

## **SPECIFICATIONS FOR EXTRUDED ALUMINUM FLAT PANEL TYPE COVERS**

### **I. GENERAL**

#### **A. Purpose**

This specification establishes minimum criteria for the design, fabrication and erection of aluminum flat panel covers and is applicable except as otherwise noted.

#### **B. Definition**

An aluminum flat panel cover is a system of individually removable, fully sealed aluminum panels supported around the perimeter of the tank rim and, when necessary, by aluminum beams and/or trusses, also supported by the tank rim. The panels are made up of reinforced extruded aluminum planks assembled edge to edge with a tongue and groove detail. Secured to the perimeter of the planks are specialized aluminum extrusions which allow the panels to be interlocked and sealed to each other. The planks are to be deeply textured to form a slip resistant surface.

#### **C. References**

The latest editions of the following codes and standards form a part of this specification to the extent specified herein:

1. ASCE 7 Minimum Design loads for Buildings and Other Structures.
2. ASTM C509 Standard Specifications for Cellular Elastomeric Preformed Gasket Sealing Material.
3. Aluminum Association Aluminum Design Manual, Specifications for Aluminum Structures, Allowable Stress Design, Eighth Edition, January, 2005.
4. AISI Stainless Steel Cold-Formed Structural Design Manual.
5. AWWA D-100
6. Federal Standard RR-G-1602

### **II. MANUFACTURER**

The aluminum flat panel cover system, as specified, shall be the product of a single manufacturer regularly engaged in the design, manufacture, and installation of this type of equipment, and shall be the Quad Seal Extruded Flat Panel Cover as manufactured by Ultraflote Corporation, Houston, TX (713) 461-2100.

### III. DESIGN REQUIREMENTS

#### A. Description

1. The flat panel cover shall be a relatively flat structure conforming to the specified dimensions. The flat panel cover shall consist of individual, interlocking panels made up of reinforced extruded aluminum planks assembled edge to edge with a tongue and groove detail. Secured to the perimeter of the planks are specialized aluminum extrusions which allow the panels to be interlocked and sealed to each other. The panels shall be supported at the perimeter of the tank by the tank rim. If any bridges or platforms exist, they may be used to support the panels if they are capable of bearing the design load applied by the panels.
2. The maximum removable panel weight shall be not more than \_\_\_\_\_ .
3. When the tank size and/or design loads dictate, aluminum support beams &/or trusses, spanning portions of the tank, may also be utilized to support the panels. Trusses must be inherently stable internally without relying on truss-to-truss or truss-to-panel bracing systems. The trusses must be fully triangulated, self-supporting space frame with aluminum structural members joined with rigid bolted connections to aluminum node plates. All truss panels and truss walking surfaces shall provide a bi-directional non-slip traction surface as described in section III.C.3.
4. The flat panel cover shall be designed as a reasonably water tight and air tight system under all design load & temperature conditions. All panel-to-panel and panel-to-truss connections shall utilize a system of solid silicone (not sponge) hollow cords in a quad-seal gasket arrangement to ensure maximum sealing efficiency. Sealing forces on the gaskets shall be in the vertical axis to allow for panel alignment tolerances of up to +/- 1/4" (6.4 mm) horizontally.
5. The panels shall be latched down to one another and to the support members - tank rim supports, support trusses, etc. - with stainless steel and aluminum, quarter-turn, hex head latching mechanisms. Removal of a panel requires only releasing the latches of the panel to be removed. Removal of any individual panel shall require removal of no more than two adjacent panels.

#### B. Submittals

Before executing any of the work in this section, an approval package shall be submitted to the purchaser showing dimensions, sizes, thicknesses, gauges, materials, finishes, joint attachment and erection procedure. A complete stress analysis summary showing load criteria and maximum stresses, including a comparison to the allowable stresses for the panel specified shall also be submitted. Internal stresses of any support beams &/or support trusses must also be included for all loading conditions when applicable. This package shall be signed and sealed by a registered professional engineer.

