



# Aviation Fuel Quality Control Manual

November 2025

AFQCM

# **Aviation Fuel Quality Control Manual**



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**SUMMARY:**

This section describes the FSM Group, LLC (FSM) Aviation Fuel Quality Control (AFQC) Program Waiver Request procedures.

**WAIVER PROCEDURES:**

The FSM Aviation Fuel Quality Control Program Waiver Request is intended for use at locations that have a need to deviate from the standard procedures of the FSM Aviation Fuel Quality Control Program Manual.

A variance or waiver to the policies and procedures in this Manual that will not compromise fuel quality, safety or security may be granted. A request for variance or waiver must be made in writing to each affected airline and shall include:

- (a) Requirement from which the variance or waiver is being requested.
- (b) Explanation as to why compliance with the AFQCM or airline requirement is not possible or practical.
- (c) Alternate means of compliance to be considered for approval of request.
- (d) Period of time for which variance or waiver is to be effective.

**These procedures are in addition to the air carrier's waiver. Individual air carrier waivers must be requested in accordance with section 2.1.4 of ATA 103 and the carrier's procedures.**

Waiver request shall be submitted to the following personnel for initial review and approval:

- FSM Vice President, Fuel Facilities, or
- Fuel Facilities – FSM Senior Vice President of Fuel Facilities, or
- Into-Plane Fueling – Vice President of Operations or Senior Vice President of Operations

Final approval for waivers will be issued as follows:

- Affected airlines.

Approved waivers must be kept on file at the location for as long as the request is valid. When the waiver is no longer required, the affected airline or airlines must be notified in writing of waiver termination.

Relevant forms are referenced in section 700 of this manual.



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# PROGRAM POLICY & RESPONSIBILITIES

AFQC-30

## SUMMARY:

Described is the FSM Aviation Fuel Quality Control Program policy, the responsibilities for administering the program and a definition of program participants.

## POLICY STATEMENT:

This statement shall be signed by the General Manager to indicate their acceptance and commitment to the program. This shall be updated when a new General Manager is appointed.

In order to provide our customers with the cleanest fuel possible, FSM Group has established an Aviation Fuel Quality Control Program (AFQC). The purpose of the AFQC Manual is to establish standards and to outline the necessary tests and operations required to maintain a supply of clean, dry fuel of the proper grade at the point of delivery. Strict adherence to these procedures, coupled with the outlined documentation, will ensure our objective -Delivery of contaminant free fuel into storage, into aircraft and maintaining accountability throughout this process in a safe and efficient manner.

Participation by all employees (including management) is essential in the success of any safety and health program. Compliance with FSM Standard Safety Procedures (SSP's) and the AFQCM is required.

## GENERAL MANAGER RESPONSIBILITIES:

This portion of the program lays out the responsibilities for individuals and provides the General Manager with some ideas on who should be assigned program responsibilities. Individuals identified by the General Manager shall be listed on the Program Responsibilities roster located in this section. The General Manager is not required to assign responsibilities to the individuals suggested by this manual if he/she feels that another individual best fits the responsibilities, but all areas identified on the Program Responsibilities roster shall have a person responsible. One person may be responsible for more than one area of the program. The Program Responsibilities roster shall be updated as soon as a new person is identified for a specific area of the program.

**Overall Administrative Responsibilities** -This person is responsible for coordinating listed responsibilities and for updating the information in the written program. This person may be the HSE &Training Manager/Supervisor, Fuel QC Manager/Supervisor or other person as assigned by the General Manager. This person may appoint individuals to be responsible for the program components. The administrative responsibilities include:

- Identification of employees to be included in the AFQC Manual.
- Coordination and supervision of Aviation Fuel Quality Control.
- Supervision of employee training programs.
- Coordination and supervision of record keeping.
- Overall evaluation of the local program.

**Program Implementation** -This person is responsible for ensuring that the program is

## **PROGRAM POLICY & RESPONSIBILITIES**

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implemented as designed, and that all local safety related issues and policies are included. This person shall be the HSE & Training Manager/Supervisor or Fuel QC Manager/Supervisor or others with management/ supervisory responsibilities.

**Fuel Quality Control Checks** - These individuals are responsible for ensuring the Aviation Fuel Quality Control checks are conducted in accordance with the AFQC Manual and keeping in compliance with the various industry practices. These individuals shall be properly trained and certified in the AFQC Manual and will be designated in writing by the General Manager under the Program Responsibilities.

**Fuel Quality Control Enforcement** -These individuals are responsible for ensuring employees who are required to conduct fuel quality control checks, do so. These individuals shall be the entire Management/ Supervisory team.

**Training** -This person is responsible for identifying those employees who need training, provides the training, and keeps the records of training. This person should be the HSE & Training Manager/Supervisor or others with management/ supervisory responsibilities.

**Record keeping** - This person is responsible for ensuring records regarding testing, monitoring, evaluation, and training are completed as required by the program. This person is also responsible to ensure that all technical data is maintained as current; and that controlled documentation is not duplicated for use in the field. This person shall be a member of the management/supervisory team. As this is an internal audit function, this person should not be an individual who is responsible for keeping the records required by the program, other than keeping audit records.

**Program Evaluation** - This person is responsible for performing the program evaluation and ensuring the evaluation records are kept as required by the program. This person shall be the HSE & Training Manager/Supervisor or a member of the management/supervisory team.

**Master Tool Calibration Program** - This person is responsible for ensuring all applicable master tooling is kept current with calibration requirements of the program. This person shall be a member of the management and/or maintenance team.

## **PROGRAM PARTICIPANTS:**

Employees being assigned or working with Aviation Fuel Quality Control (or on designated tasks). Employees are required to fully participate in the program as a condition of employment.

## **SCOPE:**

The AFQC program covers all aspects of Aviation fuel handling from, in some cases, terminal receipt through dispensing into aircraft. Explanations and definitions are provided for the various types of aviation fuels, specifications, contaminants, required testing, inspections, equipment design and overall fuel handling. Documentation and record keeping requirements are outlined. Technical definitions and specifications are annotated. Additionally, copies of some required technical manuals are included.

## **PROGRAM POLICY & RESPONSIBILITIES**

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This manual incorporates and exceeds the requirements of ATA 103, Standards for Jet Fuel Quality Control at Airports, latest edition.

When read and properly referenced, this program will allow for the continuing ability of our company to maintain the highest standards necessary in the handling of quality aviation fuels in a safe and efficient manner. Fully trained and qualified personnel shall conduct all fuel handling and quality control functions. It is the responsibility of management and their training department at each location to ensure that all fuel handling personnel, both fuel storage and into-plane, are given proper training (classroom and on the job), with all pertinent training records being completed prior to releasing them to perform any fuel handling required duties on their own.

### **AVIATION FUEL QUALITY CONTROL TRAINING:**

The Aviation Fuel Quality Control (AFQC) Program is a required course for all employees whose job requires conducting Fuel Quality Control activity from, in certain cases, terminal receipt to dispensing into aircraft.

The AFQC training program includes specific company and industry standard policy/procedures and accountability of proper procedures. The trainer must manage the training experience by encouraging and directing discussion, providing additional information about Aviation Fuel Quality Control, explain company policies, answer questions and plan for/conduct follow-up exercises or meetings to ensure Aviation Fuel Quality Control is being practiced consistently during daily operations.

Refer to Section 900 of this manual for additional initial and recurrent training requirements.

### **RECORDKEEPING:**

The AFQC program requires a variety of records, which must be maintained accurately and kept current. These records are discussed in section 700 of this manual.

### **PROGRAM EVALUATION:**

In order to ensure each location is in compliance with the requirements outlined in the FSM Aviation Fuel Quality Control Program, the program will be evaluated Semi-Annually per section 800 of this manual.

# **PROGRAM POLICY & RESPONSIBILITIES**

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## **PROGRAM RESPONSIBILITIES:**

Outlined are location specific Aviation Fuel Quality Control Responsibilities.

The following individuals or job positions are assigned program responsibilities as follows:

<b>Program Responsibility</b>	<b>Name or Job Position</b>
Overall Administration:	Primary: Secondary:
Program Implementation:	Primary: Secondary:
Aviation Fuel Quality Control Technicians:	Primary: Secondary:
Aviation Fuel Quality Control Enforcement:	Entire Management and Supervisory Team
Training:	Primary: Secondary:
Recordkeeping:	Primary: Secondary:
Master Tool Calibration Program:	Primary: Secondary:
Program Evaluation, Self-Audit:	Primary: Secondary:

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**40.1 OBJECTIVE**

To ensure proper notifications are made to Airline customers as related to fuel quality control (contamination) issues and/or changes in fueling equipment/systems. Changes in equipment/systems could mean new equipment or major modifications to existing equipment and/or systems. If the issue could cause an inventory shortage, the procedures listed in the A4A Fuel Portal must be followed by operators that support commercial operations.

