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**HighGuard Double-Wall Steel**

**Underground Storage Tank Guide Specification**

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, including *MasterFormat, SectionFormat,* and *PageFormat,* as described in *The Project Resource Manual—CSI Manual of Practice, Fifth Edition.*

This section must be carefully reviewed and edited by the Engineer to meet the requirements of the project and the local building code. Coordinate this section with other specification sections and the drawings. **Delete all “Specifier Notes” after editing this section.**

Section numbers are from MasterFormat 2020 Edition.

SECTION 23 13 13.13

FACILITY HIGHGUARD DOUBLE-WALL STEEL, UNDERGROUND FUEL-OIL, STORAGE TANK(S)

 **FOR BOILER/GENERATOR FUEL SUPPLY TANK SYSTEM**

Specifier Notes: This section covers Highland Tank HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s) **Model 04000HGDWBGEN96CSI** for a **Boiler/Generator Fuel Supply Tank System**. Consult Highland Tank for assistance in editing this section for the specific application.

PART 1 GENERAL

* 1. SCOPE
1. This section describes requirements for providing the equipment, labor, and materials necessary to furnish and install a fuel-oil storage tank system(s) utilizing HighGuard double-wall steel, underground storage tank(s).
2. Requirements include furnishing and installing all equipment and accessories necessary to make complete systems for storing and dispensing fuel-oil for a boiler/generator fuel supply tank system.
3. All materials shall conform in all respects to the highest standards of engineering, design, and workmanship.

1.2 SECTION INCLUDES

A. HighGuardDouble-Wall Steel, Underground Fuel-Oil, Storage Tank(s); UL 58 compliant.

1.3 RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as required. Delete related sections that are not required. List other sections with work related to this section.

1. Section 03 15 19 - Cast-In Concrete Anchors (Anchor Bolts for Hold-down Straps)
2. Section 03 30 00 - Cast-in-Place Concrete (concrete for Anchor Pad)

C. Section 05 50 01 - Liquid Fuel Piping

1. Section 09 96 00 - High-Performance Coatings
2. Section 31 23 00 - Excavation and Fill

1.4 REFERENCE STANDARDS

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| Specifier Notes: List reference standards mentioned in this section, complete with designations and titles. Delete reference standards not included in this edited section. This article merely lists some of the standards used for equipment compliance. |

1. AAMP - The Association for Materials Protection and Performance (FKA SSPC -Steel

 Structures Painting Council/NACE - National Association of Corrosion Engineers)

* SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning
* SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning
1. AASHTO - American Association of State Highway and Transportation Officials
2. AISC - American Institute of Steel Construction: Manual of Steel Construction
3. ANSI - American National Standards Institute
4. API - American Petroleum Institute
* API RP 1615, Installation of Underground Petroleum Storage Systems
1. ASME - American Society of Mechanical Engineers
* Pipe Flanges and Flanged Fittings.
* Forged Fittings, Socket-Welding and Threaded.
1. ASTM - American Society for Testing and Materials
* ASTM Standard Specification for Carbon Structural Steel - ASTM International.
1. AWS - American Welding Society
* Structural Welding Code – Steel.
1. ICC- International Code Council, Inc.
	1. IBC - International Building Code
	2. IFC – International Fire Code
* Chapter 57 Flammable and Combustible Liquid
1. NEC - National Electric Code

1. NEMA - National Electric Manufacturers Association
2. NFPA - National Fire Protection Association
* NFPA 30, Flammable and Combustible Liquids Code.
* NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages.
* NFPA 31, Standard for the Installation of Oil-Burning Equipment.
* NFPA 70, NEC National Electric Code.
* NFPA 110, Standards for Emergency and Standby Power Systems.
1. OSHA - U. S. Department of Labor, Occupational Safety and Health Administration.
* OSHA 29 CFR 1910.146, Occupational Safety and Health Standards, particularly Flammable and Combustible Liquids.
1. PEI - Petroleum Equipment Institute.
* RP100, Recommended Practices for Installation of Underground Liquid Storage Systems.
1. UL - Underwriters Laboratories, Inc.
* UL 58 - Standard for Steel Underground Tanks for Flammable and Combustible Liquids.
* UL 1746 - Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks.

