

SECTION 15050

MECHANICAL EQUIPMENT, FUELING

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SECTION 15050

MECHANICAL EQUIPMENT, FUELING

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

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

FEDERAL SPECIFICATIONS

QQ-A-601F(1) Aluminum-Alloy Sand Castings

MILITARY SPECIFICATIONS

MIL-C-4556D(1) Coating Kit, Epoxy, for Interior of Steel Fuel Tanks

MIL-H-6088F(1) Heat Treatment of Aluminum Alloys

MIL-M-28519A Meter, Volumetric, Positive Displacement, Liquid Aircraft Fuel, 600 gpm

MIL-T-5624N Turbine Fuel, Aviation, Grades (JP-4 and JP-5)

MIL-P-24441A (Supp 1) General Specification for Paint, Epoxy - Polyamide

MIL-T-38219B(1) Turbine Fuel, Low Volatility JP-7

MIL-T-83133C Turbine Fuel, Aviation, Kerosene Type, Grade JP-8

MILITARY STANDARD

MIL-STD-130F (Notice 2) Identification Marking of U. S. Military Property

MIL-STD-161F (Notice 2) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

MIL-STD-244845 Flange, Adapter Locking, Pressure Fuel Servicing

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B16.5-1981 Pipe Flanges and Flanged Fittings

B40.1-1985 Gage Pressure and Vacuum Indicating, Dial Type, Elastic Element

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C827-87 Standard Test Method for Change in Height at
Early Ages of Cylindrical Specimens from
Cementitious Mixtures

AMERICAN PETROLEUM INSTITUTE (API)

Manual on Disposal of Refinery Wastes, Volume on Liquid Wastes,
Chapter 5, 1969

1529-82 Aviation Fueling Hose

1615-79 Installation of Underground Petroleum Storage
Systems

2555-86 Method for Liquid Calibration of Tanks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

30-87 Flammable and Combustible Liquids Code

70-87 National Electrical Code

UNDERWRITERS LABORATORIES, INC. (UL) PUBLICATIONS

58-86 Steel Underground Tanks for Flammable and
Combustible Liquids

STEEL TANK INSTITUTE (STI)

P3 Specification and Manual for Exterior
Corrosion Protection of Underground Steel
Storage Tanks

ENVIRONMENTAL PROTECTION AGENCY (EPA)

40 CFR Part 280 Underground Storage Tanks; Technical
Requirements and State Program Approval,
Final Rules

1.2 SUBMITTALS

The submittal requirements of Section entitled ["Mechanical General Requirements",] ["General Requirements"] applies to the following lists. All items shall be submitted for Government approval.

NOTE: SELECT "MECHANICAL GENERAL REQUIREMENTS" FOR NAVFACENCOM PROJECTS OR "GENERAL REQUIREMENTS" FOR C.O.E. PROJECTS.

1.2.1 Manufacturer's Data

- a. Pressure gages.
- b. Automatic pump controls including issue and return venturi tubes.
- c. Meters (M and FSM).
- d. Oil/water separator and accessories.

- e. Product recovery tank and accessories.
- f. High point vent and low point drain pits.
- g. Operating tank level indicator.
- h. Water draw-off system.
- i. Fueling station venturi (FSV).
- j. Hydraulic deadman control fuel sensing hose and hose reel.
- k. Nozzle adapter.
- [l. Grounding cable reel].

NOTE: OMIT WHEN USING HOSELESS TYPE PANTOGRAPH

1.2.2 Shop Drawings

- a. Meters.
- b. Fueling station venturi (FSV), issue and return venturi tubes.
- c. Oil/water separator.
- d. Product recovery tank.
- e. High point vent and low point drain pits.
- f. Water draw-off system.

1.2.3 Certificates of Compliance

- a. Oil/water separator.
- b. Coating products.
- c. U. L. labeled products.
- d. STI-P3 labeled products.
- e. High point vent and low point drain pit.

1.2.4 OMSI Submittals

OMSI information shall be submitted for the equipment items or systems listed below. Refer to section entitled "Operation and Maintenance Support Information (OMSI)", for the information to be submitted for various type of equipment and systems.

- a. Pressure gages.
- b. Automatic pump controls including issue and return venturi tubes.
- c. Meters.
- d. Oil/water separator and accessories.