**40.2 NOTIFICATION LIST**

Each location shall establish a Location Specific Customer Notification List. This list shall include at least the following information:

- (a) Aircraft Operator (Company Name)
- (b) Contacts (Name of Contacts - Local Station Manager or Shift Operations Manager or Consortium Contact and Quality Assurance Representative)
- (c) Telephone Number (Telephone numbers for contacts, include email addresses if available)

**40.3 NOTIFICATION REQUIREMENTS**

Airline customers shall be notified when they are affected by any of the following issues:

- (a) New, additional, replacement, or modified equipment is going to be placed into operation.

**NOTE**

**Affected airlines are to be notified at least two weeks in advance (if possible), of the changes. The affected airlines have the option to inspect and approve all fueling equipment/ systems and our procedures for use prior to servicing the airline's aircraft.**

**NOTE**

**When new or replacement equipment is received or existing equipment has undergone major modifications to the fueling system, all required quality control checks and tests shall be complete and up to date (i.e. Daily, Monthly, Quarterly, Semi-Annual and Annual) prior to the equipment being put into service.**

- (b) During the course of any fuel handling operation, if contaminated fuel is detected or any fuel system becomes inoperative that may affect airline operations.
- (c) When a fuel facility operator receives notification from a fuel supplier of off-specification product that may affect deliveries to the airport.
- (d) Whenever there is an interruption of supply of product to the airport that may affect airline operations.
- (e) Whenever a variance or waiver is requested or terminated.

**NOTE**

**Internal notification procedures must be completed before contacting airline customers. Notify FSM VP of Fuel Facilities and the VP of Operations with all pertinent information regarding fuel contamination.**

**NOTE**

**If a fuel supply is suspected of contamination, aircraft fueling shall be discontinued from that source. The cause of the contamination shall be immediately investigated. Corrective measures shall be initiated to ensure the removal of the contaminants.**

**40.4 LOCATION OF CUSTOMER NOTIFICATION LIST**

Each location shall as a minimum, have copies of the Location Specific Customer Notification List in the following locations:

- (a) General Manager's office
- (b) Dispatch/ Operations
- (c) Fuel Facility

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# TOOL CALIBRATION

# AFQC-50

## 50.1 OBJECTIVE

To ensure equipment/tools are maintained within specifications.

## 50.2 FREQUENCY

The following tools shall be calibrated for accuracy per the table below. Calibration shall be performed by a company that uses standards traceable to the National Institute of Standards and Training (NIST) and in compliance with ANSI/ISO/IEC 17025:2017, or equivalent. A calibration certificate shall be provided.

Item	Frequency
Master Gauges (c), (d)	Every three years
Ohm Meters (a)	Annually
Torque Wrenches (b)	Annually
Laboratory / Field Equipment (e), (f)	Annually, or frequency mandated by the applicable test method or manufacturer specifications, <b>whichever is less</b>
Master Hydrometers/Thermometers	Must have valid certificate stating the master is accurate and traceable to NIST
Hydrometers/Thermometers	Calibration verified every six months by comparison against masters.
Electronic Water Sensors [EI 1598]	Verified annually. Calibrated when annual verification indicated accuracy is out of tolerance.

- (a) Meters used to check the resistance of static/bonding wires at the fuel facility and on into-plane fueling equipment
- (b) Torque wrenches that are used to torque the closure bolts on filter vessels, the filter elements installed in the vessels, and lug nuts on vehicle wheels.
- (c) Fuel Quantity Master Meter or Prover Tank that is used to prove the accuracy of into-plane product meters.
- (d) Fuel Pressure Master Test Gauge(s) that are used to check the accuracy of all into-plane fueling equipment nozzle/fueling pressure gauges.
- (e) All into-plane fueling equipment nozzle/fueling pressure gauges.
- (f) Filter Differential Pressure Gauges at the fuel facility and on all into-plane fueling equipment.

## 50.3 PROCEDURE

The aforementioned equipment/tooling shall be calibrated by the following procedures.

## TOOL CALIBRATION

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- (a) Multi-meters, Torque Wrenches, and Fuel Pressure Master Test Gauges shall be checked for accuracy annually by an authorized calibration agency or service traceable to the N.I.S.T., at minimum ANSI /NCSL Z540-1.

### NOTE

**A placard identifying the date of calibration, the personnel who performed the calibration and the next due date shall be affixed to the tooling.**

- (b) Master Meter/Prover Tank shall be calibrated as required by the applicable government agency in which the equipment is operated by or a government certified service company. A calibration certificate for the Master Meter/Prover Tank shall be obtained from the company performing meter calibrations and kept on file indefinitely.
- (c) Into-plane equipment fueling gauges must be checked for accuracy by having a common connection for pressure and comparison to a Fuel Pressure Master Test Gauge (i.e.: quick connect fitting). The pressure to check will be 40 PSI (2.75 bar) +/-2 PSI (0.14 bar). The accuracy of the test gauge shall be within +/-2% (percent) of full scale. If the reading comparison is greater than +/-2% (percent), the test gauge can be sent to a service company certified to do gauge calibrations for adjustments (if the gauge is so equipped). If not, the gauge must be replaced with one that meets the accuracy requirements
- (d) Gammon and Shultz filter differential pressure gauges must be checked for accuracy by:
  1. Replace the gauge protection filter element.
  2. With no flow in the system, read the gauge. A gauge without defect must indicate within the zero band.
  3. Establish full system flow. A gauge without defect must indicate a differential pressure greater than zero.
  4. Actuate the test valve on the bottom of the gauge to vent the underside of the piston. The piston should move to the bottom of its travel smoothly without evidence of sticking as it moves. Be prepared to collect approximately 50ml of fuel from the outlet of the test valve. Return the test valve to the Normal position and secure.
  5. Stop flow. The piston should move back to a position within the zero band.

#### Note:

**If the piston moves erratically or fails to return to the Normal band, disassemble and clean the piston and glass tube with applicable fuel and glass safe abrasive scrubber (i.e. Scotch Brite pad or equivalent).**

- 6. Repeat the test after cleaning and reassembly. If the piston still does not return to zero, the spring must be replaced.

## 50.4 RECORDS

All tool calibration certificates and records must be maintained on file for the duration of service. Any personal tools used for Company business are also subject to the Tool Calibration requirements contained in this Section.

- (a) For tracking purposes, a list of all Master Tools requiring calibration shall be maintained on file with at least the following information listed:
  1. Description of tooling/test equipment.
  2. Identification number and/or serial number.
  3. Date of last calibration.
  4. Name of company and individual who performed calibration.
  5. Due date of next calibration.

## **TOOL CALIBRATION**

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### **50.5 RESPONSIBILITY OF LOCAL CALIBRATION PROGRAM**

It shall be the responsibility of the highest-ranking person in the local maintenance department or their designee(s) to ensure that all required tooling and testing equipment is calibrated at the required frequency.

#### **NOTE**

**Any calibration required tooling or test equipment that is out of calibration should be tagged "OUT OF SERVICE FOR CALIBRATION" and removed from the work area until it meets compliance with this program.**



**TOOL CALIBRATION**

**AFQC-50**

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## **60.1 PURPOSE**

Delivering the wrong grade of fuel into an aircraft is termed a misfueling. It is essential that the right control procedures are in place at all times to avoid misfueling. The risk of delivering the wrong grade of fuel exists because many General Aviation (GA) aircraft and some airline type aircraft are over wing fueled and can therefore potentially be fueled with the wrong grade of fuel.

The serious consequences of misfueling include:

- Total engine failure due to knock damage if jet fuel is delivered into a spark ignition piston engine powered aircraft that requires avgas.
- Ignition failure if avgas is delivered into a compression ignition (diesel) piston engine powered aircraft that requires jet fuel.
- Potential engine failure or power loss if avgas is delivered that is below the minimum specified octane level for the engine type.
- Vapor lock and engine failure due to fuel starvation if avgas is delivered into a turbine engine powered aircraft that requires jet fuel. Many turbine engines are capable of operating on avgas, but such operation is strictly controlled as described in the Pilot Operating Handbook.

Measures are required to ensure that the correct grade of fuel is delivered when using an overwing (trigger) nozzle. Fueling personnel should never make an assumption about the grade of fuel required. Grade confirmation between the customer and fueling personnel must take place. All verbal requests shall be repeated back to the pilot/aircraft/airline representative and verbal requests alone are not acceptable if the aircraft does not have the relevant grade markings adjacent to the fill point. Whenever possible, written confirmation of the grade of fuel required shall be provided by the customer.

## **60.2 PROCEDURE**

Before fueling commences, the operator shall check that the grade requested is the same as the grade marked on the aircraft, adjacent to the tank filler cap, and the same as the grade marked on the overwing fueling nozzle.