P. US EPA – United States Environmental Protection Agency

* 40 CFR 112 - Oil Pollution Prevention.
* 40 CFR 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST).

Q. Applicable state and local regulations and ordinances.

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| Specifier Notes: In case of differences between building codes, state laws, local ordinances, utility company regulations, and contract documents, the most stringent shall govern. The codes and standards listed are the latest as of this publication. Codes and standards are continuously updated. The Contractor shall confirm the construction standard edition enforced by the authority having jurisdiction. |

1.5 SUBMITTALS

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| Specifier Notes: Edit submittal requirements as required. Delete submittals that are not required. |

1. Comply with Section 01 33 00 – Submittal Procedures.
2. Shop Drawings: Submit shop drawings of the manufacturer's underground fuel-oil storage tank(s) showing the principal dimensions and location of all fittings.
3. Product Data: Submit manufacturer’s product data, including:
	1. Brochures/Catalogs specifically describing underground fuel-oil storage tank(s),
	2. Compliant chemically resistant internal protective lining,
	3. Floatout and Anchorage (Buoyancy) Calculations (assuming a fully flooded excavation with an installed empty fuel-oil storage tank),
	4. Structural Calculations using Roark Formula for Stress and Strain (based on actual burial depth),
	5. Installation, Operation, and Maintenance Instructions.
4. Quality Control: Quality control, inspection procedures, and reports shall be considered part of the submittal package.
5. Manufacturer’s Certification:
	1. Submit the manufacturer’s certification that the underground fuel-oil storage tank(s) comply with specified requirements and are suitable for the intended application.
	2. Signed Certified Manufacturing Statement: A clear statement that:
		1. All structural and pipe welds as specified herein shall be performed by certified welders, and
		2. The fuel-oil storage tank is fabricated in the United States of America.
	3. Warranty Documentation: Submit the manufacturer’s standard warranty.

Specifier Notes: There shall be a limit to the number of submittals for the specified underground fuel-oil storage tank. If the fuel-oil storage tank is not “Approved” or “Approved as Noted” on the second submittal for approval, the engineer reserves the right to refuse further submittals from the same manufacturer and may require the contractor to submit for approval a different manufacturer’s product.

1.6 QUALITY ASSURANCE

1. Manufacturer’s Qualifications:
	1. Manufacturer regularly engaged, for the past 10 years, in the manufacture of underground fuel-oil storage tank(s) of a similar type to that specified.
	2. The manufacturer shall provide written documentation that the underground fuel-oil storage tank was “Made in the USA.” The product must be "all or virtually all" fabricated in the United States, including the 50 states, the District of Columbia, and the U.S. territories and possessions.

B. Installer's Qualifications:

1. Installer regularly engaged, for the past 5 years, in the installation of underground fuel-oil storage tank(s) of a similar type to that specified.

2. Employ persons trained for the installation of underground fuel-oil storage tank(s).

1.7 DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, and handle underground fuel-oil storage tank(s) in accordance with the

 manufacturer’s instructions.

B. Protect underground fuel-oil storage tank(s) during delivery, storage, handling, and installation to prevent damage.

1.8 WARRANTY

A. Warranty Period:

1. The manufacturer shall:

 a. warrant its products to be free from defects in material and workmanship for a period

 of one (1) year from the date of shipment. The warranty shall be limited to the repair or

 replacement of the defective part(s).

 b. supply thirty (30) years (10 years + an additional 20 years) limited warranty against

 external corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Highland Tank LLC.

 One Highland Road

 Stoystown, PA 15563

 Phone 814-893-5701

 Fax 814-893-6126

 E-mail: info@highlandtank.com

 Website: [www.highlandtank.com](http://www.highlandtank.com)

Specifier Notes: Specify the type of facility or operation.

2.2 HIGHGUARD DOUBLE-WALL STEEL UNDERGROUND STORAGE TANK FOR BOILER/GENERATOR FUEL SUPPLY TANK SYSTEM

A. HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s) for the storage of fuel-oil for boiler or generator systems. The underground fuel-oil storage tank:

1. shall be designed for the storage of fuel-oil at near atmospheric pressure.
2. shall be installed underground with top access near or above grade level.

