ADDENDUM NUMBER TWO
BID S-11-21

To: All Prospective Bidders and all others concerned

From: City of Cheyenne, Purchasing Manager, TJ Barttelbort

Date: January 21, 2021

Subject: Addendum Number Two to Bid S-11-21 for the Cheyenne Junior League Pre-Cast Restroom and Concession Building Project

The changes, clarifications, omissions, additions, and/or alterations in, on, and to the bid information and specifications shall apply to the Invitation For Bid submitted for and to the project indicated above. Except as modified by this Addendum Number Two, all of the terms and provisions of the Invitation for Bid for the above listed project remain in full force and effect. This Addendum Number Two supersedes all previous instructions pertaining to the items listed:

Updates & Revisions

1. The City has approved the following building manufactures as approved for submission under this Bid:

   a. CXT
      i. Information included previously in Addendum One.

   b. Public Restroom Company
      i. Product information included with this Addendum Two.

   c. UBC Precast
      i. Product information included with this Addendum Two.

2. The building shall be constructed and specified as follows:

   a. Five section Restroom Building & Concession. The fixtures shall be standard porcelain, timed door locks, tan exterior color, white interior color, baby changing stations in each restroom, one frost free exterior hose bib.
3. Page 39, Part 6, General Conditions, 15.00 Time for Completion, is updated as follows:
   a. The Contractor shall commence the work required under this contract at the time stipulated by the City in the Notice to Proceed. The Contractor shall complete the work by **August 31, 2021**.

4. Page 45, Part 6, General Conditions, 29.00 Liquidated Damages, is hereby **struck and removed** from this Bid, Bid #S-11-21. Liquidated Damages will not be assessed.

**Questions & Responses**

Q1: Will a 3 ft stem wall foundation be required?

A1: The City is unable to provide a blanket yes or no answer to this question. If a 3 ft stem wall foundation is required as a component of installation of any specific building this cost shall be included in the overall bid price. If the building installation does not require a 3 ft stem wall foundation, the building shall be placed directly on the compacted surface.

Q2: What will the existing grade of the site be at the time of installation?

A2: The site will be backfilled, smoothed, and compacted by the City, prior to installation. No geotechnical services will be required.

Q3: CXT is not a Wyoming contractor, So CXT cannot pull permits

A3: Permits will be required to be pulled for the installation and connection. The City will waive all required permit fees.

Q4: CXT has a company policy that cannot sell buildings with liquidated damages directly (only through a contractor)

A4: The City has waived and removed, Section 29.00 LIQUIDATED DAMAGES.

Q5: CXT doesn’t do surveys

A5: A Survey is not necessary for completion of this project.

Q6: CXT doesn’t do traffic plans

A6: A traffic control plan is not necessary for the completion of the project.

Q7: CXT can do the demo, but in this case it would probably be better done by a contractor

A7: Demolition has already been completed.

Q8: CXT can provide the pad, but it will be better serviced by a contractor

A8: The city will provide the pad. See Answer A2.

Q9: Is 120-150 days delivery timeline from the completed paperwork acceptable?
A9:  The City has modified the Time for Completion to accommodate the required delivery timeframe.

Q10:  Can provide a 2 year warranty, but not our standard 1 year warranty. It will cost additional to get to the 2 year warranty.

A10:  Please include the cost of any warranty upgrades in the overall submission cost.

ADDENDUM TWO ACKNOWLEDGED:

BY ______________________________ TITLE ______________________________
(Addendum must be signed and returned with bid or receipt of the addendum must be acknowledged on the Invitation to Bid).

REMAINDER OF PAGE INTENTIONALLY LEFT BLANK
PUBLIC RESTROOM COMPANY
PRODUCT INFORMATION
SECTION 13000
PREFABRICATED RESTROOM/CONCESSION BUILDING

A. General, Specifications and Clarification of Prefabricated Building and Site Installation
   1. This portion of the bid specifications does not follow the CSI standard format as the prefabricated structure in this bid is an off-site constructed “product” and not “typical” general construction.
   2. The installation of the product on-site is general construction which must be coordinated between the owner or their general contractor and the supplier. Specifications for the building foundation/pad shall be provided herein by the specified design/build supplier. Due to the responsibility of the specified building supplier for architecture, engineering and a five-year warranty, the site pad/foundation must meet the suppliers design so the pad and building can be considered from a single source for warranty purposes. The supplier must accept the pad and compactions tests before they take responsibility for the entire system under their warranty.

B. Architectural Design/Engineering and Insurance Responsibility
   1. While City of Cheyenne has provided bid specifications and a design for the building, the building design/build supplier remains legally responsible for architecture, engineering, and all applicable building, safety, health, fire, and accessibility code compliance. Since they hold professional design responsibility to the owner, the building supplier must furnish certification that they provide product liability insurance in the amounts required by the general specifications to cover property damage and personal injury. Final drawings shall be stamped by a Wyoming engineer and Wyoming Department of Housing and Community Development, suitable for local permitting.

C. Errors and Omissions Insurance
   1. The building design/build supplier must also provide an additional Professional Architectural and Engineering Errors and Omissions insurance, in the minimum amount of $2,000,000, to cover claims against the owner or their general contractor for State and Federal ADA handicapped accessibility and other design/engineering code issues. This Errors and Omission Policy must remain in effect for 5 years from the completion and owner acceptance of the project. Products liability insurance (since it does not cover professional design responsibility only) will be insufficient for this bid and will be cause for rejection of the bidder.
D. Insurance for the Building offsite, while in transit, and/or on site until turn over and final owner acceptance
1. The supplier may request invoicing for a percentage of building completion in-plant, monthly. Under UCC law, this means that the supplier is turning over responsibility for the portion invoiced to the owner yet the building will not be on the owner’s property and may not be covered by the owners insurance. Therefore, the building supplier must provide a separate insurance policy insuring the owner and their general contractor as additionally insured for liability, damage and/or vandalism to the building while in the manufacturing facility, while in transit, and/or while in storage at a certified bonded storage facility or at the final project site for up to $200,000 for each prefabricated building module, until the building is final accepted by owner.

E. Owner or General Contractor Coordination with Design/Build Supplier
1. The specified prefabricated restroom/concession building requires coordination between the owner or their general contractor (who prepares the site foundation and delivery access for the prefabricated restroom/concession building) and the prefabricated building supplier (who completes the architectural design, engineering, off-site building construction, delivery, and installation on site.) The specified prefabricated restroom/concession building specifications include unique components/systems which are custom to the restroom/concession building supplier. Since the restroom/concession building supplier is responsible for design, additional insurance requirements for errors and omissions is required.

F. Owner or General Contractor, General Scope of Work
1. The owner or their general contractor for this project is responsible for the site survey and staking the building location, finished slab survey elevations and marking on site, construction and compaction of the required building foundation; access to the site for a large crane and tractor trailers delivering the prefabricated building; providing water, sewer, and power at a point of connection (POC) within 6 feet of the building and at the depth required by the building subcontractor and local code; and the installation of any sidewalks outside the building footprint.

2. The owner or their general contractor is responsible for verification to the building subcontractor design/build firm that there are no unanticipated site delivery issues such as overhead wires, trees, tree roots, or existing grade changes and that prevent a clear path of travel between a roadway and the final site exists for a tractor trailer and crane to expedite delivery. The design/build supplier requires that the owner or their general contractor certify that the required delivery crane must be able to set the building module/modules within 35’ distance from the center of the building to the center of the crane hoist.
G. Supplier/Prefabricated Restroom/concession Building, General Scope of Work
1. The prefabricated building specialist will provide to the owner or their general contractor final building design architectural drawings and engineering calculations under the responsibility of a licensed engineer, in compliance with all local, state and federal codes. The design/build supplier shall construct the building offsite as a permanently relocatable building, transport it to the final required destination, and install the building turnkey, (to 6’ from the building footprint) on an owner or general contractor prepared foundation per the drawings included in this bid.

