12" x 2" color sample will be available for customer approval.
1. The following will contain colored concrete, if required:
 - 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.

C. Cold Weather Concrete

1. Cold weather concrete placement will be in accordance with ACI 306.
2. Concrete will not be placed if ambient temperature is expected to be below 35° Fahrenheit during the curing period unless heat is readily available to maintain the surface temperature of the concrete at least 45° Fahrenheit.
3. Materials containing frost or lumps of frozen materials will not be used.

D. Hot Weather Concrete: The temperature of the concrete will not exceed 80° Fahrenheit. At the time of placement and when the ambient temperature reaches 90° Fahrenheit. 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, loose mill scale, loose or thick rust when placed.
3. Details not shown on drawings or specified will be to ACI 318.
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 ½".
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.
9. Post Tensioning Strand: 41K Polystrand CP50, .50, 270 KSI, 7-wire strand, greased plastic sheath, (ASTM A416), roof and floor to be each post-tensioned by a single, continuous tendon. Said tendon shall form a substantially rectangular configuration having gently curving corners wherein the positioning of the cable member results in a pattern of one or more loops and a bisecting of the loop(s). The cable member starts from one corner of the concrete building panel, forms a gentle perimeter loop(s) returning to a point where the cable member entered the concrete building panel. The tendon then turns 90° and follows the cable member(s) to a point midway along the "Y" axis of the concrete building panel and then turns 90° along the "X" axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel.

If post-tensioning is not used in the roof panel, the following guidelines must be followed to ensure a watertight roof design.

The entire precast concrete roof panel surface must be cleaned and primed with a material that prepares the concrete surface for proper adherence to the coating material.

The entire precast concrete roof panel surface shall be sealed with a .045 EPDM continuous membrane cemented to the concrete with a compound designed for this purpose.

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 J-24).

G. Caulking, Grout, Adhesive and Sealer

1. All caulking will remain flexible and non-sag at temperatures from 50 to 140 ° Fahrenheit.
2. Interior joints will be caulked with white "Sidewinder" by DAP, or equal.
3. Exterior joints will be caulked with a siliconized acrylic caulk that closely matches the exterior concrete color (by GE Sealants). Roof ridge will be 100% silicone caulk (also by GE Sealants), or equals.
4. Epoxy concrete adhesive will be two components rigid, non sag gel adhesive for bonding to dry or damp surfaces, moisture insensitive.
5. Portland cement mortar will consist of one part Portland cement, three 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-components". Paints will be lead free.
 - a. Inside concrete surfaces
 - I. Interior floors will be a 2-part water based epoxy (AQUA TILE by INSL-X). The color will be gray.
 - II. Interior walls and ceiling will be a 100% acrylic emulsion, Mirrorlac-WB DP84XX by DEVOE/GLIDDEN, or equal. The color will be white.
 - b. Metal surfaces both inside and out.
 - I. Primer and enamel – Mirrorlac DP85XX by DEVOE/GLIDDEN or equal.
 - c. Exterior concrete surfaces
 - I. Exterior slab will be clear sealer
 - II. Exterior walls will be a pure acrylic water repellent penetrating stain in the same color as the walls followed by a clear acrylic sealer, or equal.
 - III. Simulated shake roofs will receive a heavy coat of stain and sealer.

I. Grab bars

1. Stainless steel tubing, 1-1/2 inch outside diameter mounted 1-1/2 inches from wall, 18 gauge, type 304 stainless steel concealed screw-mounting flanges, Bobrick series B-6806, 888-610-8889, or approved equal.

J. Toilet Paper Dispenser

1. Bar-type toilet paper dispenser shall be constructed of stainless steel with satin finish or steel with glossy white enamel finish with neoprene sleeve, designed to hold three standard rolls of toilet paper. Holder shall not prevent the free turning of the paper rolls. The dispenser shall be manufactured by Romtec, Inc., 18240 N. Bank Road, Roseburg, Oregon 97470, 541-496-3541 or approved equal.

K. Optional Wet Flush Facility: Standard stainless steel fixture and accessory package to be furnished by Murdcock Super Secure (Acorn Mfg) or as listed below approved equal or owner's choice.

