SECTION 136000

MOTOR FUEL UNDERGROUND STORAGE TANKS

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 1 Specification with completely editable text; therefore, any portion of the text can be modified by the A/E preparing the Solicitation Package to suit the project.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
	1. SUMMARY
		1. Related Documents: The work of this Section is governed by Division 1.
		2. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
		3. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.
		4. In general, the work of this Section includes furnishing labor, equipment and materials necessary to perform the excavation, de-watering, bedding, backfilling, shoring and installation of underground storage tanks specified or indicated in the Contract Documents.
		5. Related work specified in other Sections includes, but is not necessarily limited to:
			1. Section 136005 (R&A) Removal of Underground Storage Tanks
			2. Section 136010 Underground Motor Fuel Piping and Related Systems
			3. Section 136020 Motor Fuel Electrical System
			4. Section [ ]
	2. REFERENCES
		1. American Petroleum Institute:
			1. API 12P - Fiberglass Reinforced Plastic Tanks.
			2. API 1615 - Installation of Underground Petroleum Storage Systems.
			3. API 1632 - Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems.
			4. API 2000 -Venting Atmospheric and Low-Pressure Storage Tanks: Non-refrigerated and refrigerated.
		2. ASTM International:
			1. ASTM D4021: Glass Fiber Reinforced Polyester Underground Petroleum Storage Tanks.
			2. ASTM C136: Standard Test Method for Sieve Analyses of Fine and Coarse Aggregates.
			3. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics Using Modified Effort
		3. NACE International:
			1. NACE RP-02-85 - Corrosion Control of Underground Storage Tank Systems by Cathodic Protection.
		4. National Fire Protection Association:
			1. NFPA 30 - Flammable and Combustible Liquids Code.
			2. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages.
			3. NPFA 70 – National Electrical Code
		5. International Code Council
			1. International Fire Code
		6. Petroleum Equipment Institute:
			1. PEI RP100 - Recommended Practices for Installation of Underground Liquid Storage Systems.
		7. Underwriters Laboratories Inc.:
			1. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
			2. UL 913 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.
			3. UL 1316 - Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products.
	3. DEFINITIONS
		1. Degree of Compaction: Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.
	4. SUBMITTALS
		1. Comply with [ ] General Requirements.
		2. Shop Drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including, but not limited to:
			1. Tank bedding and backfill material.
			2. Dewatering plan.
			3. Underground Storage Tanks.
			4. Anchors and supports.
			5. Shoring.
		3. Test Reports: Submit written test results for all tests as outlined in this specification.
		4. Manufacturer’s Field Reports: Submit report of each visit of manufacturer’s representative to provide technical assistance during installation.
		5. State Installer Certification: Certify tank installers employed on the Work, verifying that all workers meet State installer requirements.
		6. Record Drawings: Submit record drawings in accordance with [ ].
		7. Operation and Maintenance Manuals: Submit copies of the Operation and Maintenance Manual in compliance with Closeout Submittals.
		8. Manufacturer certifications: Submit manufacturer certifications for underground piping and environmental monitoring system installers.
	5. CLOSEOUT SUBMITTALS

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**NOTE TO SPECIFIER**

Closeout documents are critical for the successful fueling system project, because a complete set of closeout documents is necessary for the facility to meet life-cycle compliance requirements. This specification section is intended to be highly detailed, as experience has shown that contractors are much better able to comply with a detailed list including specific state and other regulatory forms and reports, and manufacturer checklists. As such, this section should be made as specific as possible. The state or other governing UST regulatory program will have most of the information needed for the appropriate level of specificity. Also, consult manufacturers for their installation checklists and test reports. The final closeout list should be coordinated with the “field quality control section” such that all test forms identified there as required, are included in the closeout list.

Coordinate this section with the corresponding section in 136010 and 136020.

