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USACE / NAVFAC / AFCEC / NASA **UFGS-44 41 00 (August 2020)**

Preparing Activity: NAVFAC **Superseding**
UFGS-44 41 00.00 20 (May 2020)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2023
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DIVISION 44 - POLLUTION AND WASTE CONTROL EQUIPMENT

SECTION 44 41 00

WATER POLLUTION CONTAINMENT AND CLEANUP EQUIPMENT

08/20

-- End of Section Table of Contents --

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SECTION 44 41 00

WATER POLLUTION CONTAINMENT AND CLEANUP EQUIPMENT
08/20

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NOTE: This guide specification covers the requirements for factory fabricated storage tanks used to contain fire suppressant discharge. Except when used to contain fire suppressant discharge during an emergency, the containment tank must remain empty. The containment tank must be expeditiously emptied after each emergency that discharges fire suppressant, water or fuel. The tank operator will need to use the strapping chart and stick gauge to determine quantity for disposal. The tank is not meant for storing hazardous substances other than emergency discharges that are expeditiously emptied and would not include connections that would allow any discharges to storm or sanitary sewer.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
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PART 1 GENERAL

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NOTE: This specification is intended for systems using factory-fabricated storage tanks with

capacities less than or equal to 227,000 L 60,000 gal. Additional system components/devices necessary to meet state and local regulations must be added by the designer.

The design and installation of underground factory-fabricated storage tanks must be coordinated with Base Environmental.

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1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO HB-17	(2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges
AASHTO M 294	(2021) Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO MP 20	(2013; R 2017) Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 1500-mm (12- to 60-in) Diameter

AMERICAN PETROLEUM INSTITUTE (API)

API MPMS 2.2E	(2004; Errata 2009; R 2009) Petroleum and Liquid Petroleum Products - Calibration of Horizontal Cylindrical Tanks - Part 1: Manual Methods

API RP 540	(1999; R 2004) Electrical Installations in Petroleum Processing Plants
API RP 1615	(2011) Installation of Underground Petroleum Storage Systems
API RP 2003	(2015; 8th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A48/A48M	(2003; R 2021) Standard Specification for Gray Iron Castings
ASTM A193/A193M	(2022a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A194/A194M	(2022) Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM B26/B26M	(2018; E 2018) Standard Specification for Aluminum-Alloy Sand Castings
ASTM D1784	(2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D3034	(2016) Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3350	(2021) Polyethylene Plastics Pipe and Fittings Materials
ASTM F679	(2016) Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F714	(2022) Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

ASTM F794	(2021) Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F844	(2019) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F894	(2019) Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	(2020) Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562/F2562M	(2015; R 2019) Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	(2013; E 2014) Standard Specification for 6 to 30 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe And Double Wall Pipe
ASTM F2764/F2764M	(2019) Standard Specification for 6 to 60 in. [150 to 1500 mm] Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881/F2881M	(2021; E 2021) Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
IEEE 1100	(2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2021; TIA 20-1; TIA 20-2; TIA 21-3) Flammable and Combustible Liquids Code

NFPA 70 (2023) National Electrical Code

NFPA 77 (2014) Recommended Practice on Static Electricity

NFPA 780 (2023) Standard for the Installation of Lightning Protection Systems

PETROLEUM EQUIPMENT INSTITUTE (PEI)

RP900-17 (2017) UST Inspection and Maintenance

STEEL TANK INSTITUTE (STI)

STI SP131 (2014) SP131 Standard for Inspection & Repair Underground Steel Tanks

UNDERWRITERS LABORATORIES (UL)

UL 58 (2018) UL Standard for Safety Steel Underground Tanks for Flammable and Combustible Liquids

UL 1316 (2018; Reprint Mar 2019) UL Standard for Safety Fiber Reinforced Underground Tanks for Flammable and Combustible Liquids

UL 1746 (2007; Reprint Dec 2014) External Corrosion Protection Systems for Steel Underground Storage Tanks

1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Grounding and Bonding

SD-03 Product Data

Underground Storage Tank; G[, [_____]]

Tank Protective Coatings; G[, [_____]]

Atmospheric Vent; G[, [_____]]

Independent Level Alarm System; G[, [_____]]

Manhole Containment Sump; G[, [_____]]

SD-06 Test Reports

Underground Storage Tank Tightness Tests; G[, [_____]]

Tank Manufacturer's Tests

Tank Fill Tests

Tank Inspection Reports; G[, [_____]]

SD-07 Certificates

Letter; G[, [_____]]

Manufacturer's Certification; G[, [_____]]

State Certification; G[, [_____]]

Pollution Liability Insurance

Permitting

Registration

Licensed Personnel

Demonstrations

STI SP001 Inspector's Certification; G[, [_____]]

SD-08 Manufacturer's Instructions

Underground Storage Tank

Independent Level Alarm System

SD-10 Operation and Maintenance Data

Underground Storage Tank; G[, [_____]]

Independent Level Alarm System; G[, [_____]]

SD-11 Closeout Submittals

Warranty

1.3 QUALITY CONTROL

1.3.1 Regulatory Requirements

1.3.1.1 Permitting

Obtain necessary permits in conjunction with the installation of storage tanks as required by federal, state, or local authority.