If there is no grade marking on the aircraft, fueling shall not commence until a Fuel Confirmation Order Form reconfirming the grade of fuel required has been completed by the pilot or designated airline representative.

If the grade marking on the aircraft is different to that of the fueling equipment, fueling must not commence until the discrepancy has been fully investigated and resolved in writing between the pilot or designated airline representatives.

For turbine powered aircraft which do not accept the larger diameter jet fuel nozzle spout a small diameter jet fuel nozzle spout shall be available. These shall be kept in secure containers and only fitted for those fuelings where they are required and returned to their container when the fueling is complete. If a small diameter jet fuel nozzle spout is required to fuel the aircraft, fueling shall not commence until a Fuel Confirmation Order Form reconfirming the grade of fuel required has been completed by the pilot or designated airline representative.

Written procedures shall be prepared to ensure that after fueling such aircraft the smaller spout is removed from service and replaced by the larger Jet Fuel spout. An alternate means of compliance would be to locate the Jet nozzle spout on the equipment in a holder which is interlocked with the Vehicle drive-off interlock system of the vehicle. Such a system will then require the jet nozzle to be reinstated before the equipment can be moved.

The following additional precautions are applicable for overwing fueling:

- Prior to fueling aircraft, and where a nozzle spout extension or funnel is required to avoid splash fueling ensure that the grade of fuel is confirmed in writing by completing the fuel order form with the pilot or designated airline representative.
- Several companies produce reciprocating aircraft engines that are powered using Jet Fuel or Diesel Fuel. These engines are being installed on aircraft that typically had previously been fitted with engines that used Aviation Gasoline (Avgas).
  - These aircraft represent a serious risk of misfueling by the delivery of Avgas to an engine designed for diesel fuel. Also, because these aircraft were originally designed for use with Avgas, most will have filling orifices that are too small for the normal 67mm Jet Fuel nozzle.
  - Although some engines may be certified for use with Jet Fuel and Diesel, DIESEL FUEL MUST NOT be supplied to those aircraft.
  - The use of a Fuel Confirmation Order Form is required for all refueling of diesel-powered aircraft types.



**70.1 PURPOSE:**

To define the safety sensitive requirement for possessing normal color vision in the performance of task-specific Aviation Fuel Quality Control functions and the testing procedures used to identify color vision deficiency in employees and job applicants tasked with Aviation Fuel Quality Control responsibilities.

**70.2 SCOPE:**

This policy applies to all FSM Group employees or applicants whose job functions include conducting Aviation Fuel Quality Control tasks, defined as one or more of the following:

1. Visual testing of aviation fuels (white bucket, clear & bright)
2. Filter Color Membrane and Particulate Test (Millipore)
3. Free water testing (any approved method)
4. Section 600 [post-accident] events which prescribe any of the aforementioned sampling or rating methods

**70.3 RESPONSIBILITIES:**

- A. Corporate Training Manager will own and administer this policy in conjunction with individual location leadership.
- B. FSM Group shall comply with all obligations under the Americans with Disabilities Act (ADA) and other related Federal and State laws, as well as any collective bargaining agreements.

**70.4 POLICY:**

FSM Group takes pride in our into-plane business and providing the cleanest aviation fuel possible ranks among the highest reasons our customers continue coming back to our locations. Due to the complexities involved in tasks associated with Aviation Fuel Quality Control, and the potential for misidentifying color-rated fuels and quality control processes, the requirement for employees performing Aviation Fuel Quality Control tasks to possess color vision free of deficiency has been identified as a significant risk by the industry, as well as regulatory agencies.

Color Blindness, more accurately defined as Color Vision Deficiency, is a hereditary condition that affects approximately 8% of the male population, and roughly 0.5% of the female population. Red/green deficiency (Protanopia or Deutanopia, respectively) is most prevalent, although a more rare blue-yellow (Tritanomaly or Tritanopia) deficiency may also exist. The latter is concerning as certain colors, yellow hues for instance, can be perceived as having pink or red hues, which may result in 'false negatives' determining the

rating of turbine aviation fuel which can have a straw or pale yellow appearance. Presently, there is no treatment or cure to correct for color deficiency.

Although generally inherited and affecting both eyes, in very rare cases color vision deficiency can affect one or both eyes, and may be caused by surgical procedures, traumatic injury, prolonged UV exposure, exposure to certain chemicals, alcoholism, or rare ailments. Color deficiencies prevent the proper identification of certain color spectrums and could pose a significant risk in safety-intensive fields such as aviation fuel quality control.

Many industries currently require color vision absent deficiency as a prerequisite for employment in safety-sensitive positions. FSM Group, LLC., being the leader in business aviation services, is taking a proactive view with this issue and has developed this Aviation Fuel Quality Control Color Vision policy.

## **70.5 PROCEDURE:**

### **70.5.1 Testing Applicants**

Personnel applying for aviation fuel quality control or M&O positions, with job Descriptions requiring the ability to distinguish the colors of fuels and/or rate various color values of required tests and checks, shall be initially tested for color blindness prior to assuming a quality control position. Should the applicant fail the initial color vision test, they will not be considered for positions which require rating color or contrast of fuel samples and sample media. However, the applicant may still perform mechanical aspects of tasks associated with aviation fuel quality control.

### **70.5.2 Initial Testing of Employees**

Applicants for aviation fuel quality control-specific positions, and employees that currently perform or move into a position that performs Aviation Fuel Quality Control checks, as addressed above, will be subject to the initial color vision test. This will include all Fuel QC Department employees and any other persons engaged or who may engage in the rating of color and contrast of aviation fuels and sample media.

### **70.5.3 Recurrent Testing of Employees**

Recurrent testing of employee color vision shall be performed once every three (3) years, using the color vision test method approved at the time of recurrency. It is further required that if an employee undergoes surgery to the eye(s), or incurs a significant eye injury, that the employee be retested to confirm the absence of color vision deficiency after the employee has recovered and has returned to work.

### 70.5.4 Testing procedures

Test administration shall be completed as follows:

1. Initial and recurrent color vision tests will be administratively managed by a designated location leadership team member (General Manager, HSE&T Manager/Supervisor).
2. The Color Vision test will be administered utilizing the Ishihara Color Blindness Test.
3. If the employee fails the test, less than 100%, the employee will be allowed to retake the test. If failed the second time, the employee will be retested a final time at an approved medical clinic.

In the event this method of color vision testing system is no longer supported or becomes either obsolete, upgraded, or otherwise unavailable, the location shall follow the instruction of the Corporate Training Manager concerning color vision testing.

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**100.1 DEFINITIONS**

The following definitions and terms are unique to the petroleum and aviation industry in handling Avgas and jet fuels.

**ADDITIVES:** Compounds used to impart new properties to a product or to improve a property that it already possesses.

**ADSORPTION:** A separation method where one component is concentrated on the surface of a porous solid. Surfactants (surface-active-agents) are separated from jet fuel by adsorption on clay.

**API:** American Petroleum Institute (US Oil Company Association). The institute represents and is supported by the petroleum industry. It standardizes the tools and equipment used by the industry and promotes the advancement of research in the petroleum field.

**API DEGREES:** Fuel density measurement units. Units on an Oto 1 00 scale developed by the American Petroleum Institute. The scale is used to quantify the density of petroleum products with 0API being the heaviest and I 00° API being the lightest product.

**API GRAVITY:** An arbitrary scale expressing the density of liquid petroleum products, as established by the American Petroleum Institute (APJ). The measuring scale is expressed in terms of degrees API from Oto I 00, the higher the API gravity, the lighter the compound. The observed API gravity and observed temperature of the product are used together to produce the corrected API gravity (API gravity @ 60°F or 15°C).

**AMBIENT TEMPERATURE:** The air temperature surrounding a specific area.

**ANTIOXIDANT:** A chemical added to petroleum products to inhibit oxidation.

**APPEARANCE:** Refers to the visual examination of fuel; appearances are, clear, bright, hazy and cloudy.

**APPROVED:** Acceptable to the "authority having jurisdiction".

**ASTM:** American Society for Testing and Materials. A scientific and technical organization formed for the development of standards on characteristics and performance of materials, products, systems, services and the promotion of related knowledge.

**ATA:** Air Transportation Association (US Airlines Association).

**AUTHORITY HA YING JURISDICTION:** The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

**AVIATION GASOLINE (AVGAS):** Specially blended gasoline used to power reciprocating piston aircraft engines.

**BARGE:** A vessel, either motorized or towed, used to carry products in navigable waterways.

**BARREL (bbl):** A common unit of measurement of liquids in the petroleum industry. It equals 42 US standard gallons.

**BATCH:** A measured amount in which crude oil and refined product shipments are sent through a pipeline.

**BATCHING SEQUENCE:** The order in which shipments are sent through a pipeline.

**BRIGHT:** An indication of the absence of suspended or free water in a sample. Brightness is a quality independent of the color of the sample and refers to the shiny nature of dry, moisture-free fuel.