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* + 1. Comply with pertinent provisions of [ ]. In addition, comply with the specifics and additional provisions of this chapter. For the purposes of this section, the terms “Manuals and Instructions” and Closeout Documents” are used interchangeably.
		2. Coordinate closeout submittals with Sections 136010 and 136020 to provide a single package for the project.
		3. Format of Closeout Documents, including Operation and Maintenance Manuals and Record Document
			1. Provide Electronic (pdf format for documents and jpeg format for photos) of all closeout documents, record documents, drawings, manuals, operating instructions, warranties, and all other documents referenced in this and related sections. Submission shall be on CD-ROM discs readable by Windows operating system. Files should be organized in logical folders and subfolders.
			2. In addition, provide bound manuals with all closeout documents, including record documents and drawings. Provide two (2) bound manuals/sets of documents. Bind Manuals in hardcover, three-ring binders, and provide identified dividers with tabs. Use multiple volumes as needed. Do not use three ring binders larger than 3 inches. Copies of faxed pages are unacceptable.
			3. Obtain at time of purchase of equipment, two (2) copies of operation, lubrication and maintenance manuals for all items. Assemble these manuals in the three ring binders above, and provide electronic versions.
			4. Furnish hard copy and electronic manuals for the fuel system to Engineer for approval and distribution to Owner within 30 days of completion of the fuel system. Included shall be 8 hours of training and review at which time the contractor shall review the contents of closeout documents with fuel system operating personnel.
		4. Manuals, Instructions, and Closeout Documents shall include the following items. Items shall be for the new fuel system facility:
			1. A minimum of 96 high resolution (no less than 4 mega-pixels) digital (.jpeg format) photographs depicting the installation at each critical construction phase. Particular attention should be paid to underground, buried, and normally inaccessible components.
			2. UST installation/warranty checklist with proof of delivery to manufacturer.
			3. Environmental Monitoring System final setup printout.
			4. Underground sump test records (tank top, and intermediate/transition sumps)
			5. Copies of any State/Local approvals, authorizations, permits, and registrations to include:
				1. [ ];
				2. [ ];
				3. [ ].
			6. Tank Test Results, and Test Results for all secondary containment structures or annuluses and all containment sumps.
			7. Records of all other inspections and tests to include:
				1. [ ]; and
				2. [ ].
			8. Tank certificate, licenses, and/or registration to include [ ].
			9. Warranties for all equipment and apparatus. In general, any product manufacturer documentation that was provided with the equipment shall be provided as part of the closeout documents. Any warranty requiring forms or checklists shall be completed and fully executed.
			10. Training certification for instruction seminars signed by the individuals trained on these systems.
			11. All instruction bulletins, preventive maintenance schedules, operational instructions, and parts lists provided with the tanks, and all other systems.
			12. Waste disposal documentation (if any).
			13. Other environmental information or permits (if any).
			14. Copies of receipts for any keys, locks, or other equipment turned over to the Owner.
			15. Operating and installation manuals and instructions for each piece of equipment that was provided with manuals or instructions, including but not limited to the tank installation instructions.
	1. QUALITY ASSURANCE
		1. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation and testing of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.
		2. Substitutions: Comply with [ ].
		3. Materials and Equipment shall be manufactured, installed, and tested as specified in latest editions of applicable publications, standards and ruling of:
			1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.
			2. National Fire Protection Association (NFPA).
			3. Occupational Safety and Health Act (OSHA).
			4. Factory Mutual Association (FM).
			5. Underwriter’s Laboratories (UL).
			6. American Petroleum Institute (API).
		4. The most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents:
			1. American National Standards Institute (ANSI).
