SECTION 231313 - FACILITY UNDERGROUND FUEL-OIL STORAGE TANKS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Composite, steel, fuel-oil USTs.

Jacketed, steel, fuel-oil USTs.

FRP fuel-oil USTs.

Liquid-level gage systems.

Leak-detection systems.

Fuel oil.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

Abbreviation in "FRM" paragraph below is generic name for "Viton."

* + - * 1. FPM: Vinylidene fluoride-hexafluoropropylene copolymer rubber.
				2. FRP: Glass-fiber-reinforced plastic.
				3. UST: Underground storage tank.
			1. SUBMITTALS
				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: For each type of product.

Include construction details, material descriptions, and dimensions of individual components and profiles.

Include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

Leak-detection and monitoring system.

* + - * 1. Shop Drawings: For underground fuel-oil storage tanks.

Include plans, elevations, sections, and ballast pads and anchors, and lifting or supporting points.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Shop Drawing Scale: **[1/4 inch per foot] <Insert scale**>.

* + - * 1. Site Survey: Plans, drawn to scale, on which underground fuel-oil storage tanks are shown and coordinated with other services and utilities.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
				2. Sample Warranty: For special warranty.
			1. QUALITY ASSURANCE
				1. Installer Qualifications: FRP tanks; trained and certified by the tank manufacturer.
				2. Underground Fuel-Oil Storage Tanks: Comply with requirements of the EPA and of state and local authorities having jurisdiction, including recording fuel-oil storage tanks.
			2. DELIVERY, STORAGE, AND HANDLING
				1. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.
			3. WARRANTY

When warranties are required, verify with Owner's Representative that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of fuel-oil storage tanks that fail in materials or workmanship within specified warranty period.

Storage Tanks:

Failures include, but are not limited to, the following when used for storage of fuel oil at temperatures not exceeding [**150 deg F] <Insert temperature**>:

Structural failures including cracking, breakup, and collapse.

Retain first subparagraph below for steel tanks.

Corrosion failure including external and internal corrosion of steel tanks.

Verify available warranties and warranty periods for units and components with manufacturers listed in Part 2 articles.

Warranty Period: [**30] <Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. STEEL, FUEL-OIL UST WITH STI-P3

This article specifies USTs with the STI-P3 corrosion-protection system.

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Ace Tank & Fueling Equipment, LLC.

Brown Tank.

Highland Tank & Manufacturing Company, Inc.

Steel Tank & Fabricating Co., Inc.

Watco Tanks, Inc.

Approved equivalent.

* + - * 1. Description: UL 58 and STI P3, double-wall, horizontal, steel tank; with cathodic protection and electrical isolation.

Containment Method: STI-P3, [**Type II, with interstitial space]**.

* + - * 1. Construction: Fabricated with welded steel; suitable for operation at atmospheric pressure and for storing liquids with specific gravity up to 1.1; fabricated for the following loads:

Depth of Bury: 36 inches from top of tank to finished surface.

External Hydrostatic Pressure: To withstand general buckling with safety factor of 2:1 if hole is fully flooded.

Surface Loads: AASHTO's "Specifications for Highway Bridges," H-20 axle loads of 32,000 lb.

* + - * 1. Corrosion-Protection System: Protect tank and factory-installed piping by engineered and installed corrosion-protection system according to STI P3, with means of monitoring cathodic protection.

If Project has more than one type or configuration of steel, fuel-oil UST with STI-P3, delete "Capacities and Characteristics" paragraph below and schedule tanks on Drawings.

* + - * 1. Capacities and Characteristics:

Capacity: <**Insert gal**.>.

Diameter: <**Insert feet**>.

Length: <**Insert feet**>.

Connection Sizes:

Fill Line: <**Insert NPS**>.

Vent Line: <**Insert NPS**>.

Outlet: <**Insert NPS**>.

Return: <**Insert NPS**>.

Gage: <**Insert NPS**>.

Manholes:

Number Required: <**Insert number**>.