**°C:** Degrees Celsius.

**CATHODIC PROTECTION:** A method of controlling or impressing an electrical current to prevent corrosion of metal components of airport fueling systems that is in contact with the ground.

**CLAY TREATMENT VESSEL:** A filtration vessel equipped with bulk clay, clay bags or clay canisters used for removing surfactants from jet fuel.

**CLEAR:** Refers to the absence of suspended particles of silt, flakes of dye, rust or other solid particulate matter in the sample. A one-pint sample containing two or three very fine particles may be considered a clear sample.

**CLOUDY:** The result of extremely fine droplets of water dispersed throughout the sample giving it a milky appearance.

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

**COALESCE:** To bring together very fine droplets of free entrained water to form larger droplets, which are heavy enough to fall to the bottom (sump) of a filter/separator vessel.

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

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

**DEADMAN CONTROL:** A **handheld** control device, which must be physically held open by the system operator to allow fuel to flow. When released, fuel flow stops automatically.

**DENSITY:** The amount of mass (weight) in a unit volume of a material.

**DIFFERENTIAL PRESSURE (Delta P, AP):** The measured difference in pressure between any two points, generally between inlet and outlet connections on filtration vessels. The regular monitoring of this pressure can help to determine the condition of filter elements, and to identify problems with the cleanliness of upstream product. Differential pressure is proportional to flow rate; i.e., it is zero when there is no flow and increases as flow increases.

**DIRTY:** Where sufficient particles are present to discolor the sample or where moderate to large sized particles are dispersed in the fuel or have settled to the bottom, the sample may be considered dirty.

**DISARMING ACTION:** As applied to filter/separators, the rendering of the elements incapable of performing their designed functions; for example, coalescer elements incapable of coalescing water and separator elements incapable of separating water from fuel.

**DISSOLVED WATER:** Water, which is in solution in the fuel. This water is not free water. Dissolved water cannot be seen.

**EFFLUENT:** Stream of fluid at the outlet of a filter or filter/separator. This is the opposite of influent.

**EMERGENCY FUEL SHUTOFF:** A devise or system used to stop the flow of fuel in an emergency.

**EMULSION:** A dispersion of two dissimilar immiscible droplets in the continuous phase.

**ENTRAINED WATER:** Small droplets of free water in suspension that may make fuel appear hazy.

**\*F:** Degrees Fahrenheit.

**FILTER:** A device to remove solid contaminants from fuel.

**FILTER ELEMENTS:** A generic term given to describe various decontamination media installed in pressure vessels.

**FILTER MEMBRANE:** A test of fuel cleanliness in which a standard sample of fuel is passed through a small filter membrane housed in a plastic holder. The cleanliness of the fuel is evaluated by comparing the membranes color shade and density to those on a standard color chart or by means of using a precision balance to weigh the membranes. This test can help to determine the performance of filtration equipment.

**FILTER/ SEPARATOR:** A pressure vessel containing inlet elements that perform a water coalescing and particulate filtering function, and elements at the outlet that perform a water separating function.

**FLASH POINT:** The lowest fuel temperature at which the fuel will generate sufficient vapors to ignite.

**FLOATING SUCTION:** A floating device used in a tank for drawing product from the upper level of the tank.

**FREE WATER:** Water in the fuel other than dissolved water. Free water may be in the form of droplets or haze suspended in the fuel (entrained water) and/or a water layer at the bottom of the container holding the fuel.

**FREEZING POINT (Fuel):** The lowest fuel temperature at which there are no crystals.

**FSII:** Fuel System Icing Inhibitor. *See Prist.*

**FULL FLOW MONITOR:** A pressure vessel containing elements at either the vessel inlet or outlet that perform both a filtration and a water absorbing function. Unlike filter/separators, water that is separated from the fuel stream is retained by the filter element and, if sufficient water is present, flow through the vessel will stop and the elements will become unserviceable.

**HAZE:** Fine droplets of free water dispersed in fuel that is visible to the eye (usually more than 30 ppm in jet fuel). Fuel appears hazy or cloudy, that is, not clear and bright.

**HAZY:** A condition resulting from fine droplets of moisture dispersed throughout the sample producing a dull hazy appearance. This can be a temporary condition due to a drop in temperature. During the first minute after a sample is drawn, the fuel can appear hazy due to air bubbles.

**HYDROPHILIC:** Water accepting.

**HYDROPHOBIC:** Water repelling; lacking affinity for water.

**IMMISCIBLE:** Liquids which are mutually insoluble. This is the opposite of miscible.

**INFLUENT:** Stream of fluid at the inlet of a filter or filter/separator. This is the opposite of effluent.

**IP:** Institute of Petroleum (International Oil Company Association).

**LOCATION:** Base or Station.

**LL:** Low Lead.

**MICRON (Micrometer):** A unit of linear measurement. One micron is equal to .000039 inches and approximately 25,400 microns equal one inch. This measurement is used in micronic filter elements. A human hair is approximately 25 microns in diameter.

**MISCIBLE:** Liquids which are mutually soluble. This is the opposite of immiscible.

**Mg:** Milligrams -A unit of mass in the metric system of measurement. One milligram= 0.001 gram. *See Conversion table appendix.*

**MILLIPORE CORPORATION:** One of the leading manufacturers of analytical filtration media and equipment. *See Filter Membrane Test.*

**ML:** Milliliter-A unit of volume in the metric system of measurement. One milliliter= 0.001 liter. *See Conversion table appendix.*

**MOGAS:** Motor gasoline - the fuel commonly used in automotive equipment, but also used by private individuals in some light aircraft for which the use of mogas has been specifically certified by the engine manufacturer. Our company does not sell or handle mogas to be used for aviation purposes.

**MONITOR:** A device that shows or gives warning of improper performance (noun); or to test or check performance on a continuing basis (verb).

**MICROSEP (MSEP):** Micro-Separometer; a test to provide a rapid means to rate the ability of jet fuel to release entrained or emulsified water when passed through fiberglass coalescing material. This test is commonly used to evaluate the performance of clay treating vessels that remove surfactants from jet fuel and to identify jet fuels that may contain significant levels of surfactant that would disarm coalescer cartridges.

**MUST:** Indicates a mandatory requirement.

**NIST:** National Institute of Standards and Technology.

**NFPA:** National Fire Protection Association.

**OCTANE:** A measurement of a gasoline fuel's resistance to detonation (knocking) in piston engines.

**OVERSHOOT /OVERRUN:** The quantity of fuel passing through the valve after the Deadman control is released or the emergency shutdown control is activated.

**PPM:** Parts per million.

**PARTICULATE MATTER:** Solids contaminants (e.g. dirt, scale, sand, dust, etc.) sometimes found in 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.

**PREFILTER:** A filter that has a high dirt-holding capacity that is installed upstream of other filtration equipment.

**PRESSURE DROP:** See *Differential Pressure*.

**PRIST:** PPG Industries' brand name for an approved anti-icing aviation fuel additive (diethylene-glycol monomethyl ether) that depresses the freezing point of free water.

**PSI:** Pounds per square inch.

**RELATIVE DENSITY:** Specific gravity. In fuel, this is the ratio of the weight of any volume of fuel to the weight of an equal volume of water.

**SETTLING TIME:** The time allowed for water or dirt entrained in the fuel to drop to the bottom of the storage tank.

**SHALL:** Indicates a mandatory requirement.

**SHOULD:** Indicates a recommendation; or that which is advised but not required.

**SLIME:** Soft, jelly-like substance.

**SPARKLE:** To glitter or shine. A property caused by the high index of refraction when jet fuel is clean and dry. *See Bright*.

**SPECIFIC GRAVITY:** See *Relative Density*.

**SUMP:** A chamber or depression installed at the bottom of a fuel storage tank or filtration vessel to facilitate the collection and removal of contaminants.

**SUMP FUEL:** Fuel removed from storage tanks, filtration vessels, and aircraft Refuelers while performing routine quality control tests and equipment maintenance. Some sump fuel may be returned to inventory through a properly designed closed reclaim system or used to power approved ground equipment engines. Improperly handled sump fuel becomes waste fuel.

**SURFACTANTS:** An acronym for surface-active-agents that are chemical substances or detergent-like compounds frequently found in jet fuels. These chemicals disarm the water removing capability of coalescer cartridges in filter/separators. Clay treatment is the primary means in removing surfactants from jet fuel.

**SURGE TANKS:** Small tanks that collect fuel from high-pressure relief valves on fueling vehicles.

**SUSPENDED WATER:** Droplets of free water that is fine enough to remain in suspension in the fuel.

**SYNTHETIC SEP ARA TOR:** Separator made of media that is synthetic mesh material with chemically bonded hydrophobic treatment.

