Highland Tank & Mfg. Co., Inc. 04000HGSWHDFPTBDCSI72.DOC

One Highland Road

Stoystown, PA 15563

Phone: 814-893-5701

Fax: 814-893-6126

E-mail: highdro@highlandtank.com

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

**HighDRO® Cylindrical, Underground Single-wall Steel**

**Water Storage Tank for Fire Suppression with Bottom Drain Pipe and Anti-Vortex Plate**

**Product Guide Specification**

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| 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 Architect or Engineer to meet the requirements of the project and applicable codes and regulations. Coordinate this section with other specification sections and the Drawings. **Delete all “Specifier Notes” after editing this section.**Section numbers are from *MasterFormat 2014 Edition*. |

**SECTION 21 41 26**

**HIGHDRO® UNDERGROUND STORAGE TANKS FOR FIRE-SUPPRESSION WATER**

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| Specifier Notes: This section covers Highland Tank & Mfg. Co., Inc. HighDRO® Cylindrical, Underground Single-wall, Steel Water Storage Tank for Fire Suppression with Bottom Drain Pipe and Anti-Vortex Plate,Model 04000HGSWHDFPTBDCSI72**.** Consult Highland Tank for assistance in editing this section for the specific application. |

PART 1 GENERAL

1.1 SECTION INCLUDES

A. HighDRO® Cylindrical, Underground Single-wall Steel Water Storage Tank(s) for Fire Suppression.

1.2 RELATED REQUIREMENTS

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

A. Section 03 15 19 - Cast-In Concrete Anchors (Anchor Bolts for Hold-Down Straps)

B. Section 03 30 00 - Cast-in-Place Concrete (Concrete for Anchor Pad)

C. Section 09 96 00 - High-Performance Coatings

D. Section 21 10 00 Water-Based Fire-Suppression Systems

E. Section 31 00 00 – Earthwork

1.3 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 provision is merely a listing of some of the standards used for equipment compliance. |

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. ASME - American Society of Mechanical Engineers
* Pipe Flanges and Flanged Fittings
* Forged Fittings, Socket-Welding and Threaded

E. ASTM - American Society for Testing and Materials

* ASTM Standard Specification for Carbon Structural Steel - ASTM International

F. AWS - American Welding Society

* Structural Welding Code - Steel

G. AWWA - American Water Works Association

* AWWA D100 - Welded Carbon Steel Tanks for Water Storage
* AWWA D102 - Standard for Coating Steel Water Storage Tanks

H. IBC - International Building Code - International Code Council, Inc.

I. NEC - National Electric Code

J. NEMA - National Electric Manufacturers Association

K. NFPA – National Fire Protection Association

* NFPA 22 - Water Storage Tanks for Fire Protection Systems
* NFPA 1142 - Water Supplies for Suburban and Rural Fire Fighting

L. NSF - National Sanitation Foundation International

* NSF/ANSI Standard 61: Drinking Water System Components - Health Effects

M. OSHA - U. S. Department of Labor, Occupational Safety and Health Administration

* OSHA 29CFR 1910, Occupational Safety and Health Standards

N. PEI - Petroleum Equipment Institute

* RP100, Recommended Practices for Installation of Underground Liquid Storage Systems

O. 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

P. STI - Steel Tank Institute

Q. UL - Underwriters Laboratories, Inc.

* UL 58 - Steel Underground Tanks
* UL 1746 - Corrosion Protection of Underground Tanks

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| Specifier Notes: The codes and standards listed are as of the date of this Specification. Codes and standards are continuously updated. The Contractor/Specifier shall confirm the construction standard edition enforced by the authority having jurisdiction. |

