

ALUMINUM DOME SPECIFICATION

1. GENERAL

This specification covers the design, fabrication, and erection of the aluminum dome structure(s) with all appurtenances as shown on the contract drawings and specified herein.

2. SCOPE OF WORK

The dome fabricator/erector shall furnish all labor, materials and equipment required to design, fabricate, deliver, and erect the aluminum dome structure(s).

3. DESIGN

- A. The enclosure shall be a dome structure(s) conforming to the specified dimensions. The dome structure shall be a fully triangulated all aluminum space truss complete with non-corrugated closure panels. It shall be clear-span and designed to be self-supporting from the periphery structure; primary horizontal thrust shall be contained by an integral tension ring. Full provisions shall be made to allow for thermal expansion. The dead weight of the dome structure shall not exceed 3.5 pounds per square foot of surface area.
- B. The dome surface paneling shall be designed as a watertight system under all design load and temperature conditions. All raw edges of the aluminum panels shall be covered, sealed, and firmly clamped with batten bars in an interlocking manner to prevent slipping or disengagement under all load and temperature changes.
- C. The roof framing system shall be designed as a three dimensional truss with moment-resisting joints. The design must consider the increased minor axis bending and compression induced in the framing members due to tension in the roof panels.
- D. The structural analysis shall be performed using stiffness analysis models. The structural computer models shall include the effect of geometry irregularities such as dormer openings and perimeter support members.
- E. Connection forces shall be transferred through gusset plates connected to the top and bottom flanges of the beam-struts. The connections shall be designed as moment connections; a minimum of four bolts shall be used to connect the gusset plate to each strut flange.
- F. Fasteners shall be designed with a safety factor of 2.34 on ultimate strength and 1.65 on yield strength.

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- G. The design of welded components shall be done in accordance with the Aluminum Structural Welding Code ANSI/AWS D1.2-90.
- H. The vertical loads transferred from the roof to the tank shall be in line with the tank support wall. The transfer of horizontal loads to the tank shall be minimized by means of low friction slide supports. Radial forces applied to the tank shall not exceed 10% of the vertical reactions.
- I. Dissimilar materials which are not compatible shall be physically separated or insulated from each other by means of gaskets or insulating compounds.

4. MATERIALS

- A. Triangulated dome frame struts: 6061-T6 aluminum.
- B. Structural frame gussets: 6061-T6 aluminum, .375" nominal thickness.
- C. Triangular closure panels: .050" nominal thickness 3003-H16 aluminum Sheet.
- D. Triangular skylight panels if specified: 1/4" thick clear acrylic. Skylight square footage shall be 1% of covered area, minimum.
- E. Perimeter tension/compression ring: 6061-T6 aluminum.
- F. Fasteners: 7075-T73 anodized aluminum or Series 300 stainless steel.
- G. Sealant: Silicone by Pecora, General Electric Silpruf or equal.
- H. Gaskets: Silicone, General Electric SE-44/88 or equal.
- I. Anchor Bolts: Series 300 stainless steel.
- J. Dormers, doors, and hatches: 6061-T6, 5086-H34 or 5052-H36 aluminum, .090" nominal thickness.

5. ALLOWABLE STRESSES

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

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5. ALLOWABLE STRESSES (continued)

A. Aluminum Structural Members

For members subjected to axial forces and bending moments due to load eccentricity or lateral loads, the combined member stresses shall be determined by adding the stress component due to axial load to the stress components due to bending in both the major and minor axis.

B. Snap-Through Buckling

General shell buckling shall be determined in accordance with the following formula:

$$w = \frac{2258x 10^6 \sqrt{I_x A}}{(SF) R^2 L}$$

Where:

w = Allowable load [pressure psf].

I_x = Moment of inertia of strut about the strong axis [in⁴].

A = Cross sectional area of strut [in²].

R = Spherical radius of dome [in].

L = Average member length [in].

SF = Safety factor (1.65).

The allowable buckling pressure shall be compared to the maximum intensities of symmetrical and nonsymmetrical load conditions.

6. DESIGN LOADS

A. Dome Design Loads

The dome frame and skin shall be designed in accordance with the "Specifications for Aluminum Structures" as published by the Aluminum Association and designed for full dead load plus live or snow load in accordance with applicable local codes.

1. Basic Live Load [psf]:

2. Ground Snow Load [psf]:

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- A. Dome Design Loads (continued)
 - 3. Wind Load:
 - 4. Seismic Zone:
- B. Panel Design Loads (not acting simultaneously with the above loads)

The aluminum panels shall be secured to the dome frame to withstand the following vertical loads:

- 1. Two concentrated loads of 250 pounds each, applied simultaneously on two separate one square foot areas of the panel.
- 2. A distributed load equal to the ground snow load (Item 6.A.2) or 60 pounds per square foot over the total panel, whichever is greater.

7. SHOP DRAWINGS, DESIGN CALCULATIONS AND SUBMITTALS

- A. Before executing any of the work in this section, prints or drawings shall be submitted to the engineer showing dimensions, sizes, thickness, gauges, materials, finishes, joint attachment and erection procedure.
- B. A complete set of design calculations for the dome(s) shall also be submitted. These calculations shall be signed by a registered professional engineer. All work shall be fabricated and erected in accordance with the approved drawings.
- C. Certification that the specified material alloys, sizes and quantities have been furnished shall be submitted upon completion of the project.

8. FABRICATION AND ERECTION

- A. Dome contractor shall perform the work described herein with mechanics skilled and experienced in the fabrication and erection of aluminum structures. All field work shall be directed by a qualified supervisor who will remain on the job site until completion.
- B. Field refabrication of structural components or panels will not be accepted. Forcing of the structure to achieve fit-up during construction is expressly forbidden and not acceptable.

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- C. All sealant joints shall be tooled slightly concave after sealant is installed. Care shall be taken to keep sealant confined to joint area, and any outside of the joint shall be removed so that the panels will be free from misplaced sealant. All gasket materials shall be continuous; splices will not be allowed.

9. QUALIFICATIONS TO BID

- A. The dome fabricator/erector must have installed and had in satisfactory service for a period of not less than five years at least one clear span aluminum dome with a diameter equal to or larger than the unit(s) specified, and shall submit evidence of such with his bid proposal and/or pre-bid submittal.
- B. The experience requirement will be waived if the manufacturer provides a five-year Performance Bond in lieu of evidence of experience and operation. Proof of the ability to provide said bond shall be submitted with his bid proposal and/or pre-bid submittal. The bond shall guarantee satisfactory operation as defined by the technical specifications, and it shall state that the manufacturer will, in case of unsatisfactory service, remedy any problem(s) within thirty (30) days after written notification, or, at the Owner's option, replace the domes or forfeit the bond. The bonding period shall commence upon written acceptance by the Owner of the installed equipment and all appurtenances and final acceptance of the General Contract.
- C. The dome shall be manufactured by Temcor of Gardena, California, (800-421-2263) or an approved equal.

10. GUARANTEE

The dome(s) shall be guaranteed for a period of one (1) year against defective materials and workmanship.

10/09/01