SECTION 15899

SYSTEM START-UP, FUELING

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PART 1 GENERAL

1.1 SUBMITTALS

1.1.1 Certification of Entire System

Prior to the acceptance of the newly constructed system by the Government, all installed mechanical and electrical equipment shall be inspected and approved by the Contracting Officer. The Contractor shall give the Contracting Officer [ ] days notice in order to schedule the [Command Fuel Facilities Engineer as a technical consultant to the contracting Officer and shall not have any contract authority] [Government representatives] for participation in the inspection and equipment tests and final acceptance procedures and approval. Any deficiencies observed shall be corrected by the Contractor without cost to the Government. The Contractor shall prepare a detailed written plan for implementation of system start-up. The plan shall be submitted for Government approval [ ] days prior to system start-up. The plan shall include a list of personnel by trade, list of key personnel, safety equipment, list of miscellaneous equipment such as two way radios, personnel transportation vehicles, etc. and detailed procedures and schedules. The Contractor shall be responsible for implementing system start-up in coordination with ongoing base operations.

NOTE: INSERT NUMBER OF DAYS NOTICE. USE THE COMMAND FUEL FACILITIES ENGINEER ON NAVFACENGCOM PROJECTS. ON C.O.E. PROJECTS, SELECT GOVERNMENT REPRESENTATIVES AND INCLUDE IN MoU SPECIFIC AIR FORCE REPRESENTATIVES TO BE NOTIFIED WHEN DATES ARE SUBMITTED TO CONTRACTING OFFICER.

1.1.2 Test Reports

Submit written test reports to the Contracting Officer prior to the final acceptance procedure. Information reported shall include:

a. Elapsed operating time.

b. Tank liquid level readings.

c. System flow rate and meter readings.

d. System pressure gage readings.

e. Number identification of pumps running.

f. Pump RPM, amperage, and voltage.

g. Condition of fuel samples.

h. Refueling control valve performance (including flow rate and pressure) during emergency shutoff; downstream valve closure, and relief operations.

PART 2 PRODUCTS

2.1 DESIGN CONDITIONS

Temporary flushing lines and equipment shall be equal in strength, stability, and materials to the associated permanent components. However, spools may be carbon steel. Additional design conditions shall be as specified in Section entitled "Mechanical Equipment, Fueling."

2.2 SOURCES OF MATERIAL AND EQUIPMENT

2.2.1 Material and Equipment

The Contractor shall provide material, equipment and labor not specified to be Government-furnished and required for proper start-up of the system. Equipment shall include but not be limited to the following:

a. Temporary strainers.

b. Pipe spools.

c. Flow meters.

d. Pressure gage.

e. Electronic sensors, volumetric meters and seven channel strip recorders for pressure and flow recording. This equipment shall be used to monitor and record the system during the "Equipment Test" and "Performance Testing" portions of this Specification Section. Recorded data shall be used by the Contractor and equipment factory representatives to achieve final control valve and equipment adjustments. Recorded data shall include:

- Fueling pumps discharge pressures

- Supply Venturi flow rates

- Refueling Control Valve pressures

- Fueling Station Venturi flow rates

- Back Pressure Control Valve upstream pressures

- Back Pressure Control Valve downstream pressures

- Return Venturi flow rates

f. Minimum three (3) spare sets of coalescers and separator cartridges for each filter separator. During cleaning operation, Contractor shall provide a flow vs. pressure drop graph for each filter separator. Graph format shall be as shown at end of this Section. Contractor shall change coalescers and cartridges upon reaching a differential pressure of 15 psi or when pressure drop is less than previous graph or fails to increase properly. Isolate each filter separator, one at a time and use one fueling pump to obtain rated flow rate (600 gpm). Unused coalescers and cartridges shall become the property of the Government.

2.2.2 Government-Furnished Material and Equipment

The Government will furnish the following materials, equipment and services during the performance of the work under this section.

2.2.2.1 Aircraft Turbine Fuel: The Government will provide the fuel necessary for system testing. The Contractor shall notify the Contracting Officer one hundred and twenty (120) days in advance of the requirements. Additional fuel will be provided by the Government as required for satisfactory flushing of the system. Upon satisfactory completion of the flushing and cleaning operations, the government will supply the additional quantities of fuel required to complete the other work under this section. Fuel will not be delivered to the system until the Contractor has satisfactorily completed all work under the preceding sections of the specifications; and, in particular, the cleaning and coating of the interior surfaces of the operating storage tanks and the removal of preservatives and foreign matter from those portions coming in contact with the fuel valves, pumps, filter separators and other such equipment. Fuel delivered to the system shall remain the property of the Government and the Contractor shall reimburse the Government for shortages not attributable to normal handling losses. The Government shall be reimbursed for fuel lost as a result of defective materials or workmanship. An empty Operating Tank shall never be filled at a rate greater than 2 feet per second until fill nozzle is completely submerged.

