

## PART 1 – GENERAL

## 1.1 SECTION INCLUDES

- A. Glass fiber reinforced plastic (FRP/GRP) tank cover deck panels.
- B. Glass fiber reinforced plastic (FRP/GRP) structural supports.
- C. Flashing and trim.
- D. Fasteners and anchors.
- E. Gaskets.
- F. Accessories and appurtenances.
- G. Covers for these tanks, channels, and other areas:
  - 1.
  - 2.

## 1.2 RELATED SECTIONS

*\*NOTE TO SPECIFIER\* Add or delete sections as required.*

## 1.3 REFERENCES

- A. ASTM D638, Standard Test Method for Tensile Properties of Plastics
- B. ASTM D790, Standard Test Method for Flexural Properties of Plastics
- C. ASTM D695, Standard Test Method for Compressive Strength of Plastics
- D. ASTM E84, Standard Test Method for Surface Burning Characteristics of Plastics

## 1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 – Administrative Requirements.
- B. Product Data: Manufacturer's data sheets for each product to be used including:
  - 1. Calculations, design data, and test reports as applicable indicating compliance with all specified requirements.
  - 2. Storage and handling instructions.
  - 3. Installation instructions.
- C. Drawings including layouts, product description, connection and framing details, fastener types and spacing.
- D. Miscellaneous certifications.

## 1.5 QUALITY ASSURANCE

- A. Tank cover supplier shall manufacture and fabricate all FRP components in its own facility, which shall have current ISO 9001 certification and shall be located in the USA.
- B. Tank cover manufacturer shall be solely responsible for the design and satisfactory performance of the cover system specified herein. No division of responsibility between manufacturer of FRP components and design is implied or allowed.
- C. Within the prior five years, the tank cover manufacturer shall have completed minimum of five (5) projects in the state of Colorado of similar type as required in this scope
- D. Contractor shall verify all field dimensions for development of manufacturer's drawings.
- E. Contractor shall review and confirm in writing approval of manufacturer's drawings.

## 1.6 PRODUCT SUBSTITUTIONS

- A. Substitutions shall be considered if Engineer has received written request at least two weeks prior to bid date. If substitutions are acceptable, bidders shall be notified by addendum.
- B. Requests for substitutions shall include technical information verifying its capability meets all specified requirements and design criteria including, but not limited to, all items listed Section 1.8 Design Criteria, A. through F.

## 1.7 Performance Testing

- A. Materials shall comply with Federal and Local laws or ordinances, applicable codes, standards, regulations, and/or regulatory agency requirements.
- B. Structural framing and deck panels shall meet performance and design criteria listed herein for span conditions indicated on drawings. Individual units shall demonstrate compliance with design criteria by large-scale testing.
  - 1. FRP Deck Panels: Uniform Load and Deflection Test
  - 2. FRP Structural Components: Three (3) Point Load Bending Test
- C. Rate of air leakage for the tank cover system shall be demonstrated by testing conducted by independent test agency certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).

## 1.8 Design Criteria

- A. Design Loads shall comply with local codes with combined loads determined by Allowable Stress Method.
  - 1. Live or Snow: \_\_\_\_\_ psf    2. Wind Uplift: \_\_\_\_\_ psf    3. Dead Load: \_\_\_\_\_ psf
    - a. Deck panels: Individual unit weight plus other materials attached to and supported by panels.
    - b. Cover structure: Individual unit weight plus other materials attached to and supported by cover structure.