- e. Product recovery tank and accessories.
- f. High point vent and low point drain pits.
- g. Operating tank level indicator.
- h. Water draw-off system.
- i. Fueling station venturi.
- j. Hydraulic deadman control fuel sensing hose and hose reel.
- k. Nozzle Adapter
- l. [Grounding Cable Reel]

NOTE: OMIT WHEN USING HOSELESS TYPE PANTOGRAPH

PART 2 PRODUCTS

2.1 DESIGN CONDITIONS

Components shall be suitable for use with [JP-4 turbine fuel; specific gravity 0.76 at 60 degrees F, viscosity 0.92 CS at 60 degrees F, Reid vapor pressure 2-3 psi, MIL-T-5624], [JP-5 turbine fuel; specific gravity 0.82 at 60 degrees F, viscosity 1.62 CS at 60 degrees F, Reid vapor pressure less than 0.05 psi, MIL-T-5624], [JP-7 turbine fuel; specific gravity 0.79 at 60 degrees F, viscosity 1.95 CS at 60 degrees F, Reid vapor pressure less than 0.05 psi, MIL-T-38219], [JP-8 turbine fuel; specific gravity 0.81 at 60 degrees F, viscosity 1.62 CS at 60 degrees F, Reid vapor pressure less than 0.05 psi, MIL-T-83133]. Components to be ANSI Class 150 (275 psig at 100 degrees F) unless noted otherwise. Components to be suitable for outside, unsheltered location, and to function normally in ambient temperatures between [] degrees F and [] degrees F.

NOTE: SELECT TYPE OF FUEL AND INSERT EXPECTED TEMPERATURE EXTREMES

2.2 COMPOSITION OF MATERIALS

Contact with the fuel shall be non-corrosive. Refer to section entitled ["Mechanical General Requirements"] ["General Requirements"] for metallurgic specification.

NOTE: SELECT "MECHANICAL GENERAL REQUIREMENTS" FOR NAVFACENCOM PROJECT OR "GENERAL REQUIREMENTS" FOR C.O.E. PROJECTS.

2.3 MATERIALS AND EQUIPMENT

All items of material and equipment shall be new and of the best quality used for the purpose in commercial practice and shall be products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address and catalog number on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. The gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly

guarded. Equipment, assemblies and parts shall be marked for identification in accordance with MIL-STD-130 and MIL-STD-161.

2.3.1 Supplier

The Contractor's attention is directed to the fact that the pump control system, including but not limited to pump control panel, venturi tubes, transmitters and control valves with all hardware and software is an integrated system, shall be furnished by a single systems supplier. Supplier shall provide all equipment and appurtenances regardless of manufacture, and be responsible to the Contractor for satisfactory operation of the entire system. Substitutions of functions specified will not be acceptable. The Contractor shall coordinate the work of the system manufacturer's service personnel during construction, testing, calibration, and acceptance of the system.

2.4 PRESSURE GAGES

Pressure gages shall conform to ANSI B40.1 with metal cases and 4-1/2 inch diameter ~~black~~ white dials. Gages shall be bottom connected, without back flanges. A pulsation dampener, adjustable to the degree of dampening required, shall be provided for each gage. Range of gages shall be as indicated. A ball valve shall be provided for each pressure gage. Gages shall have all parts immersed in silicone oil. **Or other type of liquid filled.**

2.5 GASKETS

Gaskets shall be in accordance with Section entitled "Pipe, Manual Valves, and Fittings".

2.6 BOLTS AND NUTS

Bolts and nuts shall be in accordance with Section entitled "Pipe, Manual Valves, and Fittings" system. Substitutions of functions specified will not be acceptable. The Contractor shall coordinate the work of the system manufacturer's service personnel during construction, testing, calibration, and acceptance of the system.

2.7 AUTOMATIC PUMP CONTROLS

The pressure and flow transmitters specified in this paragraph shall be obtained from a single supplier of such products. The same supplier shall also furnish the associated venturi tubes and differential manometer. The supplier shall be responsible for furnishing components that are compatible and that operate as a system to perform the required pump control functions. Control tubing between controls/instruments and fuel lines shall be installed to eliminate air entrapment. Control tubing shall be as specified in Section entitled "Pipe, Manual Valves, and Fittings". Each item of equipment specified hereafter shall have manufacturer's authorized service personnel present to assist in PERFORMANCE TESTING as specified in Section entitled "System Start-Up, Fueling". Items specified under this paragraph shall be submitted for approval concurrently with items specified in Section entitled "Pump Control and Annunciation System".

2.7.1 Pressure Indicating Transmitters

Pressure indicating transmitters shall consist of a bellows type pressure sensing element operating on a differential in pressure of fuel (one side being open to atmospheric pressure) and a mechanical indicator (driven by the bellows unit) with an analog two-wire electrical output of 4-20 MA signal directly proportional to pressure. Loop power shall be provided from remote power supply located in the pump control panel (PCP). Transmitters shall not require recalibration due to power outages.

2.7.1.1 The bellows shall be dual opposed, liquid filled, rupture-proof type with bellows movement converted to rotation and transmitted by a torque tube. Displacement of bellows to be 1.5 cubic inches for full scale travel. Bellows housing shall be stainless steel and shall have a rated working pressure of not less than 500 psi with a minimum differential pressure range of 0-250 psi. Liquid used to fill the bellows shall be suitable for the expected minimum ambient temperature.