2.2.2.2 Tank Trucks: Refueler tank trucks and operation of same will be furnished by the Government.

2.2.2.3 Bladders: The Government will provide up to [ ] 50,000 gallon hydrant mobility bladders.

NOTE: COMMAND FUEL FACILITIES ENGINEER TO DETERMINE QUANTITY.

2.2.2.4 Utilities: Electric power required for the performance of the work under this section will be furnished at no charge to the Contractor.

NOTE: SELECT DEFUEL CART FOR SYSTEMS USING PANTOGRAPHS.

PART 3 EXECUTION

3.1 PREPARATIONS FOR FLUSHING

Upon completion of the system to the satisfaction of the [Contracting Officer and the Command Fuel Facilities Engineer] [Contracting Officer], the Contractor shall make the following preparations for flushing the system.

NOTE: SELECT CONTRACTING OFFICER AND THE COMMAND FUEL FACILITIES ENGINEER ON NAVFACENGCOM PROJECTS. ON C.O.E. PROJECTS, SELECT CONTRACTING OFFICER AND INCLUDE IN MoU SPECIFIC AIR FORCE REPRESENTATIVES TO BE NOTIFIED WHEN DATES ARE SUBMITTED TO CONTRACTING OFFICER.

3.1.1 Protection of Equipment

The following items shall be removed from the system prior to start of flushing operations and, where applicable, replaced with spools of pipe, diameter equal to the item removed:

a. Control valves.

b. Sensors which are exposed to the fluid.

c. Coalescer and separator elements in filter separators.

d. Issue and Return Venturi Tubes and Pressure Indicating Transmitters and Fueling Station Venturi.

e. Meters.

After flushing, the above items shall be reinstalled in the system and the spool sections turned over to the Contracting Officer.

3.1.2 Strainers

Temporary 40 mesh cone type strainers shall be installed in the suction line ahead of each fueling pump for first pass only. Any damaged strainers shall be replaced by the Contractor at no additional cost to the Government.

3.1.3 Water Draw-Off

Remove any accumulated water from Operating Tanks' sumps and bottoms.

3.2 FLUSHING

Flushing procedures shall precede cleaning procedures. The transfer line, pump house piping, apron and Aircraft Direct Fueling Station supply and return lines, supply and return lines to the operating tanks and product recovery lines shall be flushed with fuel until the fuel being delivered is free of construction debris to the satisfaction of the Contracting Officer. Samples of fuel shall be taken and tested by the designated government agency and shall be free of gross contamination, maximum of 8.0 mg/gallon solids and free water not to exceed 2 ml per quart.

3.2.1 Fueling System Piping

The flushing of system pipelines shall be accomplished by pumping fuel from one of the operating tanks through the fueling system piping and back to another tank. Air shall be bled from system high points. The procedure shall be continued until the fuel being delivered into the tanks is acceptable to the Contracting Officer. After the system has been flushed to the satisfaction of the Contracting Officer, the Contractor shall remove any water remaining in the low point drains and remove any accumulated water from Operating Tank sumps and bottoms by means of the Water Draw-off systems. Cone strainers shall be kept clean in order to insure maximum flow rate. Upon completion of the first flushing operations, the cone strainers shall be removed from the system. In addition, baskets from all strainers shall be removed and cleaned.

3.2.1.1 Transfer Line: Flushing of the transfer line shall occur during the filling operations. Samples of the incoming fuel shall be taken at the point of connection with bulk storage supply line. These samples shall be taken at one hour intervals and shall be tested by the designated government agency.

3.2.1.2 Pump Shelter Piping: Remove equipment as specified in the paragraph entitled "Protection of Equipment." Perform the following flushing operations by withdrawing fuel from one operating tank and returning it to another tank. Circulate a sufficient amount of fuel for each operation. Bleed air from high points.

a. Position manual valves to circulate fuel through one pump, filter separator combination.

b. Position manual valves to circulate fuel through the bypass line . Flush this line using two fueling pump.