**THERMOHYDROMETER:** A hydrometer with a built-in thermometer that is used to determine fuel density and temperature.

**THIEF PUMP (Sump Pump):** A small pump having a suction line that extends to the low point of a tank for the purpose of drawing off accumulated water.

**TURBINE FUEL:** A group of various kerosenes or wide-cut types of fuels used to power turbine engines.

**TEL:** Tetraethyl lead (lead). An approved additive in AvGas; It is used to reduce the tendency of gasoline to detonate in a hot combustion chamber (knock).

**WASTE FUEL:** Fuel that is contaminated resulting from exposure to biological activity, surfactants, oil/water separators, chemicals, petroleum product mixes, surface drains, and from other various water/solid combinations.

**WATER DEFENSE SYSTEM:** A device which senses a predetermined volume (generally in the range of 0.5 to 1 gallon) of free water in filter/separator sumps and automatically stops the flow of fuel to prevent downstream water contamination.

**WATER SLUG:** A large amount of free water.

**WET:** Any free water in sufficient volume to form droplets or bulk water on the bottom of or clinging to the sides of the sample container.

**WORKING TANK:** The fuel storage tank currently being used to supply fuel to aircraft refueling tanker trucks or to hydrant systems.

**WSIM:** Water Separation Index Modified.

**100.2 PRODUCT IDENTIFICATION**

**100.2.1 Jet A:** A kerosene fuel having a -40°F (-40°C) maximum freezing point, a 100°F (38°C) minimum flash point and API gravity range of 37° to 51 ° API (relative density range of 0.839 to 0.775).

Freeze Point:	40°F (-40°C)
Flash Point:	100°F (38°C) min.
API Gravity:	37° to 51° (corrected to 60°F)
Specific Gravity:	0.839 to 0.775
Millipore Color:	A2, B2 or G2 (max. dry rating - downstream)
Millipore Particulate:	A (maximum rating - downstream)

**100.2.2 Jet A-1:** A kerosene type fuel that has a -53°F (-47°C) (Jet A50, -50°F/-46°C) maximum freeze-point. It is similar in all other characteristics to Jet A fuel.

Freeze Point:	-53°F (-47°C), (Jet A50 -50°F/-46°C)
Flash Point: API	100°F (38°C) min.
Gravity:	37° to 51° (corrected to 60°F)
Specific Gravity:	0.839 to 0.775
Millipore Color:	A2, B2 or G2 (max. dry rating - downstream)
Millipore Particulate:	A (maximum rating - downstream)

**100.2.3 AvGas 100:** Aviation gasoline 100 has a minimum lean rating of 100 PN (Performance Number) and a rich rating of 130 PN min. The flash point is below 0° F (-18°C) and the maximum freeze point is -72°F (-58°C). The average corrected API gravity range is 64° - 75°. This grade is dyed green and contains a maximum of 4.0 ml. TEL (lead) per gallon.

Freeze Point:	below 0°F (-18°C)
Flash Point:	-72°F (-58°C)
Reid Vapor	min. 5.5 max. 7.0
Press: Color:	green
API Gravity:	64°-75° (corrected to 60°F)
PN:	min. 100 to min. 130.

**100.2.4 AvGas 100LL:** AvGas 100 has a min. lean rating of 100 PN (Performance Number) and a rich rating of 130 PN min. The flash point is below 0° F (-18°C) and the freeze point maximum is -72° F (-58° C). The average corrected API gravity range is 64°-75°. This grade is dyed blue and contains a maximum of 2.0 ml. TEL (lead) per gallon.

<b>Freeze Point:</b>	max. -72°F (-58°C)
<b>Flash Point:</b>	below 0°F (-18°C)
<b>Reid Vapor Press:</b>	min. 5.5 max. 7.0 psi
<b>Color:</b>	blue
<b>API Gravity:</b>	64°-75° (corrected to 60°F)
<b>PN:</b>	min. 100 to min. 130.

\*This fuel differs from AvGas 100 only by the TEL content and color.

**100.2.5 AvGas 80:** AvGas 80 has a min. lean rating of 80 (ON octane number), and a rich rating of 87 ON min. The flash point is below 0°F (-18°C) and the freeze point is -72°F (-58°C) max. The corrected API range is 64 to 75. This grade is dyed red and contains a max. 0.5 ml./gal. of TEL (lead).

<b>Freeze Point:</b>	max. -72°F (-58°C)
<b>Flash Point: Reid</b>	below 0°F (-18°C)
<b>Vapor Press:</b>	min. 5.5 max. 7.0 psi
<b>Color:</b>	red
<b>API Gravity:</b>	64°-75° (corrected to 60°F)
<b>PN:</b>	80 (ON) min. 87 (ON) min.

**100.3 COLOR CODING SYSTEM (per EI 1542)**

**100.3.1** In addition to the product name, the various grades of aviation gasoline are dyed different colors to aid recognition and prevent the wrong type and/or grade of fuel from being utilized. These colors have been established by international agreement. Jet fuels, however, are colorless or a shade of light straw (yellow) or tan.

**100.3.2** Product identification shall utilize a system of color coding and banding of all valves, loading and unloading lines and connections, switches at facilities, hydrant systems, airport hydrant pits, transport vehicles, Refuelers, hydrant servicers or any other point where grade ID is necessary. Bands shall be 4" wide.

**100.3.3** Where space permits, a stencil-painted name, a product ID tag, color-coding and banding system shall be utilized. Where space is limited, such as valves, the identifying color and a product tag should be used.

**100.3.4 A summary of the color-coding system is as follows:**

Fuel Name	Fuel Color	Markings	Valves etc.	Banding
Jet A	Natural	White on Black	Black	1 Black
Jet A-1	Natural	White on Black	Black	2 Black
AvGas 100	Green	White on Red	Green	1 Green
AvGas 100LL	Blue	White on Red	Blue	1 Blue

**NOTE**

All piping base coats shall be either white or silver in color.

**100.4 Sample Terminology**

The following terms have been defined to clarify the composition of a particular sample or the point at which a sample is taken.

**Top Sample:** A sample obtained 6 inches below the top surface of the container's contents.

**Upper Sample:** A sample obtained from the middle of the upper third of one container's contents.

**Middle Sample:** A sample obtained from the middle of the container's contents.

**Lower Sample:** A sample obtained from the lower of the container's contents.

**Bottom Sample:** A sample obtained 6 inches above the lowest point of the container bottom.

**Water Draw Sample:** A sample obtained from the extreme bottom or internal sump of the container.

**Average Sample:** A sample obtained by submerging a closed sampler to a point as near as possible to the draw-off level, then opening the sampler and raising it at a rate such that it is almost full as it emerges from the liquid.

**Line Sample:** A sample drawn from a small connection on a line during flow.

**Drip Sample:** A "drip" or "continuous" sample is a line sample obtained by either of the following methods to produce a representative average:

- a. The product is allowed to drip or trickle into a container throughout the period of product transit.
- b. A pint sample may be drawn at regular intervals during a delivery to fill a gallon container.

**Hose Sample:** A sample obtained from a Refueler or dispensing cabinet "over-the wing" delivery hose. It is preferable to fill a gallon container.

**Composite Sample:** A sample consisting of a blend of equal portions of two or more of any of the preceding types of samples.

**Discrete Sample:** A sample consisting entirely of one specific type of the preceding samples (excluding Composite).

## **100.5 CONTAMINANTS**

### **100.5.1 General.**

- Strict quality control measures are of the utmost importance, because aircraft power plant failure during flight can result in disaster. Effective fuel handling equipment and techniques for gasoline are fairly simple because gasoline has relative low viscosity and density giving it the ability to shed contaminants more easily than turbine fuels. With the introduction of turbine powered aircraft, the need for effective procedures and equipment to maintain fuel cleanliness is more critical than ever because of the ability of turbine fuel to maintain contaminants in suspension and carry them throughout the distribution system - ultimately into aircraft fuel tanks and engines.
- Everyone involved in production, transportation, storage and delivery of aviation fuels (including fueling an aircraft), must work vigilantly to maintain fuel quality and cleanliness.
- The more common forms of aviation fuel contaminants are solids, water, surfactants, microorganisms, and miscellaneous ones including the intermixing of grades or types of fuel. Surfactants and microorganisms, contaminants that are virtually unknown in aviation gasoline, have become critical with the advent of turbine fuels.

- An important part of product quality control is a thorough understanding of some of the types and sources of fuel contamination.
- Contaminants can be introduced into aviation fuels during the refining process, and particularly in the transfer of the fuel from the refinery to the aircraft. The fuel specification controls the fuel as produced by the refinery and insures a satisfactory product from the standpoint of impurities.
- During the transfer process, water, rust, dust particles, and microorganisms are the major contaminants that can be added into the fuels. Good housekeeping, both in the transfer equipment and storage facilities, is most important in this case.
- Added protection is provided by the use of filter/separators capable of efficiently removing significant quantities of water and solid particles. The coalescing capability of the filter/separators is protected by specification requirements, limiting materials detrimental to the ability of filter/separators to perform their functions.

