Cryogenic Liquid Tank Overview

Large-Capacity Field-Erected Refrigerated Liquid Storage









Typical Stored Media



LOX
Liquid Oxygen



LIN
Liquid Nitrogen



LAr
Liquid Argon

Key Engineering Parameters

Vonfiguration	Vertical / Flat-Bottom / Double-Wall
Construction	Factory Prefabrication + Field Erection
Design Basis	Project-Specific
Reference Capacities	900 / 1,200 / 1,500 / 3,000 / 6,000 m³

Capacities shown are documented engineering references, not a fixed product range.

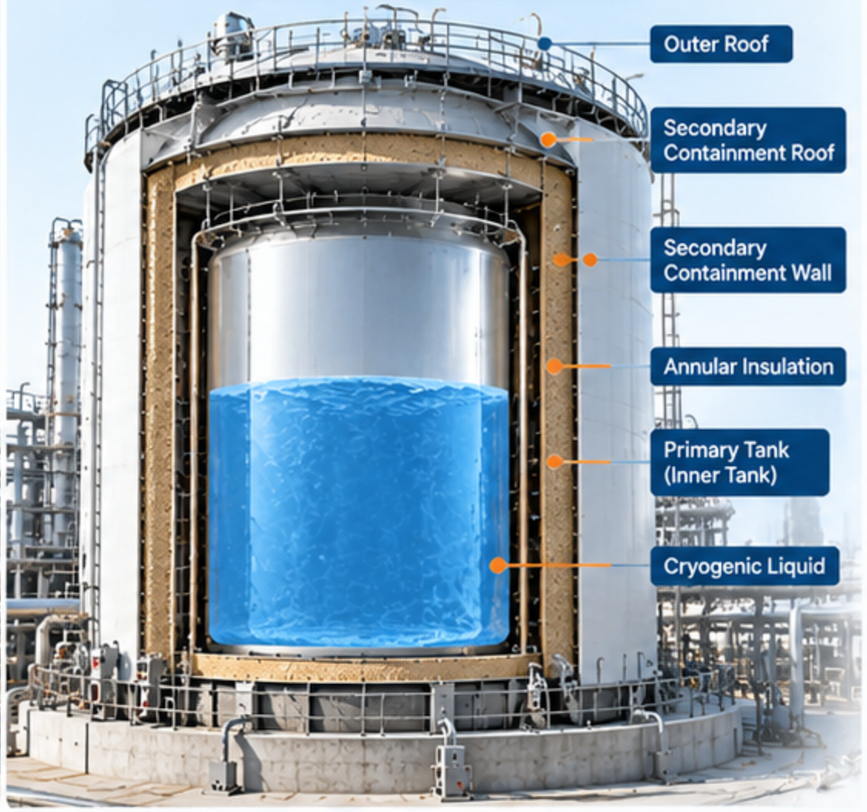
Tank Configurations & Containment

Structural Arrangements for Cryogenic Liquid Storage

Single Containment



Full Containment



Configuration Comparison

Item	Single Containment	Full Containment
Primary Liquid Containment	Independent metallic tank (inner tank)	Independent metallic tank (inner tank)
Secondary Liquid Containment	Not provided (the outer shell is a weather enclosure)	Provided (engineered liquid-tight containment)
Vapor Containment	Normally not provided as a dedicated system	Provided as part of the containment design
Outer Enclosure Function	Weather protection and support for insulation system	Structural and containment function according to design
Typical Application	General low-pressure cryogenic storage	Projects requiring higher environmental protection or specific containment requirements
Project Selection Basis	Stored medium, site conditions, applicable codes	Project risk assessment, regulatory requirements, applicable codes