- B. Design Limits
  - 1. Dead + Live or Snow Load: Limit =  $L/$ \_\_\_\_\_ (min); Factor of Safety = 2.5
  - 2. Wind Uplift less Dead Load: Deflection Limit =  $L/60$ ; Factor of Safety = 1.88
  - 3. Personnel Load: Cover shall be capable of supporting 300 lb. concentrated load over 30"x30" area located at panel midspan with  $L/180$  deflection limit or deflection not exceeding  $5/8"$ .
- C. Removability of Decking Panels:
  - 1. Each cover panel shall be removable without having to remove any adjacent panel.
  - 2. Each cover panel shall be removable vertically and without cutting of a cover component or affecting fastener holes.
  - 3. Panels shall be fastened to structural supports and locking channel utilizing a bolt with a locked-in place channel nut. Self-tapping screws or nut inserts, which are not suitable for frequent removability, shall not be allowed.
  - 4. Individual panel units shall weigh no more than 135 pounds each.
- D. Slip Resistance of Cover System
  - 1. Cover panels, end-to-end joint flashing and side-joint, locking channel shall utilize TreadMAX™ integral, non-skid surface technology or meet the following criteria:
    - a. The cover shall have a slip-resistant walking surface designed for operator foot traffic.
    - b. Non-skid surface shall be an integral (embedded) part of the cover panel and not achieved by use of coatings/paint, adhesive tapes, or other applied product after the manufacturing process.
    - c. Slip resistance tread shall be at minimum bi-directional.
    - d. Post applied tape and/or grit for anti skid is now allowed.
  - 2. Minimum average Dynamic Coefficient of Friction (DCOF) shall be 0.50 per ANSI A137.1/A326.3 Dynamic Coefficient of Friction Test.
  - 3. Minimum wet Pendulum Test Value (PTV) shall be 45, with Four S (96) hard rubber slider, per AS HB198:2014 (AS/NZS 4586) Pendulum Test.
- E. The top of tank cover system shall be flat and meet ADA guidelines of no change in vertical level of  $\pm 1/4"$ .

## PART 2 – PRODUCTS

### 2.1 Manufacturer(s)

The standard for design, characteristics, and performance shall be AXS-3™ Cover System as manufactured by Enduro Composites, Inc., Houston, TX\_ (713) 358-4000 [www.endurocomposites.com](http://www.endurocomposites.com).

### 2.2 Materials

Fiberglass reinforced plastic (FRP) structural components including cover panels, beams, and framing shall be manufactured by pultrusion process. Contact molded or hand-laid up fiberglass materials shall not be acceptable as structural components.

- A. AXS-3 Tank Cover Panels
  - 1. Resin type for FRP tank cover decking shall be UV stabilized, Isophthalic Polyester or Vinyl Ester. Orthothalic (or general purpose) polyester shall not be acceptable.
  - 2. Glass fiber reinforcements shall be 50% (min) of the material weight.
  - 3. Materials shall be fire retardant and have flame spread rating of 25 or less per ASTM E84.
  - 4. Materials shall exhibit these Physical Properties (at a minimum):
 

Tensile Strength	30,000 psi	ASTM D 638
Flexural Strength	30,000 psi	ASTM D 790
Stiffness	45,000,000 lb-in. <sup>2</sup>	
Compressive Strength	30,000 psi	ASTM D 695
Izod Impact (Notched)	20	ASTM D 256
Water Absorption	.20% max	ASTM D 570
  - 5. Cover panels shall be sealed at side, butt joints with EPDM gaskets, which shall be factory installed to bottom of locking channel so gaskets are compressed when the locking channel is placed into position.
  - 6. Cover panels shall utilize TreadMAX™ non-skid surface technology or meet the design criteria in section 1.8.E.
  - 7. Color of deck panels shall be standard gray.
- B. Access Hatches (as shown and detailed on plan drawings)
  - 1. Access hatches shall be raised or flat with one-leaf hatch door and fabricated from pultruded fiberglass components.
  - 2. Access hatches and framing shall fit inside a single deck panel to enable removal of individual deck panels with hatches without affecting adjacent panels. Standard sizes include 11"x15", 19"x24" and 22"x22" dimensions. Inquire for additional sizes.
  - 3. Underside of raised hatch lids shall be sealed with factory installed with EPDM gaskets. Perimeter hatch curb shall be sealed to decking surface with adhesive sealant.