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| Specifier Notes: Specify quantity and nominal fuel-oil storage tank capacity, diameter, and length. Nominal HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s) capacities range from 240 to 50,000 gallons. This spec is for a 4,000-gallon tank |

B. Quantity: \_\_\_\_\_\_

C. Nominal Fuel-Oil Storage Tank Capacity: 4,000-gallons, as indicated on the drawings.

D. Nominal Inside Tank Dimensions:

1. Nominal Diameter: 8-feet,0-inches, as indicated on the drawings.
2. Nominal Length: 10-feet, 8-inches, as indicated on the drawings.

E. Conformance:

1. The fuel storage tank shall be designed and fabricated in accordance with UL-58 Standard for Steel Underground Tanks, Double-Wall construction with 360-degree integral Steel Secondary Containment.
	1. The inner steel tank shall be completely contained within the outer steel tank, enclosing 100% of the tank volume.
	2. The tank must have a double steel shell with a space between the layers. Tank construction using a thin-walled primary tank with an external fiberglass jacket shall not be permissible.
	3. The interstitial space between the primary and secondary tank walls must allow for the

free flow and containment of any leaked product from the primary tank.

* 1. The space between the inner and outer steel walls shall be monitored with an approved electronic interstitial monitoring device through a monitoring pipe that extends vertically to the top of the tank from a small sump at the bottom.
	2. The fuel-oil tank shall be shipped to the work site with the interstitial space under 6 inches Hg (20.3 kPa) of vacuum for continuous tightness testing during transit and installation.
1. Pressure testing of the new tank. The fuel-oil tank, welds, seams, and connecting fittings must be factory-tested for tightness using standard engineering practices. The tank must be guaranteed by the manufacturer to be tight.
2. Fuel-oil storage tank Corrosion Control System shall be in strict accordance with Underwriters Laboratories, Inc. Subject UL-1746 Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks,
3. The fuel-oil storage tank shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions.
	1. The fuel-oil storage tank’s dimensions and thickness shall be in strict compliance with Roark’s Formulas for Stress and Strain as presented in UL 58.
	2. Calculations, signed and stamped by a Registered Professional Engineer shall be submitted to document structural strength under specified overbearing or external pressure.

F. Construction:

1. The fuel-oil storage tank shall be a cylindrical, horizontal, atmospheric-type steel tank intended for the safe underground storage of petroleum products.
	1. Fuel-oil storage tank shall be of double-wall construction.
	2. Fuel-oil storage tank shall be fabricated of mild carbon steel with shell seams of continuous lap weld construction.
	3. Fuel-oil storage tank shall be provided with 1/4-inch-thick steel striker plates beneath all openings.
	4. The fuel-oil storage tank shall be fabricated, inspected, and pressure tested for leakage before shipment from the factory by the manufacturer as a completely assembled, single vessel ready for installation. The fuel-oil storage tank shall be a pre-packaged, pre-engineered, ready-to-install unit.
2. Loading Conditions – The fuel-oil storage tank shall meet the following design criteria:
	1. Internal Load – The fuel-oil storage tank shall withstand a 5-psig air test (3-psig for >12’) with a 5:1 safety factor.
	2. Vacuum Test - To verify structural integrity, the fuel-oil storage tank shall be designed to withstand a vacuum test of 6 inches Hg (20.3 kPa).
	3. Surface Loads - The fuel-oil storage tank is to withstand surface H-20 axle loads when installed per the manufacturer’s installation instruction and PEI/RP100.
	4. External Hydrostatic Pressure - The fuel-oil storage tank shall be capable of being buried in the ground with five feet of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling.
	5. Ancillary Equipment - The fuel-oil storage tank shall be capable of supporting the pump, drop/fill/suction tubes, sensors, gauges, and ladders when installed according to the storage tank manufacturer’s current installation instructions.
3. Product Storage:
	1. Storage tank shall be capable of storing petroleum products with a specific gravity not greater than 1.