3.2.1.3 Fuel Supply and Return Piping to Apron: Remove equipment as specified in the paragraph entitled "Protection of Equipment". Position manual valves to circulate fuel through the apron loop and back to the operating tank. Begin flushing the apron loop at a flow rate of 600 gpm. Increase flushing flow rate slowly up to the maximum rated system capacity for a minimum of 6 hours.

3.2.1.4 Product Recovery Tank Lines: During the flushing of apron loop piping, operate all manual drain lines individually to flush their connection to the product recovery tank. Fill the tank a minimum three times, each time utilizing the fuel transfer pump to drain it by returning the fuel to storage.

3.2.1.5 Aircraft Direct Fueling Station: Utilize Aircraft Direct Fueling Station supply line and single point receptacle to flush each station. Sample the fuel at station sample connections.

3.3 CLEANING

After initial flushing is completed, the pump shelter and apron loop piping and Aircraft Direct Fueling Station shall be cleaned in accordance with the procedure specified hereafter. Operating Tanks shall be isolated from system and cleaned as specified in Section entitled "Cleaning Petroleum Storage Tanks".

3.3.1 Preparation for Cleaning

Filter elements shall be installed in the filter separators. Adjust filter separator flow control valve. Valves and equipment removed for flushing shall be reinstalled. Cone strainers shall be removed. Operating Tanks shall be drained, vapor freed and cleaned. Transfer the contents from one operating tank to the other for the purposes of cleaning.

3.3.2 Cleaning Requirements

Cleaning shall continue until Contracting Officer certifies that the fuel passes the color and particle assessment method as defined in T.O. 42B-1-1 or contains 2 milligrams per gallon or less of particulate. Fuel shall also contain 10 parts per million or less of free water.

Sampling and testing shall be done by the [Air Force] [independent testing laboratory].

NOTE: ON C.O.E. PROJECTS, IF AIR FORCE IS TO DO SAMPLING AND TESTING, INCLUDE IN MoU.

3.3.3 Cleaning Procedure

During cleaning procedure periodically bleed air through high point vent and rain water through low point drains.

3.3.3.1 Transfer Line: Continue to receive fuel and circulate it until fuel samples taken at the tanks meet the requirements.

3.3.3.2 Pump Shelter Piping: Pump shelter piping shall be cleaned as follows:

a. Position manual valves so that fuel is withdrawn from one operating tank, circulated through one fueling pump and filter separator, then returned to the operating tank through the receiving filter separators.

b. Clean the piping system using one pump at a time. Alternate the fueling pumps and filter separators during the operation to clean the individual fueling pump section and discharge lines.

c. Monitor pressure drop through the filter separators during each cleaning operation and provide flow vs. pressure drop graphs as specified herein before.

d. Periodically take samples from all sample connections. Cleaning shall continue until the fuel meets the specified requirements.

3.3.3.3 Apron Loop Piping: Apron loop piping shall be cleaned as follows:

a. Position manual valves to circulate fuel through the apron loop and back to the operating tank through the receiving filter separators.

b. Initially pump fuel through the apron loop at a flow rate of 600 gpm, then increase flow rate up to the designed capacity starting manually one pump at a time. When pumping at a rate greater than 1200 gpm, by-pass receiving filter separators.

c. Monitor pressure drop through the filter separators during the cleaning operation and provide flow vs. pressure drop graphs as specified herein before.

d. Periodically take samples from all sample connections. Cleaning shall continue until the fuel meets specified requirements.

3.3.3.4 Product Recovery Lines: Repeat the process described under initial flushing until samples taken at the connection of the pipe line back to storage meet the requirements.

3.3.3.5 Aircraft Direct Fueling Station: Repeat the process described under initial flushing until samples taken at the pressure fueling nozzle meet the requirements.

3.4 CONTROL VALVE AND PANTOGRAPH ADJUSTMENT

The filter separator control valves and fueling pump non-surge check valve and needle valve on Fueling Station Venturi shall be checked and adjusted as follows:

3.4.1 Control valves on issue filter separator downstream side:

3.4.1.1 Position valves so that one fueling pump can pump through only one filter separator. Close the valve at the entrance of the apron loop, and open the bypass valve, allowing discharge into the circulating line.

3.4.1.2 Start the pump and adjust the filter separator control valve for the rated flow capacity of the filter separator (600 gpm).