1.3.1.2 Registration

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NOTE: The designer must confirm with the DoD Installation the number of days required to obtain the permit documentation.
****

Obtain and complete all tank registration forms required by federal, state, and local authorities. Submit all completed tank registration forms within [30][_____] days after contract award to the Contracting Officer. The Contracting Officer will ensure the Base Environmental staff for the DoD Installation submits the forms to the proper regulatory agencies.

1.3.1.3 Licensed Personnel

Tank installers must be licensed by the state when required by state law or regulations.

1.3.2 Contractor Qualifications

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NOTE: Include specific local regulatory requirements into the specification as applicable.
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Each installation Contractor must have successfully completed at least 3

projects of the same or similar scope, and the same size or larger within the last 3 years and demonstrated specific installation experience in regard to underground tank installation. Submit a letter listing prior projects, the date of construction, a point of contact for each prior project, the scope of work of each prior project, and a detailed list of work performed. The letter must also include evidence of prior manufacturer's training, and other related information.

[State certified installers must be provided by the Contractor.]Each installation Contractor must have taken, if applicable, manufacturer's training courses on the installation of storage tanks and must meet all applicable licensing requirements in the state. Installers must also be trained and certified by the manufacturer to install the equipment and materials[and must be STI certified].[Contractor must have Pollution Liability Insurance.]

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect system components and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer, upon recommendation by Base Environmental for the DoD Installation. Replace damaged or defective items.

1.5 PROJECT/SITE CONDITIONS

Exposed moving parts, parts that produce high operating temperatures and pressures, parts that may be electrically energized, and parts that may be a hazard to operating personnel must be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Install safety devices so that proper operation of equipment is not impaired.

1.6 WARRANTY

All factory fabricated storage tanks must come with a manufacturer's warranty of a minimum period of 30 years. All warranty paperwork will be completed and submitted by Contractor to both the tank and system component manufacturers, the Contracting Officer, and the Base Environmental for the DoD Installation. This includes all applicable completed manufacturers' equipment installation checklists.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

This section defines the requirements for factory fabricated storage tanks used to contain fire suppressant discharge.

2.1.1 Design Requirements

2.1.1.1 Electrical Work

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NOTE: Coordinate the ignition temperature of the fuel(s) to be handled with the electrical design. Ignition temperatures will be as defined in NFPA 497. Fuel ignition temperatures will dictate the maximum allowable location classification of the electrical system components.

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2.1.1.1.1 Grounding and Bonding

Grounding and bonding must be in accordance with NFPA 70, NFPA 77, NFPA 780, API RP 540, API RP 2003, IEEE 142, and IEEE 1100. Provide jumpers to overcome the insulating effects of gaskets, paints, or nonmetallic components.

2.1.1.2 Earthwork

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NOTE: The designer developing the earthwork specifications will evaluate the need for a filter fabric to be installed between the native soil and the new backfill material. The intent of a filter fabric would be to prevent the displacement of new backfill material with native soil due to a high water table. If the new backfill material is displaced, it could affect the structural integrity of the tank. If a filter fabric is determined to be necessary, include the requirements for the new fabric in the excavation and backfilling specifications.

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Excavation and backfilling for tanks must be as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

2.2 MANUFACTURED UNITS

Provide materials and system components that are standard products of a manufacturer regularly engaged in the manufacturing of such products and that are of a similar material, design and workmanship. Provide materials and system components that have been in satisfactory commercial or industrial use for a minimum 3 years prior to bid opening. The 3 year period must include applications of the system components and materials under similar circumstances and of similar size. Provide materials and system components that have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 3 year period.

Internal parts and components of system components, piping, piping components, and valves that could be exposed to fuel during system operation must not be constructed of zinc coated (galvanized) metal, brass, bronze, or other copper alloys. Do not install cast iron bodied valves in piping systems that could be exposed to fuel during system operation.

2.2.1 Underground Storage Tank

Provide a factory fabricated double wall storage tank. Tank may be either steel with a non-metallic outer jacket or a double wall fiberglass tank. Tank must be designed and manufactured for an underground, horizontal installation. The exterior tank walls must be separated from the interior tank walls by standoffs; thus creating an open or interstitial space. The entire interstitial space must be monitorable for leaks.