			2. American Society of Mechanical Engineers (ASME).
			3. National Electric Manufacturers Association (NEMA).
			4. American Society for Testing of Materials (ASTM).
			5. American Welding Society (AWS).
			6. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
		5. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrow materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.
		6. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by this Contractor.
		7. Quality assurance testing to validate results of quality control tests performed by the Contractor’s testing laboratory shall be performed by an independent testing laboratory retained and compensated by the Owner.
		8. All fuel system equipment shall be compatible with oxygenated fuel blends including up to 15% Ethanol and 20% biodiesel blend.
		9. Complete the gasoline system installation in accordance with the requirements of the State of [ ].
		10. Comply with the testing and field quality control requirements elsewhere in this section.
	2. PERMITS AND SUBMISSIONS
		1. The Contractor shall be responsible for all permits and notifications required by State and Local codes and regulations.
		2. Specifically at a minimum, the Contractor shall make the following submissions to the State of [ ] Department of [ ]:
			1. [ ].
			2. [ ].
			3. [ ].
			4. [ ].
		3. The Contractor shall also be responsible for the making the following submission to the [ ] Weights and Measures:
			1. [ ].
		4. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.
	3. QUALIFICATIONS
		1. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.
		2. Tank Installer: Company specializing in performing Work of this section with minimum ten years documented experience. The Contractor installing the Gasoline System shall be a State certified installed when required.
	4. GENERAL CONDITIONS
		1. Lines and grades shall be as indicated. Establish and maintain temporary benchmarks on the site for reference. All vertical dimensions shall be verified from these benchmarks.
		2. All permanent benchmarks shall be protected from disturbance or destruction. Any point disturbed or destructed shall be immediately replaced by a qualified surveyor at this Contractor’s expense. Documentation of any such relocation or replacement shall be given to the Engineer.
		3. Disposition of Utilities
			1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified or directed.
			2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug or cap as directed by the Engineer.
			3. Provide a minimum of a 48 hour notice to the Engineer and receive written notice to proceed before interrupting any utility.
		4. Stockpiling of topsoil and other excavated materials will be permitted on-site within the project limits on a case by case basis provided the stockpiles are constructed and maintained in a manner that does not create a foreign object damage risk or adversely affect any other ongoing construction or operation at the site.
		5. During windy or wet conditions and at the conclusion of each day’s work period, cover all excavated material to prevent it from becoming saturated or being displaced by wind or rain. Anchor all sides of covering as required to hold the covering firmly in place. In all cases, provide additional measures as necessary to prevent erosion, sedimentation and wind-borne displacement of excavated materials from their stockpiled location.
		6. Before beginning any work specified in this Section, the Contractor shall make certain that all applicable soil erosion and sediment control requirements are compiled with and the proper authorities have been informed of the construction schedule.
		7. Provide the services of a registered land surveyor to lay out all fuel related work perform under this Contract.
	5. DELIVERY, STORAGE, AND HANDLING
		1. Comply with [ ].
		2. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage and erection until final acceptance from the Owner.
	6. ENVIRONMENTAL REQUIREMENTS
		1. Comply with [ ].
		2. Do not install underground piping when bedding is wet or frozen.
	7. FIELD MEASUREMENTS
		1. Verify field measurements prior to fabrication.
	8. COORDINATION
		1. Comply with [ ].
	9. WARRANTY
		1. All tanks shall carry a 30 year warranty.
1. PRODUCTS
	1. EARTHWORK MATERIALS
		1. Underground Storage Tank Bedding and Backfill Material
			1. Provide UST bedding and backfill material in strict accordance with the tank manufacturer’s installation instructions.
			2. Provide a laboratory Certificate of Sieve Analysis (ASTM Method C136) to the Owner for approval prior to backfilling.