1. Waste and vent piping: ABS or PVC plastic.
2. Water piping: Copper tubing Type L, hard drawn. Provide a gate or ball valve at the inlet end of the water line. Size water lines to provide proper flushing action based on a nominal water pressure of 40 psi.
3. Provide a main shut-off valve and drain in the service area.
4. Toilet (water closet) and seat and urinal (if provided): Type 304 stainless steel, wall hung, with siphon jet action. Provide back spud for concealed flush valve connection, or approved equal, or owner's choice.
5. Flush valve: Concealed closet flush-o-meter constructed of rough brass with water saver flow of 1.6 gallons per flush. Furnish valve with integral vacuum breaker and wall mounted push button.
6. Lavatory: Type 304 stainless steel, 20 inches wide x 18 inches front to back x 6 inches deep, or approved equal or owner's choice.
7. Faucet: Self-closing water set with indexed push button.
8. Hose bib: Provide single unit in the service area.
9. Floor drains: Provide a floor drain in each room of the toilet building.

L. Electrical

- A. Provide a 100-amp breaker panel in the service area.
- B. Wire: Copper.

C. Light fixtures:

1. Service area: 2 each, 4-foot ceiling mounted fluorescent, switch and motion detector controlled.
2. Toilet rooms: Motion detector that activates fluorescent fixtures in service area.
3. Outdoor: 35-watt high-pressure sodium, cast aluminum case, rated for outdoor use, photocell activated.
4. Hand dryer: Air compression type with remote motor unit. Push button switch located in cast nozzle housing with flexible hose connecting blower motor, housing and nozzle. Power input 120VAC, 7A (non-heated air).

M. Toilet Riser (Dry): Toilet riser will be 18" high, white cross linked polyethylene, with heavy duty seat and lid, manufactured by Romtec, Roseburg, OR.

N. Steel Doors

1. Doors will be flush panel type 1-3/4" thick, minimum 18 gauge prime coated steel panels with minimum 16 gauge internal bracing channels with honeycomb core. Doors to be galvanized steel.
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 of frame.

O. Door Hinges: 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.

P. Lockset

1. Lockset will meet ANSI A1 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, and etc.
6. Inside lever always active.
7. U. S. 26D finish.

Q. Door or Wall Louvers: Door louver will be fixed, inverted split Y, non-vision, 18 gauge cold rolled

steel with a factory prime coat equal to FDLS series.

Wall louver (if requested) will be HEAVY DUTY KICK PROOF VENT by Romtec, Roseburg, OR.

- R. Doorstop: Door stop will have a cast metal base, U. S. 26D finish with gray rubber 2-3/8" diameter bumper with a 1" projection.
- S. Double Coat Hook: 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.
- T. Door Sweep: Door sweep will be provided at the bottom of door and will be an adjustable brush type.
- U. Windows and Vault Cleanout Cover
 - 1. Windows and cleanout cover frames will be constructed from steel.
 - 2. Window glazing will be 1/4" 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.
- V. Vault Liner: The vault shall include a one-piece 0.187" thick LDPE plastic liner by RMI Manufacturing, Caldwell, ID or equal approved coatings as outlined in the ("In Depth Design and Maintenance Manual for Vault Toilets" – July 1991 – Publication No.. 9123 1601) or approved equals.

5.0 MANUFACTURE

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

6.0 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, 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 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° 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 water 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. Exterior slab will be 1 coat of clear sealer
 - II. 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.

7.0 QUALITY CONTROL AND INSPECTION

A. Pre-pour inspection.

1. Check all panel measurements including diagonals (must be within ¼ 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 ATM C172.
 - a. The slump of the concrete will be performed on the first batch of concrete in accordance with ASTM C143. This slump will be in the 3"-5" range.
 - b. The air content of the concrete will be checked per ASTM C231 on the first batch of concrete. The air content will be in the range of 4%-6%.
 - c. The compressive strength of the cylinders will be tested to ASTM C39.
 - d. 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 5,000 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.

8.0 INSTALLATION

A. Scope of Work: Work specified under this Section includes, unless otherwise noted, excavation, backfill and placement of precast concrete vault toilet.

1. Optional Flush Toilet

- a. All plumbing and electrical connections shall be made by licensed plumbers and electricians in the state where the building is installed.

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" x 1" Butyl Rubber Sealant.

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 be positioned.
3. Verify that bridges/culverts en-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 vault toilet requires a hole that is 8 ft wide and 16 ft long as measured at the bottom. Depth should be 4'-9" 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 ± 0.05 feet of the specified floor elevation. It is very important that the installation provides drainage away from the structure.

E. 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.

F. 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.

G. Vault Toilet Riser and Accessories

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

H. 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.