



HMT Inc.

23832 Tomball Parkway · Tomball, Texas 77375

Phone: (281) 401-7300 · Fax: (281) 351-8654

ALUMINUM GEODESIC ROOF SPECIFICATION

1. GENERAL

This specification covers the design, fabrication, and erection of an aluminum geodesic dome structure (s) designed and fabricated with accessories as described and shown in the contract drawings and supporting documents.

2. SCOPE OF WORK

The dome manufacturer shall provide all labor, materials, and equipment necessary to design, fabricate, deliver, and erect an aluminum dome structure (s) as required in the contract documents.

3. DESIGN

- A. The aluminum dome roof shall be a fully triangulated clear-span space frame that is self supporting from the periphery structure with non-corrugated closure panels. Primary horizontal thrust shall be contained by an integral tension ring.
- B. The dome surface paneling is a lapped design and shall be designed as a watertight system. The lapped panels shall be covered, sealed, and firmly clamped with batten bars to prevent slippage or disengagement under all design load conditions.
- C. The roof framing structure shall be designed as a three-dimensional space frame with moment resisting joints. The design shall consider the increased minor axis bending and compression induced in the frame members due to tension in the roof panels.
- D. The structure analysis shall be performed using stiffness analysis models in which the irregularities in the dome geometry are considered.
- E. Connection forces shall be transferred through node (gusset) plates connected to the top and bottom flanges of the dome beams. The connections are designed to be moment connections and a minimum of four bolts shall be used to connect the node (gusset) plates to each beam flange.



- F. All dome structural fasteners shall be designed with a minimum safety factor of 2.34 on ultimate strength and 1.65 on the yield strength.
- G. The vertical loads of the dome roof to the tank shell shall be in line with the vertical tank wall. The transfer of horizontal loads to the tank wall shall be minimized by means of low friction slide supports. Radial forces applied to the tank wall shall not exceed 10% of the vertical reactions.
- H. The design of welded aluminum components shall be done in accordance with the latest edition of the Aluminum Structural Welding Code, ANSI/AWS D1.2. All welding shall be performed prior to field erection of the dome structure. Field welding on aluminum is prohibited.
- I. Dissimilar materials shall be isolated or insulated from each other by means of gaskets or insulating compounds to prevent galvanic corrosion.

4. MATERIALS

- A. Dome frame structural shapes: AA-6061-T6, AA-6005-T5 aluminum
- B. Dome structural node (gusset) plates: AA-6061-T6, AA-5454-H34 aluminum, 0.25 minimum thickness
- C. Dome closure panels: AA-3003-H16, 0.05" minimum thickness, mill finish aluminum sheeting
- D. Sealants: clear or aluminum gray silicone, by General Electric 1000 or equal and Butyl Tremsil 440, by Tremco or equal
- E. Fasteners: 300 series stainless steel
- F. Standard gaskets: EPDM or Neoprene, resistant to ozone and ultraviolet light
- G. Accessories (hatches, nozzles, etc): AA-3000/5000 series aluminum, 0.09" minimum thickness
- H. Triangular skylights: ¼" clear acrylic



5. ALLOWABLE STRESSES

Aluminum structural members shall be designed in accordance with the latest edition of the Aluminum Association's Specifications and Guidelines for Aluminum Structures and Aluminum Standards and Data and the following clarifications.

- A. Aluminum Structural Members: For structural members under 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 loads to the stress components due to bending in both the major and minor axes.
- B. Snap Through Buckling: General buckling shall be determined in accordance with the latest edition of API 650, Appendix G, Section G.4.1.3.

6. DESIGN LOADS

The dome structure (s) shall be designed in accordance with the latest edition of Aluminum Association's Specification for Aluminum Structures and the latest edition of API 650, Appendix G and Addendum Number unless the purchaser specifies a different design code.

The load cases to be considered are described below unless more severe loads are specified by the purchaser.

- A. Dead Load – The dead load shall be defined as the weight of the dome structure and all components that will be permanently attached to the structure.
- B. Live Load – The minimum uniform roof live load is 20 lbs/ft² (1.0 kPa) on the horizontal projected area of the roof *unless a more severe live load is specified by the purchaser.*
- C. Snow Load – Roof snow loads and/or ground snow loads shall be specified by the purchaser if required for design.
- D. Unbalanced Live Load – An unbalanced live load is one half of the live load applied to one half of the dome structure with no live load on the other half.



- E. Unbalanced Snow Load – Unbalanced Snow loads shall be determined per the latest edition of ASCE 7 if required unless a different code is specified by the purchaser.
- F. Wind Load – The wind load is the load resulting from a design 3-second gust wind speed of 120 mph (190 km/h) which imposes a velocity pressure of 31 lbs/ft² (1.48 kPa) *unless a more severe wind speed is specified by the purchaser.*
- G. Seismic Load – Seismic design shall be determined in accordance with the latest edition of API 650, Appendix E & G. *The purchaser must specify seismic use group and factors if seismic design is required.*
- H. Load combinations – the loads cases above shall be applied to the dome structure per the combined load cases of the latest edition of API 650, Appendix R.
- I. Temperature – a minimum temperature range of +/- 120°F (+/- 70°C) shall be used for design *unless a wider range is specified by the purchaser.*

7. DESIGN CALCULATIONS, FABRICATION DRAWINGS, AND SUBMITTALS

Prior to any fabrication, design calculations and drawings shall be submitted to the purchaser for approval. These drawings should show dimensions, materials, and typical component details. All work shall be fabricated and erected in accordance with the approved drawings.

8. ERECTION

All field work shall be executed by skilled mechanics with a qualified supervisor that will remain on site for the duration of the dome erection. The dome shall be erected level and in proper alignment. The HMT geodesic dome installation manual shall be used as a guide in erecting the dome structure.

For Existing Tanks:

Before beginning the field erection process, the top course of the tank structure shall be measured by a qualified field crew person to verify and/or confirm the roundness (verticality) study completed prior to final dome

design. Any discrepancies and/or questions shall be reported to HMT Engineering for evaluation prior to dome erection.

9. WARRANTY

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