H. Licensing:
The supplier must comply with all the State of Wyoming; prefabricated “Commercial Modular Requirements”.

I. Bid Standard for the Prefabricated Restroom/Concession Building
1. City of Cheyenne understands that there are several firms who design and build various types of pre-fabricated public restroom/concession buildings in varying quality and architectural styles, using similar or different construction methods and materials. For the purpose of this project, the owner has selected:

Public Restroom Company, 2587 Business Parkway, Minden, Nevada, 89423 and specifies herein that this firm is the standard for architectural design, safety, green design, code compliance, and site-specific compatibility. Public Restroom Company is the standard of building performance and quality for the 50-year building design-life with low restroom/concession based upon the longevity of the materials selected.

Contact: **Ted Munley**, Regional Sales Manager
Phone: **888-888-2060 extension 103**
Fax: **888-888-1448**
Email: **ted@PublicRestroomCompany.com**
Web: **www.publicrestroomcompany.com**

J. “Or Equal Restroom Design/Build Suppliers”
1. City of Cheyenne may also allow other firms to become qualified to bid but any firms so authorized to bid must comply with the bid specifications and plans, or be subject to post bid rejection.
2. In order to provide full and open competition, other firms may request approval as “or equal.” **The following items must be provided to the City in accordance with substitution requirements outlined in the project specifications.** Failure to supply these items will result in bid rejection.

a) Or Equal applicant shall provide with their bid submission, scaled floor plans and elevations, to show general architectural design criteria is met.

b) Or Equal applicant shall provide with their bid submission, a written list of each
and every deviation from the published bid specifications/plans. Lack of specificity to each deviation from the bid specifications will be cause for rejection.

c) Or Equal applicant shall provide with their bid submission, manufacturer’s certification of test compliance from a national independent testing laboratory to support the claim for absorption resistance of the slab type that will be used in their proposed building. Or Equal applicant must provide a list of every building they designed and built over the last 3 years utilizing the same building materials/systems design criteria as published in this bid. Provide date of building bid, date of completion, and most knowledgeable owner contact.

d) Or equal applicant shall provide certification of the special insurance required in this bid.

e) Or Equal applicant shall be responsible for and bear all cost for architecture, plan checks, design and structural engineering and all fees in obtaining approvals and permits from applicable agencies.

3. City of Cheyenne or their consultant will be solely responsible for the decision to accept or reject the “or equal” submission.

K. Certificate of Off-site Inspection and Construction Compliance, Provision for Restroom/Concession Manuals, and Warranty

1. The off-site building construction requires that a licensed third-party inspection firm provide the owner and the local building official with certification and compliance for the building with the approved plans and specifications. A certificate of compliance shall be issued by this inspector to the local building official to provide certification that the building meets and or exceeds the approve plans and applicable codes.

2. At the project conclusion, the building supplier shall furnish two sets of complete restroom/concession manuals including a trouble shooting guide and a five (5) year warranty to the owner or general contractor.

L. Site Scope of Work by Owner or Their General Contractor

The owner or general contractor shall prepare the Restroom/concession building sub grade foundation to receive the prefabricated building in accordance with the bid drawings.

1. The building pad shall be excavated to 14” deep from the final building concrete slab elevation in accordance with the drawing titled “foundation pad design.”

2. The building pad shall meet a 90% compaction in lifts using class II base for the first four inches and coarse sand for the last two inches of the pad, leaving the finished sub grade pad elevation at finished floor, minus 8”.

3. The owner or general contractor shall provide water point of service at 30” below finished building slab; sewer at 24” below the finished building slab; and electrical at 36” below the finished building slab or other per bid plans.
4. Owner or their general contractor shall coordinate with building supplier to provide full site delivery access for a 70’ tractor-trailer and hydro crane to the final building site.

5. If the final site access is over existing sidewalks, utilities, or landscaping, the owner or their general contractor shall be responsible for plating and or tree trimming, utility line removal, or other to protect any existing conditions.

6. The hydro crane must be able to locate no greater than 35’ from the center point of the building to the center point of the crane.

7. The utilities shall be furnished per bid site plans at specified points of connection (POC) nominally 6’ from the building line.

8. Owner or their general contractor shall furnish and install final grading, landscaping and sidewalks.

M. Connection to Utilities

1. The building subcontractor will furnish Electrical, Water, and Sewer at the proper POINT OF CONNECTION AND AT THE PROPER ELEVATION BELOW GRADE, for this project. Building subcontractor shall provide final hook up of the water from building to POC; sewer hookup to POC; and electrical sleeve from building panel to POC only. Final utility connections shall be by owner, their general contractor, or others. Owner or their general contractor shall flush the water lines thoroughly before making final water connection to the building.

N. Concrete Slab, Required Independent Testing Laboratory Certification

1. The prefabricated building slab special concrete technology claims to be water and urine resistant for life due to special additive technology. The building subcontractor must furnish a test certification of compliance from a national independent testing laboratory to support the claim for absorption resistance. The written report must state the concrete compressive and absorption per ASTM standard #C642 and #C39 respectively. Since this non-absorbency capability is so significant, the design/build subcontractor must provide a general certification of compliance with the above standards.

O. Prefabricated Restroom/Concession Building

1. City of Cheyenne has evaluated several prefabricated restroom building suppliers. This bid requires such a building be used in lieu of site built traditional construction because of the unique built-in advantages guaranteed by the design/build firm. This technology includes many new innovations such as non-absorbent concrete; anti-microbial components to reduce health risks; built in vandal resistance design; lowered restroom/concession and long-term warranties that reduce owner risk for failure. The specifications below are written around this new technology.
P. Mat Engineered Concrete Building Slab/Foundation

1. The mat engineered 8" thick slab/foundation shall be engineered and constructed to withstand the transportation weight of the building without cracking and to resist absorption from any liquids deposited on the surface. The concrete slab shall be constructed inside a steel angle curb, reinforced with dual mats (tension and compression,) and poured with a custom concrete formula with special admixtures to create a finished slab that is water proof for life.

2. Perimeter Steel Curb: 5/16" 50,000 kip steel 6" X 6" welded continuous angle.

3. Rebar Steel Mat: Two layers of 40,000 tensile steel rebar in varying sizes per engineers requirements, including a perimeter structural continuous grade beam design inside the exterior steel angle and at any other location deemed by the engineer of record as required for the use intended. In coastal locations or when required for corrosion resistance rebar shall be epoxy coated or fiberglass to resist permanent corrosion. Rebar mats shall be wire tied to code with a minimum of three turns of the wire and overlaps shall be minimum of 15 diameters for any connection.

4. All slab openings shall be surrounded with two layers of steel collars as required by the engineer of record to stop corner cracking and to reinforce the openings for lifting.

5. 1" thick by 3" minimum length threaded nuts shall be welded to the steel perimeter frame with continuous ¼" fillet welds. Nuts shall be welded to common steel plates per the engineer of records design and attached to the interior steel rebar structural mats.

6. The engineer of record shall provide lifting locations with sufficient reinforcement to allow the safe lifting of the entire designed weight of the structure with dual 1" steel bolts and washers at each lifting location. The number of lifting locations with each location fitted with removable ¾" 8" X 8" 50,000 tensile strength steel angles shall be determined by the engineer of record.

