

SECTION 15980

DAY TANK, INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, tools, and equipment, and install all instrumentation and controls associated with all new or upgraded Petroleum systems as required by the Contract Drawings.

1.02 APPLICABLE STANDARDS

All instrumentation and control equipment shall comply with the following standards and all other applicable federal, state, and New York City Building Codes including revisions to the date of Contract.

NFPA	National Fire Protection Association
ANSI	American National Standards Institute
ASTM	American Society of Testing Materials
ASME	American Society of Mechanical Engineers
NEC	National Electric Code
ISA	Instrumentation Society of America
NEMA	National Electrical Manufacturers Association

Year-2000 Compliant: All electrical components including but not limited to computers, controllers, readouts, motors, transmitters, relays, displays, recorders, and associated software, etc. shall be capable of accurately processing, receiving, and sending data to and from their intended inputs and outputs, into and between the twentieth and twenty first centuries (and extending throughout the twenty-first century), including leap-years, without any date-related malfunction.

1.03 SUBMITTALS

A. Shop Drawings:

1. Wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.
3. Equipment and instrument list, including size, input/output types, expected range of operation, utility requirements, and materials of construction. A Bill of Materials also shall be included and keyed to the drawings. The Bill of Materials shall provide sufficient information to determine compliance with the Contract Drawings

and Specifications.

3. Drawings showing the proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work, including clearances for maintenance and operation.
 4. Manufacturers' descriptive and technical literature, including catalog cuts.
 5. Legends for name plates.
 6. Equipment certifications and test reports.
- B. Spare Parts Data: Within 30 days of Shop Drawing approval, the Contractor shall furnish spare parts data for each different item of material and equipment specified. Data shall include a complete list of parts and supplies, with current unit prices and a source of supply. A list of all special tools required for installation, maintenance or repair of equipment shall be provided.

The Contractor shall furnish those spare parts and special tools which are recommended by the manufacturers. The Contractor also shall provide a 12-month supply of any expendable items and frequently replaced parts as identified by the manufacturer.

- C. Operating and maintenance instructions shall be provided for each different type of control, instrument, and system.
1. The Contractor shall furnish to the Construction Manager six (6) complete copies of the operating instructions outlining the procedures required for equipment and system start-up, operation, and shut-down. The instructions shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features.
 2. The Contractor shall furnish to the Construction Manager six (6) complete copies of maintenance instructions listing routine maintenance procedures, possible breakdown and repairs, and troubleshooting guide.
- D. Performance Test Reports: Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing that all field tests are performed to adjust each component and that all field tests are performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of the controls.

1.04 MANUFACTURER'S SERVICES

- A. The Contractor shall provide the services of a manufacturer's engineering representative who is experienced in the installation, adjustment, and operation of the instruments and controls specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.
- B. The leak detection/inventory control system shall include a minimum five-year extended service contract for the entire system that includes on-site replacement of parts, programming, and testing of system features. This extended service contract will go into effect at the end of the construction warranty period. The extended service contract shall be between the manufacturer's authorized service contractor (a third party) and the City. The contractor shall obtain this extended service contract and shall submit it to the Construction Manager at substantial completion.

1.05 FIELD TRAINING

The Contractor shall provide a field training course for the Project Manager and his designated operating staff. Training shall be provided for a total of 24 hours of normal working time, and shall be completed prior to the system's final acceptance by the Project Manager. Field training shall cover all of the items contained in the operating and maintenance manuals.

PART 2 - PRODUCTS

2.01 GENERAL

The general instrumentation requirements are identified on the Contract Drawings. All instruments and control equipment shall conform to the following general provisions.

- A. All equipment in a system shall be compatible in function and appearance. Provisions shall be made, where necessary, for signal dampening to suppress noise and spurious electrical signals in order to provide the desired degree of performance.
- B. All instrument supports and interconnecting wiring and conduit shall be as recommended by the manufacturer and approved by the Construction Manager.
- C. Identifying tag number for each instrument shall be permanently etched or embossed onto a durable tag which shall be fastened to the device housing

with stainless steel rivets or self-tapping, stainless-steel screws of appropriate size. Where neither of the above fastening can be accomplished, tag number nameplates shall be permanently attached to the device by a circllet of stainless-steel wire.