Diameter: <**Insert inches**>.

Fuel-Oil Grade Number: [**Grade No. 1] [Grade No. 2] [Diesel] <Insert grade**>.

* + - 1. COMPOSITE, STEEL, FUEL-OIL UST
				1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Ace Tank & Fueling Equipment, LLC.

Brown Tank.

Highland Tank & Manufacturing Company, Inc.

Watco Tanks, Inc.

Approved equivalent.

* + - * 1. Description: UL 58, double-wall, horizontal, composite tank; with coating complying with UL 1746 and STI F894.

Containment Method: STI F894, [**Type II, with interstitial space**].

* + - * 1. Construction: Fabricated with welded steel and factory coating according to UL 1746 and STI F894; suitable for operation at atmospheric pressure and for storing liquids with specific gravity up to 1.1; fabricated for the following loads:

Depth of Bury: 36 inches from top of tank to finished surface.

External Hydrostatic Pressure: To withstand general buckling with safety factor of 2:1 if hole is fully flooded.

Surface Loads: AASHTO's "Specifications for Highway Bridges," H-20 axle loads of 32,000 lb.

If Project has more than one type or configuration of composite, steel, fuel-oil UST, delete "Capacities and Characteristics" paragraph below and schedule tanks on Drawings.

* + - * 1. Capacities and Characteristics:

Capacity: <**Insert gal**.>.

Diameter: <**Insert feet**>.

Length: <**Insert feet**>.

Connection Sizes:

Fill Line: <**Insert NPS**>.

Vent Line: <**Insert NPS**>.

Outlet: <**Insert NPS**>.

Return: <**Insert NPS**>.

Gage: <**Insert NPS**>.

Manholes:

Number Required: <**Insert number**>.

Diameter: <**Insert inches**>.

Fuel-Oil Grade Number: [**Grade No. 1] [Grade No. 2] [Diesel] <Insert grade**>.

* + - 1. JACKETED, STEEL, FUEL-OIL UST
				1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Ace Tank & Fueling Equipment, LLC.

Highland Tank & Manufacturing Company, Inc.

Watco Tanks, Inc.

Approved equivalent.

* + - * 1. Description: Jacketed, horizontal, steel tank; complying with UL 58, and with plastic or fiberglass jacket and corrosion-protection system according to UL 1746 [ **and STI F922**].
				2. Construction: Tank fabricated with welded carbon steel, and jacket fabricated with plastic or fiberglass and vacuum-sealed interstitial space; suitable for operation at atmospheric pressure and with integral leak-detection device. Tank fabricated for the following loads:

Depth of Bury: 36 inches from top of tank to finished surface.

External Hydrostatic Pressure: To withstand general buckling with safety factor of 2:1 if hole is fully flooded.

Surface Loads: AASHTO's "Specifications for Highway Bridges," H-20 axle loads of 32,000 lb.

If Project has more than one type or configuration of jacketed, steel, fuel-oil UST, delete "Capacities and Characteristics" paragraph below and schedule tanks on Drawings.

* + - * 1. Capacities and Characteristics:

Capacity: <**Insert gal**.>.

Diameter: <**Insert feet**>.

Length: <**Insert feet**>.

Connection Sizes:

Fill Line: <**Insert NPS**>.

Vent Line: <**Insert NPS**>.

Outlet: <**Insert NPS**>.

Return: <**Insert NPS**>.

Gage: <**Insert NPS**>.

Manholes:

Number Required: <**Insert number**>.

Diameter: <**Insert inches**>.

Fuel-Oil Grade Number: [**Grade No. 1] [Grade No. 2] [Diesel] <Insert grade**>.

* + - 1. FRP FUEL-OIL UST
				1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Containment Solutions, Inc.

Palmer Manufacturing and Tank Company.

Xerxes Corporation.

Approved equivalent.