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**Note to specifier**

Adjust general site fill materials (crushed stone and crushed gravel) to meet site specific conditions or to meet the recommendations of a geotechnical report. Do not vary tank backfill materials from that required by that tank manufacturer.

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* + 1. Granular Fill
			1. Crushed stone and similar base materials shall be material that will compact and adequately bond under watering and rolling. Base course materials are to be placed in one or more layers, rolled thoroughly, and compacted until the material does not creep or wave ahead of the roller. All coarse aggregates shall be removed, and the finish surface of the base must be firm and free of loose material.
			2. Crushed gravel or crushed rock shall be 1-1/2 inch minus, free from dirt, clay balls, and organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction, and less than 8% by weight passing the No. 200 sieve.]
		2. Geotextile Fabric
			1. Provide geotextile fabric for all underground storage tank installations.
			2. Geotextile fabric shall be "ProPex 4545" manufactured by the Amoco Corporation. approved equal, or as specified by the tank manufacturer.
	1. CONCRETE
		1. Concrete for tank cover pad and fuel dispensing apron shall have a minimum 28-day compressive strength of 3000 psi, with a maximum slump of 4 inches. Concrete shall be broom finished.
		2. Reinforcing bar shall comply with ASTM A-615.
	2. UNDERGROUND GASOLINE STORAGE TANKS
		1. Manufacturer:
			1. Containment Solutions, Inc.
			2. Xerxes
			3. ZCL
		2. All underground storage tanks shall be constructed of fiberglass reinforced plastic (FRP) and carry a UL-1316 listing.
		3. The contractor shall provide UL labeled model fiberglass underground storage tank in sizes and with fittings shown on the contract drawings.
		4. Tanks shall be tested and installed with pea gravel or approved alternate backfill material according to the current installation instructions provided with the tank.
		5. Loading Condition
			1. Tank shall be designed to meet the following design criteria:
				1. External hydrostatic pressure: Buried in ground with seven feet of cover over the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.
				2. Surface loads: When installed according to manufacturer’s installation instructions, tanks will withstand surface H-20 axle loads (32,000 lbs./axle).
				3. Internal load: Primary and secondary tanks shall withstand five PSI air pressure test with 5:1 safety factor.
				4. Tanks shall be designed to support accessory equipment such as heating coils, ladders, drop tubes, etc. when installed according to manufacturer’s recommendations.
		6. Product Storage Requirements
			1. All primary tanks must be vented. Tanks are designed for operation at atmospheric pressure only.
			2. Tanks shall be capable of storing liquids with specific gravity up to 1.1.
		7. Dimensional Requirements
			1. Nominal capacity and dimensions of the tank shall be as shown on the Contract Documents.
		8. Monitoring Capabilities
			1. Tanks shall have a space between the primary and secondary shell walls to allow the free flow of containment of all leaked product from the primary tank.
			2. The following continuous monitoring conditions shall be compatible with the cavity between the inner and outer tanks:
				1. Vented to atmosphere.
				2. Vacuum -5 PSI maximum.
				3. Positive air pressure: 5 PSI maximum.
				4. External hydrostatic pressure: 7 feet maximum groundwater head pressure over top of tank.
			3. Tanks shall have an integrally mounted reservoir installed on the tank for hydrostatic monitoring. The reservoir shall be constructed of fiberglass reinforced plastic materials and warranted for 30 years against failure due to internal/external corrosion and when properly installed, against structural failure.
			4. Tank shall be designed with one 4 inch fitting that will access the tank bottom between the primary and secondary walls (annular space).
			5. The double wall tank monitor shall be capable of detecting a breach in the inner and/or outer tank under the following installed conditions:
				1. When the inner tank is empty.
				2. When the inner tank is partially or completely full and the groundwater is below the tank bottom.
				3. When the inner tank is partially or completely full and the tank is partially or completely submerged in ground water.
			6. The leak detection performance of the hydrostatic monitoring system shall be tested and verified by a qualified independent consultant to detect leaks as small as 0.10 gallons per hour within a one month period.
			7. All monitoring equipment, including FRP reservoirs and electronic controls, shall be UL listed or accepted.
			8. The solution used in the tank annular space shall have UL approval for compatibility with the tank and be contrasting color to the tank surface to facilitate visual inspection of the tank for leak prior to burial.
		9. Accessories
			1. Anchor Accessories
				1. Anchor Straps: Provide glass fiber reinforced plastic anchor straps for each tank. Number and location of straps shall be as specified by manufacturer. Each strap shall be capable of withstanding a maximum load of each tank diameter as shown.

Tank Diameter Max. Load (lbs.)

4 feet 4,200

6 feet 18,000

8 feet 25,000

10 feet 25,000

* + - * 1. Straps shall be standard as supplied by the tank manufacturer. Hardware shall be mastic coated and wrapped in geotextile fabric.
			1. Deadmen: Tank hold down deadmen shall be factory fabricated and supplied by the tank manufacturer.
			2. Certification Plate
				1. Underwriters Laboratories label shall be permanently affixed to each tank.
			3. Flanged Manways
				1. Flanged manways shall be provided as specified in the contract drawings.
				2. All manways will be furnished complete with UL listed gaskets, bolts and covers.
				3. Location: Refer to details on Contract Documents.
			4. Fill Tubes
				1. Fill tubes of shall be provided by the contractor as specified on the Contract Documents.
			5. Hydrostatic Monitor Accessories
				1. Brine Antifreeze

Brine Solution Designation: BAS-30 Chemical Composition: 30%+ calcium chloride, 1% to 3% potassium chloride, 1% to 2% sodium chloride, Balance water Visual Appearance: Green in color, Odorless fluid, Specific Gravity @ 60°F: 1.272-1.317 Factory installed.

Reservoir Sensor – A reservoir sensor manufactured by the environmental monitoring system manufacturer shall be provided.