- D. All instruments and devices furnished under this Section requiring electrical power shall be suitable for operation on a 120 Volt $\pm 10\%$, 60 Hertz ± 2 Hertz supply.
- E. All instruments shall return to accurate measurement upon restoration of power after a power failure.
- F. Unless otherwise noted, all instruments in contact with a process stream shall be furnished with diaphragm seals.
- G. Instruments shall be guaranteed to maintain the characteristics listed herein and under conditions listed and shall meet the following specifications, except where otherwise noted:
 - 1. Accuracy: $\pm 1\%$ of span
 - 2. Repeatability: $\pm 0.1\%$ of span
 - 3. Dead Band: $\pm 1\%$ of span (where applicable) in accordance with ISA Standard S50.1
 - 4. All signal generators and transmitters shall be capable of operating at a load of 600 ohm in accordance with ISA Standard S50.1, higher when specified. Signals shall be output isolated.
 - 5. All electronic instruments shall be solid-state and shall be capable of operating throughout the temperature range of 10 degrees Fahrenheit to 110 degrees Fahrenheit, unless otherwise specified.
 - 6. Temperature effect on calibration shall be not more than 1% over a temperature change of 100 degrees Fahrenheit.
- H. The ranges and scales shall be as per specified, shown on the Contract Drawings, or approved by the Construction Manager.
- I. Where separate measuring elements and transmitters are required, they shall be fully matched and any special cables or equipment required must be supplied for installation.
- J. The Contractor shall be responsible for the matching of electrical

characteristics of instruments and shall supply transmitters with ample signal output capacity. Additional signal generators or repeaters shall be avoided if possible, but must be supplied if necessary.

- K. All equipment, unless otherwise specified, shall be furnished in the manufacturer's standard enclosure for the service indicated by the equipment location.
- L. All miscellaneous necessary work required to complete installation shall be included. This work includes, but is not limited to, bolts, nuts, studs, gaskets, pipe tapping, holes through walls, and repair.
- M. Electrical control conductors shall be No. 14 AWG or larger. Conductors larger than No. 14 shall be used where herein specified, or where indicated on the Contract Drawings.
- N. The size of the conductors and other current-carrying parts of switches and control equipment shall be ample for the rating of the devices to which they are to be connected for service, without undue heating. In no case shall the current density exceed 1,000 amperes per square inch of cross-section. At contacts, the current density shall not exceed 150 amperes per square inch.

2.02 LEAK DETECTION/INVENTORY CONTROL SYSTEM

- A. The leak detection/inventory control system shall include all parts, equipment, and software necessary for a complete system. All software, firmware, and hardware shall be of the latest revisions at the time of contract signing and/or requisition placement. The leak detection/inventory control system shall include, but not be limited to the following:
 - 1. One (1) monitoring head/system controller
 - 2. Two (2) magnetostrictive technology type, inventory control and in-tank leak testing probe assembly (per tank, as required)
 - 3. One (1) annular space liquid sensing probe for interstitial space (per double-wall tank, as required)
 - 4. Zero (0) liquid sensing probe for manway sump (per sump, as required)
 - 5. One (1) overflow alarm with acknowledgment switch
 - 6. Zero (0) pulser/totalizer for dispenser (per hose assembly, as required)