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NOTE: Provide a concrete anchor pad(s) or deadmen for any tank that will be installed in areas subject to high water tables or flooding. Size the pad(s) or deadmen in accordance with API RP 1615. Require the tank to be connected to the pad(s) or deadmen in accordance with the tank manufacturer's recommendations.

Delete the bracketed sentences if concrete anchor pads or deadmen are not required.

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[For tanks requiring concrete anchor pads or concrete deadmen, provide holddown straps and accessories as recommended by the tank manufacturer. Use filler strips between the tank shell and any metal holddown straps that conform to the tank manufacturer's requirements.

]2.2.1.1 Double Wall Tank (Steel with Non-Metallic Jacket)

The primary tank must be constructed of steel and jacketed with a non-metallic secondary containment tank. The entire tank assembly must conform to UL 58 Type II and UL 1746 Part III. The UL 58 label must be affixed to the exterior surface of the tank.

2.2.1.2 Double Wall Fiberglass Tank

Provide a UL 1316 compliant fiberglass tank. The tank manufacturer shall be recognized by Underwriters Laboratories as a manufacturer of tanks listed to the UL 1316 standard. The UL 1316 label must be affixed to the exterior surface of the tank.

2.2.1.3 Tank Protective Coatings

2.2.1.3.1 Interior Surfaces

Use an SSPC QP-3 certified coating company to apply interior coating. Coat 100 percent of a metal tank's interior surfaces including all metal piping and metal appurtenances with the manufacturer's standard coating system.

2.2.1.4 Tank Piping Penetrations

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NOTE: Use tank manholes as the primary point of entry for piping penetrations unless unfeasible. Pipe penetrations into an underground storage tank are the most likely place for a leak to occur. Designing pipe penetrations to enter through a tank manhole allows each of the penetrations to be contained in a manhole containment sump. The piping that penetrates the manhole must be flanged on both sides of the manhole hatch. This will allow the piping to be removed from the manhole and allow removal of the manhole without having to cut the piping.

Where stand alone tank piping penetrations are required, indicate on the drawings the required number, size, and location of each penetration.

Flanged nozzles must be installed in locations with ISO Corrosivity Categories C3, C4, and C5.

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Provide a flanged pipe nozzle for each tank piping connection. All unused or spare tank piping penetrations must be sealed with a steel blind flange.

2.2.1.5 Tank Striker/Impact Plates

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NOTE: Striker plates under all openings used for manual gauging in steel tanks and all openings in fiberglass tanks.

****

Provide an interior striker/impact plate under the manual gauging/sampling hatch and each tank manhole and pipe connection. Each plate must be a minimum of 6 mm 1/4 inch in thickness, be larger in diameter than the tank penetration, fit the curvature of the tank bottom, and be completely coated in the same fashion as the interior tank bottom coating. Each plate must be welded or bonded to the tank bottom at the factory (full circumference connection). The welds must be non-destructive tested using the appropriate means.

2.2.1.6 Manual Gauging/Sampling Hatch

Provide a combination gauging and sampling hatch assembly. The assembly must include a bronze top-seal type adapter with a corresponding locking type cap (adapter and cap both externally-mounted to the top of the tank)[and a [steel] or [aluminum] stilling well pipe.][The stilling well pipe must be a minimum 100 mm 4 inches in size and extend downward through the top of the tank to within 75 mm 3 inches of the tank bottom. Provide the entire length of pipe inside the tank with 13 mm 1/2 inch wide by 300 mm 12 inches long slots at alternate locations. Coat the pipe in the same fashion as the interior tank bottom coating.]

2.2.1.7 Tank Manhole

****

NOTE: Indicate the number, size, and location of each tank manhole required.

Provide tanks 18,900L 5,000 gallons and smaller with a minimum of one 760 mm 30 inch tank manhole to allow for internal tank access. Provide tanks larger than 18,900 L 5,000 gallons with a minimum of two 915 mm 36 inch tank manholes (one manhole for access).

****

Provide tanks with a minimum of [2] [1] [_____] manholes. Tank manholes must have an internal diameter of [760 mm 30 inches] [813 mm 32 inches] [915 mm 36 inches]. Provide each manhole with a matching flanged watertight manhole cover. Manhole covers must be UL listed, be constructed of pressed or mild steel, and include a UL listed gasket.[Frame and cover assembly must be rated to withstand H-20 highway loading as defined by AASHTO HB-17.]

2.2.1.8 Atmospheric Vent

Provide atmospheric, updraft type cap no closer than 5 feet from any building openings. Cap must be constructed of aluminum or carbon steel. Cap must have an internal brass or bronze insect screen, minimum 40-mesh. Cap must prevent rain, snow, or ice from entering the vent piping.