Tank Gauge Probe – A tank level probe as specified in Section 136.020 Motor Fuel Electrical Systems Part 2.15 Environmental Monitoring System shall be installed

* + - * 1. Watertight Turbine Enclosures – Watertight FRP turbine enclosures, manufactured by the tank manufacturer, shall be furnished by the Contractor, in accordance with the Contract Documents.
	1. Tank Top Equipment: All tank top equipment shall meet the Phase I EVR standard as defined by the California Air Resources Board.
1. EXECUTION
	1. GENERAL
		1. The installation of underground storage tanks and all fuel system equipment shall be conducted in strict accordance with the manufacturer’s installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
		2. Install underground tanks and all fuel system equipment in accordance with the requirements of all State and Local codes and regulations including, but not limited to, the State [ ], the State of [ ] Fire Code as adopted and amended by the State of [ ], and The International Fire Code and NFPA 30A.
	2. DRAINAGE AND DEWATERING
		1. The Contractor is responsible for the collection and disposal of all surface and subsurface water encountered during construction.
		2. Drainage
			1. So that construction operations progress successfully, completely drain the construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide surface water runoff away from the construction activity and/or provide temporary ditches, dikes, swales and other drainage features and equipment as required to maintain dry soils and prevent erosion. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.
		3. Dewatering
			1. The Contractor shall not allow water to accumulate in excavations. Surface water must be prevented from flowing into excavations and from flooding the Project site. The Contractor shall be responsible for all equipment and labor necessary for the removal of all surface water that enters the excavation. Remove water from excavations to prevent softening of foundation bottoms, undercutting of footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain portable holding tanks, pumps, well points, sumps, suction and discharge water lines, and other dewatering system components to convey water away from excavations. Maintain erosion control measures to prevent sediment from leaving the work area.
			2. Groundwater flowing toward or into the excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in excavation and to eliminate interference with orderly progress of construction.
			3. [A geotechnical report is available.] The Contractor shall be responsible for all dewatering of the tank excavation necessary to complete the installation in accordance with manufacturer requirements. The Contractor is responsible for securing all State and Federal permits for the discharge of groundwater.
			4. All dewatering shall be accomplished in strict accordance with all Federal, state, and local requirements, and in strict accordance with all applicable general or site specific dewatering permits.
			5. Unless authorized by the Owner, bulk transportation and disposal of excavation water at an off-site facility will not be allowed.

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**NOTE TO SPECIFIER**

Pay particular attention to this section on dewatering. Permitting groundwater discharges, especially if to surface water, especially from a site that has an existing UST use, can be involved, and may require a groundwater discharge permit or notification of intent under the remediation general permit. Understanding that the direction here is for this to be the contractor’s responsibility, if a difficult dewatering situation is predicted as part of the design process, more detail to the contractor, or the development of a dewatering plan prior to bidding, may be desired.

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* + - 1. The Contractor shall be responsible for filing all permits to allow groundwater discharges to surface or groundwater.
	1. SUBGRADE GEOTEXTILE FABRIC
		1. The installation of geotextile fabric is required under all tank backfill and bed materials in accordance with tank manufacturer instructions. Place synthetic filter fabric as indicated directly on prepared subgrade free of vegetation, stumps, rocks and other debris which my puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of three feet overlap in all directions. Overlap fabric at joints a minimum of three feet. Obtain approval of filter fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturer’s recommended installation procedures.
	2. BACKFILL AND FILL MATERIAL PLACEMENT – OTHER THAN TANK EXCAVATIONS
		1. Backfilling shall not begin until construction below finish grade has been approved, underground utilities or fuel and related piping installations have been inspected, tested, and approved.
		2. Excavation:
			1. The area under new concrete slabs and/or footings, concrete and/or asphalted paving, and concrete walkways shall be excavated to the depth indicated on the Contract documents. Unless otherwise directed, all excavated native soil must be replaced with approved backfill material. Allowance must be made for the required base and sand or gravel cushion-leveling course. The area of the foundations and footings shall be proof rolled to detect any soft zones. All soft zones must be removed and replaced with select material compacted to 95% maximum dry density (ASTM D 1557), as tested by the Contractor.
			2. Structures and utilities located within the excavated area shall not be disturbed without prior approval by the Owner. The Contractor shall protect all structures and utilities to remain so as to prevent disruption of facility operations.
			3. The Contractor shall provide the necessary shoring, sheeting or bracing as required by OSHA and other applicable regulatory agencies for any trenching or similar excavation. All shoring materials used shall be in good, serviceable condition, and carried down as the excavation progresses.