7. The slab shall be poured over a 1" thick steel plate table. The concrete mix design shall not exceed a 3" slump and shall be stinger vibrated for maximum consolidation. All floors shall slope to any floor drains within each room and if no floor drain is present the floor should not slope. The surface shall be a very light broom that should meet a coefficient of friction on the surface of .06. Birdbaths shall be cause for rejection.

8. The steel perimeter angle will remain below the concrete surface by nominal two inches to prevent corrosion. After the site concrete sidewalks are poured, the joint shall be full flow sealed with self-leveling grey urethane caulk to prevent penetration of water into the joint.

9. The building shall be designed for future relocation and shall provide protection for the lifting openings in the mat slab so that the threaded openings will be available for future use if needed.

10. The building system shall be designed for placement on an owner or their general contractor site prepared class 2 building pad/and or footings as required by code, per the bid drawings, suitable for 1500 pounds soil bearing capacity minimum. Any
soils survey (if necessary) shall be by owner or engineer of record.

Q. Exterior & Interior Masonry Block Walls
1. The exterior walls shall be 4” thickness per State of Wyoming codes or engineering for wind and seismic. The interior walls shall be 4” block to cap beam height.
2. The 8” mat engineered concrete slab shall be cured a minimum of 7 days. Holes for vertical dowels shall be drilled into the mat engineered slab avoiding any grade beams or other structural reinforcement. Once the holes are drilled, blow out the remaining material and using two part structural epoxy, wet set the #3 or #4 vertical rebar (as specified on the engineering calculations into holes drilled to the depth per the engineer of record requirements. Each rebar shall be held vertical to allow equal epoxy support to each dowel during the drying period. Engineering calculations require that rebar shall be installed in each concrete block center void or every block hole. The engineered uplift on each rebar shall be sufficient to restrain any load imposed on the masonry block wall for vertical rebar pull out from the concrete mat engineered slab.
3. The block walls shall be nominal 8" x 16" CMU. The building corners shall have special corner return block that matches the exterior finish and creates a uniform appearance. All 4” CMU shall be custom fabricated with an enlarged interior hole for placement of the grout and vertical rebar.

R. Roof System
1. The roof structure shall be 2” x 6” wood rafters at 24” on center with 5/8” OSB sheathing, and ice and water shield membrane with 26-gauge standing seem metal, color selected by owner. The rake and fascia shall be 14 gauge formed steel painted in a color selected by owner.
2. Roof shall be designed per plans to reduce vandals climbing on roof and to obtain proper ventilation size openings to provide fan-free ventilation.
3. The Restroom room ventilation screens (described in a following section) shall be attached to the truss frames and non-removable by vandals. Roof color shall be determined by owner.

S. Interior Wall Finish
1. Interior precision CMU block masonry walls shall be smoothed to a pebble grain finish with 2-4 mil layers of 7-day curing block fillers and painted with two additional 4 mil layers of industrial high solids (white) industrial grade enamel.
2. Interior Concession walls shall be insulated and finished with PVC panels.

T. Exterior Wall Finish, Masonry and Gable
1. The building exterior finish shall be split face CMU painted to color selected by owner. The block shall be coated with two layers of industrial high solids, industrial enamel to a 4-mil thickness. Color to be selected by Owner.
2. Building to have anti-graffiti coating.
U. Ventilation System
1. Shall be woven ¼” X 1” X 1”, 316T, stainless steel woven crimp-stop wire mesh set into grooved channels within the CMU block with a stainless steel channel at the connection to roof structure.
2. Ventilation to have removable Lexan Covers
3. Ventilation to have insect screens.

V. Doors and Windows
1. The Restroom/concession room entry doors shall be 7'-0" high, custom fabricated, 14 gauge steel; reinforced with 14 gauge steel ribs welded at 6" intervals on each face, concealed; reinforced with a welded plate for door closer mounting; hung on a single continuous, 1 million cycle, aluminum gear hinge with stainless steel vandal resistant screws at nominal 4" on center. The doors shall weigh nominally 176 lbs each for a 36" X 84" door. Custom fabricated 14 gauge steel door jambs with 4" steel heads shall be welded to the steel cap beam and be solid filled with 3000 psi masonry grout mix.
2. All entry doors shall have a 1/8" thick plate stainless steel “Z-shaped” anti-microbial pull handles with integral latch guard (latch guard on concession entry door and utility chase door only) and Schlage B-600 series commercial series dead bolts.
3. The door closer shall be “LCN” heavy duty #4211 Series, fastened to a structural reinforced door plate per door manufacturer design.
4. Concession windows shutter and frame to be used with a Ready Access Window Model #600 with insulated glass for hot/cold area/extreme weather.
5. Stainless steel vandal resistant fasteners shall be used on all hardware.

W. All specialty washroom equipment shall be commercial grade stainless steel fastened securely to walls with vandal resistant stainless-steel screws to avoid removal by vandals as follows:
1. Toilet paper holder shall be a covered three-roll, 18 gauge stainless steel. Toilet paper holders shall be attached to block walls with 4 epoxy bedded vandal resistant stainless-steel fasteners.
2. Stainless steel grab bars to code shall be 1 ¼” minimum exposed fastener vandal resistant design and installed at each accessible water closet.
3. Cast Aluminum ADA compliant signs shall be recessed into block surface flush with masonry exterior. Signs shall have raised pointed Braille tips and shall be blind secured with epoxy adhesive and stainless-steel fasteners.
4. Baby Changing Stations shall be the Foundations Horizontal Surface Mount W/ Polyethylene Body W/ Full Stainless Wrap, #5410339.
5. Hand Dryer: Dyson Airblade V, nickel finish, mounted adjacent to lavatories
6. Mirrors: Shall be Bobrick Model #B-1556 2436.
X. Plumbing

1. Building shall be fully compliant with the following codes:
   a) All applicable State of Wyoming Building Codes. Latest edition applicable.

2. GENERAL: All components and fabrications shall be designed to reduce life cycle maintenance, be compatible with current restroom/concession spare parts, and shall be listed in a spare parts/ maintenance manual (two copies) delivered in utility chase of building.

3. WATER PIPING: Shall be type L copper above grade and type K with silver solder below grade. All water piping shall be designed and constructed with high and low point drain fittings. All piping shall be mounted on Uni-strut wall brackets with neoprene isolators, to code.

4. DWV PIPING: DWV piping shall be concealed behind the wall. DWV piping shall be PVC DWV, solvent welded, for all concealed piping. A cast iron no hub DWV vent pipe with a cast iron roof mounted vandal cap vent shall be required, through the roof.

5. REMOVABLE PIPE TRAPS: All floor drain, sink drain, and waste traps shall be removable for maintenance. Floor drains shall be trapped behind the wall in the utility chase using a combination waste and vent system. Floor drains shall be increased two pipe sizes over standard to allow code use. All surface mounted utility chase piping shall be mounted on Uni-strut with plastic isolators to code. Sink drain traps shall be concealed behind the utility chase walls where maintenance staff can access all plumbing.