7. One (1) stick gauge calibrated in inches (per tank)
- B. The controller shall be capable of performing in-tank leak detection functions, business inventory reconciliation (BIR) functions, automatic tank calibration and charting, and external leak detection functions. The controller shall be completely compatible with all probes, sensors, and dispensers. The controller shall have LCD light groups identifying inventory, system status, setup, and diagnostics. The controller shall be supplied with an integral printer. The controller shall be supplied with an internal telephone fax/modem/dialer capable of dialing a pre-programmed telephone number at operator specified alarm or inventory conditions. The controller shall include all software and interface modules required for probes, sensors, dispensers, alarms, modems, and other input/output devices required for a complete system. The controller shall be a model TLS-300i Monitoring Head/System Controller with Integral Print, with SiteFax Fax/Modem Interface Module, Model No. 330149-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
 - C. The inventory control and in-tank testing probe assembly shall be of the magnetostrictive technology type. The in-tank probe shall be capable of measuring product level in the tank in inches, and detecting the presence of water in the tank. The probe shall be capable of performing the 0.1 gallon per hour volumetric tank tightness testing and 0.2 gallon per hour automatic tank gauging in the tank system. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20 Celsius to +50 Celsius. The in-tank probe assembly shall include 4-inch floats and 4-inch sealed riser cap and ring. Each probe shall be completely compatible with the fluid to be stored in the tank. The probe shall be Series 8473 MAG1 Magnetostrictive Probe with 4-inch Float Kit, Model No. 847391, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. The probe assembly shall also include Magnetostrictive Probe Installation Kit, Model No. 849600, and Riser Cap and Ring Kit, Model No. 312020-952, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Four-Input Probe Interface Module, Model No. 329356-002, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
 - D. The annular space liquid sensing probe shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in the interstitial space between tank walls. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20 Celsius to +70 Celsius. Annular space sensor shall be Series 7943 Discriminating Interstitial Sensor For

Fiberglass Tanks, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Eight-Input Type A Sensor Interface Module, Model No. 329956-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.

- E. The manway sump sensing probe shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in the manway containment sump. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations, and shall be capable of withstanding the harsh environment and wide temperature ranges possible in the intended location. Containment sump sensor shall be Series 7943 Solid-State Discriminating Containment Sump Sensor, Model No. 794380-320, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Six-Input Type B Sensor Interface Module, Model No. 329950-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
- F. The overflow alarm shall be the audible horn and flashing light type. The overflow alarm shall be supplied with an alarm acknowledgment switch. Alarm electronics shall be capable of operating from -40 degrees Fahrenheit to +150 degrees Fahrenheit. The alarm and acknowledgment switch shall be Series 7900 Overflow Alarm and Alarm Acknowledgment Switch, Models No. 790091-001 and 790095-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Four-Relay Output Interface Module, Model No. 329359-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Installation of all equipment shall be in accordance with the New York City Fire Prevention Code and the New York City Electrical codes. The Contractor shall furnish and install all required conduit sealing fittings, explosion-proof accessories, and NEMA Type 7 enclosures where indicated on the Contract Drawings, or where required by Code, or both.
- B. Instrumentation and control equipment shall be installed as indicated on the Contract Drawings or as indicated by the Construction Manager. All power and control wiring and connections not specifically indicated on the Contract Drawings, but required for the proper operation of equipment shall be made by the Contractor in accordance with these Specifications. All electrical control and instrumentation equipment installed in Class 1

hazardous locations shall be installed in NEMA Type 7 enclosures. Conduits and wireways leading to and from these areas shall be provided with sealing fittings. All non-conducting metal parts of switches and control, shall be rust-proofed by galvanizing, cadmium plating, baked enamel or by the use of a non-corroding metal. Springs, wherever used, shall be a phosphor bronze.

- C. Each leak detection inventory control system shall installed, programmed and adjusted in accordance with the manufacturer's instructions so that all components function properly. Each overflow alarm and alarm acknowledgement switch shall programmed and adjusted so that the alarm is activated at 90 percent of the tank capacity.