Roof Structure Arrangements

1 Suspended Deck



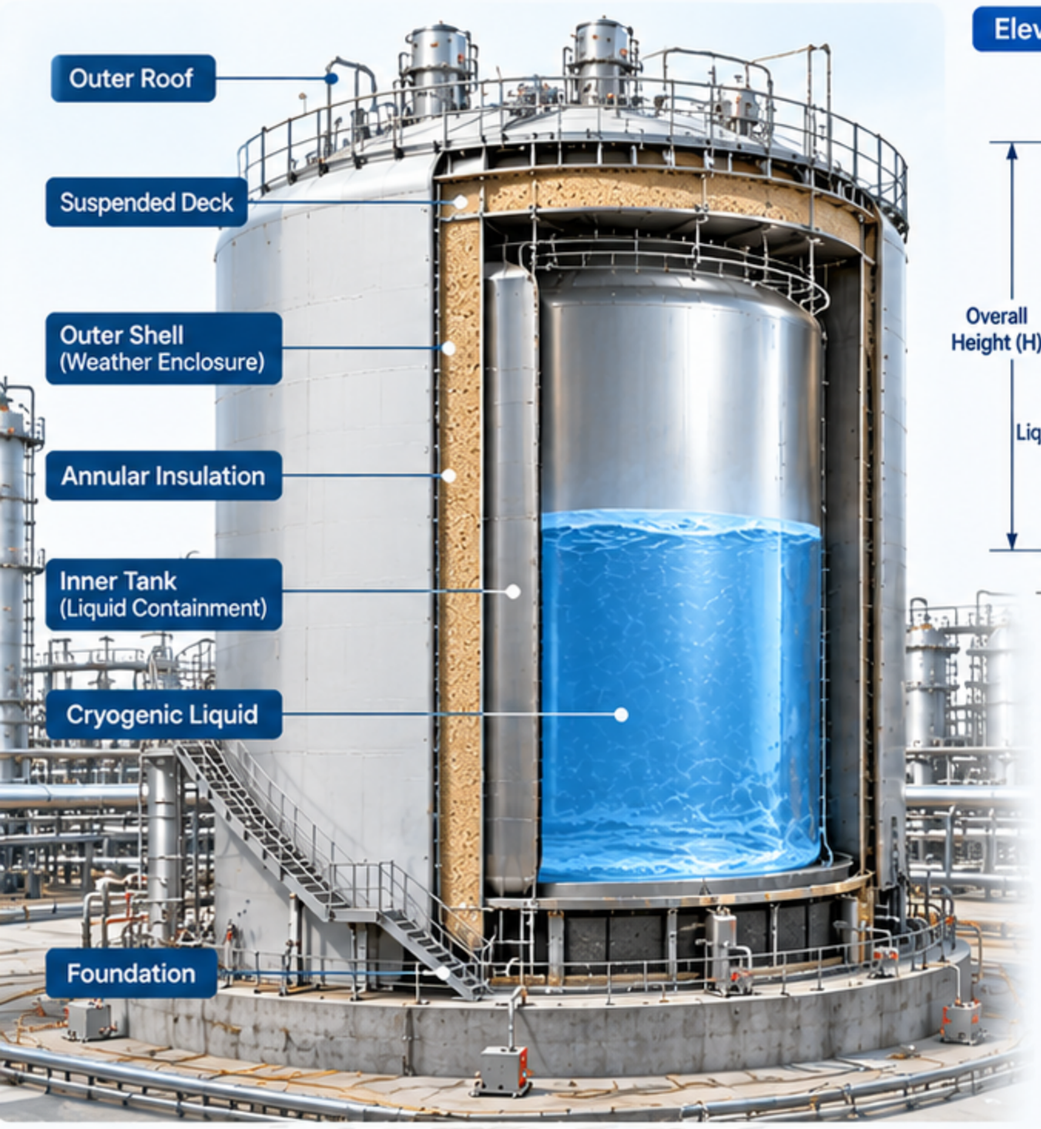
2 Domed Roof



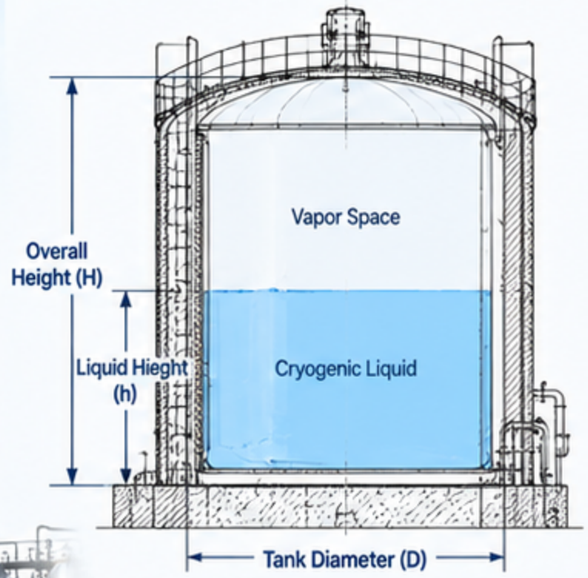
! Final containment classification depends on the complete system design, not merely on the presence of two steel walls.

Design Standards & Engineering Parameters

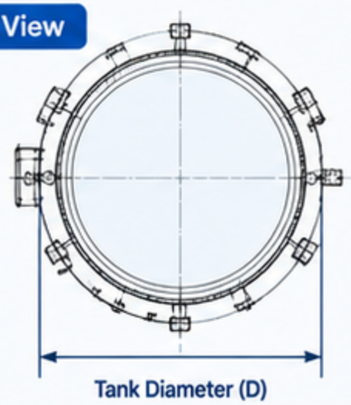
Engineering Basis for Cryogenic Liquid Storage Tanks



Elevation View (Partial Section)



Top View



Applicable Design Standards

Standard	Scope and Application
API 620	Large welded low-pressure storage tanks (Design and construction)
API 620 Annex Q	Additional requirements for low-temperature service within its applicable temperature range (Annex to API 620)
API 625	Refrigerated liquefied gas storage tank systems (Design, materials, insulation, safety and operation)
EN 14620	Site-built, flat-bottom refrigerated storage tanks (Design, construction and testing)

Engineering Reference Tank Capacities

Third-Party Engineering References

Storage Medium	Reference Capacity	Project / Design Reference
Liquid Oxygen (LOX)	6,000 m³	Two tanks documented for an integrated steelworks project
Liquid Nitrogen (LIN)	1,500 m³	Two tanks documented for the same steelworks project
Cryogenic Liquid Storage	3,000 m³	Ten large cryogenic tanks documented for an industrial steelworks project
Cryogenic Liquid Storage	900 / 1,200 m³	Export project with factory prefabrication and project-specific equipment design

Key Design Input Parameters

Design Pressure