6. Schedule of fixtures:
   a. Water Closets: Acorn Penal-Ware, 1675-W-1-HET-FVBO-9-ADA-PFS
   b. Water Closet Flush Valve: Zurn ZH6152AV-HET-7L-BG
   c. Urinal: Acorn Penal Ware: Acorn 1709HEU-1-0.125 GPF-FVBO
   d. Urinal Flush Valve: Zurn ZH6195AV-ULF-7L-BG
   e. Lavatories: Acorn Penal-ware 1652LRB-1-DMS-03-M-H1

7. Schedule of Fixtures Concession:
   a. Floor Mount Mop Sink: Mustee 63M
   b. Mop Rack: Proflo Model #PF245
   c. L Shaped Sink: Elkay three compartment sink
   d. Sanitary Floor Sink: Watts Model #FS-743-NH-150
   e. Hand Sink: Zurn Model #5344

8. UTILITY SINK MECHANICAL CHASE: There shall be a Mustee Utilitub 17F, wall-mounted, with Chicago 891-ABCP faucet.

9. FLOOR GRATES: Removable 350 lbs per square foot pultruded fiberglass non-skid floor grates shall be installed over every opening in the utility chase for OSHA protection/compliance.

10. HOSE BIB: There shall be one Acorn #8121-LF hose bib provided in the utility chase.
Y. Electrical

1. GENERAL: Electrical system and components shall be commercial grade or better and piping conduits shall be installed on commercial Uni-strut wall hangers. Interior and exterior electrical lighting fixtures in public areas shall provide lifetime manufacture's warranty.

2. PANEL/WIRING: One 200 amp, Single phase main industrial grade Panel Board, Square "D" QO series, shall be mounted in the utility chase in the building. All breakers shall be plug-on type, minimum 10,000 A.I.C. RMS (Sym) at 120/240 vac. Wiring shall be stranded copper wire #12 min in EMT piping with screw fittings.

3. PIPING: All piping shall be surface mounted to the masonry block walls with minimum of 2" fastener penetration. EMT conduit shall be compression type. Main panel shall maintain a 30" X 36" safety code required clear space, floor to 6' above finished floor.

4. EXTERIOR LIGHTING: Luminaire YWP610, LED, vandal resistant, high-impact polycarbonate lens fixtures shall be installed per plans.

5. INTERIOR LIGHTING: SWP1212-OCC, LED, vandal resistant high-impact polycarbonate lens fixtures shall be installed in the restrooms per plans. The utility chase shall have one (3), 4' Double-tube LED fixture, suitable for wet locations, with a single switch at door entry. Concession to have four (4) 4' AL-42L 36W LED fixture suitable for wet locations with single switch at door entry.

6. LIGHTING CONTROL: All exterior restroom lighting shall be controlled by a photocell mounted 8' high on the utility chase/restroom wall. Two (2) bypass switches shall be located in the utility chase (one for interior lighting and one for exterior lighting), so maintenance staff can check operation during daylight hours. Integral occupancy sensors shall control the interior lighting.

7. ELECTRICAL OUTLETS: (1) commercial spec grade dedicated GFCI in the utility chase. (11) commercial spec grade dedicated GFCI in the concession.

Z. Shipping Protection

The building, while traveling over roads to the destination may encounter inclement weather or road grime that could require substantial cleaning when it arrives on site. The building shall be shrink-wrapped before transportation and sufficiently strong to arrive at the owner site intact for exterior finish protection. Materials removed on site shall be disposed of and recycled by restroom building install staff.

AA. Certifications

Building shall be certified in compliance with the plan approval by the State of Wyoming and shall be delivered with an applied insignia in compliance with all State regulations. The local building authority shall provide site inspections for the underground mechanical piping and final connections, footings, and access issues outside the restroom footprint. Restroom building subcontractor shall also furnish 5-year warranty, certifications for the concrete slab specification compliance, and maintenance manuals for the building and components.
## TYPE OF BUILDING

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVR WOOD</td>
<td>Wood Framed walls above cap beam, and wood framed rafters [ceiling &amp; vents same as MVR]</td>
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## FLOOR SYSTEM

<table>
<thead>
<tr>
<th>ROOM/ITEM</th>
<th>FINISH</th>
</tr>
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<tbody>
<tr>
<td>Entire Building</td>
<td>Exposed Concrete with Light Broom Finish with Water Resistant Coating</td>
</tr>
<tr>
<td>Concession</td>
<td>Gray Epoxy with Skid Resistant Additive (Spartacote XPL)</td>
</tr>
<tr>
<td>Concession</td>
<td>White PVC Sanitary Cove Base</td>
</tr>
<tr>
<td>Footings/Foundation</td>
<td>Provide Steel Angle Tie Downs</td>
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</table>

## WALL SYSTEM

### BUILDING WALLS HEIGHT

Building Walls Height: 7'4"

### EXTERIOR WALLS - CMU

<table>
<thead>
<tr>
<th>BLOCK TYPE AND COLOR</th>
<th>ROWS</th>
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<tbody>
<tr>
<td>Split Face Exterior 4&quot; CMU</td>
<td>All</td>
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### WALLS INSULATION

|Wall Insulation| Insulate Concession only, to Code|

### CAP BEAM

|Cap Beam| Cap Beam, Steel Tube, Painted|

## WALL FINISHES - EXTERIOR

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FINISH</th>
<th>HEIGHT</th>
</tr>
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<tbody>
<tr>
<td>CMU</td>
<td>Paint over block filler</td>
<td>To Cap Beam</td>
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<tr>
<td>CMU</td>
<td>Anti-Graffiti Coating</td>
<td>Full Height</td>
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<tr>
<td>Exterior Paint</td>
<td>PPG Exterior Gloss - Colors TBD by client</td>
<td></td>
</tr>
<tr>
<td>Siding - Above Cap Beam</td>
<td>FRC Stucco Pattern - James Hardie - Painted</td>
<td>Above Cap Beam</td>
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<tr>
<td>Exterior Paint</td>
<td>PPG Exterior Gloss - Colors TBD by client</td>
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## WALL FINISHES - INTERIOR

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<tr>
<th>ROOM</th>
<th>FINISH</th>
<th>HEIGHT</th>
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<tbody>
<tr>
<td>Restrooms Below Cap Beam</td>
<td>Block filler &amp; paint</td>
<td>To Cap Beam</td>
</tr>
<tr>
<td>Restrooms - Above Cap Beam</td>
<td>Stucco Pattern FRC - Painted</td>
<td>Above Cap Beam</td>
</tr>
<tr>
<td>Mechanical - To Cap Beam</td>
<td>Block filler &amp; paint</td>
<td>To Cap Beam</td>
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<tr>
<td>Mechanical - Above Cap Beam</td>
<td>Painted OSB</td>
<td>Above Cap Beam</td>
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<tr>
<td>Storage - To cap Beam</td>
<td>Block filler &amp; paint</td>
<td>To Cap Beam</td>
</tr>
<tr>
<td>Storage - Above Cap Beam</td>
<td>Painted OSB</td>
<td>Above Cap Beam</td>
</tr>
<tr>
<td>Concession</td>
<td>PVC Panels</td>
<td>Full Height</td>
</tr>
<tr>
<td>Behind Mop Sink</td>
<td>FRP</td>
<td>To Cap Beam</td>
</tr>
</tbody>
</table>
## Concession Screens
- **Concession Lavatory Splash Screen**

## Privacy Screens (Partition Walls)

### CMU with Paperstone Doors
- CMU Stall Walls With Paper Stone Doors, Continuous Hinges, Pilasters

## Restroom Specialty Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concession Screens</td>
<td>Concession Lavatory Splash Screen</td>
<td></td>
</tr>
</tbody>
</table>
### PLUMBING