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**NOTE TO SPECIFIER**

The A/E shall determine if shoring will be required, or if general direction to maintain safe slopes will be given to the contractor. Experience has shown that if the contractor is not required to shore in the specification, it will generally not be included in the bid price. In the alternative, if the A/E determines from the geotechnical or site conditions that shoring will be beneficial to the project, it should be specific as mandatory here. Adjust this language as necessary for the site specific approach. If shoring will not be required, use alternate language to direct the contractor to maintain safe excavations.

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* + 1. Sheeting and Shoring
			1. Engineered excavation support shall be required for all underground storage tank excavations. *Or* [The Contractor is responsible for maintaining safe excavations through the project, including safe slopes and/or engineered excavation support.]
			2. The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of sheeting, shoring and bracing as necessary to complete the installation and/or removal of underground storage tanks, and as required by OSHA and other applicable regulatory agencies for any trenching or similar excavation. The required construction shall meet all applicable federal, state, and local regulations. All shoring materials used shall be in good, serviceable condition, and carried down as the excavation progresses. Shoring shall be removed after tank is backfilled.
			3. All material shall conform to the minimum requirements of applicable federal, state, and local codes and/or regulations.
			4. Pressures on sheeting and the stability of the sheeting and bottom of the excavation are dependent not only on soil conditions but on many procedures and options available to the Contractor, such as dewatering, staging of excavation, installation of bracing, flexibility of sheeting, construction equipment used, and time of completing the work. All such factors shall be considered in the design of the sheeting and bracing.

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**NOTE TO SPECIFIER**

Adjust this language based on the availability of geotechnical information. Generally, it is beneficial to know soil conditions, groundwater depth and depth to bedrock before undertaking a UST installation.

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* + - 1. Shoring shall be designed and provided by the Contractor.
			2. The Contractor shall submit drawings, computations and substantiating data prepared, signed, and sealed by a professional engineer licensed in the State of [ ], and shall be submitted to the Owner in accordance with project submittal requirements. The plans shall show the proposed sheeting design and method of construction. Any review or comments by the Owner shall not relieve the Contractor of his responsibility for proper sheeting and bracing.
			3. The contractor shall design the shoring system having consulted the project geotechnical report. The contractor shall review the geotechnical report and design the shoring system accordingly. No additional compensation will be provided for conditions that were identified in the report.
			4. During the installation of the shoring and bracing and as long as the excavation is open, the Contractor shall monitor the work to ensure that it is carried out in accordance with the design and procedures.
			5. Before commencing work the Contractor shall check and verify all dimensions and elevations. The Contractor shall be solely responsible for the proper alignment and fit of the proposed tank installation.
			6. Dewatering and groundwater treatment may occur in conjunction with the sheeting and shoring operation. It is the Contractor's responsibility to ensure that such dewatering activities do not adversely impact upon the sheeting and shoring. Any movement in the sheeting and shoring shall be corrected immediately, and corrective measures enacted to ensure no further movement.
			7. The Contractor shall make every effort to reduce noise, vibration, and other adverse conditions which may result from the installation of the sheeting and shoring.
			8. If the excavation is to be left unattended, the Contractor shall erect and maintain solidly constructed fencing to restrict unauthorized access. The use of orange construction fence, flashing barriers, or similar measures will not be allowed.
		1. Material Disposal
			1. The Contractor shall dispose of all excess and/or unsuitable excavated material. In the event that contaminated soil, water or hazardous waste material is encountered in any excavation, the Contractor shall secure the excavation and notify owner immediately. Under no circumstances shall any contaminated soil, water or hazardous materials be removed without authorization by Owner. Refer to and comply with Section 013543 – Environmental Procedures, and Section 017419 – Construction Waste Management and Disposal.
		2. Subgrade Preparation
			1. The Contractor shall finely grade all improvement areas indicated on the contract documents to the finish elevation indicated less the depth of the slab, footing, paving, and/or walkways and their base. Any required fill must conform to specifications set forth in Paragraph F.4.a. All subgrades shall be compacted to 95% Maximum Dry Density (ASTM D 1557) as tested by the Contractor.
		3. Fill, Backfill, and Base
			1. The Contractor shall not commence placement of fill, backfill, or base materials until the subgrade has been inspected and approved by the Owner. Excavations resulting from underground storage tank (UST) or above ground storage tank (AST) removals shall not be backfilled until the Owner has reviewed the results of post-excavation soil sample analysis and advised Contractor to proceed.
			2. The Contractor shall provide a minimum of [8-inch] compacted gravel cushion below all new concrete slabs, (including replacement), footings, paving, and walkways. Backfill around concrete shall be of materials not subject to expansion or contraction (non‑cohesive) and shall be sloped away from the concrete work. Sand shall not be placed above any gravel used as backfill in an area undergoing installation of concrete slabs, footings, paving, and walkways.
			3. Trench or excavation backfill shall be compacted to 95% maximum dry density, as tested by the Contractor, with a mechanical tamper in lifts not to exceed 6 inches. Surface material and finish must be replaced to match that of adjacent grade surface, including any base material required.
			4. All new fill shall be compacted to at least 95% Maximum Dry Density at Optimum Moisture Content according to ASTM D‑1557, as tested by the Contractor.
				1. Granular Fill.