2.2.1.9 Nameplates

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NOTE: In a salt water environment, substitute acceptable non-corroding metal such as, but not limited to, nickel-copper, 304 stainless steel, or monel. Aluminum is unacceptable. Nomenclature (or system identification) should be established by the designer.

Require melamine plastic nameplates for all NAVFAC projects. Also, for NAVFAC projects, require nameplates to be associated or keyed to system charts and schedules.

****

Attach nameplates to all specified system components defined herein. List on each nameplate the manufacturer's name, address, [contract number,] [acceptance date,] component type or style, model or serial number, catalog number, capacity or size, and the system that is controlled. Construct plates of [anodized aluminum] [stainless steel] [melamine plastic, 3 mm 0.125 inch thick, UV resistance, black with white center core, matte finish surface and square corners] [_____]. Install nameplates in prominent locations with nonferrous screws, nonferrous bolts, or permanent adhesive. Minimum size of nameplates must be 25 by 65 mm one by 2.5 inches. Provide manufacturer's storage tank nameplates as required. Lettering must be the normal block style with a minimum 6 mm 0.25 inch height. Accurately align all lettering on nameplates.[For plastic nameplates, engrave lettering into the white core.][Key the nameplates to a chart and schedule for each system. Frame charts and schedule under glass, and locate where directed near each system. Furnish two copies of each chart and schedule. Each nameplate description must identify its function.]

2.2.2 Manhole Containment Sump

****

NOTE: Require on the drawings a containment sump to be installed directly above each tank manhole. Do not require the sump to be connected in any way to the surfaces above (e.g., street manhole cover, concrete and similar accessories).

Typical installations include a street manhole cover to be installed directly above each sump in order to allow access to the sump and the tank manhole below. Size the manhole cover large enough to allow the removal of the sump access cover below.

****

Sump must be the factory fabricated, direct-buried type that provides a watertight connection either directly to the exterior of the tank or to a

flanged manhole opening. Sump must be constructed of fiberglass reinforced plastic. Sump construction must be chemically compatible with the type of products being handled within the connecting tank. Sump must allow access to a tank manhole cover without disturbing surrounding backfill. Sump must be larger in diameter than the connecting tank manhole. Sump must be designed to withstand the underground burial loads. Sump assembly must prevent the influx of rainfall drainage or ground water.

2.2.2.1 Piping Penetrations

Sump sides must allow the penetration of carrier pipes, exterior containment pipes, conduits, and vapor pipes as required. Sump penetrations must be booted or sealed to ensure that liquid will not escape from the sump in the event that the liquid level within the sump rises above the pipe penetration. Boots and seals used must be compatible with the fuel to be handled. Boots and seals must be water resistant to the influx of water from outside the sump. Boots and seals must be designed and installed to accommodate the anticipated amount of thermal expansion and contraction in the piping system.

2.2.2.2 Access Cover

****
NOTE: Require watertight covers if high ground water is a problem and frequent access to the manhole below is not necessary. Watertight covers are generally bolted or strapped down. Strapped down covers provide easy access to the sumps without the use of tools. Friction fit covers will prevent the influx of rainwater and are easily removable by hand.
****

Where indicated, the entire top of a containment sump must be capped with a [friction fit] [bolted down, watertight] [strapped down, watertight] access cover that allows water to flow away from the manhole. Cover must be constructed of the same material as the sump. Cover must have a larger diameter than the tank manhole cover below. Cover must be lightweight and not exceed 16 kilograms 35 pounds.

2.2.3 Interstitial Space Access Sump

Provide an access sump around the interstitial monitoring pipe to allow for manual monitoring of the interstitial space of the tank in accordance with RP900-17 Section 7.5.7. The monitoring pipe must be capped with a watertight [threaded cap,] [quick release cap,] [or other cap as may be recommended by the manufacturer]. Both the monitoring pipe and the sump will be labeled respectively as the "interstitial monitoring pipe" and "interstitial monitoring pipe access". Label must be affixed to the exterior surface of the tank

2.3 COMPONENTS

Provide materials and system components that are standard products of a manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship. Provide materials and system components that have been in satisfactory commercial or industrial use for a minimum 3 years prior to bid opening. The 3 year period must

include applications of the system components and materials under similar circumstances and of similar size. Provide materials and system components that have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 3 year period.

Internal parts and components of system components, piping, piping components, and valves that could be exposed to fuel during system operation must not be constructed of zinc coated (galvanized) metal, brass, bronze, or other copper alloys. Do not install cast iron bodied valves in piping systems that could be exposed to fuel during system operation.

2.3.1 Independent Level Alarm System

****

NOTE: Level alarms are recommended to ensure that the tank does not fill by infiltration in the drain line or other means. The containment tanks needs to remain empty so that it can contain fire suppressant discharge during the anticipated fire event.