<table>
<thead>
<tr>
<th>FIXTURE/PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilets - Stainless Steel</td>
<td>Acorn # 1675 W-1-HET 1.28 GPF-FVBO-ADA-PFS-316SS</td>
</tr>
<tr>
<td>Urinals - Stainless Steel</td>
<td>Acorn # 1709 HEU-W-1-0.125-FVBO-316SS</td>
</tr>
<tr>
<td>Lavs - Stainless Steel</td>
<td>Rear Connect Acorn # 1652LRB-1-DMS-03-M-316SS</td>
</tr>
<tr>
<td>Hydraulic - Toilet Flush Valve</td>
<td>Zurn W.C. Flush Valve 1.28 Ga Zurn # ZH6152AV-HET-7L-BG</td>
</tr>
<tr>
<td>Hydraulic- Urinal Flush Valve</td>
<td>Zurn Urinal Flush Valve .125 GPM Zurn # Z6195AV-ULF-7L-BG</td>
</tr>
<tr>
<td>Air Control Faucets (Std)</td>
<td>Acorn Integral (Standard for Stainless Steel Lavatory)</td>
</tr>
<tr>
<td>Floor Drains: W/Trap Primer</td>
<td>Floor Drain Zurn # ZN460-2NH-5B W/Strainer / With Trap Primer</td>
</tr>
</tbody>
</table>

### PLUMBING SPECIAL

<table>
<thead>
<tr>
<th>FIXTURE/PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor Mount Mop Sink</td>
<td>Mustee Mop Service Basin, Model # 63M 24&quot; x 24&quot; x 10&quot;, Color: White</td>
</tr>
<tr>
<td>Mop Rack</td>
<td>ProFlo PF245: Mop Hanger</td>
</tr>
<tr>
<td>L Shaped Elkay</td>
<td>Elkay 3 Compartment Sink L-Shape (18&quot; x 18&quot; x 18&quot; Deep) - OK</td>
</tr>
<tr>
<td>Watts Sanitary Floor Sink</td>
<td>Watts # FS-743-NH-150, 2&quot; Square x 8&quot; Deep, with 1/2 Grate</td>
</tr>
<tr>
<td>Vitreous China Hand Sink</td>
<td>China Lav Zurn # 5344, 4&quot; Faucet Centers</td>
</tr>
<tr>
<td>With Legs Service Sink</td>
<td>Mustee Service Sink White, Model #17F, Floor Mount w/Legs</td>
</tr>
</tbody>
</table>

### PLUMBING GENERAL

<table>
<thead>
<tr>
<th>FIXTURE/PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Heater</td>
<td>Stiebel DHC-E8</td>
</tr>
<tr>
<td>Water Heater</td>
<td>AO Smith/Bradford White 50 Gal Residential 12KW Quick Recovery</td>
</tr>
<tr>
<td>Tempered Water to Lavs</td>
<td>Thermostatic Mixing Valve, Acorn Model # ST70-12</td>
</tr>
<tr>
<td>Valve Combo (PRV)</td>
<td>Valve Combo with Pressure Reducing Valve</td>
</tr>
<tr>
<td>Water Line Material</td>
<td>Copper (Std)</td>
</tr>
<tr>
<td>Bladder Tank</td>
<td>ProFlo PFXT5, (PRC)/ Amtrol 2 gal (Blazer) - no elect required</td>
</tr>
<tr>
<td>Pressure Booster</td>
<td>Amtral RP-25 PRO (requires elect)</td>
</tr>
<tr>
<td>Hose Bibb- Interior</td>
<td>Acorn #8121-LF - in the Chase</td>
</tr>
</tbody>
</table>

### ELECTRICAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Panel</td>
<td>200 amp Single Phase</td>
</tr>
<tr>
<td>Breakers</td>
<td>Plug on (QOD)</td>
</tr>
</tbody>
</table>

### LIGHTING

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION (W=WALL, C=CEILING)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting Control -Interior-</td>
<td>Light Fixture Integrated Occupancy Sensor</td>
</tr>
<tr>
<td>Interior Lights</td>
<td>W/C Luminaire, Swoop Series SWP1212-BRZ -OP-BRZ</td>
</tr>
<tr>
<td>Lighting Control -Exterior-</td>
<td>Photo Cell Intermatic Photo Control #EK4336S</td>
</tr>
<tr>
<td>Exterior Light</td>
<td>W) Luminaire, Swoop Series YWP-610-OP-BRZ</td>
</tr>
<tr>
<td>Chase Lights</td>
<td>C) Green AL-42L (large Chase)Waterproof</td>
</tr>
<tr>
<td>Concession Lights</td>
<td>C) Green AL-42L 36W (large concessions)</td>
</tr>
<tr>
<td>Storage Lights</td>
<td>C) Green AL-41L (small room) waterproof</td>
</tr>
</tbody>
</table>

### RECEPTACLES/SWITCHES, HEATERS, FANS, HVAC, LIGHTED SIGNS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptacles</td>
<td>GFCI (Adjacent to Panel)</td>
</tr>
<tr>
<td>Receptacles</td>
<td>GFCI</td>
</tr>
<tr>
<td>Switches Single Pole</td>
<td>Single Pole (Adjacent to Panel)</td>
</tr>
<tr>
<td>Switches</td>
<td>Single Pole (Any Other Location)</td>
</tr>
<tr>
<td>Switches By Pass</td>
<td>By Pass (To By Pass OCC Sensors)</td>
</tr>
<tr>
<td>HVAC</td>
<td>Friedrich PTAC in room</td>
</tr>
<tr>
<td>Emergency Exit Sign</td>
<td>Lithonia LHQM *need one for each door</td>
</tr>
<tr>
<td>Emergency Light</td>
<td>Lithonia ELM2L Led 2 Head Led Emergency Light (Mechanical Room)</td>
</tr>
</tbody>
</table>
PRECAST CONCRETE TOILET BUILDINGS
PLUMBED MODELS

STANDARD SPECIFICATIONS

UBC PRECAST
464 WEST HIGHWAY 26
BLACKFOOT, ID 83221
PART 1 GENERAL

1.1 SUMMARY

A. The work of this section consists of furnishing and installing precast restrooms. This specification establishes a quality and performance level for structural design, quality, and workmanship. The buildings covered by this specification shall be precast concrete with all lighting and electrical equipment, toilet accessories, and all other specified items necessary for a complete and ready to use structure. Delivery to the site and erection of the building is included.

1.2 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer’s descriptive data for all items used on the project.

B. Shop Drawings: Submit manufacturer’s standard manufacturing drawing and specifications including all dimensions, materials, equipment, and accessories.

1.3 BUILDING DESCRIPTION

A. Toilet Building: Shall be the Prescott with Chase (plumbed) manufactured by UBC Precast, 464 West Highway 26, Blackfoot, Idaho, (208) 681-2665.

1.4 DESIGN CRITERIA

A. Snow Load: 240 pound per square foot.

B. Wind Load: 120 miles per hour.

C. Earthquake: Zone 4.

D. Design Standards: Meet the requirements of the Americans with Disabilities Act and the Uniform Federal Accessibility Standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Coordinate with the manufacturer for the delivery and placement of the precast concrete buildings.

B. Handling: Protect all materials and finishes against damage from construction activities and harmful substances.
PART 2

2.1 MATERIALS: This section establishes a quality and performance level for structural design, materials, durability and workmanship used in the manufacture and installation of the building.

A. Concrete – General
   
   1. The concrete mix design shall be designed to ACI 211.1 to produce concrete of good workability.
   
   2. Concrete shall contain a minimum of 600 pounds of cement per cubic yard. Cement shall be a low alkali Type I, II, or III conforming to ASTM C150.
   
   3. Coarse aggregates used in the concrete mix design shall conform to ASTM C33 with the designated size of coarse aggregate, 3/4 inch minus.
   