* + - * 1. Description: Horizontal, FRP UST; UL 1316, double wall, with interstitial space[ **and integral, hydrostatic, leak-detection and monitoring system**].
				2. Construction: Fabricated with fiberglass-reinforced polyester resins; suitable for operation at atmospheric pressure; fabricated for the following loads:

Depth of Bury: 36 inches from top of tank to finished surface.

External Hydrostatic Pressure: To withstand general buckling with safety factor of 2:1 if hole is fully flooded.

Surface Loads: AASHTO's "Specifications for Highway Bridges," H-20 axle loads of 32,000 lb.

If Project has more than one type or configuration of FRP fuel-oil UST, delete "Capacities and Characteristics" paragraph below and schedule tanks on Drawings.

* + - * 1. Capacities and Characteristics:

Capacity: <**Insert gal**.>.

Diameter: <**Insert feet**>.

Length: <**Insert feet**>.

Connection Sizes:

Fill Line: <**Insert NPS**>.

Vent Line: <**Insert NPS**>.

Outlet: <**Insert NPS**>.

Return: <**Insert NPS**>.

Gage: <**Insert NPS**>.

Manholes:

Number Required: <**Insert number**>.

Diameter: <**Insert inches**>.

Fuel-Oil Grade Number: [**Grade No. 1] [Grade No. 2] [Diesel] <Insert grade**>.

* + - 1. FUEL-OIL UST ACCESSORIES

Retain this article for USTs. Show fittings and accessories on plans, details, and piping schematics.

* + - * 1. Tank Manholes: 22-inch- minimum diameter; [**polyethylene][fiberglass**], bolted, flanged, and gasketed, with extension collar; for access to inside of tank.

Retain "Steel Tank Masonry Supports" paragraph below for steel tanks.

* + - * 1. Steel Tank Masonry Supports: Two [6-by-6-by-3/8-inch] <**Insert dimensions**> steel angles, [**72 inches] <Insert dimension**> long, located longitudinally on tank on each side of manholes and continuously welded in place.
				2. Threaded pipe connection fittings on top of tank for fill, supply, return, vent, sounding, and gaging; in locations and of sizes indicated. Include cast-iron plugs for shipping.
				3. Striker Plates: Inside tank, on bottom below fill, vent, sounding, gage, and other tube openings.
				4. Lifting Lugs: For handling and installation.
				5. Ladders: Carbon-steel ladder inside tank, anchored to top and bottom. Include reinforcement of tank at bottom of ladder.
				6. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.
				7. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.
				8. Containment Sumps: [**Fiberglass] [PE**] with sump base, add-on extension pieces as required, sump top, lid, and gasket-seal joints. Include sump entry boots for pipe penetrations through sidewalls.
				9. Sump Entry Boots: Two-part pipe fitting for field assembly and of size required to fit over pipe. Include gaskets shaped to fit sump sidewall, sleeves, seals, and clamps as required for liquid-tight pipe penetrations.
				10. Anchor Straps: Storage tank manufacturer's standard anchoring system, with straps, strap-insulating material, cables, and turnbuckles; of strength at least one and one-half times maximum uplift force of empty tank without backfill in place.
				11. Filter Mat: Geotextile woven or spun filter fabric, in 1 or more layers, for minimum total weight of [**3 oz./sq. yd.] <Insert dimension**>.
				12. Overfill Prevention Valves: Factory fabricated or shop or field assembled from manufacturer's standard components. Include drop tube, cap, fill nozzle adaptor, check valve mechanism or other devices, and vent if required to restrict flow at 95 percent of tank capacity and to provide complete shutoff of filling at [**98] [99] <Insert other**> percent of tank capacity.
			1. LIQUID-LEVEL GAGE SYSTEM

Retain this article if liquid-level gage system is not specified in "Leak-Detection and Monitoring System" Article. Delete this article if liquid-level gage system is included in the leak-detection and monitoring system.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Highland Tank & Manufacturing Company, Inc.

INCON, Inc.

King Engineering Corp.

Rochester Gauges, Inc.

Approved equivalent.