2.7.1.2 The indicating dial shall be at least 6 inches in diameter with a weatherproof glass cover. The case shall be finished with a weather resistant epoxy resin enamel. The indicating pointer shall traverse a 270 degree arc.

2.7.1.3 The scales shall be graduated over the selected pressure ranges so that the pressure can be read in pounds per square inch gage (psig). Indicator accuracy shall be 0.5% of full scale and transmitter accuracy shall be 0.25% of pointer indication. Pressure indicating transmitter shall be provided with built-in pulsation damper and suitable over-range protection.

2.7.1.4 Pressure indicating transmitters shall be UL listed for Class I, Division 1, Group D, hazardous locations. Each transmitter shall be supplied with a factory assembled two valve stainless steel manifold. Vent valves shall be furnished on upper ports of each transmitter.

2.7.1.5 Pressure indicating transmitters shall be suitable for mounting on a 2 inch pipe stand. Complete installation shall be in accordance with manufacturer's recommendations.

2.7.2 Flow Switches

Switches shall be the actuating vane type flow switch with single adjustable set-point. Switches shall mount on ANSI B16.5 Class 150 raised face flange. Provide snap action switch mechanism UL listed for Class 1, Division 1, Group D hazardous locations. Switches to be double pole double throw (DPDT). Switch power shall be 120 volts, single phase, 60 hertz, 10 amps minimum.

2.7.3 Issue and Return Venturi Tubes

2.7.3.1 The venturi tubes shall be provided in conjunction with Section entitled "Pump Control and Annunciation System".

2.7.3.2 Start-up, adjustments and calibration, and instruction of personnel in the operation and maintenance of the venturi tubes shall be considered as a required portion of the controls package.

2.7.3.3 The venturi tubes shall be low loss differential pressure producers consisting of a short housing piece and a fully machined, contoured throat section providing a restriction at the center, with

both inlet approach and exit having geometrically symmetrical curves. They shall be velocity head, impact, differential producing devices designed to measure differential pressure of [JP-4] [JP-5] [JP-7] [JP-8] fuel. They shall be constructed of 304L stainless steel with ANSI Class 150 flanges on each end and be suitable for operation of 275 psig at 100 degrees F. They shall be of sufficient thickness to withstand the same stresses as the upstream and downstream piping. Each venturi tube shall have a minimum of four 1/2-inch connections. An individual head-capacity curve shall be furnished for each venturi tube.

NOTE: SELECT TYPE FUEL

2.7.3.4 Operating conditions for the venturi tubes shall be as follows:

a. Issue Venturi Tube

Minimum inlet-to-throat differential pressure at 1200 gpm: 200 in. H₂O.

b. Return Venturi Tube

Minimum inlet-to-throat differential pressure at 600 gpm: 200 in. H₂O.

2.7.3.5 Venturi tubes discharge coefficient "C" to be greater than or equal to 0.97 over pipe Reynolds number range between 200,000 and 1,000,000 and shall be independent of Beta over a Beta range of 0.4 to 0.75. Pressure loss shall be less than 24% of differential pressure generated by the venturi tube. Repeatability of the discharge coefficient "C" shall be 2% for Reynolds number range of 10,000 to 1,000,000.

~~2.7.3.6 Provide one manometer, complete with hoses, fittings, and suitable tables for each venturi tube. The tables shall convert inches differential pressure to gallons per minute. Maximum range of the manometer shall be 1.5 times the maximum flow tube differential. The manometers shall be furnished with a permanent carrying case capable of storing the manometer, hoses, fittings and tables. The manometers shall be delivered to the Contracting Officer at the project site.~~

(Note: **Bay Associates recommends deleting the manometers in favor of portable GPM meters such as ITT Barton units, which are much easier for LFM to use.**)

2.7.4 Differential Pressure Transmitters

Differential pressure transmitters shall consist of a bellows type pressure sensing element, operating on a differential in pressure of fuel, and a mechanical indicator, driven by the bellows unit, with an analog two-wire electrical of 4-20 MA signal directly proportional to differential pressure across the venturi tube. Loop power shall be provided from remote power supply located in the pump control panel (PCP). Transmitters shall not require recalibration due to power outages.

2.7.4.1 The bellows shall be dual opposed, liquid filled, rupture-proof type with bellows movement converted to rotation and transmitted by a torque tube. Displacement of bellows shall be 1.5 cubic inches for full scale travel. Bellows housing shall be stainless steel and shall

have a rated working pressure of not less than 500 psi. Liquid used to fill the bellows shall be suitable for the expected minimum ambient temperature.

2.7.4.2 The indicating dial shall be at least 6 inches in diameter with a weatherproof glass cover. The case shall be finished with a weather resistant epoxy resin enamel. The indicating pointer shall traverse a 270 degree arc.