   4. Minimum water/cement ratio shall not exceed 0.40. Slump shall not exceed 5 inches.
   
   5. Air-entraining admixtures shall confirm to ASTM C260. Water reducing admixtures shall conform to ASTM C494, Type A. Other admixtures shall not be used without approval.

B. Colored Concrete
   
   1. Color additives shall conform to ASTM C979 approval. Submit standard color charts for approval
   
   2. The following shall contain colored concrete:

   a. Building roof panels.
   
   b. Building walls.
   
   c. The same brand and type of color additive used in the sample shall be used throughout the manufacturing process.
   
   d. All ingredients shall be weighed and the mixing operation shall be adequate to ensure uniform dispersion of the color.

C. Cold Weather Concrete
   
   1. Cold weather concrete placement shall be in accordance with ACI 306.
   
   2. Concrete shall 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 shall not be used.

D. Hot Weather Concrete
1. The temperature of the concrete shall not exceed 80 degrees F at the time of placement and when the ambient reaches 90 degrees F. Concrete shall be cured according to standards in the industry.

E. Concrete Reinforcement

1. All reinforcing steel shall conform to ASTM A615. All welded wire fabric shall conform to ASTM A 185.
2. All reinforcement shall be new, free of dirt, oil, paint, grease, loose mill scale and loose or thick rust when placed.
3. Details not shown of drawings or specified shall be to AC1318.
4. Steel reinforcement shall be centered in the cross-sectional area of the walls and shall have at least 1-inch of cover on the under surface of the floor and roof.
5. The maximum allowable variation for center-center of reinforcing steel shall be 1/2-inch.
6. Full lengths of reinforcing steel shall be used when possible. When splices are necessary on long runs, splices shall be alternated from opposite sides of the components for adjacent steel bars. Lap bars in accordance with ACI 318.
7. Reinforcing bars shall be bent cold. No bars partially embedded in concrete will be field bent unless approved by the Contracting Officer.

F. Sealers and Curing Compounds

1. Curing compounds, if used shall be colorless, complying with ASTM C309, Type I or 1-0.
2. Weatherproofing sealer for exterior of buildings shall be clear, acrylic water repellent penetrating sealer.

G. Caulking, Grout Adhesive, and Sealer

1. All caulking shall remain flexible and non-sag at temperatures from -50 to +140 degrees F.
2. Interior joints shall be caulked with a paintable silicone based caulk.
3. Exterior joints shall be caulked with siliconized acrylic caulk that closely matches the exterior color.
4. Grout shall be a non-shrink type and shall be painted to match the color of surrounding concrete as nearly as possible.
5. Any repairs shall be epoxy concrete adhesive shall be two component, rigid, non-sag gel adhesive for bonding to dry or damp surfaces, moisture insensitive.
6. Portland cement mortar shall consist of one part Portland cement, three parts sand and enough water to make workable mixture.
H. Paint

1. All paints and materials shall conform to all applicable Federal specifications or be similar "top-of-the-line" components. Paints shall be lead free.

2. Type of paints for building
   a. Inside concrete surfaces:
      1) Interior floors shall be a 2-part water based epoxy. The color shall be gray.
      2) Interior walls and ceilings shall be 2-part water based epoxy. The color shall be white.
   b. Metal surfaces both inside and out:
      1) Primer and enamel.
   c. Exterior concrete surfaces:
      1) Exterior slab shall be clear sealer.
      2) Exterior walls and roof shall be pure acrylic water repellent penetrating stain in the same color as the walls or roof followed by a clear acrylic anti-graffiti sealer.

I. Wall Vents

1. Wall vent will be heavy duty kick proof vent. Wall vents shall be placed in each of the two front doors of the building.

J. Windows

1. Windows and cleanout cover frames for the toilet building shall be constructed from steel.

2. Window glazing shall be 1/4-inch thick translucent LEXAN polycarbonate.

K. Steel Doors

1. Doors shall be flush panel type 1 3/4-inch thick, minimum 18-guage prime coated steel panels, level 3 heavy duty.

2. Door frames shall be knockdown or welded type, single rabbet, minimum 18-guage prime coated steel width to suite wall thickness. Three rubber door silencers shall be provided on latch side of frame.

L. Finish Hardware

1. Toilet Building
a. Door Hinges: Door hinges shall be 3 per door with dull chrome plating Two 4 1/2" x 4 1/2" adjustable spring tension Stanley 2060 or Hager 1150 hinges. One standard 4 1/2" x 4 1/2" ball-bearing hinge.

b. Lockset:

1) Lockset shall meet ANSI A 156.2 Series 4000, Grade 1 cylindrical lockset for exterior door.

2) Lever handles both inside and out.

3) US 260 finish.

c. Door Stop:

1) Doorstop shall have a cast metal base, US 26 D finish with gray rubber 2 3/4" bumper diameter with a 1-inch projection.

d. Door Sweep:

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

M. Toilet Accessories

1. Grab Bars.

a. Grab bars shall be 18 gauge, type 304 stainless steel with 1 1/2" clearance.

b. Grab bars shall each be able to withstand 300 pound top loading.

2. Toilet Paper Dispenser

a. Dispenser shall be constructed of 1/4 - inch steel with an enamel finish.

b. Dispenser shall be capable of holding two (2) standard rolls of toilet paper.

c. Toilet paper fastening system shall be able to withstand 300-pound top loading.

3. Toilet

a. Toilet to be wall-mount vitreous china with handicap flush valve or optional stainless steel.

4. Lavatory

a. Lavatory shall be wall-mount vitreous china or optional stainless steel.
N. Electrical

1. All electrical wiring shall be in conduit, surface mounted in the service area and concealed in the user compartments. All wire shall be copper.

2. A 100-amp breaker panel shall be provided in the service area.

3. The service area shall have one 4-foot ceiling mounted HO fluorescent light fixtures, switch activated.

4. Outdoor lights above restroom doors shall be a 35-watt High Pressure Sodium; cast aluminum case, rated for outdoor use. Photocell controlled, Lithonia model OWP3 42F or equal.

5. Indoor lights in restrooms shall be a 35-watt High Pressure Sodium cast aluminum case, rated for indoor use. Photocell controlled.

PART 3 EXECUTION

3.1 GENERAL: This section is to establish quality and performance level for the manufacture and installation of the building.

3.2 MIXING AND DELIVERY OF CONCRETE:

A. Mixing and delivery of concrete shall be in accordance with ASTM C94, section 10.6 through 10.9 with the following additions:

1. Aggregate and water shall be adjusted to compensate for differences in the saturated surface-dry condition.

2. Concrete shall be discharged as soon as possible after mixing is complete. This time shall not exceed 30 minutes.

B. Placing and Consolidating Concrete

1. Concrete shall be consolidated by the use of mechanical vibrators. Vibration shall be sufficient to accomplish compaction but not to the point the segregation occurs.

C. Finishing Concrete

1. Interior floor and exterior slabs shall be floated and troweled until all marks are removed. A light broom finish shall be applied to the exterior and interior walls.

2. All exterior building walls shall be a barnwood texture.

3. All exterior surfaces of the roof panels shall be cast to simulate a cedar shake roof. The underside of the overhang shall have a smooth finish.

D. Cracks and Patching

1. Small holes, cracks, depressions and air voids shall be patched with the suitable material. The patch small match the color, finish and texture of the surrounding surface.
2. Patching shall not be allowed on defective areas of the structural integrity of the building is affected.