* + - * 1. Description: Calibrated, liquid-level gage system complying with [**UL 180 with floats] [UL 1238 with probes**] or other sensors and remote annunciator panel.

Alarms specified in "Annunciator Panel" paragraph below may be used as part of leak-detection system.

* + - * 1. Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms, fuel indicator with registration in gallons, and overfill alarm. Include gage volume range that covers fuel-oil storage capacity.
				2. Controls: Electrical, operating on [**120] <Insert voltage**>-V ac.
			1. LEAK-DETECTION AND MONITORING SYSTEM

Retain one of two paragraphs in this article.

* + - * 1. Cable and Sensor System: Comply with UL 1238.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Containment Solutions, Inc.

Franklin Fueling Systems.

Highland Tank & Manufacturing Company, Inc.

INCON, Inc.

Approved equivalent.

Visual and audible alarms in "Liquid-Level Gage System" Article may be used as part of leak-detection system.

Calibrated, leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil storage tanks and fuel-oil piping.

Include fittings and devices required for testing.

Controls: Electrical, operating on [**120] <Insert voltage**>-V ac.

Retain subparagraphs below for an optional feature that replaces system described in "Liquid-Level Gage System" Article.

Calibrated, liquid-level gage complying with [**UL 180 with floats] [UL 1238 with probes**] or other sensors and remote annunciator panel.

Remote Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms, fuel indicator with registration in gallons, and overfill alarm. Include gage volume range that covers fuel-oil storage capacity.

Controls: Electrical, operating on [**120] <Insert voltage**>-V ac.

* + - * 1. Hydrostatic System: Comply with UL 1238.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Containment Solutions, Inc.

Franklin Fueling Systems.

Highland Tank & Manufacturing Company, Inc.

INCON, Inc.

Approved equivalent.

Visual and audible alarms in "Liquid-Level Gage System" Article may be used as part of leak-detection system.

Calibrated, leak-detection and monitoring system with brine antifreeze solution, reservoir sensor, and electronic control panel to monitor leaks in inner and outer tank walls.

Include fittings and devices required for testing.

Controls: Electrical, operating on [**120] <Insert voltage**>-V ac.

Retain subparagraphs below for an optional feature that replaces system described in "Liquid-Level Gage System" Article.

Calibrated, liquid-level gage complying with [**UL 180 with floats] [UL 1238 with probes**] or other sensors and remote annunciator panel.

Remote Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons and overfill alarm. Include gage volume range that covers fuel-oil storage capacity.

Controls: Electrical, operating on [**120] <Insert voltage**>-V ac.

* + - 1. FUEL OIL

Second option in "Fuel Oil" paragraph below is grade typically used for fuel-oil-burning equipment.

* + - * 1. Fuel Oil: ASTM D396, [**Grade No. 1] [Grade No. 2**].

Last option in "Diesel Fuel Oil" paragraph below is typically used for automotive or other diesel engines.

* + - * 1. Diesel Fuel Oil: ASTM D975, [**Grade Low Sulfur] [Grade No. 1-D, special purpose] [Grade No. 2-D, general purpose**], high volatility.
			1. CONCRETE MANHOLES
				1. Precast Concrete Manhole Sections: ASTM C478, base and concentric-cone sections with integral ladder or steps.
				2. Cast-Iron Frame and Cover: Heavy-duty, water-resistant, cast-iron manhole frame, gasket, and bolted cover; [**24-inch-] <Insert dimension**> diameter, inside opening dimension; **[8-inch] <Insert dimension**> frame riser height.
			2. LABELING AND IDENTIFYING
				1. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.
			3. SOURCE QUALITY CONTROL

Coordinate standards for tests in this article with those referenced in Part 2 fuel-oil storage UST articles. Do not include STI tests if tanks are not STI type.

* + - * 1. Pressure test and inspect fuel-oil storage tanks, after fabrication and before shipment, according to ASME and the following:

Retain one or more of subparagraphs below.

