

**C.A.S.E.
AIR CARRIER SECTION
POLICIES AND PROCEDURES**

C.A.S.E. Standard 2-A

Fuel Into-Plane and Storage Vendors

Quality Program Requirements

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PROGRAM REQUIREMENT

1. General

- A. This standard is intended to be a supplement to the latest addition of applicable industry specifications. It is not meant to restate or replace those specifications. The specifications used to develop this document are as follows:
- 1) Air Transport Association of America, Inc. Specification 103 (ATA 103).
 - 2) Joint Inspection Guidelines (JIG).
 - 3) Canadian Standard B836-00.
 - 4) National Fire Protection Association (NFPA) Standards 10, 30, 77, 407, and 430.
 - 5) American Petroleum Institute (API) Standards 1529 and 1542.
 - 6) American Petroleum Institute (API) Publication 1581.
 - 7) Institute of Petroleum (IP) Specifications and Qualifications Procedures –Aviation Fuel Flow Monitors with Absorbent Type Elements.
 - 8) American Society for Testing and Materials (ASTM) Manual 5.
 - 9) American Society for Testing and Materials (ASTM) D1655.
 - 10) American Society for Testing and Materials (ASTM) 2276.
 - 11) Federal Aviation Administration (FAA) Advisory Circular 150 & Title 14 CFR part 139.
 - 12) Local authority having jurisdiction over the facilities.
- B. This standard, in conjunction with applicable specifications, describes the minimum requirements for a jet fuel vendor's quality program. It is designed to aid surveillance of a vendor who provides fuel storage and fueling services to customers. This standard may be used to determine the adequacy of the vendor's quality program.
- C. Compliance with this standard does not necessarily accept a vendor for entry into the C.A.S.E. Register. Vendors that are accepted for listing in the C.A.S.E. Register must continue to meet the requirements of this standard. Vendors may not publicize by statement or inference their C.A.S.E. register status in any form, i.e. advertising, other solicitation of business, or use of the C.A.S.E. logo.
- D. Vendors are subject to a technical audit at any time during normal working hours. The audit may be conducted by the customer or by another C.A.S.E. member. The audit may encompass the entire technical portion of the vendor's operation or any part thereof. Normally, the auditor will notify the vendor and arrange the audit so as to cause minimal interference with the vendor's operation. However, should circumstances dictate, the auditor may arrive unannounced.
- E. An acceptable audit result does not relieve the vendor of its responsibility to provide acceptable product/services.

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- F. All C.A.S.E. listed vendors shall maintain for a period of three years, audit findings and corrective actions resulting from a 2-A Standard audit. This file shall be accessible to any C.A.S.E. authorized auditor on request.
- G. Vendors operating in the United States shall have a pre-employment and post accident drug/alcohol program for personnel dealing with the receipt, handling, storage and dispensing of fuel.
- H. All programs that identify an individual (per their Policies and Procedures Manual), by title, responsible for the effectiveness of a program shall have a back-up person, by title, to insure the continuity of the program during the primary individual's absence.
- I. No employee having a degree of color blindness that precludes correct identification of aviation fuel coloring, its related color code, or test color ratings shall be engaged in aviation fuel handling tasks. Prior to employment, personnel performing quality checks shall be tested for color blindness by practical tests, carried out in circumstances akin to those encountered in the field (including poor light conditions) in which they are required to identify fuel grade, color code markings and actual samples of various fuels.
- J. When initials or employee numbers are used to sign off quality inspections, the vendor shall maintain a current roster identifying those individuals, their employee number, and sample of initials. The roster must be available for review upon request.
- K. CACS-25 and CACS-26 are the C.A.S.E. checklists associated with this standard.
- L. When performing into-plane refuelling the following safety practices must be adhered to:
 - 1) Vehicles are to operate safely on the ramp.
 - 2) Vehicles are to approach the aircraft no faster than walking speed.
 - 3) Ensure the truck/cart is chocked correctly.
 - 4) Fueling vehicle is to be bonded to the aircraft prior to hose hook up.
 - 5) Ensure there is no leakage around the nozzle or along the fuel line.
 - 6) Check for any leakage around the fueling truck/cart.
 - 7) Ensure the vehicle is positioned clear of the wing.
 - 8) A deadman control is to be correctly used.
 - 9) The fueller shall check primary nozzle and filter differential pressure.
 - 10) After fueling operation has been completed and, if applicable, ensure the aircraft fuel cap cover been properly reinstalled.

2. Quality Program

- A. The vendor shall have an established quality program adequate to assure safe receipt, storage and distribution of jet fuel in accordance with industry standards. The vendor must insure that all applicable quality control tests be performed in accordance with, but

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not limited to, quality control standards (e.g. ATA 103, ASTM, API, IP, NFPA, JIG, Canadian B836-00).

- B. The vendor shall have an internal audit and surveillance function that:
- 1) Periodically reviews its programs to assure that the programs have procedures in place that assure compliance with customer specifications, regulatory requirements, and good industry practice.
 - 2) Verifies that operations are being conducted in accordance with these programs and customer requirements.
- C. The vendor's internal audit and surveillance function shall contain provisions assuring that appropriate corrective action is promptly taken to:
- 1) Correct the discrepancies reported to meet the customer's requirement.
 - 2) Locate and correct similar discrepancies, if they exist, in areas not audited.
 - 3) Correct the root cause of the problem evidenced by the discrepancies.
- D. The internal audit report shall be kept on site for 24 months.
- E. The quality program, including procedures and operations, shall be described in detail in a policies and procedures manual. The purpose of the manual is to provide operational guidance to management and staff. This manual shall be kept current and shall be readily available to employees and to the customer's auditor or designee. The document shall include, but not necessarily limited to, a detailed description of:
- 1) General.
 - a) Responsibility.
 - i) There is a clearly identifiable, qualified and knowledgeable person who is accountable for the quality of a process.
 - b) Authority.
 - i) There is a clearly identifiable, qualified and knowledgeable person with the authority to establish and modify a process.
 - c) Procedures.
 - i) There are documented methods for accomplishing a process.
 - d) Controls.
 - i) There are checks and restraints designed into a process to ensure a desired result.
 - e) Process Management.
 - i) The vendor measures and assesses its processes to identify problems or potential problems.

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- f) Interfaces.
 - i) The vendor identifies and manages the interactions between processes.
- g) Quality program.
- 2) Operations.
 - a) Receipts.
 - b) Transfers.
 - c) Storage.
 - d) Dispensing.
 - e) Handling contaminated fuel and customer notification.
 - f) Notifying customers/Quality department when new, additional, replacement, or modified equipment is placed into operation.
 - g) Notifying customers/Quality department of inoperative systems that impact operations.
 - h) Defueling procedures.
 - i) Reporting of observed deficiencies or safety hazards.
 - j) Inspection Program.
 - k) Quality control and maintenance record keeping requirements and record retention time.
 - l) Fuel meter and tool calibration program.
 - m) Training Program.
 - n) Technical data program, e.g. quality control, maintenance and air carrier manuals.
 - o) Required tests to ensure fuel meets quality specifications.
- 3) Environmental.
 - a) Spill Prevention Control & Counter Measure Plan (SPCC) and /or facility response plan must be certified every 5 years.
 - b) Emergency Information.
 - i) Contact list.

3. Technical Data Program

- A. All actions shall be accomplished in accordance with industry-accepted specifications as outlined in section 1.A (General) of this standard.
- B. The vendor shall have a documented system to assure that:
 - 1) All technical data is kept current and there is a record of revisions received and filed.

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- 2) Only the latest technical data is available to persons performing assigned tasks, and
- 3) The technical data used by persons performing these actions is appropriate for the work being done, readily available, in good condition, and in adequate quantity.

C. Specific individual(s), by title, shall be named as responsible for:

- 1) Maintaining an adequate quantity of the appropriate technical data that is up to date and properly distributed.
- 2) Maintaining the technical data in an environment that will protect it from loss or damage.
- 3) Maintaining viewing devices, if required, in good working order and protected from damage.

4. Tool/Test Equipment Calibration Program

- A. Tools and test equipment used to comply with or verify specifications shall be calibrated periodically to assure their accuracy.
- B. The program shall identify the individual(s) responsible, by title, for the operation of the calibration program.
- C. The calibration program shall include identification of the tools and test equipment in the program, the frequency of calibration, and the applicable tolerance or specification. (e.g. volt /ohmmeters, torque wrenches, master gauges, provers.)
- D. Standards used in calibration shall be traceable to the controlling government agency or to a standard provided by the equipment manufacturer, e.g. The National Institute of Standards & Technology (N.I.S.T.).
- E. The program shall provide a system for identifying the calibration status of each piece of equipment in the calibration program and their calibration due dates.
- F. Tools and test equipment that are in the calibration program, but are out of calibration or are past due calibration check, shall be identified in a manner that will prevent maintenance personnel from using them.
- G. Personal tools or equipment used in verifying or complying with specifications shall be included in the program.
- H. Records shall:
 - 1) Show the date the item was calibrated or checked.
 - 2) Show the date the next calibration is due.
 - 3) Identify the individual or, where applicable, the outsource vendor that accomplished the calibration or check.
 - 4) Contain a certificate of calibration for each item calibrated by an outside agency.

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- 5) Record the details of any adjustment or repair required, and identify the standard, including the part number and serial number, used to calibrate the tool.

