AluminumDomes.com Roof Specification

I. GENERAL

This specification covers the design, fabrication, and erection of a geodesic clear span aluminum dome roof structure(s) designed and manufactured with appurtenances as required on the contract drawings and specified herein. The structure shall be as manufactured by Tank Connection under the brand name of AluminumDomes.com.

II. SCOPE OF WORK

The supplier shall furnish a design that includes all materials necessary to fabricate and deliver an aluminum dome roof as specified herein.

III. DESIGN

A.   The roof shall be a dome structure(s) conforming to AWWA D103 and conforming to the dimensions of the tank with fully triangulated all aluminum space truss complete with non-corrugated closure panels. The roof 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. Provisions shall be made in the design to allow for thermal expansion of the dome and its parts over a temperature range of +/-120°F.

B. The dome surface paneling is to be designed as a watertight system under all design load and temperature conditions. All raw edges of the aluminum panels should be covered, sealed, and firmly clamped with batten bars in an interlocking manner to prevent slipping or disengagement under design load and temperature changes. Batten bar to roof panel gaskets shall be silicone. Roof panel designs which do not use batten bars, and an interlocking panel joint or that otherwise do not comply with The Aluminum Design Manual Part IX Section 4.1 as published by the Aluminum Association will not be considered.

C. The roof framing system shall be designed as a three dimensional truss with moment-resisting joints.

D. The structural analysis shall be performed using stiffness analysis models, which include the effect of geometric 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, with connections which are designed as moment connections; a minimum of four lock-bolts are to be used to connect the gusset plate to each strut flange.

F. All dome fasteners should be designed with a minimum safety factor of 2.34 on ultimate strength.

G. The vertical loads should be transferred from the roof to the tank in-line with the tank wall. The transfer of horizontal loads to the tank shall be minimized by means of low friction slide supports from both the upward and the downward forces on the tank shell. Designs which do not have a friction reducing slide which reduces horizontal force from uplift shall not be considered.

H. Dissimilar materials shall be isolated by an insulator to prevent galvanic corrosion.

I. The design of welded components shall be done in accordance with the Aluminum Structural Welding Code ANSI/AWS D1.2-90.

IV. MATERIALS

A. Triangulated dome frame struts: AA6005A-T6 or AA6061-T6 aluminum.

B. Triangular dome panels: 0.050" nominal thickness, AA3003-H16 or H14 aluminum sheet, mill finish

C. Triangular skylight panels, (if specified): nominal thickness of 1/4" thick clear acrylic or polycarbonate.

D. Perimeter tension/compression ring: AA6005A-T6 or AA6061-T6 aluminum.

E. Fasteners: AA2024-T4 aluminum, AA7075-T73 aluminum or austenitic series 300 stainless steel as required by design.

F. Sealant: Low modulus silicone by Pecora, Dow, General Electric Silpruf or equal.

G. Standard gaskets: Silicone.

H. Dormers, doors, and hatches: AA6061-T6, AA6005A-T6, AA3003-H14, AA3003-H16 or AA5052- H34 aluminum.

I. Anchor Bolts: Series 300 stainless steel.

J. Connection Gussets AA6061-T6 or AA5052- H34

V. ALLOWABLE STRESSES

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

A. Aluminum Structural Members:

> For members subjected to axial forces and bending moments due to load eccentricity or lateral loads, the combined member stresses are 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 is considered by using either a non-linear finite element analysis with a minimum factor of safety of 1.65 or with the following equation:

$$W = \frac{2258 \times 10^6 \sqrt{IA}}{(SF)LR^2}$$

Where:
      w = Allowable load [pressure psf].

Ix = 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).

VI. DESIGN LOADS

A. Dome Design Loads:

The dome frame and skin shall be designed in accordance with the most recent edition of "The Aluminum Design Manual" as published by the Aluminum Association and is designed for full dead load plus snow load of 15 PSF unless a higher load is specified by the customer.

B. Panel Design Loads: (not acting simultaneously with the above loads).Each aluminum panel shall be secured to the dome frame and capable of withstanding two concentrated loads of 250 pounds each, applied simultaneously on two separate one square foot areas of the panel or 60 PSF distributed over the total panel area..

C. Wind Loads:

Unless otherwise specified by the purchaser, The wind load is based on a load resulting from a wind velocity of 90 mph.

D. Seismic Loads:

The roof shall be designed for seismic loading conditions as specified by the applicable building code.

E. Design Codes:

The roof shall be designed to the design code as specified by the purchaser. Domes can be designed in accordance with The International Building Code, ASCE7, API650, AWWA D100, AWWA D103 and/or other local state or international codes.

VII. SHOP DRAWINGS, DESIGN CALCULATIONS AND SUBMITTALS

A. Before executing any fabrication, calculations and drawings shall be submitted for approval showing dimensions, sizes, thickness, gauges, materials, finishes, joint attachment and erection procedures.

B. All materials shall be fabricated and erected in accordance with the approved drawings.

VIII. FABRICATION AND ERECTION

A. The roof supplier shall perform all manufacturing work described herein with mechanics skilled and experienced in the fabrication of aluminum dome roof structures.

B.   All field work shall be directed by a qualified supervisor who will remain on the job site until the dome construction is completed.

C. Field re-fabrication 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. Any indication of improper fit-up of parts shall be immediately reported to the fabricator.

D. All sealant joints shall be tooled slightly concave after sealant is installed. Care shall be taken to keep sealant confined to the joint in a neat manner. Any sealant applied 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.

IX. GUARANTEE

The dome materials shall be guaranteed for a period of 3 years against defective materials and workmanship.