Crushed stone and similar base materials shall be material that will compact and adequately bond under watering and rolling. Base course materials are to be placed in one or more layers, rolled thoroughly, and compacted until the material does not creep or wave ahead of the roller. All coarse aggregates shall be removed, and the finish surface of the base must be firm and free of loose material.

* + - * 1. Backfilling

Ballasting the underground storage tanks with water shall be required immediately upon installation of the tanks at a point specified by the tank manufacturer.

Backfill using the same material as used for bedding. Place first 12" lift evenly around tanks. From the bank or adjacent tank top, backfill must be pushed completely beneath the tank bottom, between ribs and under end caps to provide necessary support. A long handled probe can be used to penetrate backfill and push it between all ribs and at 3 to 5 points under endcaps. The backfill may be shoveled beneath the tank. Place another 12" lift evenly around the tanks. Repeat the probing of backfill from the bank or adjacent tank top.

* + - * 1. Installation Procedure - Wet Hole

Wet hole installation shall only be allowed with specific approval by the owner and in cases where dry hole installations are not practical. Follow tank manufacturer instructions for wet hole installation procedures.

* 1. EXAMINATION
		1. Verify excavations are to required grade, dry, and not over-excavated.
	2. INSTALLATION - UNDERGROUND TANKS
		1. The installation of underground storage tanks shall be conducted in strict accordance with the tank manufacturer’s installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
		2. Install underground tanks and all fuel system equipment in accordance with the requirements of all State and Local codes and regulations including, but not limited to, the State of [ ].
		3. Check factory installed equipment and accessories for loosening during transit.
		4. Install underground tanks with anchoring as specified in the Contract Documents. Secure with hold-down straps and turnbuckles.
		5. Install piping connections to tanks with unions and swing joints. Provide venting in accordance with API 2000.
		6. Seal unused tank openings using threaded steel pipe plugs, flanges, or caps.
		7. Extend fill line and cover to grade and provide concrete pad as specified in the Contract Documents.
		8. Tank Accessories:
			1. Install tank accessories shipped loose with tank.
			2. Install tank accessories as indicated on Drawings.
		9. Install underground tanks with cover as specified on the Contract Documents. The Contractor shall not exceed the specified cover by more than twelve (12) inches, the tank manufacturer’s requirements notwithstanding. The elevation of the tank relative to the aboveground piping system is critical for successful operation of the fuel dispensers.
		10. Backfill tanks with backfill approved by the tank manufacturer. Refer to Section 2.1.
		11. Ballast tanks with clean water upon tank installation at the time specified by the tank manufacturer.
		12. Only after completion of entire installation, including all concrete surface pads, remove all water ballast prior to the tanks being filled with gasoline. The contractor shall be present during the first fuel or fluid delivery to each tank.
	3. FIELD QUALITY CONTROL
		1. Coordinate with Sections 136010 and 136020.
		2. Test all tanks, sumps, and interstitial spaces in accordance with State of [ ] requirements, manufacturer requirements and guidelines, and PEI-RP100. All test results shall be submitted to the engineer within 24 hours of completion. The primary and secondary chambers of all product carrying vessels (pipes and tanks) shall be tested prior to and after final backfill. The test pressure on the interstitial piping space shall be maintained through the final backfill process and verified after backfill is complete.
		3. After completion of the gasoline system installation, and after backfilling and setting concrete, Test all underground tanks with a precision method capable of detecting leaks of 0.005 gph. The precision test shall be performed by a third party independent testing company, and shall provide a certified report of tightness to the owner with 5 days of completion.
		4. Notify the Engineer at least ten working days prior to setting the tanks into the excavation and ten working days prior to final backfill of the tank top and underground piping. The Engineer may be present during tank setting and for a final-pre-backfill inspection of all underground components, and neither of these evolutions shall be conducted until the Engineer has had the opportunity to observe.