5. Training

- A. The vendor shall have a documented training program for all personnel under their direction. Personnel who dispense fuel shall be trained in:
 - 1) Safe operation of the equipment they use.
 - 2) Operation of emergency controls.
 - 3) Procedures to be followed in the event of a fuel spill or leak and in response to an emergency. This program is to be separate from airline training programs.
- B. The vendor shall assure that each employee is properly trained for the work the individual is to perform. Although the contents of each of the components may vary to reflect individual company requirements, each employee's training shall include the training subjects relevant to the tasks that they perform. Documentation of the training for each employee shall be maintained.
- C. The vendor shall document both formal (classroom) and on-the-job (OJT) training. It will be the responsibility of site management/supervisor to ensure only qualified employees (including contract personnel) refuel aircraft without supervision. Documentation of all training records and certifications shall be on file at site and made available for review on request.
- D. Training records shall include:
 - 1) A description of the training.
 - 2) Date and hours of instruction.
 - 3) Name of instructor and student and/or signature of both.
 - 4) Name of organization conducting the training if performed by an outside agency.
 - 5) Written or oral test administered by the fueling company management to establish a consistent benchmark for all employees at that site.
- E. The following is a general list of the basic and recurrent training requirements for employees of the fueling operator:
 - 1) Aviation Fuel Knowledge:
 - a) Specific information on the fuel types handled and their characteristics.
 - b) Knowledge of all other products handled, including additives as outlined in the Material Safety Data Sheet (MSDS).
 - c) Quality control checks and tests.
 - 2) Safety:
 - a) Driver training, employee must be checked for a valid drivers license.

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- b) Fire protections.
 - c) Environmental emergency response procedures.
 - d) Static charge theory.
 - e) Site-specific first aid procedures.
 - f) Workplace hazardous materials information system.
 - g) Transportation of dangerous goods.
 - h) Emergency response plan and procedures.
 - i) Hazardous material and fuel spill and leak clean up procedures.
 - j) Fueling in adverse weather.
 - k) Title 14 CFR, Part 139.
- 3) Fuel Quality Management:
- a) Filtration types and their operation.
 - b) Daily, weekly, monthly, quarterly, and annual checks required for fuel quality management.
 - c) Knowledge of how to look for problems and what problems to look for (contamination identification, notification and corrective actions).
 - d) Documentation.
- 4) Fuel Storage Facility Operations (where applicable).
- a) Basic knowledge of components of their particular fuel storage facility and its proper maintenance.
 - b) Specific procedures of receipt, storage, discharge, maintenance, documentation, and inventory control.
- 5) Aircraft Fuel Servicing:
- a) Operation of pressure control, deadman use, water detection, and bonding.
 - b) Fueling and Defueling in accordance with specific airline policies.
 - c) Site-specific operational requirements.
 - d) Characteristics of the tank vehicle, including safety features and emergency procedures.
 - e) Characteristics of hydrant fueling.
- 6) Maintenance Topics That Could Be Expanded Upon For Other Levels.
- a) Filtration changes – proper methods for examining, testing, and replacing filter extracts.

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- b) Pressure control – proper procedures for conducting required pressure control tests.
- c) Meter proving.

6. Alternate Means Of Compliance

- A. For situations where compliance to this standard cannot be achieved, the vendor may opt for an alternative means of compliance. Fuel quality, safety, or security shall not be compromised in any way.
- B. A request for an alternative means of compliance must be made in writing to each affected air carrier.
- C. The request shall include the following:
 - 1) Requirement from which the alternative means is replacing.
 - 2) Explanation as to why compliance with requirements is not possible or practical.
 - 3) Explanation of how the alternative means of compliance does not impact the end result of the requirement it replaced.
 - 4) Period of time the alternative method is to be effective.

7. Airport Fuel Receipts

A. General

- 1) A record shall be kept for each fuel receipt to document details of the inspections being performed.
- 2) The signature, initials, or employee identification number of the person performing the task, or person accepting responsibility for the task, is required on all receipt records.
- 3) All forms shall be complete and accurate.
- 4) Forms of any type may be used as long as they provide a clear and concise record of events.
- 5) All receipt records must be maintained on file for 12 months.

B. Fuel Accepted by Pipeline or Marine Delivery.

- 1) Prior to delivery, the vendor shall receive a shipping document from the supplier or shipper certifying the delivered product meets ASTM D1655 or DERD 2494 specifications. The document shall show the following:
 - a) Product grade.
 - b) Batch number.
 - c) Correct destination.
 - d) Volume to be delivered.

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- e) API corrected to 60 degrees F or density test.
- 2) The receiving tank(s) shall be gauged and sumped before receipt begins.
- 3) Vendor shall have established communications with supplier/shipper.
- 4) Receiving process shall be monitored at all times by qualified personnel using correct procedures and applicable test equipment. Under no circumstances shall fuel be received and dispensed from the same tank simultaneously.
 - a) During fuel receipt, the following tests shall be performed downstream of receiving filtration and recorded at the beginning, midpoint, and end of receipt (midpoint may be omitted on receipts less than 4 hours in duration):
 - i) Visual appearance (vendors in the United States must use a white bucket).
 - ii) API Gravity, corrected to 60 degrees F or density test.
 - iii) Color Membrane.
 - iv) Free Water Detection (test equipment capability down to 15 PPM).
- 5) Fuel is unacceptable and shall be rejected if the API Gravity, corrected to 60 degrees F, is not between 37 degrees and 51 degrees API and/or the flashpoint is less than 100 degrees F (38 C). If the API gravity differs by more than 1 degree or the density has changed 3 kg/m^3 the receipt shall be stopped and investigated to determine if there is fuel contamination or a specification problem.
- 6) While receipt is ongoing, the vendor shall monitor inlet filtration differential pressure, tank fill levels, and monitor the fuel system for leaks.
- 7) Upon completion of receipt the receiving tank and inlet filter vessel sump shall be sampled for visual appearance.
- 8) Multi Product Pipeline:
 - a) After receipt is complete from a multi product pipeline, the vendor shall immediately perform the ASTM D1655 property tests for comparison to the shipping documents and for meeting specifications prior to releasing the product for use. (See following chart)

NOTE: When conditions allow, a settling time of one hour per vertical foot per tank is recommended.

Multi-Product Pipeline
ASTM D1655 PROPERTY TEST

PROPERTY	SPECIFICATION LIMIT	MAX DIFFERENCE
(a) Visual Appearance	Clear & Bright	
(b) API Gravity, Corrected to 60 degrees F (15 degrees C)	37 degrees to 51 degrees API	1 degree API

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(c) Distillation		
10% Recovered	400 degrees F (205 degrees C)	14 Degrees F (8 degrees C)
20% Recovered	Report	14 Degrees F (8 degrees C)
50% Recovered	Report	14 Degrees F (8 degrees C)
90% Recovered	Report	14 Degrees F (8 degrees C)
Final Boling Point	572 degrees F (300 degrees C)	14 Degrees F (8 degrees C)
Residue	1.5	Specification Limit
Loss	1.5	Specification Limit
(d) Flash Point	100 degrees F (38 degrees C)	5 degrees F (3 degrees C)
(e) Freezing Point		
JET-A	-40 degrees F (-40	5 degrees F (3 degrees C)
JET-A-1	-53 Degrees F (-47 degrees C)	5 degrees F (3 degrees C)

C. Fuel Acceptance by Tanker Truck or Rail Car

- 1) Prior to delivery, the vendor shall receive a shipping document from the supplier or shipper certifying the delivered product meets ASTM D1655 and/or DERD4294 specifications. The vendor shall ensure that fuel delivery documentation has correct destination, fuel grade or type, quantity shipped and API Gravity corrected to 60 degrees F or documented density.
- 2) The receiving tank(s) shall be gauged and sumped before receipt begins.
- 3) Before testing begins and offloading of the product, the tanker/car shall set for 10 minutes with all internal valves open for product settling.
- 4) After settling, the following tests shall be accomplished on all compartments:
 - a) Visual appearance (vendors in the United States must use a white bucket).
 - b) API Gravity, corrected to 60 degrees F, or density test.
- 5) If contamination is found during the visual appearance test, more than one sumping may be required to clear it. If contamination is visible after five one-gallon samples are taken from one compartment, the load shall be rejected.
- 6) Fuel is unacceptable and shall be rejected if the API Gravity, corrected to 60 degrees F, is not between 37 degrees and 51 degrees API and/or the flashpoint is less than 100 degrees F (38 C). If the API gravity differs by more than 1 degree or the density has changed 3 kg/m³ the receipt shall be stopped and investigated to determine if there is fuel contamination or a specification problem.

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- 7) Tanker truck unloading hoses (if used) are to be inspected for deficiencies, cleanliness, and/or impending failure prior to connecting to airport offloading connections.
- 8) Upon completion of receipt the receiving tank and inlet filter sump shall be sampled for visual appearance.
- 9) While receipt is ongoing, the vendor shall monitor inlet filtration differential pressure, tank fill levels, and monitor the fuel system for leaks.
- 10) Tanker truck shall be bonded during the unloading of transport truck.

NOTE: When conditions allow, settling time of one hour per vertical foot per tank is recommended.

8. Fuel Facility Design Requirements

- A. The number and size of tanks shall be sufficient to provide adequate working capacity, to meet peak period airport requirements, to permit recommended settling and testing, and supply replenishment and emergency stock coverage. For these reasons, a minimum of two tanks is preferred for each product. One tank is sufficient at airports where the operation permits product receipt, settling and testing between service requirements.
- B. Pipe work and valves shall be constructed and installed in accordance with industry standards. (Note: The use of galvanized piping and materials are not appropriate for the use in jet fuel servicing. Plastic materials, cadmium plating or copper alloys are not permitted for main fuel piping. Copper or copper alloys material used for other components must be minimal).
- C. All storage facilities for fuel to be used in an air carrier's aircraft shall meet the following requirements in this section:
 - 1) The fuel storage facility shall be properly color coded and identified in accordance with the latest revision of API Standard 1542.
 - 2) NO SMOKING, FLAMMABLE, EMERGENCY SHUT OFF and other information signs must be displayed in accordance with local governing codes.
- D. Design and construction of fuel storage tanks shall comply with governing codes and ordinances. Storage tanks are to include the following equipment:
 - 1) Floating suction with means of verifying proper operation, or a Standpipe.
 - 2) Inlet diffuser.
 - 3) Gauge hatch with slotted tube.
 - 4) A minimum of one access man-way.
 - 5) Operational automatic high level device to prevent tank overflow.
 - 6) Tank vents.
 - 7) A placard, adjacent to the tank drain(s), indicating volume of tank drain piping.