1.4 SUBMITTALS

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

1. Comply with Section 01 33 00 – Submittal Procedures.
2. Shop Drawings: Submit shop drawings of the underground single-wall steel water storage tank(s) for fire suppression by the manufacturer showing principal dimensions and location of all fittings.
3. Product Data: Submit manufacturer’s product data, including:
	1. Brochures/Catalogs specifically describing underground water storage tank(s).
	2. Technical Data Sheets on NSF/ANSI Standard 61 compliant internal protective lining.
	3. Floatout and Anchorage (Buoyancy) Calculations (assuming a fully flooded excavation with an installed empty water 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 manufacturer’s certification that the underground water storage tank(s) comply with specified requirements and are suitable for the intended application. Storage tank(s) intended solely for fuel storage shall not be permitted.
	2. Signed Certified Manufacturing Statement: A clear statement that:
		1. All structural and pipe welds as specified herein shall be performed by certified welders.
		2. The underground single-wall steel water storage tank(s) for fire suppression water storage tank is fabricated in the United States of America. (*See* Appendix A).
	3. Warranty Documentation: Submit manufacturer’s standard warranty.

Specifier Notes: There shall be a limit to the number of submittals for the specified underground water storage tank. If the water 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. [MAKE BOX YELLOW]

1.5 QUALITY ASSURANCE

1. Manufacturer’s Qualifications:
	1. Manufacturer regularly engaged, for past 10 years, in manufacture of underground single-wall steel water storage tank(s) for fire suppression of similar type to that specified.
	2. Manufacturer shall provide written documentation that the underground single-wall steel water storage tank(s) for fire suppression was “Made in USA.” The product must be 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 past 5 years, in installation of underground single-wall steel water storage tank(s) for fire suppression of similar type to that specified.

2. Employ persons trained for installation of underground steel water storage tank(s).

1.6 DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, and handle underground single-wall steel water storage tank(s) for fire suppression in accordance with manufacturer’s instructions.

B. Protect underground single-wall steel water storage tank(s) for fire suppression during delivery, storage, handling and installation to prevent damage.

1.7 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 repair or

 replacement of the defective part(s).

 b. Supply a ten (10) year limited warranty against external corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Highland Tank & Mfg. Co., Inc.

 One Highland Road

 Stoystown, PA 15563

 Phone 814-893-5701

 Fax 814-893-6126

 E-mail: highdro@highlandtank.com

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

Specifier Notes: Specify type of facility or operation. [MAKE BOX YELLOW]

2.2 HIGHDRO® UNDERGROUND SINGLE-WALL STEEL WATER STORAGE TANKS FOR FIRE-SUPPRESSION WATER

A. HighDRO® Cylindrical, Underground single-wall steel water storage tank(s) for the storage of fire-suppression water near atmospheric pressure. The water storage tank:

1. Must be fabricated with a liner certified to NSF/ANSI Standard 61: Drinking Water System Components - Health Effects.
2. Must be installed underground with top access near or above grade level.

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| Specifier Notes: Specify quantity.  |

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

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

D. Nominal Dimensions:

1. Nominal Diameter: 6-feet, 0-inches, as indicated on the drawings.
2. Nominal Length: 19-feet, 0-inches, as indicated on the Drawings.