Include the first bracketed sentence if multiple tanks are to be monitored as part of the design. Alarms for tanks less than 112,500 L 30,000 gallons must be provided by an automatic tank gauging system. Alarms for tanks equal to or greater than 112,500 L 30,000 gallons must be provided by an independent level alarm system (see below) in addition to an automatic tank gauging system.

****

Provide an independent level alarm system that will monitor [2] [_____] programmable liquid level setpoints. The system must delineate between each individual setpoint[as well as each individual tank]. The system must produce an audible and visible alarm in the event of monitoring an alarm condition. Mechanically-actuated float assemblies must be field adjustable. The system must be totally independent of the tank gauging system.

2.3.1.1 Setpoints

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NOTE: The suggested low-low level alarm setpoint for underground tanks is 5 percent tank capacity.

****

Configure the alarm system's setpoints in accordance with the following.

a. Low Level Setpoint. Produce an audible and visual alarm condition when a tank's liquid level rises above [10] [_____] percent capacity.

b. Low-Low Level Setpoint. Produce a visual alarm condition when a tank's liquid level rises above [5] [_____] percent capacity.

2.3.1.2 Independent Level Alarm Control Panel

****

NOTE: Indicate on the drawings the location of the

system control panel. Panels located outdoors will require NEMA 4 enclosures. Panels located indoors will only require a standard industrial enclosure. Explosion-proof enclosures are typically unavailable.
****

Install the control panel for the alarm system in a [NEMA 4 rated enclosure in accordance with NEMA 250] [standard industrial enclosure]. Panel doors must swing left or right.

2.3.1.2.1 Audible Alarm

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NOTE: If speakers external to the panel are necessary, indicate their location on the drawings.
****

Panel must have [internal] [external] speakers that produce a buzzer sound of [70] [_____] decibels or greater in the event of a detected alarm condition.

2.3.1.2.2 Visual Alarm

Panel must have a visual alarm that illuminates in the event of a detected alarm condition. The visual alarm must include either individual lights for each alarm condition or must include a single light and a liquid crystal display (LCD) panel that displaces information regarding each alarm condition.

2.3.1.2.3 Acknowledge Switch

Panel must have a manual acknowledge switch that will deactivate the audible alarm. The acknowledge switch must not deactivate subsequent audible alarms unless depressed manually again for each occurrence. Under no circumstance must this acknowledgement switch extinguish the visual alarms until the alarm condition has been corrected. The acknowledge switch must be an integral component located on the front of the control panel. The switch must be a [push button] [key switch].

2.3.1.2.4 Test Pushbutton

Panel must have a manual test pushbutton that will enable operators to verify that the panel is powered, and the visual and audible alarms are working properly.

2.4 MATERIALS

2.4.1 Piping

Pipe shall be of the sizes indicated and shall conform to the requirements Specified.

2.4.1.1 Poly Vinyl Chloride (PVC) Pipe

Submit the pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, prior to installation of the pipe.

2.4.1.1.1 Type PSM PVC Pipe

ASTM D3034, Type PSM, maximum SDR 35, produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.4.1.1.2 Profile PVC Pipe

ASTM F794, Series 46, produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.4.1.1.3 Smooth Wall PVC Pipe

ASTM F679 produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.4.1.1.4 Corrugated PVC Pipe

ASTM F949 produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.4.1.2 Polyethylene (PE) Pipe

Submit the pipe manufacturer's resin certification, indicating the cell classification of PE used to manufacture the pipe, prior to installation of the pipe. The minimum cell classification for polyethylene plastic shall apply to each of the seven primary properties of the cell classification limits in accordance with ASTM D3350.

2.4.1.2.1 Smooth Wall PE Pipe

ASTM F714, maximum DR of 21 for pipes 80 to 600 mm 3 to 24 inches in diameter and maximum DR of 26 for pipes 650 to 1200 mm 26 to 48 inches in diameter. Pipe shall be produced from PE certified by the resin producer as meeting the requirements of ASTM D3350, minimum cell class 335434C.

2.4.1.2.2 Corrugated PE Pipe

****

NOTE: Corrugated PE pipe culverts and storm drains shall not be installed beneath airfield pavements unless approved in writing by the major command. Type S pipe has a full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner. Type C pipe has a full circular cross-section, with a corrugated surface both inside and outside. Corrugations may be either annular or helical.