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- 8) Confined space entry.
- E. Above ground vertical tanks shall include the following equipment (Non-metallic tanks are not acceptable):
- 1) Floating suction with means of verifying proper operation, or a standpipe.
 - 2) Inlet diffuser.
 - 3) Gauge hatch with slotted tube.
 - 4) A minimum of one access man-way.
 - 5) Automatic high level device to prevent tank overflow.
 - 6) Fixed roof.
 - 7) Light color epoxy coated floor and sides up to the top of the first wall panel (complete internal coating is recommended).
 - 8) Cone down bottom to positive center sump with drain.
- F. Aboveground horizontal tanks shall include the following:
- 1) Floating suction with means of verifying proper operation, or a standpipe.
 - 2) Inlet diffuser.
 - 3) Gauge hatch with slotted tube.
 - 4) A minimum of one access man-way.
 - 5) Automatic high liquid level device(s) to prevent tank overflow.
 - 6) Carbon steel tanks must have complete internal light colored epoxy coating.
 - 7) Sloped bottom to positive sump with drain.
 - 8) Non-metallic tanks are not acceptable.
 - 9) It is recommended that access man-ways be equipped with an internal ladder.
- G. Underground tanks shall include the following equipment:
- 1) Floating suction with means of verifying proper operation, or a standpipe.
 - 2) Inlet diffuser.
 - 3) Gauge hatch with slotted tube.
 - 4) A minimum of one access man-way.
 - 5) Automatic high liquid level device(s) to prevent tank overflow.
 - 6) Carbon steel tanks must have complete internal light colored epoxy coating.
 - 7) It is recommended that access man-ways be equipped with an internal ladder.
 - 8) Man-ways and other tank accessories shall be extended above ground.

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- 9) Sloped bottom to positive sump with permanent pump.
- H. Filter/separators or full flow monitors are required for receiving fuel into and dispensing fuel from storage tanks that will supply fuel directly into aircraft, refueler's, or hydrant systems. If only one is available, it shall be installed to perform both fuel receiving and dispensing functions.
- I. Filter/Separators shall:
- 1) Meet the requirements of the latest revision of the applicable API/IP specification. If meeting similar qualifications, a qualification report must be maintained locally and a data plate reflecting such qualification must be attached to the vessel and not inhibit the view of the original data plate.
 - 2) Be equipped with automatic water defense systems that will stop fuel flow or alert operating personnel when actuated by a high water level. Float or electronic probe systems must include provisions for an operational test.
- J. Full Flow Monitors shall:
- 1) Meet the latest revision of the applicable API/IP specification.
 - 2) Vendors using Full-Flow Monitors shall have replacements on site or be readily available from a local distributor.
- K. All filter vessels must be equipped with:
- 1) Direct reading differential pressure gauges with a means of detecting operational failure.
 - 2) Provisions for elimination of air.
 - 3) Manual sump drains (valves with handles spring loaded to the closed position are recommended).
 - 4) Upstream and downstream sampling (membrane filtration test) connections including probes and dust caps or plugs.
 - 5) Pressure relief valves.
 - 6) Placard indicating month and year of last filter change. Filter vessels with full-flow monitors installed shall be opened and visually inspected annually. Inspection results /date recorded on applicable records on the outside surface of the filter vessel
 - 7) In freezing climates, measures to protect filter-separator sumps and associated piping that could contain water from freezing and bursting
 - 8) The use of automatic water drain valves is not recommended; existing automatic drain valves should be removed.
 - 9) Placard showing location of filter sump drain and drain volume displacement.
 - 10) Filter vessel manufacturer data plate showing vessel operational information.

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- L. Each grade of aviation fuel shall be handled in a completely segregated and dedicated system on both receiving and discharge sides of the storage tanks.
- M. At airports where more than one grade of fuel is received, selective type couplings keyed to grade of product in use shall be used on receiving connections, or, where selective type couplings are not used, other means of physically preventing product contamination shall be employed. Use of isolation valves or blind flanges is not acceptable methods of product grade separation.
- N. Fuel flow emergency shut-off valves and switches shall be clearly marked in accordance with the latest revision of NFPA 407, be visible, and the area around them must be kept free of obstructions.
- O. For all truck loading operations, a deadman device must be installed that will stop the flow of fuel in an emergency.
- P. All electrical systems shall meet the governing codes and ordinances.
- Q. Static bonding connections shall be provided between truck and fill stand at all truck loading points.
- R. Bottom loading nozzles shall be equipped with 60 mesh or finer screens.
- S. Fire extinguishers (with a current annual maintenance tag/label) shall be positioned in accordance with local requirements.
- T. All fueling hoses shall meet API 1529, Type C or BSI 3158, Type C standards with certification on file. Fuel unloading hoses shall be compatible with jet fuel and suitable for local conditions.
- U. When metal underground tanks and piping are cathodically protected, records of applicable inspection shall be maintained locally.
- V. Relaxation chambers vessels, where installed, shall be equipped with:
 - 1) Air eliminator.
 - 2) Pressure relief valve.
 - 3) Manual sump drain (valves with handles spring loaded to the closed position are recommended).
- W. Placard indicating the volume of tank drain piping shall be placed adjacent to tank drain devices. Also fueling equipment shall be clearly marked with the proper type of fuel being dispensed, FLAMMABLE, NO SMOKING, EMERGENCY SHUT OFF with operational instructions placards, and other signs, information, or decals as required.
- X. If a fuel reclamation system is installed, it must meet the design and operating criteria of Section 8. Fuel Facility Design Requirements and Section 9. Fuel Storage Facility Inspection.

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9. Fuel Storage Facility Inspection

A. General

- 1) A record shall be kept for each piece of equipment (storage tank, filter) to document details of the inspections being performed.
- 2) The signature, initials, or employee identification number of the person performing the task, or person accepting responsibility for the task, is required on all inspection forms.
- 3) All inspection forms shall be complete and accurate. Records shall indicate when any equipment was not in service
- 4) Facility equipment that is newly installed or out-of-service shall have the appropriate checks completed before being returned to service.
- 5) Inspection forms of any type may be used as long as they provide a clear and concise record of inspection events.

B. All daily inspections must be completed at the beginning of each day, including weekends and holidays.

- 1) General condition of storage area
- 2) Check the storage area for general condition, housekeeping, plugged drainage,
- 3) All inspection records must be maintained on file for 12 months.
 - a) Daily Inspections weeds, and spillage.
 - b) Report, investigate, and correct any condition that needs immediate attention.
- 4) Security, Fire and Safety Deficiencies
 - a) Check fuel storage facilities for any security, fire or safety deficiencies or unusual conditions requiring immediate correction. Where applicable, ensure that any broken fences or gates are repaired or replaced immediately. All gate and access doors must be kept locked. If the area is unsecured, loading/unloading hoses, master electrical switches and other accessible fittings shall be kept locked at all times when not in use.
- 5) Fuel Leaks
 - a) Check tanks, piping, valves, hoses, meters, filters, and other fuel handling for fuel leaks. Any visible leaks shall be reported and repaired immediately.
- 6) Hoses, Swivels, and Nozzles.
 - a) Check condition of all fuel hoses, swivels and nozzles for wear, damage and leakage.

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- b) Check hoses for abrasions, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists and sharp bends that give the appearance of pending failure.
 - c) Check tightness of all swivel attachment screws and hose couplings.
 - d) Check for “slippage marks” at hose/coupling connections.
 - e) Check condition of nose and poppet seals on nozzles for cuts, nicks, wear and dust covers if applicable.
 - f) Any item that is defective and/or leaking shall be replaced or repaired immediately.
- 7) Bonding Reels, Cables and Clamps
- a) Check condition of static bonding reels, cables and clamps.
 - b) Defective equipment shall be repaired or replaced immediately.
- 8) Fire Extinguishers
- a) Verify that fire extinguishers are in proper place with unobstructed access for immediate use. If seal is broken or inspection tag is missing, extinguisher shall be taken out of service until recharged and tagged for acceptance.
- 9) Storage Tank Sumps.
- a) Perform visual appearance test of all sump drains on working tanks. Flush drain at maximum velocity beyond capacity of sample piping to ensure complete displacement. Record the result of the first sump. Continue draining until all contaminants are removed and fuel is clear. Additional sump testing is required before fuel is received into storage, after receipt, during and after heavy rainfall.
- 10) Filter Sumps
- a) Perform visual appearance test of all working filter sump drains. Drain minimum of one gallon of fuel under pressure. Record results of first sump. If fuel is not clean and dry after 3 gallons have been taken, the fuel is not clean and dry. Remove the vessel from service and investigate. Record final results in remarks portion of quality control form.
- 11) Filter Differential Pressure
- a) Under normal flow conditions, check and record differential pressure across all working filters.
- 12) Waste Fuel Tanks
- a) Gauge liquid level of waste fuel tanks. Tanks are to be checked or drained as required to prevent overflow and spillage.

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C. Monthly Inspections

1) Filtration Test.

- a) Conduct a color membrane and free water test to 15 PPM downstream of all filter vessels. Perform tests and record results in accordance with applicable ASTM test procedures.
- b) In addition to the color membrane test, conduct a particle assessment test. An assessment rating of "B" or greater indicates that solid particles are visible on the test membrane or in the sample container. This observation may be an indication that there is generation of contamination in system or failure of filtration upstream of sample test connection. Particle assessment is an aid in communicating visual observations of size and distribution of solids as they appear on test membranes or the bottom of sample containers.
- c) Record the differential pressure. Note flow rate to compute adjusted DP.