• **NOTE**

If a fuel supply is suspected of contamination, aircraft refueling must be discontinued from that source. Notify all affected aircraft operators if it is anticipated that such contamination might impact aircraft operations. Immediately investigate for the cause of the contamination and initiate appropriate corrective measures. Notification shall be given to the following personnel, with all pertinent information of the finding of the contamination and corrective measures:

The Fuel Quality Control Department; and the responsible Vice President of the location.

Fueling shall not be resumed from the system until the source of fuel contamination is found and removed.

Fuel, suspected of possible contamination, shall be held in quarantine until selected fuel quality, purity or specification tests have determined that it is acceptable for aircraft use.

Selected product tests and expected acceptance criteria are to be determined and mutually agreed upon by fueling vendor and all affected customers prior to approving fuel for future use. To the extent the fuel is no longer acceptable for aircraft use, it should be managed and/or disposed consistent with applicable federal, state and local requirements.

**100.5.2 Product Mixture.**

It is usually the result of inadvertently mixing of dissimilar products. Contamination with a small amount of dissimilar product may not be readily discernible and may require laboratory testing for verification. A larger amount of contamination with a dissimilar product may be detected by a significant change in appearance or color or change in API Gravity.

**100.5.3 Solids Contamination.**

Solid contaminants are generally defined as those, which are insoluble in fuel. Solids may be present in aviation fuels in the form of sand, dust, dirt, rust, fibers,

metal particles, rubber particles and others such as, valve lubricants and sludge produced by bacterial action. These solids often referred to as particulate matter, not only plug filters but may cause high wear in engines, metering units, valves and other aircraft equipment. Kerosene type turbine fuel has a greater tendency than Avgas to dislodge rust and scale from tank and piping surfaces. In addition, kerosene fuels, because of their greater viscosity, hold debris in suspension longer than gasoline.

**Sources of solid contamination include:**

- a. Rust and scale formed on the inside of lines and tanks.
- b. Rubber particles from deteriorated hoses and gaskets.
- c. Dust, dirt and sand drawn in through vent pipes and open hatches.
- d. Fibers from damaged filters.
- e. Insoluble valvelubricants.
- f. Microbiological growth.

**100.5.4 Water Contamination.**

**Water occurs in aviation fuels in two forms, Dissolved and Free.**

- a. **Dissolved Water.** Water that is in a state of solution in the fuel. It is not visible and cannot be removed by a filter/separator. However, if a fuel saturated with dissolved water is cooled, free water is formed and some of this water will settle to the bottom of the tank or container. Except for changing to a free state upon temperature drop, dissolved water does not pose a problem to the aircraft.
- b. **Free Water.** Visible either as a cloud haze, emulsion, droplets, bulk amounts (water slug), or entrained.

**NOTE**

**Cloud haze is commonly referred to as entrained.**

**NOTE**

**No free water in the form of water slugs, visible water droplets or entrained water in excess of 15 ppm shall be delivered into an aircraft.**

- Two common methods are used for removing free water:
  - a. Allowing fuel to settle in tanks or containers and draining the sumps.
  - b. Mechanical separation utilizing a filter/separator containing water coalescer and water separator cartridges or water absorbing cartridges (See each in definitions).
- The best means to minimize the amount of water entering a system is through

proper housekeeping and maintenance, i.e., regular sumping, keeping fixed storage full to minimize condensation, proper maintenance of openings and seals and by making certain that all fuel tender tanks, storage tanks and containers are "dry" before fuel is loaded into or taken out of them.

**100.5.5 Surfactants.** Surfactants (surface active agents) are soap or detergent like materials sometimes found in petroleum fuels. Aviation fuels may become contaminated with surfactants when transported in equipment previously utilized for motor gasoline (mogas) or diesel fuels. These fuels usually contain surface-active agents purposely added to combat corrosion and improve fuel system cleanliness.

Other sources of contamination include certain refinery processes, surfactants occurring naturally in certain crude oils and also certain microbes that are known to produce surfactants. Terminals and airport storage facilities usually remove surfactants from aviation fuel by water washing and/or most commonly by filtration through large clay treatment vessels. The clay is a highly porous material and the surfactants are more strongly attracted to them than they are the fuel. The clay vessel is normally positioned just prior to the filter/sePARATOR units.

Surfactants in large concentrations usually appear as a tan to dark brown liquid, slimy or soapy to the touch, and with a sudsy-like water/fuel interface. \*Surfactants will render filter/sePARATOR elements ineffective.

The signals of a surfactant-contaminated system are:

- a. Excess quantities of dirt and/or free water detected in the filter membrane test, or single element test.
- b. Discovery of slime in distribution system tanks and filter/sePARATORS.
- c. Rapid plugging or malfunctioning of filter/sePARATORS.
- d. Water downstream of filter separator.

#### **NOTE**

**When surfactants are discovered, care must be exercised to replace filter/sePARATOR elements and to clean storage tanks before the surfactants migrate to a downstream vehicle, such as a Refueler.**

Turbine fuels, when transported by multi-product pipelines, will tend to pick up surfactants from the pipeline system. Therefore, all receipts directly from multi-product pipelines should be clay treated before delivery into airport facilities.

**100.5.6 Microorganisms (microbes):** There are numerous varieties of microorganisms that can live in the free water, which accumulates in sumps and on the surfaces of storage and aircraft tanks. Microbial growth is widely considered more of a problem in jet fuels. However, AvGas systems have been known to also experience microbial growth - no relaxation in safeguards and surveillance is justified. Many

microorganisms are airborne, while others are found in soil. Thus, there is constant exposure to inoculation with this type of contaminant.

Under ideal conditions, microbes are capable of reproducing themselves by the millions in a matter of days. The debris and slimes generated by microbes may plug filters and promote corrosion.

To prevent or retard microbial growth, the introduction of water into fuels should be scrupulously avoided through proper system design and the maintenance and testing of tank and line integrity, access hatches, gauge openings and vents. Any water finding its way into fuel, whether through condensation or accident, should be removed on a daily basis from storage tanks, filter/sePARATOR sumps, and Refueler tanks.

**NOTE**

**The determination of microbial content is a procedure that should be reserved for the laboratory. It is important to note that these test results can often be misleading due to improper sampling procedures.**

**100.6 STATIC ELECTRICITY**

**100.6.1 General.** Static electricity is a potential threat to safe fuel handling. Any relative motion between bodies - such as an aircraft in flight, a moving Refueler, product flowing through a pipeline or filter vessel, or movement within a body of liquid, can generate static electricity.

Fires and explosions can result from these static charges, depending on the presence of flammable vapors, the intensity of the charge, and the rate at which the charge dissipates or bleeds off to ground.

Simply generating a static charge is not hazardous. Most substances are good conductors and will normally dissipate or bleed off a static charge as quickly as it generates.

A charge may accumulate faster than it can bleed off. For example, the pavement and low-conductive tires will insulate the charges generated in a moving Refueler. Fueling personnel must bleed off or equalize this charge at the loading rack through static wires and at the aircraft by bonding the Refueler to the aircraft.

Jet fuels and other refined products are sometimes poor conductors. In these cases, the fuel itself accumulates static charges that do not readily bleed off or equalize through static wires to the internal surfaces of pipelines and tanks and then to ground.

The accumulated bulk charge can create sparks that jump from the liquid's surface to the walls of the tank and other conductive projections inside the tank. Static discharges up to 18 inches in length have occurred on the surface of Jet fuel in a tank truck that was perfectly grounded and bonded to the fill stand piping and equipment.

**100.6.2 Vapor Space.** Always assume the vapor space above aviation fuels is within the flammable range or explosive zone. Even when the temperature is not high enough to produce vapor above the fuel, other conditions may contribute to vapor formation such as:

- a. Misting or spraying high-flash fuels, which occurs during splash loading, enriches the composition of vapors that would normally be below the explosive range.
- b. Lean vapors can dilute overly rich vapors into a flammable mixture. This condition occurs when loading high-flash products such as jet fuel, into a truck compartment containing vapors from a previous low-flash cargo, such as AvGas.

The aforementioned factors have contributed to fires that seemed unlikely because the temperature was not high enough to form flammable vapors.

**100.6.3 Velocity.** The rate of static charge generation varies directly with the relative velocity of a body or liquid and the medium through which it is moving.

- a. A fast-moving body will generate a greater charge than a slow moving one.
- b. Liquids moving rapidly through pipelines, or flowing through strainers, filter/separators and other media that finely divide or shear the fuel, are primary generators of static charges. Filter/separators seem to generate much higher charge intensities than other media. This is a key concern in handling aviation fuels, which require extremely fine filtration.

**100.6.4 Conductivity** Fuel conductivity is expressed in units called Pico Siemens per meter, or Conductivity Units (CU). The conductivity of jet fuels can range from a fraction of a CU to hundreds of CUs.