2.7.4.3 Differential pressure ranges shall be selected as necessary to operate in conjunction with associated venturi tube:

Issue Venturi Tube - 0 to 1200 gpm (full range)
Return Venturi Tube - 0 to 100 gpm (low range) and
0 to 800 gpm (high range)

Each venturi tube shall have two transmitters per function and shall be installed as indicated on the drawings.

2.7.4.4 The scales shall be graduated over the selected pressure ranges so that the flow rate can be accurately read in gallons per minute. Indicator accuracy shall be 0.5% of full scale and transmitter accuracy shall be 0.25% of pointer indication. Differential pressure transmitter shall be provided with built-in pulsation damper and suitable over-range protection.

2.7.4.5 Differential pressure transmitters shall be UL listed for Class I, Division 1, Group D hazardous locations. Each transmitter shall be supplied with a factory assembled five valve stainless steel manifold. Vent valves shall be furnished on upper ports of each transmitter.

2.7.4.6 Differential pressure transmitters shall be suitable for mounting on a 2 inch pipe stand. Complete installation shall be in accordance with manufacturer's recommendations.

2.8 METER (M-1)

Meter shall be a one-way flow, positive displacement type meter designed for a continuous flow of 1200 gpm. Meter shall have ANSI Class 150 flanges and body working pressure of not less than 200 psig and shall be suitable for hydrostatic testing of 275 psig. Meter shall be factory calibrated for [JP-4] [JP-5] [JP-7] [JP-8] jet fuel. The register shall have a non-setback total indicator and a setback type run indicator so that individual runs can be registered without affecting the total of all runs as shown on the indicator. The total indicator shall have a minimum of seven figures and the setback run indicator shall have a minimum of six figures. The register shall read in gallons and the smallest unit of indicated delivery shall be one gallon. Accuracy shall be within ± 0.3 percent between ten percent and maximum rated flow.

NOTE: SELECT TYPE FUEL.

2.8.1 Provide an attached transmitter with the meter. The transmitter shall consist of mercury wetted single-pole, double-pole encapsulated switch which makes and breaks contact at a rate proportional to the low flow rate through the meter. The transmitter shall be compatible with the electronic counter at the graphics panel, which will count up one unit each time the meter counts up one unit. Transmitter shall be UL

listed for application in Class I, Division 1, Group D hazardous locations.

2.8.1.1 Pressure loss through the meter shall not exceed 3 psi at 1200 gpm flow rate.

2.8.2 Materials of construction shall be stainless steel, aluminum or non-ferrous material except meter case may be steel with electroless nickel plated internals coated to 3 mil thickness. No ferrous or zinc-coated material bronze, brass or other copper bearing alloys shall be used in contact with the fuel.

2.9 OIL-WATER SEPARATOR AND ACCESSORIES

The oil-water separator shall be an API gravity type separator designed for intermittent flow of rainwater, [JP-4] [JP-5] [JP-7] [JP-8] or a variable mixture of the two. Design shall be in accordance with the API Manual on Disposal of Refinery Wastes, Volume on Liquid Wastes. Water discharged from the unit shall contain no more than [] parts per million of fuel under maximum flow conditions with fuel content of the input varying from zero to 100 percent.

NOTE: SELECT TYPE FUEL AND INSERT STATE OR LOCAL EFFLUENT REQUIREMENT.

2.9.1 Separator Construction

The separator vessel shall be double wall, constructed of welded steel or glass fiber reinforced plastic at the Contractor's option. Vessel shall have interstitial monitor. Internal baffles and diffusers shall be provided to insure controlled uniform flow through the unit. Fuel discharge from the separator shall be controlled by a fixed, manually adjustable baffle. Floating skimmers will not be permitted. Provide separator vessel with 36 inch round access manway. The unit shall be suitable for underground installation. Provide anchor bolts in accordance with the manufacturer's instructions. Coat interior steel surfaces in accordance with MIL-C-4556. Exterior steel surfaces shall be coated in accordance with STI-P3 and bear the STI-P3 label. Finish painting in the field shall conform to the requirements of the Section entitled ["Painting of Buildings (Field Painting)"] ["Painting, General"].

NOTE: SELECT "PAINTING OF BUILDINGS (FIELD PAINTING)" FOR NAVFACENGCOM PROJECTS OR "PAINTING, GENERAL" FOR C.O.E. PROJECTS.

2.9.2 Water Discharge

Water shall flow from the separator by gravity. Provide an automatic oil stop valve on the water outlet. The valve shall employ a float that operates on the fuel/water specific gravity differential to close the valve when fuel enters the water outlet chamber and reopen it when the fuel is replaced with water.

2.9.3 High Level Alarm Switch

Provide a float-actuated high liquid level alarm switch to detect abnormally high liquid level in the separator. The switch shall actuate audible and visual alarms. Switch contacts shall be double pole double throw, suitable for use in a 120 volt, 60 hertz AC circuit. The switch shall be UL listed for Class I, Division 1, Group D hazardous locations.