Specified according to stored medium, operating conditions and applicable code

Minimum Design Temperature
According to stored liquid

Stored Medium
LOX, LIN, LAr, LNG or other refrigeated liquids

Working Volume
Based on liquid density and filling level

Wind Loads
According to project location

Seismic Loads
According to project location

Final design, dimensions, thickness, insulation arrangement and operating limits are established during detailed engineering.
Capacities shown are documented engineering references, not a fixed product range.

Cryogenic Material Selection

Materials for Safe and Reliable Low-Temperature Service



Inner Tank Shell

Austenitic stainless steel (304 / 304L / 316 / 316L)

Outer Shell

Carbon steel / Low-temperature steel

Cryogenic Piping

Stainless steel / Cryogenic compatible material

Bottom Support

Cellular glass insulation

Main Material Options for Cryogenic Tanks

Component	Typical Material Options	Notes
Inner Tank	ASTM A240 Type 304 / 304L ASTM A240 Type 316 / 316L Cryogenic nickel steel (as required)	Selected according to stored medium, design temperature and code requirements
Outer Shell	Carbon steel, low-temperature steel or other project-specified material	Selected for applicable design metal temperature and structural requirements
Piping and Nozzles	Austenitic stainless steel or other approved cryogenic material	Compatible with stored liquid and operating conditions
Bottom Support	Cellular glass or approved equivalent insulation system	Load-bearing and suitable for cryogenic service

