SECTION 463156 - LIQUID OXYGEN STORAGE AND FEED EQUIPMENT

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section specifies liquid oxygen tanks, components, and accessories for mixing of liquids in field applications, such as tanks and open-channel basins.

Oxygen is often stored as a liquid, although it is used primarily as a gas. A typical storage system consists of a cryogenic storage tank, one or more vaporizers, and a pressure control system. The cryogenic tank is constructed almost like a thermos bottle, consisting of an inner vessel surrounded by an outer vessel. Vaporizers convert liquid oxygen into a gaseous state, and a pressure-control manifold regulates the gas pressure that is fed to the process or application.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Liquid oxygen storage tanks.

Atmospheric vaporizers.

Ball valves.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 033000 - Cast-in-Place Concrete: Equipment foundation pads.

Section 055000 - Metal Fabrications: Miscellaneous metalwork and fasteners as required by this Section.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. American Petroleum Institute:

API 6FA - Fire Test for Valves.

API STD 607 - Fire Test for Quarter-Turn Valves and Valves Equipped with Nonmetallic Seats.

* + - * 1. ASME International:

ASME B16.34 - Valves - Flanged, Threaded and Welding End.

ASME Boiler and Pressure Vessel Code (BPVC), Section VIII - Pressure Vessels.

* + - * 1. ASTM International:

ASTM A962 - Standard Specification for Common Requirements for Bolting Intended for Use at Any Temperature from Cryogenic to the Creep Range.

* + - * 1. British Standards Institution:

BS 6364 - Specification for Valves for Cryogenic Service.

BS 6755-1 - Testing of Valves. Specification for Production Pressure Testing Requirements.

BS 6755-2 - Testing of Valves. Specification for Fire Type-Testing Requirements.

BS 30118077 DC - Cryogenic Vessels. Cryogenic Insulation Performance.

BS 30118080 DC - Cryogenic Vessels. Hoses.

BS EN 1797 - Cryogenic Vessels. Gas/Material Compatibility.

BS EN 12300 - Cryogenic Vessels. Cleanliness for Cryogenic Service.

BS EN 12434 - Cryogenic Vessels. Cryogenic Flexible Hoses.

BS EN 13371 - Cryogenic Vessels. Couplings for Cryogenic Service.

BS EN 13648 - Cryogenic Vessels. Safety Devices for Protection against Excessive Pressure. Safety Valves for Cryogenic Service.

BS EN 30158957 - Cryogenic Vessels. Valves for Cryogenic Service.

BS ISO 21010 - Cryogenic Vessels. Gas/Materials Compatibility.

BS ISO 21011 - Cryogenic Vessels. Valves for Cryogenic Service.

BS ISO 21012 - Cryogenic Vessels. Hoses.

BS ISO 21013 - Cryogenic Vessels. Pressure-Relief Accessories for Cryogenic Service. Recloseable Pressure-Relief Valves.

BS ISO 21014 - Cryogenic Vessels. Cryogenic Insulation Performance.

BS ISO 28921 - Industrial Valves. Isolating valves for Low-Temperature Applications. Design, Manufacturing and Production Testing.

BS ISO 30118084 - Cryogenic Vessels. Valves for Cryogenic Service.

* + - * 1. Code of Federal Regulations:

29 CFR 1910.104 - Occupational Safety and Health Standards - Oxygen.

* + - * 1. Compressed Gas Association:

CGA 341 - Specification for Insulated Cargo Tank for Nonflammable Cryogenic Liquids.

* + - * 1. CSA Group:

CSA Z245.20-Series 10 - Plant-Applied External Coatings for Steel Pipe.

* + - * 1. Manufacturers Standardization Society of the Valve and Fittings Industry:

MSS SP-134 - Valves for Cryogenic Service; Including Requirements for Body/Bonnet Extensions.

* + - * 1. NFPA:

NFPA 55 - Compressed Gases and Cryogenic Fluids Code.

NFPA 566 - Standard for the Installation of Bulk Oxygen Systems at Consumer Sites.

* + - * 1. SAE International:

SAE ARP900B - Methods for Evaluating Cryogenic Filters.