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| Specifier Notes: All tank fittings shall be in the Manway Cover or located along the top center line of the tank. Typical Fuel-Oil Storage Tank Fittings include Supply (Fill), Return, Vent, Suction (Outlet), Gauge, Sensor, etc. Please review your project to determine the appropriate size, quantity, and location of the tank fittings.  |

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| Specifier Notes: Specify the number of threaded NPT fittings (add entries as required). |

1. Threaded NPT Fittings: Threaded fittings with thread protectors shall be supplied as follows located and indicated on the drawings:
	1. \_\_\_\_-inch diameter, intended for Interstitial Leak Sensor usage
	2. \_\_\_\_-inch diameter, intended for Level Indicator usage
	3. \_\_\_\_-inch diameter, intended for Level Transmitter usage
	4. \_\_\_\_-inch diameter, intended for Air Vent usage
	5. \_\_\_\_-inch diameter, intended for Spare usage
	6. \_\_\_\_-inch diameter, intended for Submersible Turbine Pump/Fuel Supply usage
	7. \_\_\_\_-inch diameter, intended for Fuel Return usage
	8. \_\_\_\_-inch diameter, intended for Fuel Polisher Intake usage
	9. \_\_\_\_-inch diameter, intended for Fuel Polisher Return usage
	10. \_\_\_\_-inch diameter, intended for Fuel Fill usage

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| Specifier Notes: Specify the number and usage of flanged fittings below. Specify size, class, facing, and type of flanges (add additional entries as required). |

1. Flanged Fittings: Flanged fittings with flange protectors shall be supplied as follows located and indicated on the drawings:
	1. \_\_\_\_-inch diameter, Class: \_\_\_\_#, Type: \_\_\_\_\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) Flange intended for \_\_\_\_\_\_\_\_\_\_ usage

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| Specifier Notes: Manways and extensions shall be provided in the locations specified. At least one manway shall be circular with a minimum diameter of 24”, however larger diameter manways are available. Typical diameters are 24”, 30”, and 36”. Fuel-oil storage tanks larger than an eight-foot diameter or 5,000 gallons require a minimum of one additional manway. All internally lined storage tanks require at least two (2) manways for OSHA compliance. |

1. Two (2) Manways for Access and Operation:
	1. Manway, circular, minimum 24” in diameter. The two (2) manways are to be located as indicated on the drawings. All tank fittings shall be placed in the storage tank manway covers.

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| Specifier Notes: Manhole covers are heavy and the potential for injury exists in handling them. A means of supporting them during installation or removal is prudent. Please select method below. |

* 1. Manhole covers shall have lifting-eye, surface handles.

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| Specifier Notes: For Reversed Flange Manway for mounting the Containment Sump, refer to the drawings for the required Ring Patterns and threaded openings. |

1. Provide two (2) Reversed Flange Manways with a double bolt ring mounting and 24-inch minimum inside diameter bolted access cover with UL-listed gasket. Use studs or secure heads of bolts to the underside of the flange. Protect threads on bolts during transit and installation.
	1. One ring pattern is for the mounting cover plate.
	2. One ring pattern is for mounting the containment sump.
	3. The bolted access cover shall have welded threaded openings of the number and sizes required.
	4. Containment Sump Mounting Ring: Sized to accept minimum 48-inch fiberglass watertight Containment Sump.
2. Corrosion Protection System: The corrosion control system shall be in strict conformance with Highland Tank HighGuard specifications.
	1. Exterior Protective Coating:
		1. Surface Preparation: Steel Grit Blast - SSPC-SP 6/NACE No.3 Commercial Blast Cleaning.
		2. Finish: External surfaces coated with 75 mils DFT Self-Reinforcing Polyurethane.
			1. Polyurethane coating shall have a high cross-link density, which is self-reinforcing or self-fibrated. Artificial fillers or reinforcement (chopped fiberglass or roving) shall not be permitted.
			2. Coating shall be subjected to a 10,000-volt spark test after application to ensure coating integrity and effective corrosion protection.
	2. Interior Protective Coating: OPTIONAL
		1. Surface Preparation: Steel Grit Blast - SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning.
		2. Finish: Internal surfaces coated with 15 mils DFT solvent-free, two-component polyurethane lining.
3. Lifting lugs shall be provided at balancing points to facilitate fuel-oil storage tank handling and installation.
4. Identification plates: Plates to be affixed in a prominent location and be durable and legible throughout equipment life

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| Specifier Notes: Specify Optional Equipment below, remove unwanted items |

1. HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s)

 Options/Accessories:

1. Venting: Tank system(s) shall include one (1) normal vent for the primary tank(s)
	1. Capacity of the vent shall be sized according to Table 2-8, NFPA 30.
	2. Vent riser piping shall be a minimum 2" diameter, Schedule 40 steel pipe, pre-cut for field assembly, and conform to ANSI B31.3 or ASTM A53, A106, or A135. The length of the pipe shall be such that the point of vent discharge is a minimum of 12 feet above grade.
	3. 3” Updraft Vent - Acceptable Manufacture: \_\_\_\_\_\_\_\_\_\_\_\_
	4. Vent installation shall comply with applicable sections of the fire and mechanical codes, including, but not limited to, NFPA 30A and NFPA 30
2. Below Grade Double Wall Fill Spill Containment Assembly:
	1. Size: 15 gallons.
	2. Stainless steel construction
	3. UL 2447 Listed for USTs
	4. Integral Hatch Cover: Waterproof, locking type.
	5. Grade Access Manhole for access to below grade fill spill container: 30” diameter composite watertight flush cover with frame and 12” deep skirt complying with

EN-124 load rating.

* 1. Manual push drain valve.
	2. Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_

OR

1. Above Grade Remote Fill Port Assembly – 3”
	1. Min. 10 Gal. Painted enclosure
	2. Quick connect w/dust cap
	3. SS ball valve
	4. Check valve
	5. Internal hand pump
	6. Hinged locking door
	7. Threaded Back connection
	8. Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_
2. Fill Assembly: Tank system(s) shall include top-fill assembly, inclusive of:

 a. One (1) lockable fill cap [2-4” in size] with a liquid-tight seal and positive mechanical

 locking mechanism.

 b. One (1) fill pipe adapter [2-4” in size] with a threaded fitting with cam-and-groove or

 a bayonet-style lip that provides a fill hose connection that will not expose fuel to air

 during delivery.

 c. One (1) drop tube (fill pipe) constructed of corrosion-resistant metal [2-4” nominal

 diameter]. The fill pipe shall terminate within 6” of the inside bottom of the tank. A striker plate is to be provided at the bottom of the fill.

1. Overfill Prevention: Tank system(s) shall include overfill prevention equipment that incorporates the following:
	1. Overfill Prevention Valve: Shall be installed on the fill port and be designed to prevent overfilling of the tank by providing a positive shut-off during a pressurized fill. The valve will stop the flow of liquid into the tank when the product level reaches 95% of the tank capacity. The fill limiting device shall be rated to accept the fill flow rate and pressures up to 100 psi and must be UL Listed.

Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_

1. Containment Sump Assembly for HighGuardDouble-Wall Steel, Underground Fuel-Oil, Storage Tank(s)
	1. 48-inch diameter Collar Mount Single Wall Octagon Fiberglass Containment Sump.
		1. Watertight cover lid.
		2. Sump Collar Mounting Adhesive Kit with slurry pour epoxy.
		3. UL 2447 Listed
		4. Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_

6. Tank shall be supplied with an Automatic Tank Gauging (ATG), Leak Monitoring, and

 Overfill Prevention System:

 a. Console Construction: High-quality Stainless Steel; designed to function reliably

 within an operating temperature range of -22 to 140 degrees Fahrenheit

 b. Includes LINUX operating system for secure, cloud-based monitoring with encrypted

 VPN for remote software updates. Systems data and programming history can be

 backed up onto an onboard SD card.

 c. The System shall utilize Magnetostrictive level probe technology; the ATG system

 measures product and water levels as well as multiple temperature elements.

 d. The magnetostrictive probes shall be constructed of Stainless Steel.

 e. The system shall be effective in conducting low volume leak test thresholds of 0.1

 GPH (with 12.7% product volume in the tank) for use with USTs for EPA compliance

 Monitoring.

 e. System(s) shall include electronic leak detection for each tank interstice to

 continuously monitor both the primary and secondary containment tanks.

 f. Leak sensors are also made of Stainless Steel.

 g. Sensors shall be microprocessor based, capable of networking up to sixteen self-

 testing sensors on a single cable.

 h. Base system shall support up to four level probes and sixteen smart leak sensors.