Approximate Boiling Points of Common Cryogenic Liquids

Stored Medium	Approximate Atmospheric-Pressure Boiling Point
Liquid Nitrogen (LIN)	−196°C
Liquid Oxygen (LOX)	−183°C
Liquid Argon (LAr)	−186°C
Liquefied Natural Gas (LNG)	Approximately −162°C (composition-dependent)

Note: These are approximate atmospheric-pressure boiling points, not design temperatures.

Key Material Selection Considerations

Low-Temperature Toughness

Suitable performance at required temperature

Weld Compatibility

Approved welding procedure and filler materials

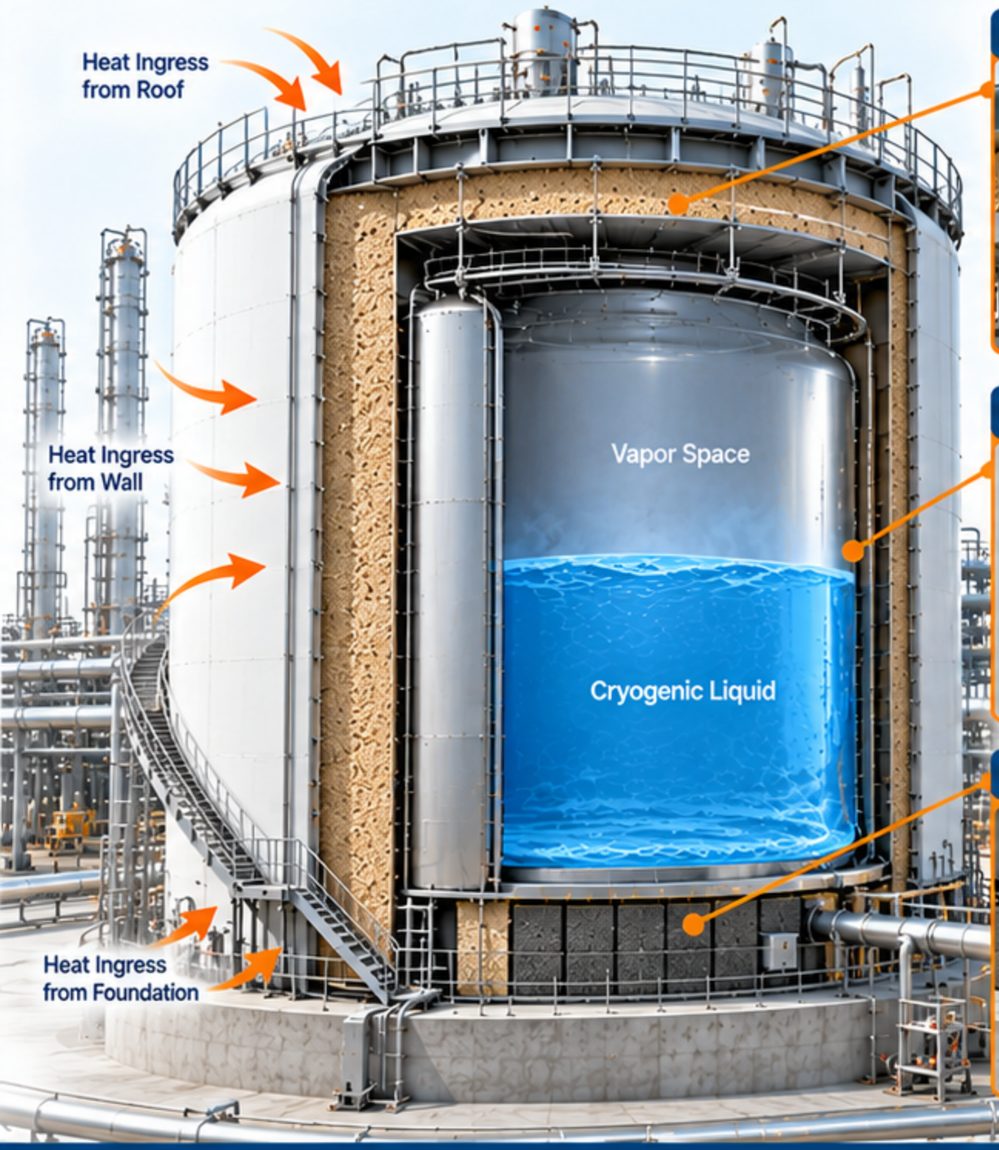
Material Traceability

Full traceability and documentation according to project requirements

Material selection must be based on the stored medium, minimum design temperature, applicable code and project-specific requirements. Different cryogenic liquids may require different materials, design considerations and verification.

Insulation & Thermal Performance

Minimizing Heat Ingress and Controlling Boil-Off Gas



A. Suspended Deck Insulation



B. Annular Wall Insulation



C. Bottom Insulation



Heat Ingress and Boil-Off Gas Generation



External Heat Ingress	Liquid Vaporization	Boil-Off Gas Generation	Pressure Control / BOG Handling
Heat enters through roof, wall and bottom	Absorbed heat vaporizes liquid	Vapor increases in the tank vapor space	Managed by relief and BOG system

Key Factors Affecting Boil-Off Rate

Stored Medium	Insulation Performance	Tank Geometry	Ambient Conditions	Operating Conditions
Different liquids have different thermal properties	Type, quality and installation	Diameter, height and surface area	Ambient temperature, wind and solar radiation	Filling, withdrawal and pressure control

Boil-off performance must be calculated or guaranteed for defined reference conditions.

Insulation Materials and Typical Applications

Location	Typical Insulation	Application
Annular Wall	Expanded perlite, mineral wool or equivalent	Reduces heat ingress through tank wall