E. Conformance:

1. The water storage tank shall be designed and fabricated in accordance with UL-58 Standard for Steel Underground Tanks, Single-Wall construction.
2. Pressure testing of new tank. The water tank, welds, seams and connecting fittings must be factory-tested for tightness using standard engineering practices. Tank must be guaranteed by the manufacturer to be tight.
3. Storage tank shall be coated for potable water service in accordance with AWWA D102.
4. Storage tank liner shall be certified to NSF/ANSI Standard 61: Drinking Water System Components - Health Effects.
5. Water 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 and HighGuard External Corrosion Protection Specifications.
6. The water storage tank shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions
	1. The water 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 water storage tank shall be cylindrical, horizontal, atmospheric-type steel tank intended for storage of fire-suppression water.
	1. Water storage tank shall be of single-wall construction.
	2. Water storage tank shall be fabricated of \_\_\_\_\_\_ mild carbon steel with shell seams of continuous lap weld construction.
	3. The water storage tank shall be fabricated, inspected and pressure tested for leakage before shipment from the factory by manufacturer as a completely assembled, single vessel ready for installation. The water storage tank shall be a pre-packaged, pre-engineered, ready to install unit. Sectionalized, bolted steel storage tanks are not permissible.
2. Loading Conditions - Water storage tank shall meet the following design criteria:
	1. Internal Load – Water 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, water storage tank shall be designed to withstand a vacuum test to 11.5” of mercury.
	3. Surface Loads – Water storage tank to withstand surface H-20 axle loads when installed per manufacturer’s installation instruction and PEI/RP100.
	4. External Hydrostatic Pressure – Water storage tank shall be capable of being buried in 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 – Water storage tank shall be capable of supporting internal pump platforms, drop/fill/suction tubes, submersible pump(s) and ladders when installed according to storage tank manufacturer’s current installation instructions.
3. Product Storage:
	1. Storage tank shall be capable of storing water products with a specific gravity up to 1.1

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| Specifier Notes: Typical Water Storage Tank Fittings include: Supply (Suction), Vent, Fill, Gauge and Sensor. Please review your project to determine the appropriate size and quantity of the tank fittings. Flanged Fittings are preferred except for small (less than 2”) opening, where threaded fittings are preferred. |

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

1. Threaded NPT Fittings: [Carbon Steel, Stainless Steel (to prevent corrosion in threaded area).]
2. Threaded fittings with thread protectors shall be supplied as follows:
	1. 4-inch diameter, intended for fill usage, located as indicated on the drawings

4-Inch diameter, intended for vent usage, located as indicated on the drawings

* 1. \_\_\_-inch diameter, intended for \_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	2. \_\_\_-inch diameter, intended for \_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	3. \_\_\_-inch diameter, intended for \_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	4. \_\_\_-inch diameter, intended for \_\_\_\_\_\_\_\_ usage, located as indicated on the drawings

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| Specifier Notes: Specify quantity of flanged fittings (add entries as required). Specify size, class, facing and type of flanges (add entries as required). |

1. Flanged Fittings: Flanged fittings with flange protectors shall be supplied as follows:
	1. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for drain usage, located as indicated on the drawings
	2. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	3. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	4. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	5. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ usage, located as indicated on the drawings
	6. \_\_\_-inch diameter, Class: \_150\_#, Type: \_RF\_ (RF – Raised Face, FF – Flat Face / SO – Slip On, WN –Weld Neck) flange intended for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ usage, located as indicated on the drawings

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| Specifier Notes: Manholes and extensions shall be provided in the locations specified. At least one manhole shall be circular with a minimum diameter of 24”, however larger diameter manholes are available. Typical diameters are 24”, 30”, and 36”. Water storage tanks larger than eight foot diameter or 5,000 gallons require a minimum of one additional manhole. Rectangular manways with pneumatic assist covers are available upon request. |

1. Manholes and Extensions:
	1. Manhole and extension, circular, minimum 24” in diameter. Manhole to be located as indicated on the Drawings. Extensions to terminate below grade at a distance determine by the type of frame and cover at grade. Storage tank manholes are not meant for any type of traffic loading.

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| Specifier Notes: Manhole covers are heavy and potential for injury exists in handling them. A means of supporting them during installation or removal is recommended. |

* 1. Manhole covers shall have [lifting eye] [surface handles] [hinge or davit].