Fuel of one CU requires 12 seconds to relax or bleed off half of its charge. The time fuel requires to lose half its charge is the half-value time. High-conductivity fuels have a very brief half-value time (thousandths of a second), while low-conductivity fuels can retain potentially dangerous charges for 20 seconds or longer.

Always allow enough time for charges to relax into the walls of piping, between the charge generation point (i.e., the filter/separator) and a receiving tank with a vapor space. A 30 second relaxation time is recommended.

Use the following measures to reduce the hazard of fire or explosion when handling aviation fuels.

- a. Bond the truck to the loading rack or to the aircraft to ensure the continuity of conductive materials.

- b. When loading fuels, reduce flow rates to 3 feet per second until the compartment bottom is well covered, to prevent extreme turbulence of the product.
- c. Provide at least 30 seconds relaxation time through the piping between the discharge side of a filter/separator and the receiving tank or compartment.
- d. Never put metal or conductive objects (such as gauge tapes, sample containers and thermometers) in a tank or compartment while filling with aviation fuels. **Wait at least a couple of minutes after the flow stops before using any of these devices.**



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**200.1 FUEL STORAGE FACILITY REQUIREMENTS (General)**

Fuel storage facilities/systems are designed to assure product segregation in order to prevent the accidental mixing of dissimilar fuels; therefore, the system must be properly designed, color-coded and placarded for the type and grade of fuel in each tank.

Protection of the ecology is very important. There should be no spills, and leaking equipment should be immediately repaired or removed from service. Waste tanks and/or reclamation systems shall be provided for the disposal of fuel that cannot be used to service aircraft. This includes samples drawn from the tanks and filters for testing, inspection and maintenance purposes. Fuel shall never be poured onto the ground nor directly back into the storage tanks.

Safety within our company and operations is a prime factor. The storage area shall have adequate lighting, fire extinguishers, and proper signage posted. Only fully qualified and responsible personnel should have access to the storage facility. The area should be secure (i.e., fenced in and locked when unattended).

Fuel storage facilities must meet the following requirements in addition to the applicable operating standard, unless otherwise indicated. Reference **ATA-103** as applicable for requirements not covered in this manual. The locations with facilities that do not meet the requirements of this section shall submit a waiver request to the affected airline Quality Assurance Departments, as applicable. Internally, waiver requests shall be submitted in accordance with the guidelines established within AFQC-020. Approved waivers must be kept on file at the location for review and for as long as the waiver request is valid.

Third-party owned facilities and equipment (regardless of location) may be operated and maintained in accordance with the Owner's Specifications and/or stipulated Contract Standard. In such instances, the alternative standards must be readily available for corporate review. Fueling equipment leased for the purpose of conducting Company business must meet the FSM AFQCM standards but shall not be modified without the consent of the OEM and leasing agent.

**CAUTION**

**Zinc galvanized materials shall not be used in jet fuel service. No copper alloys, cadmium plating or plastic materials are permitted for main fuel piping. The use of copper or copper alloy materials for other components must be minimized.**

**CAUTION**

**Where more than one type or grade of fuel is stored in a fuel storage system, completely segregated systems are required. The use of isolation valves or blind flanges is not acceptable methods of product type or grade separation. This shall include the use of non- compatible connections between systems for both receiving and dispensing to prevent the accidental mixing of products.**

**200.1 STORAGE TANKS**

New storage tank systems should be above ground type, either vertical or horizontal as dictated by the volume throughput and local airport height, space and location restrictions. Design and construction of fuel storage tanks shall comply with all Federal, State, Local codes and ordinances and Airline requirements. New tanks construction must meet API 650 / EN14015, UL 42, UL 58, or equivalent.

Tanks used for storing aviation fuels shall incorporate the following equipment:

- (a) Floating suction with means of verifying proper operation. Floating suction shall be supported to keep the suction inlet a minimum of 18 inches from the tank bottom for vertical tanks and a minimum of 6 inches from the tank bottom for horizontal tanks. (Note: Floating Suction is not required for existing Avgas tanks, but should be incorporated into the design of new facilities).
- (b) Inlet diffuser
- (c) Access manway (two are preferred)
- (d) Automatic high liquid level shut-off/alarm device(s) to prevent tank overfill

**NOTE**

**High-level control (alarm) set at 90% of tank capacity and a high-high level control (shut off) set at 95% of tank capacity are recommended. Refer to the Operations and Maintenance Manual for engineering guidance on alarms setpoints. High-Level override controls must be sealed and locked such that only authorized persons have access.**

- (e) Suitable secondary containment, as applicable
- (f) The dates of the last tank interior inspection and cleaning must be placarded or stenciled on or near the tank manway.
- (g) Danger - Confined Space placards on or near tank manways, as applicable
- (h) A tank / sump drain with adjacent placard indicating the volume of product in the tank drain/sump piping

**200.1.1 Above Ground Vertical Tanks**

Above ground vertical tanks shall also include the following equipment, in addition to 200.1.1, unless otherwise indicated. **Non-metallic tanks are not acceptable.**

- (a) A fixed roof
- (b) Light color epoxy coated floor and sides up to the top of the first ring panel.  
Newly constructed tanks shall be completely internally coated. Coatings shall comply with EI 1541.
- (c) Tank bottom shall be coned down to a positive center sump with drain. Floor plates shall be arranged to ensure water run-off. Newly constructed tanks shall be constructed with a minimum floor slope of 1 in 30.
- (d) A slotted tube as a means for proper sampling and manual gauging of the tank (gauging hatch)
- (e) Tank roof access and work platforms must be guarded by engineered handrails and toe boards, or equivalent means of safe access.

**200.1.2 Above Ground Horizontal Tanks**

Above ground horizontal tanks shall also include the following equipment below in addition to 200.1.1, unless otherwise indicated. **Non-metallic tanks are not acceptable.**

- (a) Carbon steel tanks shall have complete internal light-colored epoxy coating. Coatings shall comply with EI 1541.
- (b) Tank shall be sloped to create a low-end sump and have a drain. New tanks shall be constructed with a minimum floor slope of 1 in 50.
- (c) A means for proper sampling and manual gauging of the tank
- (d) Access manways should be equipped with an internal ladder.
- (e) Tank top area shall have a work platform guarded by engineered handrails and toe boards for manual gauging and for maintenance functions, or equivalent means of safe access.

**200.1.3 Underground Tanks**

Underground tanks shall also include the following equipment below in addition to 200.1.1, unless otherwise indicated. **Non-metallic tanks are not recommended. New underground non-metallic tanks (i.e., fiberglass tanks shall have complete internal light-colored coating compatible for jet fuel use.**

- (a) Carbon steel tanks shall be completely internally coated with a light-colored epoxy. Coatings shall comply with EI 1541.
- (b) Manways and other appurtenances shall be extended above ground. Access manways should be equipped with an internal ladder.
- (c) The tank should be sloped with a positive sump with a permanent pump. New tanks shall be constructed with a minimum floor slope of 1 in 50.
- (d) Manways and other appurtenances shall be extended above ground.
- (e) A means for proper sampling and manual gauging of the tank

**200.1.4 Waste / Reclaim Tanks see 2.9.3.11 verbiage**

Waste fuel tanks, slop tanks, reclaim tanks, etc. must have:

- a. Adequate secondary containment
- b. High level controls

**200.1.5 Oil / Water Separators**

Oil/Water Separators must have:

- a. High level controls
- b. A written description that includes:
  - 1.Design capacity
  - 2.Configuration/Operation
  - 3.Inspection frequency
  - 4.Preventive maintenance and cleaning schedule

**200.2 FILTERS**

Filtration is required for receiving into and dispensing aviation fuels out of fuel storage facilities. Filter/separators are required for receiving Jet A/Jet A 1 into and dispensing Jet A /Jet A 1 out of storage tanks that will supply fuel directly into aircraft, Refuelers, or hydrant systems. If only one filter/separator is available, it must be plumbed to perform both fuel receiving and dispensing functions, and checks shall be in place to ensure that all fuel passes through this single filtration system.

Full Flow Fuel Monitors (Water Absorbing Cartridges) may be utilized for receiving AvGas into and dispensing AvGas out of fuel facility storage tanks. Only monitors meeting the requirements of EI 1583 "Specifications and Qualification Procedures - Aviation Fuel Filter Monitors with Absorbent Type Elements", latest edition, may be used. A differential pressure limiting device is required for this application.