		5. In addition to the requirements outlined above, hydrostatically test all tanks sumps and turbine enclosures by filling each sump with water to within six inches of the top and monitoring the water level of two hours. This test shall be conducted by a testing agency and the results reported to the Engineer within 24 hours of completion.
		6. Provide documentation of all tests signed by certified personnel to the owner prior to the operation of the facility and in the closeout documents including a copy of the State of [ ].
		7. Complete the Suction Stub Verification Form, Overfill Verification Form, Tank Tilt Verification Form, and Brine Level Verification Form, as provided on the construction documents.
	4. INITIAL FUEL DELIVERY
		1. The Contractor shall be responsible for supplying sufficient gasoline for startup and calibration activities.
	5. TANK AND SYSTEM REGISTRATION
		1. The Contractor shall submit to the owner, prior to the operation of the facility, a completed and executed State of [ ]. Include the completed form, with owner signature, in the closeout documents with evidence of submission to the State agency.
		2. Submit all other forms, notifications, and reports as required by the State, and provide copies to the owner prior to operation of the system, and in the closeout documents including the State of [ ], [ ], [ ].
	6. COMMISSIONING
		1. Coordinate commissioning activities with the commissioning activities required in sections 136010 and 136020. A single commission program, combining the requirements of the three sections shall be coordinated.
		2. The Contractor shall commission the motor fuel systems. Commissioning shall include all testing, start-up, calibration, programming, and documentation. At the conclusion of the commissioning, the facility shall be ready for the owner and tenants to conduct unrestricted operations and use all systems to their full intended and designed capacity.
		3. The Contractor shall submit a system commissioning plan to the owner and engineer for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The contractor shall be responsible for supplying all fluids and commodities required to startup and calibrate systems. The plan may be combined with commission plans for other vehicle service equipment systems.
		4. Commissioning of the fuel system shall commence no less than 21 days prior to date of beneficial occupancy, and be completed prior to beneficial occupancy.
		5. Fuel or flammable liquids shall not be introduced into the underground tanks until the environmental monitoring and leak detection system is fully programmed, operational, and tested. Fuel shall not be introduced into the dispensing system until all safety (including emergency stop, crash valves, etc.) and leak detection devices have been tested and fire extinguishers are installed.
		6. Notify the engineer no less than 14 days prior to the completion of Commissioning. When Commissioning is completed, the Contractor shall facilitate a final inspection by the engineer. The Contractor shall have all necessary trade personnel on-site to operate equipment, open containment areas, and open electrical enclosures and equipment during the engineer’s final Commissioning inspection. That final inspection shall include, but not be limited to:
			1. Operational test of all systems.
			2. Operational test of all safety devices (e-stop switches, crash valves, overfill alarms);
			3. General review of the installation against plans, specs, and manufacturer requirements;
			4. Review of all test reports and manufacturer start-up reports;
			5. Test of all leak detection sensors;
			6. Closeout document requirements review;
			7. Tank registration form review, to include all outstanding regulatory reports;
			8. Inspection of all tank level probes to verify 90% setting;
			9. Inspect of mechanical overfill protection devices to verify/measure 95% setting;
			10. Inspect of all sumps and containment areas;
			11. Review and validation of monitoring system programming;
			12. Operational test of the fuel management system and verification that the system is recording transactions and that the operator is able to generate fuel invoices.
			13. Confirmation that system training has been completed; and
			14. Verification that remote monitoring for the Environmental Monitoring System is programmed and functioning properly.
	7. MANUFACTURER'S FIELD SERVICES
		1. The Contractor’s field superintendent supervising the installation of all underground petroleum carrying components shall be factory or manufacturer certified to perform such installation. Additionally, the field supervisor shall carry any State or Local certifications to install underground tanks and petroleum components.
		2. Furnish factory training representatives to provide up to 8 hours of training on each major piece of equipment or system.

END OF SECTION

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