E. Curing and Hardening

1. Concrete surfaces shall not be allowed to dry out from exposure to hot, dry weather during initial curing period.

2. Curing compounds shall not be used on interior walls of the buildings or the vault.

3.3 STRUCTURAL JOINTS

A. Wall components shall be jointed together with two welded plate pairs at each joint. Each weld plate shall be 6 inches long and located on pair in the top quarter and one pair in the bottom quarter or the seam. Weld plates shall be anchored into the concrete panel and welded together with a continuous weld. The inside seams shall be paintable caulk. The outside seams shall use a caulk in a coordinating building color or clear.

B. Walls and roof shall be joined with weld plates, 2 1/2" x 5", at each building corner.

C. The joint between the floor slab and wall shall be joined with a matching colored caulk on the inside, matching colored caulk on the outside, and two weld plates 6 inches long per wall.

D. All welding shall be by certified welders only (in accordance with AWS D1.1).

3.4 PAINTING AND STAINING

A. An appropriate curing time shall be allowed before paint is applied to the concrete.

B. Some applications may require acid etching. A 30 percent solution of hydrochloric acid shall be used, flushed with water and allowed to thoroughly air dry.

C. Painting shall not be done outside in the cold, frosty or damp weather.

D. Painting shall not be done outside in the winter unless the temperature is 50 degrees F or higher.

E. Painting shall not be done in dusty areas.

F. Schedules of finishes:

1. Inside concrete surfaces:
   a. Inside floors will be 2 coats of 2-part water based epoxy.
   b. Interior walls and ceiling will be 1 coat primer filler and 2 coats of 2-part water based epoxy.
2. Metal surfaces both inside and out.
   a. 1 coat primer and 2 coats of enamel.

3. Exterior concrete surfaces:
   a. Exterior slab will be 1 coat of clear sealer.
   b. Stained enhanced exterior walls will be 1 coat of pure acrylic water repellent penetration stain in the same color as wall or roof, Behr Concrete Stain or equal.

3.5 TESTS

A. The following test shall be performed on concrete used in the manufacture of the building at an extra cost if required. All testing shall be performed in approved laboratories. Testing shall only be performed by qualified individuals who have been certified ACI Technician Grade.

1. Sampling shall be in accordance with ASTM C172.

2. The slump of the concrete shall be performed on the first batch of concrete in accordance with ASTM C143. This slump shall be in the 3-5 inch range.

3. The air content of the concrete shall be checked per ASTM C231 on the first batch of concrete. The air content shall be in the range of 4-6 percent.

4. The compressive strength of the cylinders shall be tested to ASTM C39. Make one cylinder for 7 days, one for 14 days, and one for 28 days. The 28-day must be a minimum of 5,000 psi.

5. A copy of all test reports shall be provided to the owner.

3.6 INSTALLATION

A. General: Buildings shall be installed in accordance with manufacturer's recommendations and these specifications.
ENGINEERING CALCULATIONS: IBC 2012 / ASCE 7-10 / ACI 318-14

JOB NO: 1903063
NAME: Pre-cast building

CUSTOMER: UBC-precast
BILLING ADDRESS:
ADDRESS: 464 West Highway 26
CITY: Blackfoot
STATE: AZ
ZIP: 83221
COUNTRY: USA

CONTACT: Greg Hoskins
TEL: 208-681-2665
FAX:
MOBILE:
E-MAIL: ubcprecast@mrsn.com

SITE ADDRESS: 1100 Clam Beach Rd
CITY: Mckinleyville
STATE: CA
ZIP: 95519
CONFIRM ZIP: 95519
COUNTRY: USA

References:
IBC 2012
ASCE 7-10
ACI 318-14

Notes: The structure is capable of supporting the design load referenced in 2012 International Building Code.

Acceptance and use of this report by any party constitute a contractual agreement that the Engineers total liability arising out of or in any way related to this analysis and report shall not exceed the total sum paid to the Engineer for the services provided. Liability does not exist beyond the analysis contained in this report.
**Vault wall Design**

\[ d_v := 4 \text{ ft} \quad \text{Depth of vault} \]

\[ l_v := 6.5 \text{ ft} \quad \text{Length of vault} \]

\[ \rho_{\text{soil}} := 120 \text{pcf} \quad \text{Unit weight of soil} \]

\[ f'_c := 4000 \text{ psi} \]

\[ f_y := 60000 \text{ psi} \]

\[ \phi := 30 \text{ deg} \quad \text{Assumed coefficient of friction} \]

\[ K_o := 1 - \sin(\phi) \]

\[ P_{3.5} := K_o \cdot \rho_{\text{soil}} \cdot 3.5 \text{ ft} = 210 \text{ psf} \]

\[ M_{ap} := \left( \frac{P_{3.5} \cdot l_v^2}{8} \right) 1 \text{ ft} = \left( 1.331 \cdot 10^4 \right) \text{ in} \cdot \text{lb} \quad \text{Applied moment per ft} \]

\[ \phi := 1.35 \quad \text{Factor for earth load} \]

\[ M_u := \phi \cdot M_{ap} = \left( 1.797 \cdot 10^4 \right) \text{ in} \cdot \text{lb} \quad \text{Ultimate moment} \]

\[ 0.735 A_s^2 - 2.25 A_s + 0.33 = 0 \quad \text{Solving equation} \]

\[ A_s := 0.16 \text{ in}^2 \quad \text{Required still per ft} \]

Provide #4@12" O.C both directions
**Vault Floor Design**

\[ W_{ss} := 65 \text{ kip} \]

\[ W_{of} := 11.875 \text{ in} \]

\[ L_{of} := 14.33 \text{ in} \]

\[ w_{of} := W_{ss} \frac{E_{of} \cdot L_{of}}{W_{of} \cdot L_{of}} = 381.974 \text{ psi} \]

\[ l_f := 6.83 \text{ in} \]

\[ M_{f, applied} := \left( \frac{w_{of} \cdot l_f^2}{8} \right) \text{ 1 ft } = 26.728 \text{ kip} \cdot \text{in.} \]

\[ C := 1.5 \text{ in} \]

\[ d := 4 \text{ in} - C - 0.25 \text{ in} = 2.25 \text{ in} \]

\[ 0.735 A_s^2 - 2.25 A_s + 0.494 = 0 \]

\[ A_s = 0.238 \text{ in}^2 \]

Provide #4 @ 10" O.C both directions

Weight of superstructure

Width of structure

Length of structure

Total area load floor

Max span of floor

Applied moment per foot

Concrete cover

Effective depth assuming bar #4

Solving for As
Building Roof Design

\[ DL := 65 \frac{lb}{ft} \]

\[ LL := 250 \frac{lb}{ft} \]

\[ l_{roof} := 7 \text{ ft} \]

\[ LC := 1.4 \cdot DL + 1.8 \cdot LL = 541 \text{ plf} \]

\[ M_u := \frac{LC \cdot l_{roof}^2}{8} = 39.764 \text{ kip \cdot in} \]

\[ D := 5 \text{ in} \]

\[ d := D - 1.5 \text{ in} - 0.25 \text{ in} = 3.25 \text{ in} \]

\[ 0.735 A^2 - 3.25 A_s + 0.736 = 0 \]

Solving for \( A_s \)

\[ A_s := 0.238 \text{ in}^2 \]

Provide #4 @ 10" O.C. both directions

\[ A_s := 0.239 \text{ in}^2 \]

Provide #4 at 10" O.C
Earthquake Load

General Input

\[ t_w := 5 \text{ ft} \]

USGS Provided output

\[ S_s := 2.893 \text{ g} \quad S_{MS} := 2.893 \text{ g} \quad S_{DS} := 1.928 \text{ g} \]

\[ S_i := 1.129 \text{ g} \quad S_{MI} := 1.694 \text{ g} \quad S_{D1} := 1.129 \text{ g} \]