3.4.1.3 Repeat above for each remaining filter separator.

3.4.2 Rate of flow control feature on fueling pump non-surge check valve:

3.4.2.1 Run one pump at a time and adjust rate of flow feature (650 gpm).

3.4.3 Fueling Station Venturi needle valve shall be adjusted to ensure pressure never exceeds 50 psi at the aircraft skin. After initial setting, valve shall be locked in adjusted position.

3.5 EQUIPMENT TESTS

After completion of flushing, cleaning, and control valve and electrical components adjusting operations, the tests specified hereinafter shall be performed. After cleaning is complete and prior to performance testing, field adjustment of automatic control valves and automatic pump controls while in operation shall be made only by the valve manufacturer's authorized field test engineer. For final adjustment of installed electrical control equipment the Contractor shall provide an experienced electrical engineer, factory representative of PCP manufacturer and factory representative of PIT and DPT manufacturers. Both the mechanical and electrical components shall be adjusted concurrently. Tests will be witnessed by the [Contracting Officer and the Command Fuel Facilities Engineer]. [Contracting Officer and other Government representatives]. Contractor shall complete and submit to Contracting Officer the "CHECK LIST FOR EQUIPMENT TEST" provided hereinafter.

NOTE: SELECT CONTRACTING OFFICER AND THE COMMAND FUEL FACILITIES ENGINEER ON NAVFACENGCOM PROJECTS. ON C.O.E. PROJECTS, SELECT CONTRACTING OFFICER AND OTHER GOVERNMENT REPRESENTATIVES. INCLUDE IN MoU IF THE COMMAND FUEL FACILITIES ENGINEER WILL PARTICIPATE IN INSPECTION OF EQUIPMENT TEST.

3.5.1 Operating Tank Low Level Alarm (Item 1)

Position valves to transfer fuel between operating tanks. Start one fueling pump and pump sufficient fuel out of the first operating tank to allow the low level alarm (LLA) to stop the fueling pump. This procedure shall be repeated for each fueling pump and each tank until the low level alarm stops the fueling pump due to low liquid level in operating tank.

3.5.2 Fuel Delivery (Item 2)

Flow rates at each Aircraft Direct Fueling station shall be measured against various pressure fueling nozzle back pressures. Each timed flow rate period shall be at least one minute. False back pressure shall be created by throttling a valve downstream of the nozzle. Valve can be located on tank truck or in Aircraft Direct Fueling Station return line. Record flow (GPM) at pressure fueling nozzle pressures of 20 psig, 25 psig and 35 psig. Flow rates of less than 450 GPM at 20 psig will require re-examination. Before re-examination, ensure all temporary strainers have been removed, valves are fully open, pressure relief valves are not leaking and differential pressure drop across filter separators is within acceptable range.

3.5.2.1 In order to determine the fuel delivery rate, the Contractor shall provide calibrated 600 gallon per minute capacity volumetric type meters at the refueling control valves. Delivery of fuel shall be made from any fueling station through pantographs and into return line or tank trucks. Test results shall be recorded by the Contractor.

NOTE: SELECT ARRANGEMENTS FOR PANTOGRAPHS OR HYDRANT HOSE TRUCKS.

3.5.3 Fueling Pump Operation (Item 3)

Operation of all pressure and flow devices to start and stop the fueling pumps at the indicated pressure and flow rates shall be demonstrated by the Contractor in the presence of the Contracting Officer. The operating sequence shall be repeated with each of the pumps being selected as lead pump. For this test, the flow rates shall be measured. Flow rates and test results shall be recorded and witnessed by the Contractor.

3.5.4 Emergency Shutdown (Item 4)
With one fueling pump circulating fuel through the system, test each "Emergency Stop" pushbutton station to verify that the pump stops and the emergency shutoff valve closes from each pushbutton station. Repeat above procedure for each fueling pump. Conduct tests for both the automatic and manual modes. Also simulate a total emergency stop with three pumps running.

3.5.5. Refueling Control Valve (Item 5)

Each Refueling Control Valve shall be operated to demonstrate the following:

1. Surge shut-down capability. (Surge from shut-off of on-board aircraft fill valve can be simulated by closing a fill line valve to the tank truck or bladder).

2. Pressure control at setpoint, $\pm$ 2 psi (Requires use of a pressure gage at the pressure fueling nozzle). A false backpressure shall

be created by throttling flow downstream of the pressure fueling nozzle. Throttle slowly from full flow to zero while verifying nozzle pressure does not exceed 50 psig.