2) Bonding Cable Continuity Check.

- a) Conduct electrical continuity check of static bonding system.
- b) Resistance shall be less than 10 ohms.

3) Nozzle Screens.

- a) Remove nozzles and examine screens for particles and other contaminants. If particles are found, investigate sources of contamination, which could be from inner hose lining, pipe rust, sand, low point sediment, equipment failure, seals, gaskets, etc.
- b) Record findings.
- c) Screens shall be cleaned or replaced if damaged.

4) Signs and Placards.

- a) Inspect and ensure units are equipped with required signs and placards.

5) Floating Suctions.

- a) If equipped, verify satisfactory operation of all tank floating suction.

6) Fuel Meter Seals.

- a) Where resale meters are installed, verify that calibration seals are intact.

7) Fire Extinguishers.

- a) Verify that all fire extinguishers are properly charged and sealed and that inspections are current.

D. Quarterly Inspections

1) Storage Tank High Level Controls

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- a) Check satisfactory operation of tank high level sensing devices and automatic fuel-flow shut-off valves, where installed. Inoperative controls shall be adjusted or repaired immediately or have alternate operating procedures in effect that will provide positive spill prevention while tank is in service.
- 2) Water Defense Systems
 - a) Check operation of water defense system. Proper testing will depend on design of system installed, refer to manufacturer or industry accepted standard for proper operation. Vessels equipped with full flow monitors do not require testing.
- 3) Emergency Shutdown Systems
 - a) Verify proper operation of the deadman control system. Flow shall stop within 5 percent of rated flow for vendors operating in the **United States** and within 5 seconds for all other vendors.
 - b) Operationally check the emergency shutdown system of storage facility. Coordinate shutdown test with all persons, agents, airlines, fuel suppliers, and other groups having interest in the operation of the system. Immediately report any operational discrepancies.
- E. Annual Inspections
 - 1) Line Strainers.
 - a) If installed, check line strainers for cleanliness and damage. Clean or replace screens as required.
 - 2) Storage Tank Interiors.
 - a) Open fuel storage tanks and check interiors for cleanliness and condition of coating. If inspection reveals build up of sediment and microbial growth, or build up of sediment exceeding 1/10 of the area of the tank bottom surface, cleaning shall be accomplished.
 - b) Jet fuel tanks shall be cleaned with high pressure water only. Chemicals or detergents must never be used for tank cleaning.
 - 3) Meter Calibration.
 - a) Check resale meters for calibration. Adjust meters to meet governing calibration requirements. Meter adjusters are to be properly sealed upon completion of calibration.
 - 4) Pressure Gauges.
 - a) Inspect and verify accuracy of all gauges used to monitor differential pressure. Replace or repair defective gauges.
 - 5) Filter/Separator Heaters.
 - a) If installed, inspect and verify proper operation of filter/separator sump and drain line heaters before freezing weather.

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- 6) Tank Vents.
 - a) Where installed, check cleanliness of tank vent screens.
 - b) Tanks that have pressure/vacuum vents, check satisfactory operation and condition of poppets and inlet screens.
 - c) Ensure free movement of poppets under freezing conditions.
- 7) Cathodic Protection
 - a) Where underground steel storage tanks and underground piping are installed, confirm satisfactory operation of the cathodic protection system.
- 8) Facility Condition
 - a) Check for the safe condition of stairways, hand-rails, ladders, walking surfaces and adequacy of lighting in storage tank area and on above ground tanks. Note any electrical deficiencies that are obvious safety and fire hazards.
 - b) Note any unusual sounds or noises from pumps, motors, meters, control valves and other mechanical devices that might indicate pending failure. Inspect the seals and alignment of pumps and motors.
 - c) Verify condition of exterior paint covering facilities and equipment for protection and appearance.
- 9) Filter Elements.
 - a) As long as all required testing is followed and there are no indications of problems (e.g. high differential pressure, problems identified during vessel inspection, etc.) all filter separator elements shall be changed within two (2) years; fuel monitor elements shall be changed annually.
 - b) For Filter/Separators, Teflon coated and synthetic separator element life can be extended as long as the elements are cleaned and inspected according to manufacturer's instructions. Paper separator elements must be replaced when the coalescer elements are replaced.
- 10) Long Term Fuel Storage
 - a) Water shall not be allowed to accumulate on the tank bottom. The presence of water allows the propagation of microbiological growth, so it is extremely important that the storage tank bottom remain free of water accumulation by using correct sump drain procedures.
 - b) When no shipment is received, perform a visual appearance test weekly, or a clear and bright test.
 - c) Record the test results on the applicable quality control records.

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- d) For aviation turbine fuel in static storage, where no new product has been added in six months, a composite tank sample shall be taken and an ASTM property test performed to verify that the product continues to conform to specifications.

10. Hydrant Systems

A. Underground Piping

- 1) Drawings, if available, showing the positions of the lines and the locations of valves and other fittings, shall be kept on-site and readily accessible.
- 2) All operating and maintenance equipment located below grade (e.g., low point drains, high point vents, flanges, and piping isolation valves) shall be located in pits with access covers.
- 3) Pits and covers shall be designed for easy and safe access by personnel for maintenance and water removal.
- 4) When metal underground tanks and piping are cathodically protected, records of applicable inspection shall be maintained locally.

B. Above Ground Piping

- 1) Piping shall be supported on structural supports to prevent sagging and vibration and be anchored against movement that would put undue strain on the piping or on connections to tanks, equipment, structures, or walls.
- 2) Bellows type expansion joints or grooved fittings shall not be used to control for expansion or contraction, or for vertical movement resulting from the settling of tanks.

C. Piping Grading

- 1) The slope of pipelines shall be designed to minimize the formation of high or low points within the system. Where high or low points exist, a means shall be provided to drain the fuel.
- 2) Pump suction piping shall be sloped towards the pump whenever possible.

D. Isolation Valves

- 1) Isolating valves shall be provided at suitable locations to permit the isolation of equipment and sections of piping to facilitate maintenance and repairs. These locations shall include, but are not limited to, the following:
 - a) On aboveground piping, at each tank car, tank vehicle, barge, or unloading and loading connection.
 - b) On the upstream and downstream side of each line connection to a cross-country pipeline.
 - c) As an emergency shutoff valve in the event of a failure of automatic flow control valves.

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- d) Manually operated valves shall not be permitted in any pressure-relief piping, unless sealed open.

E. Strainers

- 1) Where line strainers are required to protect pumps, meters, etc, the screen sizing shall not be less than 40 mesh.

11. Hydrant System Inspection

A. General

- 1) A record shall be kept for each piece of equipment to document details of the inspections being performed.
- 2) The signature, initials, or employee identification number of the person performing the task, or person accepting responsibility for the task, is required on all inspection forms.
- 3) All inspection forms shall be complete and accurate.
- 4) Facility equipment that is newly installed or out-of-service shall have the appropriate checks completed before being returned to service.
- 5) Inspection forms of any type may be used as long as they provide a clear and concise record of inspection events.
- 6) All daily inspections must be completed at the beginning of each day including weekends and holidays.
- 7) All inspection records must be maintained on file for 12 months.
- 8) Hydrant systems or segments of hydrant systems not in continuous use for a period of six months or more shall have the frequency checks performed and recorded before the system is placed into service. Based on fuel test results, flushing may be required prior to use. Records must indicate when systems are out of service.

B. Daily Inspections

- 1) Visually check hydrant valve pits for fuel leaks and cleanliness.
 - a) Hydrant pits should be kept clean and dry. Pits are to be removed from service if liquid level covers lowest flange or is within 12 inches of top of pit valve.
- 2) Visually check general condition of the hydrant valve including components for visual deficiencies.
- 3) Replace missing hydrant valve and sense plug dust covers. Check hydrant valve pit covers for serviceable condition. Report broken, cracked, or defective hinges, handles lids, or unsafe condition.
- 4) Check all emergency fuel shut down stations installed at ramp gate location. There shall be clear access to all emergency fuel shut down locations. Each station shall be

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checked for proper identification (in accordance with local governing codes). Any deficiencies are to be reported and corrected immediately.

- 5) Where pressure/flow chart recorders are installed, check for abnormal operating conditions. Unusual pressure/flow readings and abnormal pump start/stop cycles may indicate a fuel leak or system failure. Abnormal chart readings shall be reported immediately.

C. Monthly Inspections

- 1) Check the general condition of the hydrant pit valve, sense line connectors, and the satisfactory operation of the internal shut-off piston. Check for leaks, excessive coupler/flange wear, loose or missing connecting screws and mounting bolts. Repair or replace any deficiencies immediately.
- 2) Check isolation valve pits that control distribution of fuel to the ramp and gate areas for emergency access, for lid condition, fuel leaks, cleanliness, and general condition of electrical components. Also, check the freedom of the valve(s) opening/closing operation.
- 3) Open all low point drains and flush at maximum velocities until all water and/or sediment is removed.
- 4) Check pit, lid, and low point drain valve identification.

D. Semi-Annual Checks

- 1) Verify the satisfactory operation of the emergency shut down system.
 - a) Coordinate the shutdown test with all persons, fueling agents, fuel suppliers, and any other group having an interest in the operation of the facility. Report and repair any discrepancies immediately.

CAUTION: If for any reason the emergency shutdown system cannot be repaired immediately, the system operator must put into effect an approved alternate plan for continuing system use until the discrepancies can be corrected. Notify local authority and airline customers.