2.10 PRODUCT RECOVERY TANK AND ACCESSORIES

2.10.1 Tank Construction

Product recovery tank shall be a UL labeled, double wall, steel tank, with interstitial monitor. Tank shall be provided with calibrated gage stick and 1/8 inch increments strapping chart conforming to API 2555. Tank shall be provided with a steel vault attached to tank. Vault shall be provided with a rolling pit cover and removable access grating.

2.10.1.1 Steel Tank with Vault

- a. The design, fabrication, erection, testing, and inspection of the double wall tank shall conform to the requirements of UL 58, Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids.
- b. Material shall be carbon steel plate.
- c. Lifting lugs shall be located at the balance points.
- d. Provide anchor straps to attach tank to hold down slab. Number and location of straps shall be as specified by the manufacturer.
- e. Tank capacity, connections and appurtenance shall be as shown on the drawings and as described under "Monitor".
- f. A complete system of cathodic protection shall be provided for the tank and vault.
- g. The interior and exterior surfaces of tank and vault shall be coated for corrosion protection. The interior surface shall be coated in accordance with MIL-P-24441, Formulas 150, 151 and 152. The exterior surface shall be coated in accordance with STI-P3 and the tank shall bear the STI-P3 label.

2.10.1.2 Leak Detection Monitor

- a. An annular space shall be provided between the primary and secondary shells to allow for the free flow and containment of all leaked product from the primary tank.
- b. Method of leak detection shall be [vacuum maintenance] [positive air pressure maintenance] [hydrostatic pressure maintenance] [probe detection].

NOTE: SELECT LEAK DETECTION METHOD.

- c. Monitoring shall be continuous and shall be remotely indicated. The control console shall generate a visual and audible alarm and shall provide one DPDT contact closure on alarm for remote alarm annunciation.

2.10.1.3 Tank Appurtenances and Fittings

Tank appurtenances and fittings shall be provided as indicated. Nozzles for appurtenances and steel vault shall be as indicated or per

manufacturer's recommendations and shall be installed plumb with all above grade flange faces level. Fill line shall be provided with locking cap.

- a. Tank vents shall be standard weight steel pipe with malleable iron fittings. Vent outlets shall be equipped with [flame arresters] [pressure-vacuum vents] [flame arresters and pressure-vacuum vents] [flare stacks].

NOTE: PROVIDE DEVICES IN ACCORDANCE WITH THE RECOMMENDATION OF NFPA 30, FEDERAL, STATE AND LOCAL CODES.

- b. A 36-inch round manway shall have UL listed gasket with bolted cover. A fiberglass or stainless steel ladder shall be provided inside the tank at the manway.
- c. A sampling and gaging hatch shall be provided and shall consist of a foot-operated, hinged cover with a flexible sealing ring and provision for padlocking. The hatch shall be non-sparking and shall have a flanged connection for installation on 4-inch steel pipe.
- d. Liquid-level indicator shall provide local and remote indication. Unit shall be the same type as specified hereinafter for "Operating Tank Level Indicator". **Level transmitter should send a 4-20 mA signal to the PCP.**
- e. The float switch assembly shall be the top mounted, float operated type with vertical float rod. The switch assembly shall be suitable for flange mounting and the float and trim shall be stainless steel. The switch shall be magnetically latching reed or actuated mercury switch suitable for operation on 120 volt, 60 hertz AC power. Rating of the switch contacts shall be adequate for the indicated functions shown on the drawings.
- f. Fuel Transfer Pump (FTP-1): Refer to Section entitled "Pumps".
- g. The hand pump shall be ~~double acting piston type which delivers on every forward and backward stroke.~~ **Use a diaphragm hand pump.** Piston ring shall be self-lubricating teflon. Internal wetted metal parts shall be 316 stainless steel. Pump body, valves, valve seats and piston shall be suitable for use with petroleum products. Hand pump shall be provided with stainless suction screen, 8 foot of 3/4 inch ~~API-1529~~ **use UL listed**, Grade 2 fuel resistant hose including standard aluminum open end nozzle and built in hose assembly hanger. Hose assembly shall completely drain when pump stops. Pump shall be capable of being padlocked. Suction head shall be minimum 15 feet and discharge head to 25 feet. Discharge rate shall be ~~minimum 1 quart per full pump cycle.~~ **designer should specify.**
- h. An over-fill protection device and lockable cap shall be provided for the 2 inch fill line.
- i. Overfill Valve (OV-1): Refer to Section entitled "Control Valves".

2.11 HIGH POINT VENT AND LOW POINT DRAIN PITS

Pits shall be prefabricated units that are the standard products of a firm regularly engaged in their manufacture. Pits shall consist of minimum 0.25 inch thick fiberglass walls and floors and shall have a cast aluminum hinged top. Pits shall be suitable for on-shoulder/on-apron installation as well as off-shoulder/off-apron locations.