 i. Visual monitoring is facilitated by a vibrant sunlight visible, backlit 7-inch color graphic

 display featuring a capacitive touchscreen.

 j. The ATG shall have network printing capability, to provide a clear and accessible

 readout of levels and alarms.

 k. The ATG also includes five internal six-amp Fail Safe capable relays, individually programmable, ensuring a high degree of customization. This extends to driving both

 single and multi-tank 12 VDC NEMA 4X remote audio-visual high-level alarms and/or remote displays.

 l. The console comes equipped with one RS-232 port, two optional configurable RS- 232/RS-485 ports, and Ethernet connectivity allowing for near real-time notification

 via email and/or text.

 m. The Console shall also provide MODBUS and BACNET protocol support, additional relays, and 4-20mA output are available enhancing system flexibility.

 n. The ATG system provides a built-in webserver that allows users to view and print reports of both current and historical data of inventory levels, sensor status, system diagnostics and alarms. This remote accessibility feature ensures data availability through any standard web browser or smartphone application, affording flexibility to monitor from any remote location.

 o. Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_

1. Fuel Supply (Pump) System: Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_
	1. Pump Capacity 0.21 l/s @91.8 kPa
	2. 208/230-volt, 60 Hz, single-phase, 3450 RPM, (230 50 Hz/50 HZ)
2. Pump Control Panel - Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_
3. Pump Level Sensor (HH, H, L, LL) - Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_
4. Fuel Polishing Skid with Progressive Filtration and Conditioning System:
	1. Filtration System
		1. Coarse, straining through 40 mesh washable screens
		2. Pre-filtration through 10-micron disposable media filter
		3. Final filtration through 5-micron disposable media filter
		4. Water separator to 15 PPM with automatic water removal and integral water collection vessel
	2. Integrated, high-performance active design with 5-50 GPM PD pump or passive design for use with remote submersible pump
	3. Fully WP containment enclosure, factory assembled with automated flow control and monitoring devices
	4. PLC based programmable digital controller w/ Modbus
	5. Acceptable Manufacturer: \_\_\_\_\_\_\_\_\_\_\_\_
5. Polyester Hold-down Straps: Number and size as recommended by the manufacturer.
	1. When fuel-oil storage tank(s) anchoring is required, manufacturer-provided corrosion-resistant polyester hold-down straps with turnbuckles (2 per strap) and a cable restraint system will be provided.
	2. Steel hold-down straps with neoprene liners shall be provided where polyester straps are not applicable.
6. Prefabricated Concrete Deadmen Anchors:
	1. Pre-engineered and prefabricated concrete deadmen anchors may be an acceptable means of anchoring the fuel-oil storage tank(s) provided buoyancy calculations are submitted and signed by an engineer of the tank manufacturer.
	2. The concrete deadman must be supplied by the tank manufacturer and have been a standard product for at least five years
	3. All prefabricated concrete deadman shall be sized and installed in accordance with the tank manufacturer’s guidelines.
7. Cylindrical and/or rectangular steel Grade Level Manholes designed to AASHTO H20 requirements:

 a. Grade Access Manholes will consist of:

* + 1. Structural steel frames with integral concrete anchors and 12” deep steel concrete retention skirts. Manhole access covers shall be flush-style, skid-free composite construction with recessed picking handles for easy removal. All manholes will be H-20 truckload rated. Manholes shall be furnished by the tank manufacturer.
		2. Leak and Level sensor riser pipes shall be recessed below one single-grade access manhole, or multiple manholes as shown on contract drawings.
		3. Acceptable Manufacturer: Highland Tank LLC.

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| Specifier Notes: Never enter a storage tank or enclosed space, under any condition, without proper training and OSHA-approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 “Permit Required Confined Spaces.”) |

1. Internal Ladder:
	1. Ladder shall be fabricated of [aluminum] [carbon steel, coated with 15 mils DFT Polyurethane lining] with 2"X 1/4" flat bar sides and 3/4" diameter rungs 12" on center.
	2. Ladder shall be fabricated and installed in accordance with OSHA 1910.27.
2. Stick Gage: Hardwood, calibrated in 1/8-inch increments.