## C. Materials

### 1. General

All materials furnished to meet the provisions of the specification shall be new, previously unused, in first class condition, and shall comply with all the requirements of this specification. A complete material specification shall be submitted by the flat panel manufacturer for approval by the purchaser. The choice of materials should be governed by compatibility with the product specified to be stored in the tank and the surrounding environment. All aluminum alloys, properties and tolerances shall be as defined by the Aluminum Association's Aluminum Standards and data, latest edition.

### 2. Structural Members

All structural members - panel edge extrusions, support beams, support truss extrusions, support truss bolting node plates, etc. - shall be suitable aluminum shapes or plate from 6061 - T6 or a recognized alloy with established properties.

### 3. Panel Surfaces

Panel surfaces shall be fabricated from extruded aluminum plank with a minimum nominal thickness of 0.095" (2.4 mm) for the walking surface. The surface shall provide a bi-directional non-slip surface over the entire area of the extruded planks. The surface treads shall be spaced no wider than  $\frac{3}{4}$ " (19.1 mm) apart on each plank surface and 2" (50.8 mm) apart on each plank to plank seam. The surface treads shall extend no less than 0.100" (2.5 mm) above the flat surface and the bottom of the cross texturing shall be at least 0.050" (1.3 mm) below the top of the primary treads.

Panel surfaces must exceed the slip-resistance requirements of Federal Specification RR-G-1602 with a minimum average slip resistance of 130# (59 Kg)<sup>1</sup> (average of five sole materials [leather, Hypalon, Neolite, shoe rubber and boot rubber] tested in three directions [diagonal, longitudinal, and transverse] across a dry surface). The slip-resistant surface shall be the "Diamondback<sup>®</sup>"<sup>2</sup> design or equivalent.

Alternative methods to provide a non-slip surface such as; rolled deckplate, traction tape, textured paint, wire brushing, sandblasting or other applied coatings, are prohibited.

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<sup>1</sup> Force in Pounds acting to cause a 175 pound (79.4 Kg) weight to move 1" (25.4 mm).

<sup>2</sup> DIAMONDBACK<sup>®</sup> is a registered trademark of Alcoa.

#### 4. Finish

All panels and support members (when applicable) shall be mill finish aluminum without exposed coatings or surface treatments. Aluminum that is to be in contact with carbon steel or concrete shall be isolated with a heavy coating of bituminous paint or otherwise suitably isolated.

#### 5. Bolts

All bolts shall be 7075-T73 aluminum, 2024-T4 aluminum, or series 300 stainless steel. Only stainless steel fasteners shall be used to attach aluminum to carbon steel or concrete. All primary structural fasteners shall be 1/2" (12.7 mm) minimum nominal diameter. All fasteners exposed to the elements or to high humidity will be stainless steel or aluminum. All bolts shall be removable and replaceable with common hand tools.

#### 6. Anchor Bolts: 300 Series Stainless Steel with Epoxy Capsules

#### 7. Sealants

All sealants shall be silicone compounds conforming to Federal Specification TT-S-00230C unless another material is required for compatibility with stored materials. Sealants shall remain flexible over a temperature range of - 80 to +300 degrees F (-62 to +149 degrees C) without tearing, cracking or becoming brittle. Elongation, tensile strength, hardness and adhesion shall not change significantly with aging or exposure to ozone or ultraviolet light.

#### 8. Gaskets

All preformed gasket material shall be silicone elastomer GE SE-44/88 or equal meeting ASTM C509 or Federal Spec ZZ-R-765, Class 2 Grade 50 unless another material is required for compatibility with stored materials.

#### 9. Truss Slide Bearing Pads: Stainless Steel on Teflon.

#### 10. Hatches, viewports, and vents shall be 6061-T6, 5052-H32, and/or 3003-H16 aluminum. Hatches, hinged panels, and launder covers are to be equipped with sections of continuous hinge with removable pins to facilitate ease of removal during maintenance.

#### 11. Skylight and viewport panels, if required, shall be clear acrylic with a minimum thickness of 0.25" (6.4 mm).

## D. Allowable Stresses

## 1. Aluminum Structural Members and Panels

Aluminum structural members and connections shall be designed in accordance with the Aluminum Association's Specifications for Aluminum Structures.