2.11.1 Pit Cover

Pit cover shall be cast aluminum and shall be hinged door in lip ring design. The assembly shall be removable, including the ring. Cover shall be in accordance with Fed. Spec. QQ-A-601 No. 356 alloy heat treated to a final temper Mil. Spec. H-6088 designation T-6 or shall be Fed. Spec. QQ-A-601 No. 713 alloy, heat treated to a final temper Mil. Spec. H-6088 designation T-5. The original casting shall be free of visual shrink porosity cavity areas. Weldments and fillers are not allowed. Pit service shall be integrally cast in 1/16 inch deep letters. Pit cover shall not be painted. Cover shall open 180 degrees with a 25 pound maximum lift and shall close flush. Weight bearing mating flange surfaces of the pit and cover shall be machined flat within 0.010 inch total indicator runout. Provide unit with minimum 1/2 inch diameter hinge pin in a free floating hinge assembly. Cover shall be provided with latching device for holding cover in the closed position.

2.11.1.1 Cover Load: The pit cover shall be designed to support an aircraft wheel load of 50,000 pounds on a contact area of 200 square inches with a safety factor of 4:1.

2.11.2 Pipe Riser Seal

The riser pipe penetration through the pit floor shall be sealed by means of a Buna-N boot. The boot shall be secured to a metal collar welded to the pipe riser and to a flange at the floor opening by stainless steel clamps. Collar shall be fabricated from the same material as the pipe.

2.12 OPERATING TANK LEVEL INDICATOR

2.12.1 Operating tank level indicator shall be mounted as shown on the drawings and shall provide local and remote level indication. The gage processor unit shall serialize the data and shall provide communication over a 2 wire bus between level gage and the remote receiver. The units of measurement shall be in feet, and the measuring increment shall be in tenths of a foot.

2.12.1.1 Construction: The unit shall mount on a 6 inch ANSI Class 150 flange. The unit shall be constructed of a drum compartment and a servo compartment with terminal box. The servo compartment shall be Factory Mutual approved or UL listed for use in Class I, Division 1, Group D hazardous locations and shall be provided with a thermostatically controlled electric heater for condensate and freeze protection. Measuring cable shall be 316 stainless steel and the measuring drum shall be grooved to receive the cable. Servo and drum compartment shall be cast aluminum with stainless steel trim and Buna-N O-rings. Provide RTD and self compensating temperature converter.

NOTE: PROVIDE DETAIL ON DRAWINGS OF LEVEL INDICATOR INSTALLATION.

2.12.1.2 Service and Signal: Unit shall receive 120V/1 Phase/60Hz. power and shall consume maximum 60VA.

2.12.1.3 Performance: The displacer shall be suspended from the measuring drum. The drum shaft shall be coupled to a weighing balance with a capacitive type detector. The detector shall operate the servo motor via an integration circuit, raising or lowering the displacer until balance is attained, thereby sensing the liquid level. Accuracy shall be ± 0.01 inch. Repeatability shall be ± 0.01 inch. Wave integration time to be 1 to 10s, adjustable.

2.13 WATER DRAW-OFF SYSTEM

2.13.1 A water draw-off system shall be provided for each Operating Tank. Water draw-off system shall [gravity drain] [be pumped by a Water Drain Pump] to Product Recovery Tank. Each system shall include tank, product return pump and all necessary pipe, valves and fittings.

NOTE: SELECTED METHOD BASED ON SITES CONDITIONS. IF WATER DRAIN PUMP IS REQUIRED, PROVIDE PUMP SIMILAR TO PRODUCT RETURN PUMP. WATER DRAIN PUMP CAN BE IN-LINE OR PAD MOUNTED TYPE.

2.13.2 Water draw-off tank shall be a 55 gallon fabricated stainless steel tank with supporting legs as shown. Tank and support legs shall be fabricated from Type 304 stainless steel.

2.13.3 Sight glasses for the tank shall be standard tubular gages with density ball and shut-off valves on each end. Wetted parts other than sight glass shall be stainless steel. If glass breakage should occur, a stainless steel ball in the valve shall close preventing product loss. Glass shall be protected by minimum of four guard rods.

2.13.4 Product return pump (PRP-1 and PRP-2) shall have the capacity of not less than 5 gpm against a total head of [] feet when driven to [] rpm. Net positive suction head available (NPSHA) is [] feet of wear at 5 gpm. The pump shall have flange connections and shall be constructed of stainless steel or aluminum so as to have no zinc, brass or other copper bearing allows in contact with the fuel. The unit shall be explosion proof, class I, Division 1, Group D with maximum temperature rating of ("T2D" - 419 degrees F). The motor shall not be overloading at any point on the pump curve. Contractor has the option of selecting either centrifugal or positive displacement type pump with the restriction of the positive displacement type pump shall include a pressure relief between the discharge and suction protecting the pump from overloading. **May need to add an additional pump to transfer fuel to the product recovery tank to oil/water separator.**

NOTE: INSERT SITE SPECIFIC PUMP REQUIREMENT.