* + - 1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: Submit manufacturer information for tanks, vaporizers, valves, and accessories.
				5. Shop Drawings:

Indicate assembly, installation, and connection details.

Indicate critical dimensions, sizes, and support locations.

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

Include separate Paragraphs for additional certifications.

* + - * 1. Manufacturer Instructions: Submit special procedures and assembly of components.
				2. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
				3. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				4. Qualifications Statements:

Coordinate following Subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer and installer.

Submit manufacturer's approval of installer.

* + - 1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

* + - * 1. Code Requirements:

Containers Operating at Pressures above 15 psig: Designed, constructed, and tested according to ASME BPVC, Section VIII.

Comply with NFPA 55, 29 CFR 1910.104 [**, and**] <**\_\_\_\_\_\_\_\_**>.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following Paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
			1. QUALIFICATIONS

Coordinate following Paragraphs with requirements specified in SUBMITTALS Article.

Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [three] <\_\_\_\_\_\_\_\_> years' [documented] experience.

* + - * 1. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
			1. DELIVERY, STORAGE, AND HANDLING
				1. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				2. Store materials according to manufacturer instructions.
				3. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and Director’s Representative enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for liquid oxygen storage and feed equipment.
1. PRODUCTS
	* + 1. LIQUID OXYGEN STORAGE TANKS
				1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12710&mf=04&src=wd):

Designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above. Include configuration, size, color, material composition, and other properties needed to describe product.

* + - * 1. Description:

Configuration: [**Spherical**] [**Cylindrical**].

Mounting: As indicated on [**Shop**] Drawings.

Capacity: [**500**] [**1,000**] [**10,000**] <**\_\_\_\_\_\_\_\_**> gal.

* + - * 1. Materials:

Outer Vessel: Comply with ASME BPVC, Section VIII [**and**] <**\_\_\_\_\_\_\_\_**>.

Inner Vessel: Comply with CGA 341 [**and**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Coatings:

Comply with CSA Z245.20-Series 10.

* + - * 1. Gas/Materials Compatibility: Comply with [**BS EN 1797**] [**and**] [**BS ISO 21010**].
				2. Materials:

Outer Vessel:

Comply with ASME BPVC, Section VIII [**, and**] <**\_\_\_\_\_\_\_\_**>.

[**Carbon steel**] <**\_\_\_\_\_\_\_\_**>.

Inner Vessel: Comply with CGA 341 [**and**] <**\_\_\_\_\_\_\_\_**>.

Internal Piping: Type [**312**] [**304**] <**\_\_\_\_\_\_\_\_**> stainless steel.

External Piping: [**Copper, Type "L"**] [**Type 304 stainless steel**] <**\_\_\_\_\_\_\_\_**>.

Internal Supports: Type [**304**] <**\_\_\_\_\_\_\_\_**> stainless steel.

* + - * 1. Accessories:

Foundations and Supports: Noncombustible supports on noncombustible foundations.

Insulation:

Noncombustible.

Comply with [**BS ISO 21014**] [**BS 30118077 DC**] <**\_\_\_\_\_\_\_\_**>.

Pressure Relief Valves: Comply with BS EN 13648; BS ISO 21013; ASME BPVC, Section VIII [**; and**] <**\_\_\_\_\_\_\_\_**>.

Hoses:

Comply with [**BS ISO 21012**] [**BS 30118080 DC**] <**\_\_\_\_\_\_\_\_**>.

Flexible Hoses: Comply with BS EN 12434.

Filters: Comply with SAE ARP900B.

Bolting: Comply with ASTM A962.

Couplings and Joints:

Comply with BS EN 13371.

End Connections: [**Welded**] [**Flanged**] [**Threaded**] [**Slip**] [**Compression**].

[**Gaskets**] [**Thread Sealants**]: Suitable for oxygen service.

Accessway:

Diameter: [**16 inches**] [**As indicated on Drawings**] [**As indicated on Shop Drawings**].

Lifting lugs.