****

AASHTO M 294Type [S] [C]. For slow crack growth resistance, acceptance of resins shall be determined by using the notched constant ligament-stress (NCLS) test meeting the requirements of AASHTO M 294. Pipe walls shall have the following properties:

Nominal Size (mm) (inch)	Minimum Wall Area (square mm/m) (square in/ft)	Minimum Moment of Inertia of Wall Section (mm to the 4th/mm) (in. to the 4th/in.)
300 12	3200 1.5	390 0.024
375 15	4000 1.91	870 0.053
450 18	4900 2.34	1020 0.062
600 24	6600 3.14	1900 0.116
750 30	8300 3.92	2670 0.163
900 36	9500 4.50	3640 0.222
1050 42	9900 4.69	8900 0.543
1200 48	10,900 5.15	8900 0.543
1350 54	12,000 5.67	13,110 0.800
1500 60	13,650 6.45	13,110 0.800

2.4.1.2.3 Profile Wall PE Pipe

ASTM F894, RSC 160, produced from PE certified by the resin producer as meeting the requirements of ASTM D3350, minimum cell class 334433C. Pipe walls shall have the following properties:

Nominal Size (mm) (inch)	Minimum Wall Area (square mm/m) (square in/ft)	Minimum Moment of Inertia of Wall Section (mm to the 4th/mm) (in to the 4th/in)	
		Cell Class 334433C	Cell Class 335434C
450 18	6300 2.96	850 0.052	620 0.038
525 21	8800 4.15	1150 0.070	840 0.051
600 24	9900 4.66	1330 0.081	970 0.059
675 27	12,500 5.91	2050 0.125	1490 0.091
750 30	12,500 5.91	2050 0.125	1490 0.091
825 33	14,800 6.99	2640 0.161	2160 0.132
900 36	17,100 7.81	3310 0.202	2700 0.165
1050 42	16,500 8.08	4540 0.277	3720 0.227
1200 48	18,700 8.82	5540 0.338	4540 0.277

2.4.1.3 Steel Reinforced Polyethylene (SRPE) Pipe

SRPE pipe will meet the requirements of ASTM F2562/F2562M 200 - 3000 mm 8 - 120 inch diameter pipe and AASHTO MP 20(300 - 1525 (12 - 60 inch diameter pipe).

2.4.1.4 Polypropylene (PP) Pipe

Double wall and triple wall pipe with a diameter of 300 to 1525 mm 12 to 60 inches shall meet the requirements of ASTM F2736, ASTM F2764/F2764M, or ASTM F2881/F2881M.

2.5 ACCESSORIES

2.5.1 Stick Gauge

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NOTE: Provide each tank with a stick gauge and tank calibration chart. Provide a minimum of one additional gauge for each tank.
****

For each tank, provide [2] [_____] wooden stick gauges. Gauge length must allow the measurement of the entire level in the corresponding tank. Gauges must be compatible with the fuel to be measured (no swelling or damage from fuel contact). Provide gauge with non-sparking caps on each end. Mark gauges in m/mm in 1 mm increments feet/inches in 1/16 inch increments. Marking must be embossed into the stick and painted in a contrasting color impervious to water and hydrocarbon products.

2.5.2 Manual Interstitial Space Monitoring Equipment

Provide all equipment and materials required to monitor the interstitial space.

2.5.2.1 Dip Stick

Provide [2] [_____] dipsticks for manual interstitial space monitoring.

2.5.3 Tank Strapping Table

****
NOTE: Provide each tank with a tank calibration chart.

Reference API MPMS 2.2E is for horizontal tank applications. For tanks smaller than 19,000 L 5,000 gallons, choose tank manufacturer certified strapping tables.
****

Furnish [2] [_____] API MPMS 2.2E [tank manufacturer] certified strapping tables (calibration charts) for each tank. One of the tables must indicate the liquid volume in liters for each 1 mm of tank depth and the other in gallons for each 1/16 inch of tank depth. Strapping table volumes for all tanks 19,000 liters 5,000 gallons and larger must be determined using physical measurements and not calculated values. For each tank, provide an electronic media file of each strapping table.[For tanks larger than 19,000 L 5,000 gallons tank strapping must be performed after installation at the site.]

2.5.4 Concrete Anchor Bolts

Concrete anchors must conform to ASTM A307, Grade C, hot-dipped galvanized.

2.5.5 Bolts and Studs

Carbon steel bolts and studs must conform to ASTM A307, Grade B, hot-dipped galvanized. Stainless steel bolts and studs that conform to ASTM A193/A193M, Grade 8.

2.5.6 Nuts

Carbon steel nuts must conform to ASTM A563, Grade A, hex style, hot-dipped galvanized. Stainless steel nuts must conform to ASTM A194/A194M, Grade 8.

2.5.7 Washers

Provide flat circular washers under each bolt head and each nut. Washer materials must be the same as the connecting bolt and nut. Carbon steel washers must conform to ASTM F844, hot-dipped galvanized. Stainless steel washers must conform to ASTM A194/A194M, Grade 8.