2.13.5 All units of the water draw-off system shall be installed plumb and level and secured in place by anchor bolts.

2.14 FUELING STATION METER (FSM-1 THROUGH FSM-[]):

2.14.1 Fueling station meter shall conform to Mil. Spec. MIL-M-28519, except as modified herein. Meters shall be positive displacement type meter designed for a continuous flow of 600 gpm with ANSI Class 150 flanges and body working pressure of not less than 200 psig and shall be

suitable for hydrostatic testing of 275 psig. Meter shall be factory calibrated for [JP-4] [JP-5] [JP-7] [JP-8] jet fuel. Meter adjustment shall be possible while under pressure without leakage or loss of product and without requiring disassembly other than removal of the cover plate. The register shall have a non-setback total indicator and setback type run indicator so that individual runs can be registered without affecting the total of all runs shown on the indicator. The total indicator shall have a minimum of seven figures and the setback run indicator shall have a minimum of six figures. The register shall read in gallons and the smallest unit of indicated delivery shall be one gallon. Accuracy shall be within \pm .0.3 percent between ten percent and maximum rated flow. Each meter shall be factory calibrated.

NOTE: SELECT QUANTITY OF FUELING STATION METERS AND SELECT TYPE FUEL.

2.14.1.1 Meter shall be provided with mechanical type card printers.

2.14.2 Pressure loss through the meter shall not exceed 6 psig when operated at rated capacity.

2.14.3 Materials of construction shall be stainless steel, aluminum or non-ferrous material except meter case may be steel with electroless nickel plated internals coated to 3 mil thickness. No ferrous or zinc-coated material, bronze, brass or other copper bearing alloys shall be used in contact with the fuel.

2.15 FUELING STATION VENTURI (FSV-1 THROUGH FSV-[])

2.15.1 Fueling station venturi shall provide for compensated pressure regulation on each refueling control valve. Venturi shall be constructed of stainless steel or aluminum. The Venturi shall be sized to compensate for pressure drop through the entire pantograph assembly at minimum through maximum (0-600) flow rate. The amount of recovery shall be adjustable and the maximum unrecoverable pressure drop at 600 gpm shall be less than 10 psi. Venturi control lines shall be provided with needle valve to be used during final adjustment of pantograph. Venturi control lines shall be provided with pressure gage and stop cock. Indicating range shall be 0-100 psig. Material to be Type 316 stainless steel.

2.15.1.1. Fuel Sensing Line: Venturi shall be provided with stainless steel fuel sensing line for connection to refueling control valve pilot control system.

NOTE: SELECT QUANTITY OF FUELING STATION VENTURIS.

2.16 HYDRAULIC DEADMAN CONTROL FUEL SENSING HOSE AND HOSE REEL

2.16.1 Provide self winding reel and 75 feet of fuel sensing hose at each Aircraft Direct Fueling Station. Hose shall be provided with stainless steel fittings, nylon stop ball and aluminum deadman control handle. Hose shall be dual type with Buna-N tube, vertically braided textile body with fuel resistant neoprene cover.

2.17 NOZZLE ADAPTER

Provide 2 1/2 inch D-2 nozzle adapter with self-closing valve in accordance with MIL STD-244845 and 4 inch flange mounting and dust cap.

[2.18 GROUNDING CABLE REEL

2.18.1 Provide self winding reel with 75 feet of cable. Cable reel, the grounding cable and the connection clamp shall be in accordance with MIL-4-83232 except as noted.]

NOTE: OMIT WHEN USING HOSELESS TYPE PANTOGRAPH.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Installation

Install equipment and components in position, true to line, level and plumb, and measured from established benchmarks or reference points. Follow manufacturer's recommended practices for equipment installation. Provide required clearances between equipment components. Equipment, apparatus, and accessories requiring normal servicing or maintenance to be accessible.

3.1.2 Anchoring

Anchor equipment in place. Check alignment of anchor bolts before installing equipment and clean-out associated sleeves. Do not cut bolts because of misalignment. Notify Contracting Officer of errors and obtain the Contracting Officer's acceptance before proceeding with corrections. Cut anchor bolts of excess length to the appropriate length without damage to threads. Where anchor bolts or like devices have not been installed, provide appropriate self-drilling type anchors for construction condition.