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| Specifier Notes: |

1. Vent:
	1. A vent assembly of \_\_\_\_\_\_\_\_\_ square inches open area in accordance with AWWA D100 shall be furnished and installed above the maximum water level of sufficient capacity so that as maximum design rate of water fill or withdrawal, the resulting interior design pressure / vacuum will not exceed = 2.0 / -0.5 ounces per square inch.
	2. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including a 4 mesh (1/4” opening size) galvanized screen. If required by the contract drawings, a 16 mesh (1/16” opening size) galvanized screen will be installed to prevent the entrance of insects. However, if the storage tank is located in an area where heavy frost is common during the winter months an additional pressure / vacuum relief must also be provided.
2. Bottom Drain Pipe and Anti-Vortex Plate
	1. Bottom Drain Pipe allows for connection to a vertical pump vault in order to remove water from the tank at the specified rate of flow (fire flow).
	2. The Bottom Drain Pipe shall be equipped with an anti-vortex plate installed inside the tank according to NFPA-22. The anti-vortex plate shall be designed to eliminate air entrainment that is potentially damaging to the vertical pump.
3. Fill Pipe with Fire Department Connection:
	1. The Fill connection shall consist of a 4-inch diameter schedule 40 ductile iron pipe dropping to within 6 inches of the tank bottom.
	2. The Fill connection shall have a 4-inch Storz fitting to adapt to 4 inch pipe NPT.
	3. The fitting shall have an adapter angled downward at 30 degrees to reduce hose and fitting strain during filling operations.
	4. The fill connection shall be fixed at a height of 18 to 24 inches above finished grade or concrete slab, to the centerline of the fitting.
4. Corrosion Protection System:
	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 HighGuard Self-Reinforcing Polyurethane.
			1. Polyurethane coating shall have a high cross-link density, which is, in essence, self-reinforcing or self-fibrating. Artificial fillers or reinforcement (chopped fiberglass or FRP roving) shall not be permitted.
			2. Coating shall be subjected to a 15,000-volt spark test after application to ensure coating integrity and effective corrosion protection.
	2. Interior Protective Coating:
		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 HighDRO®-Liner Plus Polyurethane Lining
			1. The lining must comply with NSF/ANSI 61 - Approved for potable water.
			2. The liner shall be applied on all internal surfaces in accordance with AWWA D102, ICS #4.
5. Lifting lugs shall be provided at balancing points to facilitate water storage tank handling and installation.
6. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

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| Specifier Notes: Specify Optional Equipment |

G. HighDRO® Underground Single-wall Steel Water Storage Tank(s) for Fire Suppression Options/Accessories:

1. UL listed Liquid Level Sensors and Controls:
	1. Water storage tank(s) shall be supplied with an audible and visual alarm system that indicates high level in the tank.
	2. Level sensor to be intrinsically safe, tank-mounted magnetic float probes.
	3. Level sensor floats to be made of stainless steel.
	4. The control panel shall be NEMA 4X (FRP).
	5. A silence control shall be provided for the audible alarms.
	6. Power to the control panel is to be [ \_\_\_\_\_ ] volt, [\_\_\_\_\_ ] phase.
2. Polyester Hold-down straps:
	1. When water storage tank(s) anchoring is required, manufacturer provided corrosion resistant polyester hold-down straps with turnbuckles 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.
3. Prefabricated Concrete Deadmen Anchors:
	1. Pre-engineered and pre-fabricated concrete deadmen anchors may be an acceptable means of anchoring the water storage tank(s) provided buoyancy calculations are submitted and signed by an engineer of the tank manufacturer.
	2. The concrete deadmen must be supplied by the tank manufacturer and have been a standard product for at least five years.
	3. All pre-fabricated concrete deadmen shall be sized and installed in accordance with the tank manufacturer’s guidelines.
4. Cylindrical and/or rectangular steel Grade Level Manways designed to AASHTO H20 requirements:
	1. 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 tank manufacturer.
		2. Level sensor riser pipes shall be recessed below one single grade access manhole or multiple manholes as shown on contract drawings.
		3. All grade access manholes for a complete storage tank installation shall be supplied by the manufacturer for single source supply.
5. Fill Tube:
	1. Provide Drop/Fill tube per drawings.
	2. Pipe shall be [stainless steel, carbon steel coated, PVC] and terminate per engineer’s drawing.