2.5.8 Street Manhole Assembly

****

NOTE: Delete this paragraph if street manhole assemblies are addressed in the Civil specifications.

Style A frames are for manholes up to 760 mm 30 inches in diameter. Style B frames are for manholes between 915 and 1070 mm 36 and 42 inches in diameter.

****

Round street manhole frames and covers must be the straight traffic type. Frames and covers must be constructed of [cast steel in accordance with ASTM A27/A27M, grade 60-30 as a minimum] [cast iron in accordance with ASTM A48/A48M] [aluminum in accordance with ASTM B26/B26M] [or] [a engineered lightweight laminate material].[Covers must be the solid plate type with a checker pattern.] Covers must form a watertight seal with the manhole frame to prevent surface water inflow. Frame and cover assembly must be rated to withstand H-20 highway loading as defined by AASHTO HB-17.

PART 3 EXECUTION

3.1 INSTALLATION

****

NOTE: During design, layout system components to allow adequate access for routine maintenance. Do not rely solely on the Contractor to make these judgments. Show access doors where applicable for maintenance.

****

Install work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Handle storage tanks with extreme care to prevent damage during placement and install in accordance with the manufacturer's installation instructions and NFPA 30. Inspect the exterior surface of each tank for obvious visual damage prior to and during the placement of each storage tank. Repair surface damage to a

storage tank according to manufacturer's requirements before proceeding with the system installation. Provide the termination of fill lines within a tank with an antisplash deflector. Provide nylon dielectric bushings on pipe connections to a steel tank.

3.1.1 Underground Storage Tank

Install underground storage tanks in accordance with API RP 1615 except as modified herein. Place tank on a 3 mm per 30 mm 1/8 inch per foot slope with the fill point at the low end and the vent connection at the high end. Locate tank so that discharge pipes slope up uniformly toward the outlet. Install containment sumps prior to any backfill being added above the storage tanks.

3.1.1.1 Steel Underground Storage Tank Handling

Store, handle, and place externally coated steel tanks with care and in a manner that will minimize damage to the coating and will not reduce its protective value. Place coated tanks in position carefully and with a minimum of handling. Prior to backfilling a tank, visually inspect the tank exterior protective coating for damage. Repair any damaged tank coating in accordance with the appropriate UL standard, UL 1746 or UL 58.

3.1.1.2 Steel Underground Storage Tank Installation Procedures

****

NOTE: Provide straps and anchors designed to prevent flotation of underground tanks located in areas with high groundwater level or subject to flooding. Provide electrical isolation strips between hold-down straps and metal tanks. Anchors may be concrete anchor slab under the tank or concrete deadmen. Tailor paragraph to suit design. Underground storage tanks occasionally rely on backfill and top slab to hold the tank in place in addition to the hold down straps and concrete deadmen. When new or existing USTs are exposed, the contractor must take steps to ensure the tank remains safely in place without damage. Manufacturer's suggestions for installation of new tanks must be followed and used on existing tanks until the tank is safe from damage due to a sudden or slow influx of water. Existing hold down straps must be inspected to assure they are adequate for holding the tank in place and compromised hold downs reported to the Resident Engineer with a suggested solution. The recommendations of API 1615 must also be followed.

****

[Set tank on a minimum of 150 mm 6 inches of backfill material.][Anchor tank to a reinforced concrete anchor pad as indicated using manufacturer's supplied holddown straps. Separate tank from an anchor pad by a minimum of 300 mm 12 inches of backfill material. Coat metal straps, turnbuckles, anchors, and accessories to resist corrosion.]Uniformly place backfill material around the entire tank and extend to grade level. Inspect tank cathodic protection anodes, if applicable, to ensure integrity during backfill operations.

3.1.1.3 Fiberglass Underground Storage Tank Handling

Handle tank with extreme care to prevent damage during installation and transportation to the site. Any damaged tank must be replaced or repaired and tested under direct supervision and advice of the tank manufacturer, using the manufacturer's written procedures.

3.1.1.4 Fiberglass Underground Storage Tank Installation Procedures

****

NOTE: Provide straps and anchors designed to prevent flotation of underground tanks located in areas with high groundwater levels or subject to flooding. Anchors may be a concrete anchor slab under the tank or concrete deadmen. Tailor paragraph to suit design. Underground storage tanks occasionally rely on backfill and top slab to hold the tank in place in addition to the hold down straps and concrete deadmen. When new or existing USTs are exposed, the contractor must take steps to ensure the tank remains safely in place without damage. Manufacturer's suggestions for installation of new tanks must be followed and used on existing tanks until the tank is safe from damage due to a sudden or slow influx of water. Existing hold down straps must be inspected to assure they are adequate for holding the tank in place and compromised hold downs reported to the Resident Engineer with a suggested solution. The recommendations of API 1615 must also be followed.