PART 3 EXECUTION

3.1 GENERAL

1. Installation and testing shall be in strict accordance with the Highland Tank’s HighGuardDouble-Wall Steel, Underground Fuel-Oil, Storage Tank(s) Installation Instructions available at [www.highlandtank.com](http://www.highlandtank.com).
2. No modifications shall be made to the fuel-oil storage tank(s) without the prior written approval of the manufacturer and the Engineer. This includes any welding on the tank shell, adding penetrations, modifying the tank structure, or repairing any damage that might affect the integrity of the fuel-oil storage tank(s).
3. Contractor shall install fuel-oil storage tank(s), piping, and equipment (valves, sensors, pumps, vents, gauges, etc.) in accordance with the manufacturers' installation instructions, industry-standard recommended practices, and federal, state, and local regulations.
4. Fuel-oil storage tank(s) shall be handled, lifted, stored, and secured in accordance with the manufacturer's instructions.
5. Securely store the tank at the job site. The location should be selected to minimize tank relocations as work progresses.
6. The hazards associated with the cleaning, entry, inspection, testing, maintenance, or other aspects of storage tank(s) are significant. Safety considerations and controls should be established prior to undertaking physical activities associated with a storage tank(s).
7. Never enter a storage tank or enclosed space, under any condition, without proper training and OSHA-approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 “Permit Required Confined Spaces.”)
8. Entry and cleaning of fuel-oil storage tank(s) must be per federal (OSHA), state, and local regulations as well as company requirements.
9. Familiarity with the Site.
	1. The Contractor shall familiarize himself with the location of all public utility facilities and structures that may be found in the vicinity of the construction.
	2. The Contractor shall conduct his operation to avoid damage to the utilities or structures.
	3. The Contractor is responsible for meeting all the requirements established by the agencies for utility work, as well as work affecting utilities and other government agencies.
	4. Regional and local building and fire code authorities shall be consulted for local requirements.
	5. Notify the Engineer of any local requirements not incorporated in the system as designed.

3.2 EXAMINATION

1. Examine excavation to receive underground fuel-oil storage tank(s).
2. Notify the site supervisor or engineer of conditions that would adversely affect installation.
3. Do not begin installation until unacceptable conditions are corrected.

3.3 PREPARATION

Specifier Notes: Include the following paragraphs when specifying Highland Tank’s HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s)

1. The temporary storage site shall be prepared to ensure adequate support for the fuel-oil storage tank and drainage of surface water
2. Fuel-oil storage tanks located in areas subject to flooding must be protected against flotation.
3. Maintain legal separation distances from property lines, buildings, public ways, and other storage tanks. Caution: Distance requirements vary significantly between jurisdictions.
4. Air Test (if required):
	1. Perform an air test of fuel-oil storage tank(s) above ground before installation in accordance with the manufacturer’s instructions in Highland Tank Installation Instructions or with PEI/RP100 or STI R971.
		1. Test the primary (inner) tank at a gauge pressure of 3 to 5 psi for 1 hour.
		2. Test the secondary tank (interstice) at a gauge pressure of 3 to 5 psi or 6 inches Hg (20.3 kPa) vacuum for 1 hour. Do not connect a high-pressure air line directly to the interstitial monitoring port. Pressurize the interstice with air from the inner tank.
		3. Check fitting connections, and seams in the outermost tank by applying a soap suds solution.

2. Secondary containment tanks that are shipped from the factory with a vacuum drawn on the

interstitial space, and the vacuum is held through the completion of installation, meet the

tightness testing requirement. Results are to be documented.

1. Before Placing Fuel-Oil Storage Tank(s) in Excavation:
	1. Remove dirt clods and similar foreign matter from the storage tank(s)
	2. Visually inspect storage tank(s) for damage.
	3. Notify the site supervisor of damage to the storage tank(s).
	4. Repair or spark test damaged areas of storage tank coating in accordance with the manufacturer’s instructions in Highland Tank Installation Instructions.

a. Spark Testing: Set the holiday detector at a minimum of 10,000 volts.

b. Coat holidays, damaged storage tank(s) coating, and exposed steel surfaces in accordance with manufacturer’s instructions with compatible coating furnished by tank manufacturer.

c. Retest holidays at 10,000 volts.

3.4 INSTALLATION

A. Install underground fuel-oil storage tank(s) in accordance with the manufacturer’s instructions for Highland Tank HighGuard Installation Instructions and PEI/RP100 or STI R971.