- 2) Bleed all high point vents to ensure the removal of all entrapped air. Continue to bleed air until clear fuel is observed. It is necessary to bleed high point vents more frequently after system draining or modification.
- 3) Where installed, check the general condition and operating pressure setting of all surge pressure absorbers. Recharge to operating pressure.
- 4) Where installed, check the satisfactory operation of pipeline leak detection systems and pipeline monitoring wells. Test monitoring devices and fuel flow shutdown valves. Immediately report and repair any deficiencies.

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E. Annual Inspections

- 1) Where installed, confirm the satisfactory operation of cathodic protection systems.
 - a) This requirement is generally contracted to a business specializing in this type of service.
- 2) Inspect and test all major electrical components and system controls to ensure proper operation.
- 3) If applicable, check the condition and electrical continuity of all bonding rods in and around the fueling pits. Resistance to ground shall not exceed 100 ohms. Discrepancies are to be reported and corrected immediately.

12. Fueling Equipment Design Requirements

A. All aircraft fueling equipment, including tank trucks, hydrant trucks, stationary hydrant carts, and fueling cabinets, shall be equipped with the following:

- 1) Filter/separator or full-flow monitor.
- 2) Pressure control system.
- 3) Deadman/emergency control system.
- 4) Fire extinguishers.
- 5) Safety interlock system (Does not apply to fueling cabinets).
- 6) Fueling hoses and nozzle strainers.
- 7) Dust covers.
- 8) Fuel pressure gauges.
- 9) Fuel quantity measurement meter.
- 10) Electrostatic bonding system.
- 11) Cargo tanks shall be constructed of stainless steel, aluminum or internally light color epoxy coated carbon steel. At no time shall galvanized materials, copper alloys, cadmium plating or plastic materials be used on fueling equipment, these materials may not come in direct contact with fuel.
- 12) Dome covers shall be provided with a mounted hinge and latches that will automatically cause the cover to close with forward motion of the vehicle, and watertight, fuel resistant seals and gaskets. (Note: Dome covers incorporated into an interlock system are acceptable.)
- 13) All tank compartments shall be equipped with a water drain located at the lowest point.
- 14) Tank trucks shall be equipped with a high-level shutoff system, including provisions for determining the satisfactory operation of the system (known as a "Pre-Check" system) to prevent overflow of fuel.

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- 15) The following signs or placards shall be placed on the equipment as indicated:
- a) Product identification on each side and rear.
 - b) FLAMMABLE on each side and rear of equipment.
 - c) NO SMOKING posted prominently in cab of vehicles.
 - d) NO SMOKING on at least two sides of equipment.
 - e) Filter and tank drain valves shall be identified.
- 16) Filter/separators and full-flow fuel monitors shall meet the specifications of API /IP 1581, 3rd edition, group II, Class B or 5th edition, Category C. If meeting similar qualifications as defined in API/IP 1582, a qualification report must be maintained locally and a data plate reflecting such qualification must be attached to the vessel and not inhibit the view of the original data plate.
- a) There shall be a placard on the filter housing indicating the date (month and year) when the filter elements were last changed. If applicable, a placard - or conversion data placard - indicating the date (month and year) of the last satisfactory single element test shall be placed on the filter housing. Access to spare monitor elements shall be available.
 - b) Filter/separators shall be equipped with an automatic water defense system, which will cause fueling to stop when activated by excessive water, and include:
 - i) A float or electronic probe systems that must include provisions for an operational test.
- 17) All filtration vessels shall include:
- a) Air elimination provisions.
 - b) Direct reading differential pressure gauges with a means of detecting operational failure.
 - c) Manual sump drains.
 - d) Upstream and downstream membrane sampling connections and placards, including probes and dust covers.
 - e) Pressure relief valves or other devices that will prevent over pressurization due to thermal expansion of fuel, including a means for accommodating relieved fuel.
- 18) All aircraft fueling equipment shall have separate and independent primary and secondary pressure control devices.
- a) Primary pressure control is intended to protect the aircraft under conditions of constant flow and also from pressure surge caused during aircraft valve closure. Primary pressure control devices must limit fueling pressure at the fuel nozzle under conditions of constant flow to a value acceptable to aircraft operator.

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- b) Secondary pressure control is intended to protect the aircraft in the event of primary control failure. Secondary pressure control devices must limit fueling pressure, to 50 psig or less under conditions of constant flow.
- 19) All aircraft fueling equipment shall have a deadman control system that must completely stop fuel flow and, in addition to the deadman control, shall be equipped with an emergency fuel shutoff system. An EMERGENCY FUEL SHUTOFF placard shall be placed adjacent to each emergency fuel shutoff control. Placards shall also indicate method of operation (e.g. - Push, Pull, Turn, etc.). Hydrant trucks, hydrant carts, stationary hydrant carts and fueling cabinets shall meet the following:
- a) Each unit shall have an emergency fuel shutoff control accessible from the ground, and, if applicable, an emergency fuel shutoff control on installed lift platforms.
- 20) Tank trucks shall be equipped with an emergency fuel shutoff control accessible from each side of the truck.
- 21) Fueling equipment with a lift or platform shall have an emergency fuel shutoff control accessible from the lift or platform, in addition to one accessible from the ground.
- 22) All fuel equipment shall be equipped with fire extinguishers. Fire extinguishers located in enclosed compartments shall have their location clearly marked.
- a) Hydrant trucks, carts, and stationary carts must be equipped with a minimum of one 20-pound dry chemical fire extinguisher, securely mounted and readily accessible.
 - b) Tank trucks must be equipped with a minimum of two 20-pound dry chemical fire extinguishers, securely mounted on opposite sides of the truck and readily accessible.
 - c) Fueling cabinets must have a minimum of one 20-pound dry chemical fire extinguisher readily accessible.
- 23) All mobile fueling equipment shall have a safety interlock system that will prevent the equipment from being moved when:
- a) Couplers or single point nozzles are not in their stowed position.
 - b) The pumping system is activated on tank trucks.
 - c) Lift platforms are in the extended position.
- 24) Tank trucks with bottom loading provisions shall incorporate a brake interlock system that will prevent the vehicle from being moved until the bottom loading coupler has been disconnected from the vehicle.
- 25) If interlock systems are equipped with an override device, placards shall identify normal and override control positions.

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- 26) All fueling equipment shall have hoses, couplings and nozzles that meet one or more of the following standards:
 - a) API 1529, Grade 2, Type C, latest edition
 - b) BS 3158, Type C, latest edition
 - c) API 1529, Grade 2, Type F, latest edition, may be used for "Jac Risor" hoses.
- 27) Nozzle swivels shall have the collar secured by lock rings or safety wired collar retention screws.
- 28) Aircraft fueling nozzles shall be equipped with 100 mesh strainers.
- 29) All fueling equipment shall have dust covers or other protective devices used to prevent debris from accumulating on mating surfaces of hydrant couplers, single point and aircraft fueling nozzles.
- 30) All fueling equipment shall have pressure gauges that will monitor aircraft fueling pressures. Gauges should be located where they will be visible to the equipment operator during aircraft fueling operations. Aircraft fueling pressure and filter differential pressure gauges shall be identified.
- 31) All fueling equipment shall have a fuel quantity measurement meter that will be maintained to local, geographical region, state or country standards for fluid measurement devices.
- 32) All fueling equipment shall have an electrostatic bonding system that provides electrical continuity between the aircraft and the equipment. The system shall be of such a type that it can be easily checked by means of a continuity testing device.
- 33) Manual isolation valves shall be installed upstream of all hoses installed on the equipment.
- 34) "Confined Space Entry" placards shall be posted at entry points into each tanker storage man-way.
- 35) Fueling equipment having air tanks shall have a bleed air system.

13. Fueling Equipment Inspections

A. General

- 1) A record shall be kept for each piece of equipment to document details of the inspections being performed. All equipment not in daily use shall have all daily, monthly, quarterly, semi-annual, annual and biennial checks current and recorded before the equipment is returned to service. Records shall indicate when equipment is out of service.
- 2) The signature, initials, or employee identification number of the person performing the task, or person accepting responsibility for the task, is required on all inspection forms.

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- 3) All inspection forms shall be complete and accurate.
- 4) Facility equipment that is newly installed or out-of-service shall have the appropriate checks completed before being returned to service.
- 5) Inspection forms of any type may be used as long as they provide a clear and concise record of inspection events.
- 6) All daily inspections must be completed at the beginning of each day, including weekends and holidays.
- 7) All inspection records must be maintained on file for 24 months.

B. Daily and Weekly Inspections

1) General Condition

- a) Inspect the general condition of the equipment for tank vents, covers, cover latches, seals, gaskets, safety defects, leaks, damage and proper function. Equipment with a fuel leak is not to be used to service aircraft.

2) Filter Vessel Sumps

- a) Drain a minimum of one gallon (after purge of sump line) of fuel under pressure for visual appearance check.
- b) Record findings of first sample taken after displacement of sump line volume.
- c) Perform visual appearance test of all working filter sump drains. Drain minimum of one gallon of fuel under pressure. Record results of first sump. Record final results in remarks portion of quality control form
- d) If after 3 gallons have been taken the fuel is not clean and dry, remove the vessel from service and investigate.
- e) Findings shall be recorded as follows:

<u>Solids</u>	<u>Moisture</u>
1. Clean	A. Bright
2. Slight	B. Hazy
3. Particulate	C. Cloudy
4. Dirty	D. Wet (free water)
	E. Surfactants

3) Filter Differential Pressure

NOTE: For vendors operating in the **United States**, this is a daily inspection, for all other vendors this is a weekly inspection.