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| Specifier Notes: AWWA D100 does not recommend internal ladders where ice may form. Specifier to delete either carbon steel or aluminum construction material. |

1. Internal Ladder:
	1. Ladder shall be manufactured and installed in accordance with OSHA 1910.27 of [aluminum] [carbon steel, coated per AWWA D102 ICS #4] utilizing 15 mils DFT HighDRO®-Liner Plus Polyurethane lining; NSF/ANSI 61 approved for potable water.

PART 3 EXECUTION

3.1 GENERAL

1. Installation and testing shall be in strict accordance with the Highland Tank’s HighDRO® Water Storage Tank’s Installation Instructions available at [www.highlandtank.com](http://www.highlandtank.com).
2. No modifications shall be made to the water storage tank(s) without the prior written approval of the manufacturer and the Engineer. This includes any welding on tank shell, adding penetrations, modifying the tank structure, or repairing damage that might affect the integrity of the water storage tank(s). Unauthorized modifications will void warranty.
3. Contractor shall install water 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. Water 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 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 CFR §1910.146 “Permit Required Confined Spaces.”)
8. Entry and cleaning of water 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 itself 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 all governing agencies for utility work, as well as work affecting utilities and other government agencies.
	4. Regional and local building codes 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 water storage tank(s).
2. Notify 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 paragraph when specifying “HighGuard” single-wall steel HighDRO® Water Storage Tanks for Fire Suppression.

1. The site shall be prepared to ensure adequate support for the water storage tank and drainage of surface water.
2. Water 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 air test of water storage tank(s) above ground before installation in accordance with manufacturer’s instructions in Highland Tank Installation Instructions or with PEI/RP100.
	2. Test Pressure: 5 psi maximum.
	3. Bubble solution applied to welded seams.
5. Before Placing Water Storage Tank(s) in Excavation:
	1. Remove dirt clods and similar foreign matter from storage tank(s).
	2. Visually inspect storage tank(s) for damage.
	3. Notify site supervisor of damage to storage tank(s).
	4. Repair or spark test damaged areas of storage tank coating in accordance with manufacturer’s instructions in Highland Tank Installation Instructions.

a. Spark Testing: Set 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 HighDRO® Water Storage Tank(s) in accordance with Highland Tank Installation Instructions and PEI/RP100.

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

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

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

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

F. HighDRO® Water 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 water storage tank(s) directly on concrete pad.

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

4. Water Storage Tank(s) bedding material for installation in tidal area: Fine gravel or pea gravel.

G. HighDRO® Water Storage Tank(s) handling:

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

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

3. Use spreader bar where necessary.

4. Do not use chains or slings around water 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 Highland Tank Installation Instructions.

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

3. Separating Pads:

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

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

I. Backfill:

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

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

3. Deposit backfill material carefully around and over water storage tank(s) to avoid damage to storage tank(s) and tank coating.

4. Deposit backfill material to depth over water storage tank(s) as indicated on the Drawings.

J. Plugs:

1. Remove plugs at unused water 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 tank’s piping.

K. Before placing backfill over water storage tank(s):

1. Final Inspection: Visually inspect water 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):

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, conduit and seal offs as specified in Article 500 514 of the National Electrical Code.

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

3.6 PROTECTION

A. Protect installed underground steel water storage tank(s) from damage during construction.

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

A. HighDRO® Underground Single-wall Water Storage Tank(s) for Fire Suppression shall be started, operated and maintained according to the Highland Tank 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

Appendix A

**CERTIFIED MANUFACTURING STATEMENT**

All Facility Underground Water Storage Tank(s), skid, structural, transmission piping, pipe and equipment supports/restraints welding shall be performed by individuals certified the American Welding Society (AWS) Structural Welding Code, Section 9.10.

The Facility Underground Water Storage Tank(s) shall be “Made in USA.” The product must be fabricated in the United States (includes the 50 states, the District of Columbia, and the U.S. territories and possessions).

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Company Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_