Bottom	Cellular glass (load-bearing)	Supports inner tank and minimizes heat transfer from foundation
Suspended Deck	Mineral wool or fibrous insulation	Limits heat ingress from roof and maintains cold vapor space

The type, thickness and arrangement of insulation materials must be determined by detailed engineering based on the stored medium, site conditions and applicable codes.

Safety Systems & Engineering Selection

Reliable Operation and Risk Control for Cryogenic Liquid Storage

1 Pressure Relief System

Protects the tank from excessive internal pressure



2 Vacuum Protection

Prevents damaging external differential pressure



3 Level Measurement

Continuous level monitoring during filling and withdrawal



4 Temperature Monitoring

Monitors liquid and structural temperatures



5 Pressure Monitoring

Monitors vapor-space pressure



6 Boil-Off Gas Handling

Manages vapor generated during storage and handling

7 Emergency Isolation

Limits uncontrolled transfer or release



Engineering Inquiry Data

Stored Medium	LOX / LIN / LAr / LNG or other cryogenic liquids
Gross / Working Capacity	Project-specific
Design Pressure	According to stored medium and applicable code
Minimum Design Temperature	According to stored medium
Filling and Withdrawal Rates	Project-specific
Tank Containment Type	Single containment / Full containment (or other type)
Applicable Standards	API 620, API 625, EN 14620 or other applicable codes
Site Conditions	Wind load, seismic load, ambient temperature, site location
Supply and Erection Scope	Tank, instrumentetion, piping, insulation, installation and commissioning (as required)

Key Safety Considerations

Oxygen cleanliness is essential for LOX service; oxygen-deficiency protection must be addressed for nitrogen and argon facilities.

The safety systems, instrumentation and operating configuration shall be designed according to the stored medium, applicable codes and project-specific requirements.