The Response Modification factor

\[ R := 4 \quad \text{ASCE 7-10: Table 12.2-1} \]

The Occupancy Importance Factor

\[ I := 1 \]

\[ \rho := 1 \quad \text{Art. 12.3.4} \]

Seismic Response Coefficient

\[ C_s := \frac{S_{DS}}{R} = 0.482 \text{ g} \]

Approximate Fundamental Period

\[ C_i := 0.028 \quad \text{ASCE 7-10: Table 12.8-2} \]
\[ h_n := 11 \quad \text{ASCE 7-10: Table 12.8-2} \]
\[ x := 0.8 \]

\[ T_a := \left( C_i \cdot h_n \right)^x s = 0.191 \text{ s} \]

Fundamental Period

\[ C_u := 1.4 \quad \text{ASCE 7-10: Table 12.8-1} \]

\[ T := C_u \cdot T_a = 0.267 \text{ s} \]

\[ T_L := 12 \text{ s} \quad \text{ASCE 7-10: Figure 22-12} \]
Maximum seismic response coefficient

\[ C_{s \text{, max}} = \begin{cases} \frac{S_{D1} \cdot 1 \text{ s} \cdot S_{D1} \cdot T_L \cdot 1 \text{ s}}{T \cdot \left( \frac{R}{I} \right)} & \text{if } T \leq T_L \end{cases} \]
\[ \times 1.057 \text{ g} \]

Minimum seismic response coefficient

\[ C_{s \text{, min}} = 0.5 \cdot \frac{S_1}{R} = 0.141 \text{ g} \]

if \((C_{s \text{, max}} > C_s > C_{s \text{, min}})\), "OK", "NOT OK") = "OK"

Weight of the Structure

\[ H_{avg} = 7.9 \text{ ft} \]
\[ T = 0.333 \text{ ft} \]
\[ A_{\text{front panel}} = 188.8 \text{ ft}^2 \]
\[ A_{\text{side wall}} = 7 \text{ ft} \times 9.4 \text{ ft} = 65.8 \text{ ft}^2 \]
\[ A_{\text{back panel}} = 108.9 \text{ ft}^2 \]
\[ V_{\text{roof}} = 10.25 \text{ ft} \times 9.73 \text{ ft} \times 0.42 \text{ ft} = 41.888 \text{ ft}^3 \]
\[ V_{\text{interior}} = 7.25 \text{ ft} \times 8.59 \text{ ft} \times 0.25 \text{ ft} = 15.569 \text{ ft}^3 \]
\[ W_{i} = (T \cdot (A_{\text{front panel}} + A_{\text{back panel}} + 2 \cdot A_{\text{side wall}}) \cdot 150 \text{ pcf} + (V_{\text{roof}} + V_{\text{interior}}) \cdot 150 \text{ pcf}) \cdot \frac{1}{g} = (3.006 \cdot 10^4) \text{ lb} \]

Base Shear

\[ V = C_s \cdot W_{i} = 14.49 \text{ kip} \]

provide 1/2" dia studs 3"
long 4 per plate

\[ V_{\text{stud}} = 5.9 \text{ kip} \]

Use 3/16" fillet weld
5" length

\[ V_{\text{weld}} = 4.9 \text{ kip} \]

\[ V_{\text{weld, total}} = 5 \text{ in} \cdot V_{\text{weld}} = (2.45 \cdot 10^4) \text{ lb} \]
## Wind Load

**Risk category:** 2  
**Exposed category:** C  
**Wind Speed:** 110 mph  
**Wind Importance Factor:** 1  
**Wind direction factor:** 0.85  
**Topographic factor:** 1.0  
**Roof peak height:** 9.4 ft  
**Roof eave height:** 0 ft  
**Building length:** 17 ft  
**Building width:** 12 ft  
**Velocity pressure factor at 12 ft high:** 0.85  
**Gust effect factor:** 0.85  
**Internal pressure coefficient:** 0.55  
**Internal pressure coefficient:** -0.55
**Wind load main resisting system**

\[ q_x := 0.00256 \left( \frac{V_w}{1 \text{ mph}} \right)^2 \cdot K_z \cdot K_{zt} \cdot K_d \cdot \text{psf} = 22.38 \text{ psf} \]

\[ q_h := q_x = 22.38 \text{ psf} \]

**External pressure coefficients for walls and roofs ASCE 7-10, Fig 28.3-1**

**CASE 1 - Wind normal to ridge**

\[ L_{r1} := B = 12 \text{ ft} \]
\[ B_{r1} := L = 17 \text{ ft} \]
\[ \frac{L_{r1}}{B_{r1}} = 0.706 \]
\[ C_{puw_{lw1}} := -0.5 \text{ Leeward wall coefficients} \]
\[ C_{puw_{uw1}} := 0.8 \text{ Windward wall coefficients} \]
\[ C_{psw} := -0.7 \text{ Side wall coefficients} \]
\[ h := H_y = 9.4 \text{ ft} \text{ Mean roof height} \]
\[ L_{r1} = B = 12 \text{ ft} \text{ Length of bld along wind dir} \]
\[ B_{r1} := L = 17 \text{ ft} \text{ Length of bld transverse to wind dir} \]
\[ \frac{h}{L_{r1}} = 0.783 \]
\[ C_{pr_{1,ww1}} := -1.07 \text{ Windward roof coefficients} \]
\[ C_{pr_{lw1}} := 0.6 \text{ Leeward roof coefficients} \]

**Case-2: wind parallel to ridge**

\[ L_{r2} := L = 17 \text{ ft} \]
\[ B_{r2} := B = 12 \text{ ft} \]
\[ \frac{L_{r2}}{B_{r2}} = 1.417 \]
\[ C_{puw_{lw2}} := -0.25 \]
\[ C_{puw_{uw2}} := 0.61 \]
\[ C_{psw} := -0.7 \]
\[ h := H_y = 9.4 \text{ ft} \]
\[ L_{r2} := L = 17 \text{ ft} \]
\[ B_{r2} := B = 12 \text{ ft} \]
\[ \frac{h}{L_{r2}} = 0.553 \]
\[ C_{pr_{1,ww2}} := -1.07 \]
\[ C_{pr_{lw2}} := -0.6 \]
Design wind load, MFRI, ASCE 7-10, Eq. 27.4-1

1. Positive internal pressure  Case 1

\[ PP_{wu\_wall1} := (q_z \cdot G \cdot C_{pu\_wu}) - (q_z \cdot Gc_{pi-p}) = 2.909 \text{ psf} \]

\[ PP_{lw\_wall1} := (q_z \cdot G \cdot C_{pu\_lw}) - (q_z \cdot Gc_{pi-p}) = -21.821 \text{ psf} \]

3. Negative internal pressure  Case 1

\[ PP_{wu\_wall1} := (q_z \cdot G \cdot C_{pu\_wu}) - (q_z \cdot Gc_{pi-n}) = 27.528 \text{ psf} \]

\[ PP_{lw\_wall1} := (q_z \cdot G \cdot C_{pu\_lw}) - (q_z \cdot Gc_{pi-n}) = 2.798 \text{ psf} \]

\[ P_{max} := PP_{wu\_wall1} = 27.528 \text{ psf} \]

Wind toward long direction

\[ 1.8 \cdot 9.4 \text{ ft} \cdot 17 \text{ ft} \cdot P_{max} = 7.918 \text{ kip} \]

Seismic load is governing