3.1.3 Grouting

Equipment which is anchored to a pad to be grouted in place. Before setting equipment in place and before placing grout, clean surfaces to be in contact with grout, including fasteners and sleeves. Remove standing water, debris, oil, rust, and coatings which impair bond. Clean contaminated concrete by grinding. Clean metal surfaces of mill scale and rust by hand or power tool methods. Provide necessary formwork for placing and retaining grout. Grout to be non-metallic, non-shrink, fluid precision grout of a hydraulic cementitious system with graded and processed silica aggregate, portland cement, shrinkage compensating agents, plasticizing and water reducing agents; free of aluminum powder agents, oxidizing agents and inorganic accelerators, including chlorides; proportioned, pre-mixed and packaged at factory with only the addition of water required at the project site. Grouting to meeting requirements of ASTM C 827. Perform all grouting in accordance with equipment manufacturer's and grout manufacturer's published specifications and recommendations.

3.1.4 Leveling and Aligning

Level and align equipment in accordance with respective manufacturer's published data. Do not use anchor bolt, jack-nuts or wedges to support, level or align equipment. Install only flat shims for leveling equipment. Place shims to fully support equipment. Wedging is not permitted. Shims to be fabricated flat carbon steel units of surface configuration and area not less than equipment bearing surface. Shims

to provide for full equipment support. Shim to have smooth surfaces and edges, free from burrs and slivers. Flame or electrode cut edges are not acceptable.

3.1.5 Direct Drives

Alignment procedure follows:

- a. Rotation direction and speed: Check and correct drive shaft rotation direction and speed.
- b. End Play: Run drive shafts at operational speed. Determine whether axial end play exists. Run drive shaft at operational speed and mark drive shaft axial position when end play exists. Block drive shaft in operating position when aligning drive shaft with driven shaft.
- c. Shaft Leveling and Radial Alignment: Check shaft leveling by placing a spirit level across the half faces. Radially align shafts by placing a straightedge across the two coupling half faces in both horizontal and vertical planes.
- d. Angular Alignment and End Clearance: Check angular alignment and end clearance by inserting a feeler gage at 4 points, 90 degrees apart around outer edges of coupling halves.
- e. Final Recheck: Check adjustments with dial indicator after completing recheck. Align shafts within 0.001 inch tolerance, except as otherwise required by more stringent requirements of equipment manufacturer.

3.2 INSTALLATION OF UNDERGROUND TANKS

Installation shall be per tank manufacturer's recommendations, API 1615, NFPA 30, EPA Regulation 40 CFR Part 280, state and local codes and as specified herein. If recommendations require tank to be filled, only fuel will be allowed in tanks. Water filling is not acceptable.

3.2.1 Steel Tanks

- a. Cover the concrete hold down slab with 12 inches of tank bedding backfill evenly graded and thoroughly compacted, prior to tank placement.
- b. Each tank is to be unloaded and placed on the sand bed using cranes and the rigging procedures provided by the tank manufacturer. Use the tank lifting lugs for lifting the tank into place. The use of slings around the tank is not permitted, nor is the use of chock blocks of any sort. During handling, carefully inspect the tanks for coating damage and repair any damage whatsoever before proceeding. After placement, check each tank to ensure level. The elevation shall be confirmed.
- c. Before proceeding with backfill, install the hold down straps and tighten the turnbuckles securely and evenly throughout the length of the tanks. The bottom and sides of the tanks to be fully and evenly supported by hand shoveling and tamping. Use tank bedding backfill up to 12 inches above the top of tank. Hand-guided power equipment can be used to place fill in 6-inch layers, compacted to a minimum of 95% maximum density, after the bottom quadrant is

filled. A minimum of four density tests per tank to be performed. Clean, non-corrosive, well tamped gravel to be used for backfill from a point 12 inches above the tanks to finished grade.

- d. Do not fill the tank, even partially, before the bottom quadrant is backfilled. The level of fuel product not to exceed the level of compacted backfill at any time.
- e. Coordinate tank installation with the installation of cathodic protection.

3.3 INSTALLATION OF FIBERGLASS PITS

3.3.1 Fiberglass pits shall be installed per pit manufacturer's written recommendations. Written recommendations shall also include required dimensional spacing of pits from concrete construction joints and type of backfill material as well as methods of installation in off-shoulder/off-apron locations.

3.4 POSTED OPERATING INSTRUCTIONS

For each designated system or equipment item, provide instructions for guidance of operating and maintenance personnel. Following approval of content, prepare these instructions in a form and scale that will be readily legible when displayed in appropriate locations, to be designated by the Contracting Officer. Meet the following requirements:

- a. For each system, include diagrams of equipment, piping, wiring and controls. Define control sequences.
- b. For each tank provide tank calibration chart.
- c. For each equipment item, include starting, adjustment, operation, lubrication, safety precautions and shut-down procedures. Identify procedures to be performed in event of equipment failure. Provide other instructions recommended by the manufacturer.
- d. The Contractor shall provide an isometric piping diagram of the fueling system apparatus. Diagram shall be 36 inches x 54 inches and shall be color coded to match PCP color diagrams. Diagram shall show the entire facility and shall include all equipment and the operational sequences of all equipment with equipment numbers displayed. It shall be wall mounted under glass.

--End of Section--