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- a) Observe and record differential pressure across all operational filters, corrected to maximum flow rates through the vessel according to manufacturer instructions.
 - i) Remove the vessel from service if there is a sudden drop in differential pressure, or if differential pressure exceeds 15 psi (both filter/separators and full flow monitors).
- 4) Deadman Control System
 - a) Verify proper operation of the deadman control system. Flow must stop within 5 percent of rated flow for vendors operating in the **United States** and within 5 seconds for all other vendors.
- 5) Brake Safety Interlock Systems

NOTE: For vendors operating in the **United States**, this is a daily inspection, for all other vendors this is a weekly inspection.

 - a) Remove nozzles from their storage location and attempt to move the unit. Unit shall not move. Repeat for each interlock on the unit.
 - b) If equipped, check brake interlock override for operation and if applicable, presence of breakaway seal or presence of a brake interlock override warning light.
 - c) Check operation of tanker bottom loading system.
 - d) Units with defective interlock systems shall be repaired immediately.
- 6) Hoses and Nozzles
 - a) Inspect all hoses and nozzles for leaks, damage, and excessive wear.
 - b) Verify dust covers are installed and in good condition.
- 7) Nozzle Pressure
 - a) Record nozzle delivery pressure under conditions of constant flow. Nozzle pressure shall not exceed 50 psi.

CAUTION: under no circumstances will pressure controls be adjusted during aircraft fuel servicing.

- 8) Bonding Wires, Plugs, and Clamps
 - a) Inspect the condition of reels, clamps and connections.
- 9) Fire Extinguishers
 - a) Verify that fire extinguishers are on the unit that seals are intact, and inspection records are current and readily available.

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10) Tanker Troughs

- a) Inspect to ensure that tanker troughs are clear of debris and that the drains are clear.

11) Tanker Sumps

- a) Drain a minimum of one gallon (after purge of sump line) of fuel for visual appearance check.
- b) Record findings of first sample taken.
- c) Continue to sample until clean, dry fuel is obtained.
- d) If after 3 gallons have been taken the fuel is not clean and dry, remove the unit from service and investigate.
- e) Findings shall be recorded as follows:

<u>Solids</u>	<u>Moisture</u>
1. Clean	A. Bright
2. Slight	B. Hazy
3. Particulate	C. Cloudy
4. Dirty	D. Wet (free water)
	E. Surfactants

12) Air Tanks

- a) Drain all air tanks to prevent damage to air system components to prevent freezing during cold weather.
- b) Check and drain applicable surge and waste tanks.

13) Surge and Waste Tanks

- a) Check surge and waste tanks. Drain if necessary.

C. Monthly Inspections

1) Filtration Testing

- a) Perform a color membrane and free water test (15 PPM) downstream of all filter vessels. Perform tests and record results in accordance with ASTM D2276.
- b) In addition to the color membrane test, conduct a particle assessment test. An assessment rating of "B" or greater indicates that solid particles are visible on the test membrane or in the sample container. This observation may be an indication that there is generation of contamination in system or failure of filtration upstream of sample test connection. Particle assessment is an aid in communicating visual

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observations of size and distribution of solids as they appear on test membranes or the bottom of sample containers.

- 2) Static System Continuity
 - a) Perform electrical continuity check of static bonding system.
 - b) Resistance shall be less than 10 ohms.
- 3) Nozzle Screens
 - a) Examine each nozzle screen for particles or other contaminants. Clean and/or replace screens as necessary and investigate source of contamination.
 - b) Verify that screens are 100 mesh.
- 4) Fuel Hoses
 - a) Hoses must be placed at full length with system at operating pressure, inspect hoses for abrasions, cuts, etc. Replace hose if defects are found.
- 5) Signs and Placards
 - a) Inspect and ensure units are equipped with required signs and placards
- 6) Meter Seals
 - a) Verify that meter calibrator/adjusters are sealed.
- 7) Fire Extinguishers
 - a) Verify that all fire extinguishers are properly charged and sealed and that inspections are current.
- 8) Emergency Shutdown System
 - a) Verify proper operation of the emergency shutdown control system. Flow must stop within 5 percent of rated flow for vendors operating in the **United States** and within 5 seconds for all other vendors.
- 9) Lift Platforms
 - a) Verify the dependable and safe operation of lift platforms.
- 10) Tanker Interiors, Vents, Dome Covers and tanker trough drains.
 - a) Visually inspect interior for water, debris, surfactants, microbial growth, and other contamination.
 - b) Visually inspect vents and dome covers.

D. Quarterly and/or Semi-Annual Inspections

1) Pressure Controls

NOTE: For vendors operating in the **United States**, this is a quarterly inspection, for all other vendors this is a semi annual inspection.

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- a) Inspect and test all primary and secondary pressure control equipment. Adjust as necessary.
- 2) Water Defense Systems
 - a) Check operation of water defense system. Proper testing will depend on design of system installed; refer to manufacturer or industry-accepted standard for proper operation.
 - b) Vessels equipped with full flow monitors do not require testing.
- E. Annual and Biennial Inspections
 - 1) Pressure Gauges
 - a) Annually, inspect and verify accuracy of all gauges used to monitor fuel delivery pressure to aircraft and differential pressure.
 - b) Replace or repair defective gauges.
 - 2) Meter Calibration
 - a) Annually, inspect and verify accuracy of all aircraft fueling equipment meters.
 - b) Meter adjusters/calibrators shall be sealed when calibration is completed.
 - 3) Filter Vessel Interior Inspection
 - a) Annually, open and inspect the interior of all vessels.
 - 4) Filter Element Change
 - a) As long as all required testing is followed and there are no indications of problems (e.g. high differential pressure, problems identified during vessel inspection, etc.) all filter separator elements shall be changed within two (2) years; fuel monitor elements shall be changed annually.
 - i) For Filter/Separators, Teflon coated and synthetic separator element life can be extended as long as the elements are cleaned and inspected according to manufacturer's instructions. Paper separator elements must be replaced when the coalescer elements are replaced.

14. Tanker Vehicle Loading Facilities

- A. Provisions shall be made to permit the bonding of the tanker to the loading facility in accordance with NFPA Standard 407.
- B. All components of the loading facility shall be bonded electrically and the system grounded. When a ST-47 refueler bottom loading Scully System is installed and operational, the need to attach a separate bond wire to the refueler is not required. However, bonding provision shall be made when the ST-47 refueler bottom loading Scully System is in the BYPASS mode (The system self check green continuity light will not come on when the system is in BYPASS). A bonding lug shall be provided for each tanker vehicle loading position. For top-loading systems, provision shall be made

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for a bond between the fill pipe and the tanker vehicle (e.g., a drop tube of sufficient length to contact the bottom of the tanker vehicle or bonding clips).

- C. Tanker vehicle loading facilities shall consist of loading connections with self-closing control valves, shutoff control connected to the pumping units (automatically or manually operated), and filtration system of appropriate size.
- D. Bottom-loading systems shall have selective fueling nozzle adapters for each aviation fuel type dispensed.
- E. A deadman control or similar device shall be used to control the loading systems in accordance with the NFPA Standard 407.
- F. Tanker truck shall be equipped with a high level shut off system, including provisions for determining the satisfactory operation of the system (known as a "pre-check" system) to prevent overflow of fuel.

15. Flushing Standards and Specifications

- A. Before placing a new or repaired portion of a hydrant system into service, precautions must be taken to ensure all piping included in the change is clean. The following checks, test and requirements must be followed with satisfactory results before the system can be placed into service for aircraft fueling.
- B. The installing contractor shall be responsible for all flushing requirements.
- C. Airline fuel Quality Assurance representatives will pre-approve flushing procedures before publication and releasing the construction documents.
- D. Current revision ASTM D-1655/DERD 2494, kerosene Jet-A/A-1 Specification fuel must be used for system flushing.
- E. A product flow rate of 10 feet per second minimum is desired unless a lesser rate is agreed upon by the airline Quality Assurance representative. The contractor will provide any additional temporary pumps and filter vessels (with applicable filter elements) to provide minimum flow velocity.
- F. Hydrant pit valves must be removed during the system flush operation
- G. Fuel test samples must be taken immediately ahead of:
 - 1) Any filtration vessels on hydrant systems with closed loop re-circulation capabilities.
 - 2) Storage tanks receiving manifold on re-circulation systems returning flushed fuel into the storage tanks, transport trucks or other approved containers.

NOTE: When possible, temporary piping connections can be fabricated to form a closed loop piping re-circulation system allowing the fuel to be re-circulated. Adapters, needing special fabrication, must be provided by the contractor.

- H. When flushing the system into tanker trucks, the contractor must supply any temporary manifolds, an adequate number of single compartment tanker trucks, and approved fuel hoses to allow the desired flow rates to be obtained safely. Fuel hoses and couplings

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must meet aircraft type requirements, with a minimum 150-pound rating. They must be hydrostatically tested before the system flush operation begins.

- I. A 4-inch hose size is recommended to achieve applicable flow rates during the flush.
- J. The contractor must remove control valves and metering assemblies before initiating the flush. All general service valves and adapters must be in place during the flushing operation.
- K. To ensure hydrant system piping cleanliness, a satisfactory test result must be obtained by performing a two-test minimum. The hydrant system being flushed must be displaced with clean fuel before the second test is performed.
- L. Filter vessel filter elements required for the system flush will be provided by the contractor. When the flush test results are acceptable, the contractor will install new coalescer elements in all applicable filter vessels. If damaged, separator elements will be replaced. Any damaged elements are to be inspected by airline Quality Assurance personnel or their designee.
- M. Flushing Into Tanker Trucks

CAUTION: Safety precautions must be taken when flushing into tanker trucks in case of a fuel spill or equipment failure. A check of all electrical and motorized equipment in the area must be shut down. Additional safety precautions must be considered by eliminating personnel not directly involved in the flushing operation. It is recommended that personnel not directly involved in the flushing operation maintain a minimum of 100 feet separation from the tanker trucks and hydrant pits flushing operation.