B. Install fuel-oil storage tank(s) at locations and to elevations indicated on the drawings.

C. Ensure fuel-oil storage tank(s) excavation is free from materials that may cause damage to the storage tank(s) or tank’s coating.

D. Do not allow foreign matter to be introduced into excavation or backfill during fuel-oil storage tank(s) installation.

E. Bottom of Excavation: Cover with clean sand or gravel to the depth indicated on the Drawings, suitably graded, and leveled.

F. HighGuardDouble-Wall Steel, Underground Fuel-Oil, Storage Tank(s) Placed on Concrete Pad for Anchoring Purposes.

Specifier Notes: Specify the section number for cast-in-place concrete.

1. Concrete for Pad: Specified in Section 03 30 00.

2. Do not place fuel-oil storage tank(s) directly on the concrete pad.

3. Spread a layer of fine gravel, pea gravel, clean sand, or ASTM D 448 #8 coarse aggregate a minimum of 6 inches deep, evenly spread over the dimensions of the concrete pad to separate the fuel-oil storage tank(s) from the pad.

4. Fuel-Oil Storage Tank(s) Bedding Material for Installation in Tidal Area: Fine gravel or pea gravel.

G. HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s) Handling:

1. Ensure equipment to handle fuel-oil storage tank(s) is of adequate size to lift and lower storage tank(s) without dragging, dropping, or damaging the storage tank or tank’s coating.

2. Carefully lift and lower fuel-oil storage tank(s) with cables or chains of adequate length attached to the lifting lugs provided.

3. Use the spreader bar where necessary.

4. Do not use chains or slings around the fuel-oil storage tank’s shell.

5. Maneuver storage tanks with guidelines attached to each end of the tank.

H. Hold-Down Straps:

1. Install polyester hold-down in accordance with the manufacturer’s instructions in Highland Tank Installation Instructions.

2. If steel hold-down straps are used, ensure hold-down straps are separated from the fuel- oil storage tank by separating pads made of inert, insulation dielectric material.

3. Separating Pads:

a. Minimum 2 inches wider than the width of hold-down straps.

b. Place separating pads at locations on the fuel-oil storage tank where hold-down straps could come into direct contact with the storage tank shell.

I. Backfill:

1. Backfill Material: Clean sand, ASTM D 448 #8 crushed aggregate or fine gravel.

2. Place backfill material along the bottom side of fuel-oil storage tank(s) by shoveling and tamping to ensure storage tank(s) are fully and evenly supported around the bottom quadrant.

3. Deposit backfill material carefully around and over the fuel-oil storage tank(s) to avoid damage to the storage tank(s) and tank coating.

4. Deposit backfill material to depth over the fuel-oil storage tank(s) as indicated on the drawings.

J. Plugs:

1. Remove plugs at unused fuel-oil storage tank(s) openings, add pipe compound, and reinstall plugs in unused openings.

2. Do not cross-thread or damage storage tank(s) fittings when replacing plugs or installing the tank’s piping.

K. Before Placing Backfill over the Fuel-Oil Storage Tank(s):

1. Final Inspection: Visually inspect fuel-oil storage tank(s), tank coating, and pipe connections.

**3.5 ELECTRICAL**

A. Installation of all electrical components including (Electric level sensors, alarm/control panels, electronic valves, pumps, etc.):

1. Installation shall be in accordance with manufacturers' installation instructions and shall conform to state and local electrical codes with special attention to compliance with requirements for work in classified areas.

2. Provide proper electrical junction boxes, conduits, and seal-offs as specified in Article 500 514 of the National Electrical Code.

3. The contractor shall provide wiring and seal-offs for all conduits.

3.6 PROTECTION

A. Protect installed underground fuel-oil storage tank(s) from damage during construction.

**3.7 START-UP, OPERATION, AND MAINTENANCE**

A. HighGuard Double-Wall Steel, Underground Fuel-Oil, Storage Tank(s) shall be started, operated, and maintained according to the Highland Tank HighGuard Installation Instructions in effect at time of installation.

B. Calibration and start-up of ancillary equipment shall be performed by factory-trained and qualified personnel.

END OF SECTION