* + - * 1. High-Pressure Gaseous Oxygen Containers:

Description: Insulated, vacuum-jacketed pressure vessel equipped with pressure relief valves and rupture disks.

Designed, constructed, and tested according to ASME BPVC, Section VIII.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Designed, constructed, and tested according to <**\_\_\_\_\_\_\_\_**> standards.

Maximum Operating Pressure: [**350**] <**\_\_\_\_\_\_\_\_**> psig

Capacity: [**20**] [**120**] <**\_\_\_\_\_\_\_\_**> gal

Atmospheric vaporizers convert liquid oxygen into a gaseous state by exchanging heat with ambient air. No external power source is required. Steam- or electrically heated vaporizers are available for high-flow applications.

* + - 1. ATMOSPHERIC VAPORIZERS
				1. Performance and Design Criteria:

Maximum Pressure: <**\_\_\_\_\_\_\_\_**> psig

Capacity: <**\_\_\_\_\_\_\_\_**> scfm

Temperature Range: [**Minus 425**] <**\_\_\_\_\_\_\_\_**> degrees F to [**plus 100**] <**\_\_\_\_\_\_\_\_**> degrees F

* + - * 1. Materials:

Fluid Passages: [**Aluminum**] [**Type 304 stainless steel**] [**Type 316 stainless steel**].

Frame and External Fins: Aluminum alloy.

* + - 1. BALL VALVES

Purpose of extension bonnet is to protect gland packing from freeze-damage caused by low-temperature fluid.

Floating-type ball valves have a long extension bonnet; trunnion valves have a short extension bonnet.

* + - * 1. Description:

Application: Low temperature and cryogenic.

Type: [**Floating**] [**Trunnion**].

Size: [**1/2**] [**30**] <**\_\_\_\_\_\_\_\_**> [**inch**] [**inches**]

* + - * 1. Comply with [**API 6FA**] [**API STD 607**] [**ASME B16.34**] [**BS 6364**] [**BS ISO 21011**] [**BS ISO 28921**] [**BS EN 30158957**] [**BS ISO 30118084**] [**MSS SP-134**] <**\_\_\_\_\_\_\_\_**>.
			1. SOURCE QUALITY CONTROL
				1. Testing:

Storage Vessels and High-Pressure Gaseous Oxygen Containers: Comply with ASME BPVC, Section VIII.

Valves: Comply with BS 6755-1 and BS 6755-2.

Include one or both of following Paragraphs to require Director’s Representative's inspection or witnessing of test at factory.

* + - * 1. Director’s Inspection:

Make completed mixers available for inspection at manufacturer's factory prior to packaging for shipment.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.

* + - * 1. Director’s Witnessing:

Allow witnessing of factory inspections and test at manufacturer's test facility.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following Paragraph if reliance on manufacturer's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance:

If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved manufacturer.

1. EXECUTION
	* + 1. EXAMINATION
				1. Verify that designated areas, clearances, structural requirements, and utility connections are ready to receive equipment.
			2. INSTALLATION
				1. According to manufacturer instructions and NFPA 566.
				2. Signage:

Mount permanent signs with following warning: [**OXYGEN - NO SMOKING - NO OPEN FLAMES**] <**\_\_\_\_\_\_\_\_**>.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
			1. FIELD QUALITY CONTROL
				1. Testing:

After installation, test field-erected piping to demonstrate that piping is gas-tight at maximum operating pressure.

Testing Medium: Oil free and nonflammable.

[**Director’s Representative**] <**\_\_\_\_\_\_\_\_**> will witness field testing.

* + - * 1. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <**\_\_\_\_\_\_\_\_**> [**days**] [**hours**] on Site for installation, inspection, startup, field testing, and instructing Director’s Representative's personnel in operation and maintenance of equipment.
				2. Equipment Acceptance:

Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

Make final adjustments to equipment under direction of manufacturer's representative.

* + - * 1. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
			1. CLEANING
				1. Comply with BS EN 12300.
				2. Remove oil, grease, or other readily oxidizable materials before placing system in service.
			2. DEMONSTRATION
				1. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Director’s Representative.

END OF SECTION 463156