- 1) Tanker truck internal valves must be in the opened position; measures must be taken to prevent the valve from closing, such as safety wiring the valve control handle or wheel in the opened position during the flushing operation.
- 2) When using “quick disconnect” couplings, measures must be put into place, such as safety wiring the quick disconnect locking device in the locked position, ensuring the coupling remains secured to the bottom load receptacle and the hydrant pit piping adapter during the flushing operation.
- 3) Fuel hoses must be secured to prevent sudden and excessive hose movement during the system flush operation.
- 4) Hydrant system piping must be “bonded” to the fuel truck receiving the flush fuel.
- 5) Before starting the flushing operation, perform a communication check with all personnel involved in the flushing operation. Ensure all personnel are in their respective locations and emergency personnel and fire extinguisher equipment are in place.
- 6) Begin the flow of fuel slowly; perform a system check for leaks, coupling /system tightness before reaching full fuel flow velocity.

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- 7) People involved in the system flush must be positioned at the following locations:
 - a) One individual positioned at each tank truck monitoring the level of fuel going into the tank.
 - b) One individual at the hydrant system pit included in the flush, controlling the fuel flow valve into the tank truck.
 - c) One individual at the primary pump control location, standing by to shut down the fuel pumps in an emergency.
 - d) One individual positioned at the terminal building hydrant system Emergency Fuel Shut-off switch (EFS) standing by to shut down the fuel pump in an emergency.
 - e) One individual at each fire extinguisher positioned at the flush site.
 - f) One individual in command of the flushing operation. This person must not have any tasks other than overseeing the flushing operation, ensuring all safety precautions are in place.

N. Flush Acceptance Specifications

- 1) Visual Check- Fuel samples must have a clear and bright appearance. Other visual conditions such as fuel color, odor and other indicators that may indicate contamination must be further investigated to determine if the fuel is acceptable for use in aircraft.
- 2) Solids Check- Perform a "particulate assessment" using an acceptable "B" rating scale. Employing a one-gallon or five-liter membrane filtration color test, test for an acceptable rating of # 3 wet at one gallon or five liters.
 - a) Note: If the color rating exceeds the limits shown above, or color determination cannot be decided, a matched weight gravimetric rating not exceeding 0.5 mg/liter will be accepted.
 - b) Maximum un-dissolved water is 15 parts per million
 - c) A minimum water separation rating of 85
 - d) Final acceptance

Note: It is the responsibility of the airline fuel quality assurance representative, or designee, to have final acceptance of the hydrant system flush test results. The results must show the system cleanliness is acceptable and can be used for aircraft fuel servicing.

16. Definitions and Terms

ACCEPTED: Anything that is not approved.

ACCIDENT, AIRCRAFT: An occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight, until

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such time as all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.

ACIDITY: The presence of any strong acid or more than a trace of weak acid in jet fuel could result in corrosion of critical fuel systems and engine components. Some jet fuels are treated with mineral acid as part of the refining process. Weak "organic acids" may also be generated during certain treating procedures. The acidity test confirms that these substances have been washed out or neutralized.

ADMINISTRATOR: The Federal Aviation Administrator or any person to whom that person has delegated his authority in the matter concerned.

ANILINE GRAVITY PRODUCT: The determination of net heat of combustion is time consuming and difficult to conduct accurately. This led to the development and use of an empirical method, employing the aniline point in degrees Fahrenheit, multiplied by the API gravity, to estimate the net heat of combustion of fuels. (See "Heat combustion").

AIRCRAFT MAINTENANCE MANUAL: Inclusive of the appropriate airframe, engine, propeller, component maintenance, manuals, etc

API DEGREES: Are units for fuel density measurement.

API Gravity: A specific test method for determining the density of fuel.

APPLICABLE: Capable or suitable for being applied.

APPEARANCE: Aviation fuels are composed of hydrocarbons of four basic types: paraffin's, olefines, naphthalene's, and aromatics. Of these, aromatics have the least desirable combustion characteristics. They tend to burn with a smoky flame and release a greater proportion of their energy as thermal radiation. This results in a greater carbon deposition and thermal stress on the combustors. Too high a level of aromatics also may cause swelling in the fuel hose lines. For these reasons, a maximum limit on aromatics is imposed.

APPROPRIATE: Especially suitable or compatible; fitting.

APPROVED: Unless used with a reference to another person, means approved by the Administrator.

AUTO-IGNITION TEMPERATURE: Minimum temperature required in a substance to initiate or cause self-sustaining combustion independently of any sparks or other means of ignition.

AVAILABLE: Accessible, obtainable.

C.A.S.E.: Coordinating Agency for Supplier Evaluation.

CALIBRATION: Making precise measurements and adjustments to equipment or systems in order to obtain optimum performance and to certify that output data falls within prescribed tolerances.

CERTIFICATION: Written testimony of qualification. (i.e. licences, certifications, etc.)

CERTIFYING AGENCY: The employer of the personnel being certified.

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CERTIFYING AUTHORITY: The person or persons properly designated in the written practice to sign certificates on behalf of the employer.

CHECK: The procedures necessary to determine the condition of a component or system by physical movement, measurement, operation, or examination.

CLAY TREATMENT VESSEL: a vessel equipped with bulk clay, clay bags or clay canisters used for removing surface-active-agents (surfactants) from fuel.

CLEAR-AND-BRIGHT TEST: means that, when visually examined in a clear glass container, the product is visually free from water, sediment and suspended matter. A product suitable free, from these contaminants produces a bright sparkling appearance.

CLOSED RECLAIM SYSTEM: a system that allows collection and filtration of sump fuel without exposure of the fuel to contamination by other products.

COALESCER ELEMENT: a device, which removes solid particles and coalesces free water from fuel and is the first stage cartridge in the filter/separator vessel. It is upstream of the separator cartridge.

CONTAMINANTS: Substances either foreign or native that may be present in jet fuel that detracts from its performance.

COPPER CONTENT: AVJET specifications impose a tight limit on the copper content of jet fuels subjected to the "Copper Sweetening" process, which converts mercaptan sulphur to less objectionable sulphur compounds. Even small quantities of soluble copper in the fuel can greatly accelerate the formation of oxidative residues and gums.

CORROSION, COPPER STRIP No more than a slight tarnish on a copper strip after immersion in the fuel for 2 hrs. at 100°C assures that the fuel will not corrode copper or copper alloys in the fuel system.

CORROSION, SILVER STRIP Many military aircraft and some commercial planes have fuel pumps that contain silver coated parts. After it became evident that some fuels, although passing the copper strip test, caused tarnishing and pitting of these silver components, the silver strip procedure was developed and included. However, because a pass in the silver strip test does not assure a pass with copper, both test are run.

DEADMAN CONTROL: a control device that must be hand-held open by the operator. When released by the operator, flow stops.

DIFFERENTIAL PRESSURE: the difference in pressure readings (PSI) taken on the inlet and outlet sides of a filter vessel. Often referred to as Delta P.

DIRECT READING DIFFERENTIAL PRESSURE GAUGE: a pressure gauge that senses the pressure on the inlet and outlet sides of a filter vessel and automatically displays the differential pressure.

DISTILLATION RANGE: The overall volatility of a fuel through its entire distillation range is shown by its initial and final boiling points - a factor distinct from the flash point and vapor pressure.

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DISTILLATION Jet aircraft fly at considerably higher altitudes than their piston-engine counterparts. Volatility control becomes very important at high altitudes to prevent loss of fuel from nonpressurized aircraft fuel tanks due to boiling-off. Distillation points are specified in various ways to ensure a properly balanced fuel is produced with no undue proportion of light or heavy fractions. The 10% distilled temperatures are limited to assure easy starting while the 90% limit excludes any heavier fractions that would be difficult to vaporize, ultimately affecting engine combustion performance.

DOCUMENTED: The condition of being in proper written form.

DOCTOR TEST This is a simple test widely used as a control test during refinery operations. It is easy to perform and a very sensitive method for ensuring that jet fuel has a sweet odor as distinguished from the "sour" odor contributed by mercaptans. A negative Doctor Test ensures a mercaptan content less than 0.001 weight percent. (See Sulphur, Mercaptan).

ELECTROSTATIC SUSCEPTIBILITY: The degree to which aviation fuels acquire and build up a static charge depends upon many factors, such as fuel type, amount and type of impurity, linear velocity in pipes, hoses, and filters, type and condition of charge, separating surface, conductivity and treating reagents.

EXPERIENCE: Work activities accomplished in a specific method and related activities, but not including time spent in organized training programs.

ELECTRICAL CONDUCTIVITY The possibility of explosion from static discharges in a tank receiving fuel is very real because of the extreme purity and, therefore, very low natural conductivity of the fuel. High pumping velocities and the use of micro-filtration equipment contribute to static charge build-up in the flowing fuel. Anti-static additives can be conveniently used in AVJET to increase the electrical conductivity of the fuel, above a critical minimum value, allowing charge dissipation to occur faster than charge accumulation. Consequently, the risk of static charges is eliminated. This test is only done when anti-static additives are incorporated in AVJET fuel.

FILTER ELEMENTS: generic term given to various decontaminates media installed in various types of pressure vessels, i.e., coalescer elements, separator elements, clay bags, clay canisters, and micronic elements.

FILTER/SEPARATOR: a filter vessel that removes solids, and coalesces and separates suspended free water from fuel. All filter/separators are equipped with two types of elements: coalescer elements (first stage) and separator elements (second stage).

FATAL INJURY: Any injury which results in death within 30 calendar days of the accident.