3.02 TESTING

- A. General: All equipment (hardware and software) shall be factory and field tested to demonstrate that it provides the specified functions.
- B. The factory and onsite test procedures shall be submitted to the Construction Manager for approval prior to starting the actual tests.
- C. The onsite testing shall include checking of cables, testing of system subassemblies and checking of connections for each component and for the entire instrumentation and control system.
- D. The Contractor shall notify the Construction Manager in writing that he is ready and desires to start the on-site system testing. The Construction Manager will authorize start of the testing at a mutually-agreed starting date.
- E. Shop Testing: All activating devices, instruments and assemblies furnished under this item shall be set up in the shop of the manufacturer and tested over the full range of the equipment. The equipment shall satisfactorily perform all the functions within the requirements of the specifications.
- F. Field Testing: All instruments and systems shall be field tested to ensure conformance with the Specifications. Control systems shall receive dynamic loop tests, which shall conform to the intent of ANSI: MC4.1 (ISA-S26). The control systems and equipment shall include provisions for such testing.
- G. Input signals for equipment control shall be simulated for at least 5 signal values from 0 to 100 percent signal, with corresponding equipment response to be manually recorded, and adjustments made as required. Output signals from the equipment shall be read for at least 5 signal values

from 0 to 100 percent of the meaningful process values, and adjustments shall be made as required.

- H. All instruments used for control functions shall be tested with the final elements in the circuit in addition to simulated control methods. The Contractor shall adjust instruments and/or final elements to obtain the best working conditions for a dynamic system.

2.2 ANTI-SPILL AND SAFETY VALVES

- A. Where product piping extends below the top of the tank, the piping shall include a shutoff valve and normally a closed safety valve. The safety valve shall be an approved anti-siphon valve or electric solenoid valve. Universal Model 213 ¼ turn valves and unions will be located at all pipe connections between fuel tank and pumps.

2.4 DAY TANK - ABOVEGROUND

- A. Submersible Turbine Pump
 - 1. Provide 2 U.L. Listed Submersible Turbine Pumps with the following capabilities:
 - a. Turbine shall include an integral check valve to hold operating pressure at 30 psi to minimize loss of pressure due to thermal contraction. Leak detector shall be designed to trip with loss of piping pressure.
 - b. The entire pumping assembly shall have UL listing and shall meet all requirements of UL Standard UL 79.
 - c. The pump discharge head and manifold assembly shall be manufactured from ASTM A48 Class 30 gray iron.
 - d. The pump motor shall have a thermal over current overload protector with automatic reset.
 - e. The pump motor assembly shall be clearly marked with pertinent information including horsepower, voltage, phase, and manufacturer.
 - f. The pumping unit shall not incorporate any flexible diaphragms and all sealing shall be accomplished with "O" rings or UL recognized fiber gaskets.
 - g. The motor assembly height shall be field adjustable

utilizing a UL listed telescoping shaft and set to a minimum of 6" from the bottom of the tank.

- h. Provide a piston style mechanical leak detector capable of slowing flow while detecting a 3 gph leak rate. Leak detector shall be all fuels compatible utilizing Teflon for all dynamic sealing surfaces. Leak detector shall be manufactured specifically for use with intended product and piping system.
- i. Provide a control box relay with as supplied by pump manufacturer.
- j. An NEMA 4 momentary emergency stop switch Sydney Model 1008 will be supplied for each dispenser.

B. Day Tank

- 1. Day tank assembly to be double wall, rectangular tank with drip pan.
 - 2. Unit to be manufactured by Hoover 1-975-534-1429. Unit to be furnished with VeederRoot Tank Gauge and Model 49-02 mechanical overfill valve.
 - 3. Controls for the low level, low, low level, and high level alarms will be supplied by Veeder Root.
 - 4. Controls for the pump on/off switch will be furnished by Sydney Associates Model 818.
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- 2. Design Basis:
 - a. Submersible turbines to be installed one (1) in the Convault tank as primary system with 2nd pumping unit and control box located in the day tank. Controls for the day tank return system will be controlled by a separate VeederRoot gauge located in the day tank.
 - 3. Operating Valve
 - a. Provide a full ported ball valve with Teflon seats for emergency shut down of fuel supply piping, Universal Model # 213FP.

2.5 TANK BOLLARDS

1. Provide a permanent steel concrete island form sized as shown on drawings. Include inverted U shaped 6" pipe bollards. Units will be stainless steel.
2. Design Basis: Formex

END OF SECTION