Use 12 inches of backfill in Maryland. Maryland requires 12 inches of backfill under a UST.

****

[Set tank on a minimum of[300 mm 12 inches] [150 mm 6 inches] of backfill material.][Anchor tank to a reinforced concrete anchor pad as indicated through the use of manufacturer's supplied holddown straps. Separate tank from an anchor pad by a minimum of 300 mm 12 inches of backfill material.]

3.1.2 System Components

Properly level, align, and secure system components in place in accordance with manufacturer's instructions. Provide supports for system components, appurtenances, and pipe as required. Install anchors, bolts, nuts, washers, and screws where required for securing the work in place. Sizes, types, and spacing of anchors and bolts not indicated or specified must be as required for proper installation.

3.2 FIELD QUALITY CONTROL

3.2.1 Underground Storage Tank Tightness Tests

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NOTE: Pneumatic tests are the preferred type of tightness tests. Brine level tests will only be specified for Fiberglass tanks. Delete the inapplicable tests.

****

Perform a tightness test on each underground storage tank on-site just prior to their placement into the ground. Pneumatically pressurize each storage tank's primary chamber to 35 kPa 5 psig and monitor for a drop in pressure over a 2-hour period during which there must be no drop in pressure in the tank greater than that allowed for thermal expansion and contraction. Following the successful completion of the primary chamber test, bleed the pressure from the primary chamber into the interstitial space. Maintain this pressure while applying soapsuds or equivalent material over the exterior of the tank. While applying the soapsuds, visually inspect the entire tank, including the bottom surfaces, for leaks (bubble formations). Inspection of the bottom surfaces of a tank may be performed by rotating the tank; however, a tank must only be rotated in strict accordance with the manufacturer's recommendations. Do not rotate a tank more than 90 degrees from the upright position. During testing, install a pressure relief device that relieves at the tank manufacturer's suggested pneumatic pressure limit. Gauges used in pneumatic tests must have a scale with a maximum limit of 103 kPa 15 psig.

3.2.1.1 Brine Level Test

In lieu of the pneumatic testing procedures described above, a brine level test may be performed on the interstitial space of double-walled Fiberglass tanks (not applicable to steel tanks). For a brine level test, completely fill a Fiberglass tank's interstitial space with a brine solution. Connect a riser pipe to the interstitial space that will allow the solution to rise within the riser at least 300 mm 12 inches. After filling the interstitial space, the tank must set approximately 3 hours. Following the 3-hour period, measure and record the level of solution within the riser. After a subsequent 4-hour period, again measure and record the level of solution within the riser. If the level of solution within the interstitial decreases anytime during the test, the tank is considered leaking and therefore fails the test.

3.2.1.2 Repairs

Repair leaks discovered in either the primary chamber or the interstitial space in accordance with the tank manufacturer's instructions. Following any tank repairs, re-test the tank until the tank successfully passes the testing requirements defined herein.

3.2.2 Tank Manufacturer's Tests

In addition to the tests required herein, perform any additional tests (i.e., leak tests) on each storage tank that are required by the tank manufacturer's written test procedures. Manufacturer's tests that are redundant to tests already required by this specification will only be performed once per tank. Repair all leaks discovered during the tests in accordance with manufacturer's instructions. Following tank repairs, re-test the tank until the tank successfully passes the manufacturer's testing requirements.

3.2.3 Tank Inspection Reports

Prior to system commissioning, a certified inspector must inspect the completed underground tank in accordance with STI SP131 and deliver a full report to the Contracting Officer. The report must include the tank data plate information and photograph of the tank data plate. The paper and electronic copies of the report and UTMs must be provided to the

Contracting Officer for filing with the tank's "as-built drawings." Refer to Section 01 45 00.00 20 QUALITY CONTROL for STI SP001 Inspector's Certification requirements.

3.3 DEMONSTRATIONS

Conduct a training session for designated Government personnel in the operation and maintenance procedures related to the system components and systems specified herein. Include pertinent safety operational procedures in the session as well as physical demonstrations of the routine maintenance operations. Furnish instructors who are familiar with the installation/system components and systems, both operational and practical theories, and associated routine maintenance procedures. The training session must consist of a total of [_____] hours of normal working time and must start after the system is functionally completed, but prior to final system acceptance. Coordinate with the Contracting Officer prior to scheduling onsite training and agree on a proposed date for conducting the training session. Notify the Contracting Officer at least 14 working days prior to the proposed training date.

3.4 Tank Fill Tests

Fill each storage tank to verify the tank level alarm system operates properly. Stop filling each tank when the operation of all alarms is verified. Correct and retest any problems with the level alarm system until alarms operate as specified herein.

-- End of Section --