FLASH POINT: the lowest fuel temperature at which ignition can occur. The minimum flash point of Jet A and Jet A-1 38°C (100°F) is usually above the normal fuel handling temperatures and sea level pressures experienced. However, where the possibilities exist that Jet A or Jet A-1 may be heated to, or above, its flash point, there is danger that the resulting vapors can form ignitable mixtures. This condition may develop within a tank truck which is

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parked in the sun for extended periods or where ambient temperatures remain in the 38°C (100°F) range or above for extended periods.

FLASH POINT: The flash point is an indication of the fire hazard associated with fuels and provides a measure of the maximum temperature for fuel handling and storage. The shipment, storage, and handling precautions regulated by governmental laws, and insurance requirements are a function of the flash point for the particular fuel being utilized.

FREEZING POINT Because of the high altitudes and associated low temperatures connected with aircrafts, it is important that fuels possess adequate low temperature characteristics so that sufficient fuel flow to the engine is maintained. The freezing point test and associated specification limits guard against the possibility of solidification of any component hydrocarbons and consequent interference with the flow of fuel through fuel lines, filters, and nozzles. Because the temperature in an aircraft tank decreases at a rate proportional to the duration of the flight, freezing point specifications are related to the type of flight.

GRANDFATHERED: Certification of individuals that are considered qualified or meet the equivalent qualifications of the current system under a prior qualification program.

GRAVITY or DENSITY This is maintained between specified limits to control the settings and calibration of fuel metering equipment. It is used in mass/volume relationships for most commercial transactions.

GUM, EXISTENT Gum is a non-volatile residue left on evaporation of the fuel. It is a useful control to determine the amount of non-volatile material present in the fuel at the time of manufacture. Large quantities of gum indicate contamination by higher boiling oils or particulate matter, and generally reflect poor handling procedures. The existent gum test guards against the presence of such contamination, which would ultimately affect engine performance.

HEAT OF COMBUSTION The net heat of combustion provides knowledge of the energy content of fuel available for conversion from heat into mechanical energy. Aircraft design and operation depend upon a certain predetermined minimum amount of heat energy. A reduction in available heat energy below this specified limit is accompanied by an increase in fuel consumption with corresponding loss of range. The net heat of combustion is conveniently computed from the aniline gravity product and total sulphur content.

INCIDENT: An occurrence, other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.

INSTRUCTOR: Individual who provides classroom and on the job training in the method which they are qualified.

LUMINOMETER NUMBER The smoke point is not completely accepted as a reliable criterion of combustion performance. The illuminometer test was developed because certain designs of jet engines may experience a shortened combustion chamber life due to high liner temperatures caused by the radiant heat from luminous flames. It is designed primarily to provide an indication of the radiation energy emitted during combustion of the fuel in an

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engine. The illuminometer specification allows for a relaxation in smoke point from 25 minimum to 19 minimum.

MAINTENANCE: Actions required for restoring or maintaining an item in serviceable condition, including servicing, repair, modification, overhaul, inspection and determination of condition.

MANAGEMENT: Any person in a position that supervises personnel or is in charge of a particular project, or is designated as the person in charge during their period of duty. Includes crew chief, chief inspector, supervisors, managers, directors, etc.

NAPHTHALENES A 3 percent by volume limit is placed on polynuclear aromatics (naphthalene) because of their high boiling point and adverse effect on Illuminometer Number. The naphthalene content provides a reasonable prediction of AVJET smoking characteristics. The naphthalene specification allows for a relaxation in smoke point from 25 minimum to 20 minimum.

ON THE JOB TRAINING (OJT): Training, during work time, in learning instrumentation set up, equipment operation, recognition of indications, and interpretation under the technical guidance of an experienced Level II, Level III, or other qualified designated individual.

ORGANIZED TRAINING PROGRAM: Formal training, in classroom situations, where the intended purpose is qualification, certification, or re-certification in a specific NDT method.

OUTSIDE AGENCY: A company or individual who provides services (i.e. NDT Level III training, qualifying, inspection procedures, Level II inspection) and whose qualifications to provide these services have been reviewed by the Vendor.

OLEFINS These are limited to a maximum of 5 percent by volume because they are chemically reactive compounds, which easily form undesirable gums.

PARTICULATES: Solid contaminants found in jet fuel, i.e., dirt, rust, sand, fibers.

PARTICULATE (MICRONIC) FILTER VESSEL: a vessel equipped with a pleated-type paper cartridge that removes solids.

PRE-CHECK VALVE: a device used to check the operation of the automatic high level shut-off on refueling tenders.

PRODUCT: unless the text indicates otherwise, it normally means jet fuel.

POSITIVE SUMP: a chamber or depression installed at the bottom of a tank or filter vessel to facilitate the collection and removal of contaminants.

PROFICIENCY: Maintaining the skill or ability in the method for which qualified.

QUALIFICATION: Demonstrated skill, documented training, demonstrated knowledge, and experience required for personnel to properly perform the duties of a specific job.

SEPARATOR ELEMENT: allows passage of fuel, but repels free water droplets and is the second stage cartridge or shroud in a filter/separator vessel. It is downstream of the coalescer cartridge.

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SERIOUS INJURY: Any injury which requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received, results in a fracture of any bone (except simple fractures of fingers, toes, or nose), causes severe hemorrhages, nerve, muscle or tendon damage, involves any internal organ; or involves second or third degree burns, or any burns affecting more than 5 percent of the body surface.

SIGN: Means initials or signature including legible employee number or stamp.

SMOKE POINT AVJET fuels of the same class show side variations in their burning qualities as measured by carbon deposition, smoke formation and flame radiation. This is largely dependent upon hydrocarbon composition since paraffin's possess excellent burning properties in contrast to aromatics. Naphthalene's have intermediate combustion characteristics nearer to those of paraffin's. The smoke point test provides an indication of the relative smoke-producing properties of AVJET fuels. A high smoke point indicates a low smoke-producing tendency.

SMOKE VOLATILE INDEX This has been adopted for wide cut fuels to provide an indication of their tendency to form combustion chamber deposits. SVI is calculated from the sum of the smoke point and 0.42 times the volatility at 204°C. It is only applicable to AVJET B.

SULPHUR, MERCAPTAN Mercaptan sulphur is limited because it causes an objectionable odor, has an adverse effect of certain fuel system elastomers and contributes to the corrosion of fuel system metals.

SULPHUR, TOTAL Control of total sulphur below a maximum limit ensures that possible corrosion of turbine metal parts by the sulphur oxides formed during combustion is minimal.

STATION MANAGER/GENERAL MANAGER: Both are references to the Station General Manager

SUMP FUEL: fuel removed from fixed facility tank and filter vessel sumps and mobile equipment sumps while performing routine quality assurance tests or maintenance on equipment.

SURFACTANTS (Surface-active-agents): detergent-like compounds frequently found in jet fuel. These compounds are of concern because they have a disarming effect on elements used in filter/separators. Clay treatment is one means used in removing surface-active-agents from jet fuel.

SURGE TANKS: tanks that collect the fuel from high-pressure relief valves on hydrant carts.

THERMOHYDROMETER: a hydrometer with a built-in thermometer and is used to determine fuel density and temperature using one device.

THERMAL STABILITY In high-speed flight, AVJET is subjected to considerable heat input from kinetic heating of the airframe and by the use of bulk fuel as a coolant for engine oil, hydraulic and air conditioning equipment. Fuel instability leads to thermal breakdown causing particle formation, either in suspension in the fuel, or as lacquer build-up on heater tubes, causing blocked fuel filter, injection nozzles, and inefficient heat exchanger operation.

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The Jet Fuel Thermal Oxidation Test (JFTOT), or the Coker methods are used to ensure that acceptable thermal stability, at a specific temperature, fuel system pressure, and fuel flow rate, is maintained.

TRAINEE: An individual who is in the process of being qualified.

TRAINER: An individual who provides classroom and on the job training.

TRAINING: The program developed to impart the knowledge and skills necessary to qualify.

VAPOR PRESSURE When the pressure above a liquid is decreased sufficiently, it will lose its more volatile components, release dissolved air, and will boil. The increased rates of climb and operation altitudes of modern aircraft cause a reduction in atmospheric pressure and increased evaporation losses. Vapor pressure limits are only applicable to the more volatile AVJET B, and guard against excessive vapor formation during high altitude flight.

VENDOR: An organization or person providing service that operates and maintains fixed fuel storage, delivery facilities, or mobile refueling equipment.

WATER REACTION AVJET fuels vary in their tendencies to hold fine water haze and to retain suspended water droplets. Such tendencies depend upon the presence of trace quantities of surface-active impurities (Surfactants). Some surfactants may be derived from the original crude source or may result from refinery processes. Surfactants may also be picked up by contact with other products, particularly through multi-product pipelines. The presence of surfactants impairs the performance of the water separating equipment (filter separators) widely used throughout fuel handling. The water reaction test is a visual test used to assess the presence of surface-active materials in AVJET. (Anti static additives can cause a low reading with this test).

WATER SEPARATION INDEX, MODIFIED The water reaction test is too insensitive to cause rejection of any, but the heavier surfactant contaminated fuels. The MSS test is a more objective test, which provides water separation characteristics mechanically on a numerical scale. This is achieved by passing water/fuel emulsion through a water coalescing pad. The clarity of the effluent fuel after passes through a settling tank is measured by a photoelectric cell, which provides a meter rating from to 100. The higher the numerical rating, the more easily the fuel releases water. (See Water Reaction).

WASTE FUEL: Generally contaminated fuel resulting from exposure to biological activity, surfactants, oil/water separators, chemicals, petroleum product mixes, surface drains, and from various water and/or solid particle combinations.

WATER DEFENSE SYSTEM: A device, which senses a predetermined level of free water in filter/separator sumps, and automatically stops the flow of fuel to prevent downstream contamination.

WORKING TANK: The fuel storage tank being used to supply fuel to fueling trucks or the hydrant system.