4. Underside of Flat hatch lids shall be sealed with factory installed, 1/4" EPDM Flat gasket. Perimeter hatch curb shall be sealed to decking surface with adhesive sealant.
  5. Hatches shall have a stainless-steel, gas piston hold open device. Gas Piston shall be designed to aid in opening and to hold open the hatch once locked in place.
  6. Hatch lids suitable for foot traffic shall have factory applied non-skid, UV resistant surface with plastic or stainless-steel lift handles (as applicable).
  7. View port hatches, if indicated on drawings, shall be 12 inches square or less.
  8. Hatch openings shall be field cut in cover deck panels by the installer.
- D. FRP Structural Framing (as shown and detailed on plan drawings)
- a. Resin type for FRP beams and framing members shall be vinyl ester or polyester.
  - b. Glass fiber reinforcements shall be 50% (min) of the material weight.
  - c. Structural components shall be fire retardant with flame spread rating of 25 or less per ASTM E84.
  - d. If cover is flush mounted, ledger angles shall be FRP or 316 stainless steel.
  - e. All connections for attachment to FRP beams or fastening connections shall be stainless steel angles or plates.  
 316 Stainless Steel     304 Stainless Steel (*Select suitable material*)
- E. Trusses (if indicated by manufacturer on drawings)
- a. Trusses shall be designed and provided by tank cover manufacturer and conform to these specifications:
  - b. Truss components not exposed to inside of tank shall be galvanized steel.
  - c. Truss components exposed to inside of tank shall be stainless steel.
  - d. Trusses shall have minimum 6'6" of headspace from top of tank cover to bottom of top chord.
  - e. Trusses shall be provided in sections (30 ft. max length) to be bolted together by the contractor.
- F. Flashing and Trim
1. FRP flashing shall be isophthalic polyester with dimensions and profile as shown on the drawings.
  2. Top of all flashings shall be no greater than 1/4" higher than top of tank cover panels.
  3. Non-radius end flashing shall be factory attached to individual deck panels.
  4. Flashing with a radius or at the perimeter of a circular tank shall be a separate part and field attached by the installing contractor.
  5. Slide gate flashings (if indicated on drawings) shall be 304SS brush type.
- G. Air Vents and Connections (if indicated on drawings)
- a. FRP gooseneck ventilation piping (if indicated on drawings) with bird screen shall be provided by cover manufacturer.
  - b. FRP stub-vent connections with a blind flange (if indicated on drawings) shall be provided by cover manufacturer. Connections shall extend at least 6 inches from top of tank cover deck.
- H. Pipe Penetrations
- a. Existing or new pipe penetrations shall be retrofitted by contractor to penetrate cover at 90-degree angle.
  - b. Pipe penetrations shall be flashed in the field with a Sealtite retrofit, zipper type, pipe flashing or equal as provided by cover manufacturer.
- I. Hardware
- a. Fasteners, anchorage, hinges, and other structural accessories located on underside of cover shall be:  
 316 Stainless Steel     304 Stainless Steel (*Select suitable material*)
  - b. Perimeter flashing anchors, concrete anchors, or other hardware not exposed to the inside environment of tank shall be 304 Stainless Steel.
  - c. Fasteners to attach tank cover decking to structural supports shall be:  
 316 Stainless Steel     304 Stainless Steel (*Select suitable material*)
  - d. Decking fastener heads and washers shall be flush with top of flashing and extend no more than 1/4" above panels to comply with ADA requirements for tripping hazards. Fasteners shall be removable and reusable.
- J. Gaskets and Sealants
- a. All panel side joints and perimeter conditions shall have gaskets.
  - b. Gaskets under flashing with radius and at perimeter of circular tanks shall be installed by the contractor.
  - c. Adhesive sealant shall be applied by contractor at various locations as required by manufacturer for odor containment.

## PART 3 – EXECUTION

### 3.1 Material Handling

- A. At time of delivery, all materials shall be inspected for shipping damage. Freight company and manufacturer shall be notified immediately of any damage or quantity shortages.
- B. Contractor shall protect FRP materials from cuts, scratches, gouges, abrasions, and impacts. When lifting FRP materials,

spreader bars shall be used (not wire slings unless materials are fully protected). FRP components shall not be dragged across one another unless separated by a non-scratching spacer.

### 3.2 Installation

- A. Before placing and attaching components, erector must confirm alignment and location of bearing plates, surfaces, brackets, saddles, etc. All bearing surfaces must be clean and free of debris.
- B. Before placing secondary framing members or deck, erector must check the alignment and location of supports.
- C. Erection shall proceed according to sequence shown on the approved drawings.
- D. If applicable, contractor shall install structural members, beam seats, or ledger angles in locations shown on the approved drawings. Contractor shall assemble trusses as required.
- E. Position FRP tank cover beams (if applicable) in locations, as shown on the manufacturer's drawings. Field modifications (cuts, copes, holes, etc.) other than work shown on the drawings are not allowed without manufacturer's written consent.
- F. Anchor FRP beams and adjust tank cover components into final position with proper bearing and alignment at joints, laps, and supports before fastening. Refer to manufacturer's installation instructions for proper fastener selection, fastener location, driving techniques, and pertinent information for fastening equipment.
- G. Starting at end shown on the manufacturer's drawings, position and place cover deck panels in locations as shown. Field modifications (cuts, copes, holes, etc.) other than work shown on the drawings are not allowed without manufacturer's written consent.
- H. Fasten or anchor FRP cover deck panels into location as shown on the drawings.
- I. Place and attach flashing as shown on the drawings.