Horizontal, Steel USTs with the STI-P3 Corrosion-Protection System: UL 58 and STI P3.

[**Composite] [Composite and Jacketed] [Jacketed**], Steel USTs: UL 58.

FRP USTs: UL 1316.

* + - * 1. Affix standards organization's code stamp.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine roughing-in for underground fuel-oil storage tanks to verify actual locations.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. FUEL-OIL UST INSTALLATION

Indicate size and location of concrete ballast pad on Drawings, including reinforcing steel and eyelets for hold-down straps.

* + - * 1. Set tie-down eyelets for hold-down straps in concrete-ballast base and tie to reinforcing steel.
				2. Place 6 inches of clean sand or pea gravel on top of concrete-ballast base.
				3. Set tank on fill materials and install hold-down straps.
				4. Connect piping.
				5. Install tank leak-detection and monitoring devices.
				6. Install containment sumps.
				7. Install steel USTs with the STI-P3 corrosion-protection system according to STI R821 and STI R891. Protect anodes during tank placement and backfilling operations.
				8. Install composite, steel USTs according to STI R913 and STI R891.
				9. Install jacketed, steel USTs according to STI R923 and STI R891.
				10. Install FRP USTs with FRP hold-down straps, manhole extensions, and manhole risers.
				11. Fill storage tanks with fuel oil.
			1. LIQUID-LEVEL GAGE SYSTEM INSTALLATION
				1. Install liquid-level gage system. Install panel inside building where indicated.
			2. LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION
				1. Install leak-detection and monitoring system. Install alarm panel inside building where indicated.

Double-Wall, Fuel-Oil Storage Tanks: [**Install probes] [Install probes or use factory-installed integral probes] [Use factory-installed integral probes**] in interstitial space.

System in first subparagraph below requires extensive description here or layout and details on Drawings.

Single-Wall, Fuel-Oil Storage Tanks: Install probes as indicated.

Float-type probes in tank containment sumps and at piping low points, if required, are the most often used. Cable sensors are also available.

Double-Containment, Fuel-Oil Piping: Install leak-detection sensor [**probes in fuel-oil storage tank containment sumps and at low points in piping] [cable probes in interstitial space of double-containment piping**].

Retain "Install liquid-level gage" subparagraph below for liquid-level gage that is part of leak-detection and monitoring system.

Install liquid-level gage.

* + - 1. LABELING AND IDENTIFYING
				1. Nameplates, pipe identification, and signs are specified in Section 230553 "Identification for HVAC Piping and Equipment."

Coordinate dimensions in paragraph below with depth of bury for fuel-oil piping.

* + - * 1. Install detectable warning tape directly above UST, [**12 inches] <Insert dimension**> below finished grade, except [**6 inches] <Insert dimension**> below subgrade under pavements and slabs.

Terminate tracer wire in an accessible area, and identify as "tracer wire" for future use with plastic-laminate sign.

Install over edges of each UST.

* + - 1. FIELD QUALITY CONTROL

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections[ **with the assistance of a company field advisor**]:

Tank and pipe test pressures in this article are required by NFPA 31. Verify requirements with authorities having jurisdiction.

Retain "Tanks" subparagraph below if storage tanks do not bear the ASME code stamp as required in "Source Quality Control" Article.

Tanks: Minimum hydrostatic or compressed-air test pressures for fuel-oil storage tanks that have not been factory tested and do not bear the ASME code stamp or a listing mark acceptable to authorities having jurisdiction:

Double-Wall Tanks:

Inner Tanks: Minimum 3 psig and maximum 5 psig.

Interstitial Space: Minimum 3 psig and maximum 5 psig, or 5.3-in. Hg vacuum.

Where vertical height of fill and vent pipes is such that the static head imposed on the bottom of the tank is greater than 10 psig, hydrostatically test the tank and fill and vent pipes to a pressure equal to the static head thus imposed.

Maintain the test pressure for one hour.

* + - * 1. USTs will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.

END OF SECTION 231313