3. Deadman closure, maximum 2 seconds.

3.5.6 Filter Separator Float Control Valves with Manual Tester (Item 6)

Using the manual float control test lever on each Filter Separator, lift the weight from the float ball slowly and observe the following:

1. Operation of the Automatic Water Drain Valve as indicated by the flow pin wheel.

2. Operation and closure of the water slug shut-off feature on the Filter Separator Control Valve.

3.5.7 Overfill Valve (Item 7)

Place Fuel Transfer Pump in the "off" position. Delivery quality of fuel to Product Recovery Tank to demonstrate capability of valve to close. Place Fuel Transfer Pump in the "Automatic" position to demonstrate capability of valve to open when fuel level drops below set point.

[3.5.8 Bypass Valve (Item 8)

Artificially create high pressure across receiving filter separators. Valve shall demonstrate capability to fully open and fully close.]

NOTE: SELECT THIS PARAGRAPH IF BYPASS VALVE IS USED.

3.6 PERFORMANCE TESTING

Testing as performed under the above paragraphs shall be considered to be part of the performance testing after the Contractor has made the required adjustments to the various equipment and controls and demonstrates to the satisfaction of the [Contracting Officer and the Command Fuel Facilities Engineer], [Contracting Officer], that these portions of the systems are working as specified. Performance testing shall also demonstrate proper operation of System "Loop Flush" and "Pantograph Flush" modes. The Contractor shall notify the Contracting Officer 15 days in advance of the test to permit arrangement for the use of Government-furnished items.

NOTE: SELECT CONTRACTING OFFICER AND THE COMMAND FUEL FACILITIES ENGINEER ON NAVFACENGCOM PROJECTS. ON C.O.E. PROJECTS, SELECT CONTRACTING OFFICER AND INCLUDE IN MoU IF COMMAND FUEL FACILITIES ENGINEER OR HIS DESIGNATED WITH ASSIST CONTRACTING OFFICER REGARDING APPROVAL OF FINAL PERFORMANCE TESTING.

3.6.1 Final Performance Test

The final performance test shall consist of performance of the fueling system during actual fueling and defueling of an aircraft. The maximum rated capacity of the system shall be tested by using several aircraft simultaneously. If it is not possible to use the number of aircraft required to receive the full flow, the test shall be supplemented

through the use of refueling trucks or bladders. Record required data necessary to prepare "Test Reports" specified in Paragraph 1.1.2 of the specification.

3.6.1.1 Satisfactory Performance: In the event a portion of the system or any piece of equipment fails to meet the test, the Contractor shall make the necessary repairs or adjustments and repeat the Performance Test until satisfactory performance is obtained. The determination of satisfactory performance shall be made by the [Contracting Officer and the Command Fuel Facilities Engineer] [Contracting Officer].

NOTE: SELECT CONTRACTING OFFICER AND THE COMMAND FUEL FACILITIES ENGINEER ON NAVFACENGCOM PROJECT. ON C.O.E. PROJECTS, SELECT CONTRACTING OFFICER AND INCLUDE IN MoU IF COMMAND FUEL FACILITIES ENGINEER OR HIS DESIGNATED REPRESENTATIVE WILL PARTICIPATE IN PERFORMANCE TESTING.

3.6.2 Final Acceptance

The system shall be filled with fuel and shall be operable and leak-free prior to acceptance. Anything wet with fuel is considered to be leaking.

3.6.2.1 Operating Tank High Liquid Level Shut-Off Valve Test and Adjustments: During the final filling of operating tanks, the tank automatic high liquid level shut-off valve shall be checked for proper functioning at least three times by lowering the fuel level and refilling again. Adjust valve to achieve a safe fill level.

3.6.2.2 Tank Level Indicator Adjustments: Also during the final filling of operating tanks, adjust and calibrate the tank level indicators including the final setting of the high high level (HHLA) and high level (HLA) alarms. Since the HHLA is at a point higher than the High Liquid Level Shut-Off Valve float set point, an artificial method of simulating HHL must be used.

3.6.2.3 Water Draw-off System Test: During the performance testing, Water Draw-off Systems shall be filled from Operating Tank sump to ensure proper operation. After filling system, allow time for fuel/water mixture to separate. Verify liquid separation through system's sight glasses. Proper operation includes capability to [drain] [pump] separated water to Product Recovery System and capability to pump separated fuel back to a full Operating Tank.

--END OF SECTION--