## 2. Bolts

Bolts shall be selected according to the following table:

<u>Material</u>	<u>Allowable Tensile Stress KSI (Mpa)</u>	<u>Allowable Shear Stress KSI (MPa)</u>
2024-T4 Aluminum	26 (180)	16 (115)
7075-T75 Aluminum	28 (190)	17 (115)
300 Series Stainless Steel $F_{tu}=90$ (618)	25 (170)	18 (125)
300 Series Stainless Steel $F_{tu}=125$ (858)	34 (235)	25 (170)

Note: Tensile Stress applied to area at root of thread.  
Shear Stress applied to area in plane of shear.

## 3. Quarter-turn latch bolts and plates

Quarter-turn latches shall meet the following minimum requirements:

<u>Material</u>	<u>Allowable Tensile Stress KSI (Mpa)</u>	<u>Allowable Shear Stress KSI (MPa)</u>
300 Series Stainless Steel $F_{tu}=90$ (618)	25 (170)	18 (125)
5052-H32 Aluminum $F_{tu}=25$ (170)	8 (55)	4.5 (31)
6061-T6 Aluminum $F_{tu}=24$ (165)	11 (75)	7.5 (52)

## E. Design Loads

1. The flat panel cover shall be designed in accordance with the Aluminum Design Manual, Specifications for Aluminum Structures, Allowable Stress Design, Eighth Edition, January 2005 as published by the Aluminum Association and designed for dead load plus live load conditions as required by applicable U.S. standard building codes.
2. The magnitude of the loads applied to the structure shall be determined in accordance with ASCE 7-05 except that in no case shall the cover be designed for an applied live load of less than 20 psf (97.6 Kg/M<sup>2</sup>).
3. The load cases to be considered shall be those described below:
  - a. Dead Load - The dead load shall be defined as the weight of the structure and all material permanently attached to and supported by the structure.
  - b. Live Load - The live load shall be defined as the weight uniformly distributed across the entire surface and shall be no less than 20 psf (97.6 Kg/M<sup>2</sup>).
  - c. Snow Load - The ground snow load as defined in Section 7 of ASCE 7-05, Chapter 7, shall be \_\_\_\_\_psf (Kg/M<sup>2</sup>) (unheated structure).
  - d. Wind Load - The wind load shall be applied in accordance with ASCE 7-05, Chapter 6 for a \_\_\_\_\_mph (KPH) wind speed, exposure A, B, C, or D (circle one) or equivalent wind pressure of \_\_\_\_\_ psf (Kg/M<sup>2</sup>).
  - e. Seismic Zone - The seismic loading as defined in ASCE 7-05 Chapter 11 & 12 with an occupancy importance factor of 1.0 for seismic design category A, B, C, or D (circle one) and a short period response acceleration of 0.167, 0.33, 0.50, 0.75, \_\_\_\_\_ (circle or fill in).
  - f. Panel Design Load - In addition to the above mentioned loads, the panels shall be designed for a 250 pound (113.4 Kg) load distributed over one square foot (0.09 M<sup>2</sup>) at any location. This load is to be taken separately and not simultaneously with other design loads.

#### IV. FLAT PANEL COVER ACCESSORIES

- A. Vents with bird (insect) screen shall be mounted as specified by purchaser. Vent hood may be removed to expose 12" nozzle for use with air scrubbing equipment.
- B. Penetrations for air intakes, exhausts, or odor control piping shall be sized and located in coordination with the odor control equipment manufacturer.
- C. Hatches and viewports of varying sizes provided with lockable hasps shall be mounted as specified by purchaser.
- D. Acrylic skylight panels or viewports shall be provided where specified by the purchaser. They shall be 1/4" (6.4 mm) minimum thickness and designed to sustain the panel loads as defined in section E.3.f of this specification.
- E. Additional accessories not listed above shall be provided as shown on the drawings.

#### V. INSTALLATION

All work shall be executed by skilled mechanics experienced in the fabrication and erection of aluminum flat panels. The flat panels shall be erected plumb and level and in proper alignment.

#### VI. WARRANTY

The flat panel manufacturer shall warrant that the work described herein shall be free from defects in workmanship and material. The flat panel manufacturer shall replace or repair any faulty workmanship or defective material furnished by it that is reported to it within one (1) year from date of acceptance for this work.