**NOTE**

**Additional filtration, such as micronic filters, water coalescers (haypacks) or clay treaters, may be required due to local conditions. If additional filtration/treaters are in use, a written maintenance/test program must be established that ensures their proper operation.**

**NOTE**

**If micronic filters are used, they must meet the qualification requirements of EI 1590.**

**200.2.1 Filter Requirements**

Filter/separators shall meet the requirements of EI 1581 latest edition. Existing vessels and element conversions shall meet, by test or similarity, the latest edition of EI

1581/1582. For existing vessels, conversion to the latest edition shall occur within 12 months of qualified elements becoming available for a specific vessel. If qualified by similarity, a Similarity Data Sheet must be maintained locally and a conversion data plate (placard) reflecting such qualification must be affixed to the vessel. Qualification Sheets must be maintained locally for (Avgas) EI 1583 monitor applications, a conversion data plate (placard) reflecting the current elements installed must be affixed to the vessel.

All filter elements (coalescers, separators, monitors) shall be changed annually or when Differential Pressure reaches 15 PSI for filter/separator and monitor elements.

### CAUTION

**All facility filters should be operated at a flow rate of at least 50% of vessel rated flow, if this is not occurring consult the filter manufacturer to determine a configuration that will downgrade the rated flow of the vessel to comply with this requirement. The rated flow of any vessel cannot be exceeded.**

Filter/separators shall be equipped with automatic water defense systems, which will stop fuel flow or alert operating personnel when actuated by a high-water level. Float or electronic probe systems shall include provisions for an operational test. If a probe is utilized, and the fuel contains anti-icing additive, the control device must be able to detect a water/additive mixture.

### NOTE

**The use of automatic water drain valves is not permitted. Existing automatic drain valves shall be de-activated and removed at the next filter change when the vessel is empty.**

All filter vessels shall be equipped with:

- a. Provisions for air elimination, including a means for accommodating any relieved fuel without causing an environmental issue.
- b. Direct reading differential pressure gauges. Piston type pressure differential gauges shall have a scale that can give a reading up to 30 PSI (2bar). Piston type pressure differential gauges shall be equipped with provisions for testing full-scale deflection of indicating piston. To prevent fuel from venting to the ground and/or recording erroneous pressure measurements, test valves must be spring-loaded or safety wired in the normal operating position except while the gauge is being tested.
- c. Manual sump drains - With valves having handles that are spring loaded to the closed position. If sump piping is extended beyond the area directly under the vessel, a placard or label shall be posted adjacent to the filter sump drain indicating the volume of filter sump piping.
- d. Upstream and downstream sampling (Millipore) connections, including probes

and dust caps or plugs. Sampling connection locations must be labeled. The direction of flow markings on the probes must be visible (not painted) at all times.

- e. Pressure relief valves or other devices, which will prevent over pressurization due to thermal expansion of fuel, including a means for accommodating any relieved fuel without causing an environmental issue.
- f. Placards indicating month and year of last filter change of vessel.
- g. Nameplate - A stainless steel or nonferrous metal nameplate shall be securely attached to the vessel proper. As a minimum, the nameplate shall include the following information:
  - 1. The manufacturer's name and address.
  - 2. The vessel's serial number and model number.
  - 3. The vessel's ET classification.
  - 4. The vessel's rated flow capacity for Jet A or Jet A-1.
  - 5. The date of manufacture.
  - 6. The number of and model numbers of the elements installed.
  - 7. The manufacturer's recommended element-change pressure differential.
- h. If the vessel has been converted to utilize elements other than what is on the original Nameplate, a Conversion Data Tag must be posted adjacent to the original (not covering it) indicating the model numbers and quantities of elements currently installed.
  - 1. All vessel interiors shall be protected with an approved epoxy coating.
- j. A product identification decal shall be posted on all filter vessels.

**200.2.2** Gaskets shall be of Viton A, Buna N, or an equivalent material. Cork or rubber-impregnated cork gaskets shall not be used.

### **200.3 EMERGENCY FUEL SHUTOFF SYSTEM**

The facility shall have an Emergency Fuel Shutoff System that when actuated, will stop the flow of fuel in the system. Fuel flow emergency shut-off valves and switches shall be clearly marked with location placards and have the mode of operation posted on or directly next to the control(s) in accordance with the requirements of NFPA 407, latest edition.

"Emergency Fuel Shutoff" signs shall be located at a minimum of 7 feet above the ground. Lettering shall be at least 2 inches high and have a color contrasting to the background, preferably red on white or white on red. The area around these controls shall be kept free of obstructions.

### **200.4 MISCELLANEOUS**

**200.4.1** Fire extinguishers with annual and monthly inspection tags shall be positioned in accordance with local requirements.

- a. Extinguishers shall be kept clear of ice, snow, etc. Extinguishers located in enclosed compartments shall be readily accessible and their location shall be clearly marked.
- b. Safety pin(s), if applicable, and safety seals shall be intact.

- c. Fire extinguishers shall be marked with identity numbers. A record showing location and number for each extinguisher shall be maintained up to date. Records must also be maintained to track monthly inspections and include; date, initials of inspector, and any required corrective actions.

**200.4.2** Metal underground tanks and piping shall be cathodically protected. If installed, rectifiers should be inspected according to manufacturer recommendations.

**200.4.3** Product identification and warning signs shall be prominently displayed in and around the fuel storage facility. "No Smoking" and "Flammable" warning signs shall be posted on all sides of the perimeter fencing, both inside and outside as a minimum, as well as being prominently posted throughout the facility. Direction of flow arrows shall be posted on facility piping and positioned approximately 20 feet apart. Black arrows shall be used for Jet fuel systems and Blue arrows for Aviation gasoline (100LL) systems.

**200.4.4** The fuel storage facility shall be properly identified and color-coded in accordance with the standards of EI 1542, latest edition and NFPA 407, latest edition. Jet-A lines are to be marked with one black band and black accessories. Jet A-1 lines are to be marked with two black bands and black accessories. Jet B lines are to be marked with three yellow bands and yellow accessories. Jet A, Jet A-1 and Jet B product identification decals shall have a black background and white lettering.

Aviation gasoline piping shall be banded with a single band in the grade-identifying color (100LL- Blue). 100LL product identification decals shall have a RED background, White lettering and a Blue band.

All bands must be used next to the product identification labels. The bands shall be at least 4 inches wide and be spaced at intervals of no more than 20 feet.

**200.4.5** Relaxation chambers, where installed, shall be equipped with the following:

- a. Automatic aireliminator.
- b. Pressure relief valve.
- c. Manual sump drain - with valves having handles spring loaded to the closed position.

**200.4.6** Procedures signs shall be posted at loading and off-loading points for each type and grade of product.

**200.4.7** Emergency phone number signs shall be prominently displayed at the facility.

**200.4.8** Bulk air eliminators, where installed, shall be equipped with the following:

- a. Protection by pressure relief valve.
- b. Manual sump drains - with valves having handles spring loaded to the closed position.

**200.4.9** Product reclamation storage tanks, where installed, shall include the following equipment:

**NOTE**

**These design requirements do not apply to sump separators/ collector units. Low point sump must be fitted with a manual drain with spring loaded valve.**

- a. Gauge hatch with slotted tube
- b. Means for access for visual inspection
- c. Means to prevent overfill
- d. Suitable secondary containment as applicable by Local, State, or Federal Regulations
- e. A placard, adjacent to tank sump drains, indicating the volume of tank drain piping
- f. Tank must be identified as "Jet-A Recovery Tank Intended for Aviation Use."
- g. Tank must have sloped bottom to a positive sump, with a drain or permanent pump. Sump must be located in lowest point of the tank. Drain or pump pick-up must be at the lowest point of the sump, slope of 1 in 20 is recommended.
- h. All tank appurtenances, access entrances, vents, inspection ports, etc., must be extended above ground, and designed to prevent the ingress of contaminants.

**200.4.10 Additional requirements for reclaimed product:**

- a. Reclaimed product must be filtered prior to returning to off-line storage tank. Filtration must meet the requirements of this manual section 200.2.1 Filters.
- b. Recoverable product must be handled carefully to prevent contamination. Containers or equipment used for handling recovered product must be clean and dedicated to that purpose (e.g. equipment used for cleaning hydrant pits shall not be used for handling reclaim product). Every effort should be made to remove visible solids and water (waste fuel) prior to moving fuel into a reclaim tank or returning to storage from a reclaim tank.
- c. Fuel eligible for reclaim shall be limited to fuel from the following sources:
  - 1) Tank Sumps
  - 2) Filter sumps
  - 3) Low point drains
  - 4) High point vents
  - 5) Surge/relief tanks
- d. Samples from:
  - 1) Fuel truck receipts
  - 2) Membrane filtration tests
  - 3) Gravity/density checks
- e. Equipment Maintenance:
  - 1) Filter Element Change Out
  - 2) Drainage of fuel storage tanks for inspection, cleaning or repair.

**CAUTION**

**Fuel from any other source than those listed above shall not be reclaimed for aviation use.**

**200.4.11** Locations utilizing product reclamation systems shall document that the location specific procedures for operating the system have been approved by the local affected carriers prior to the operation of the system.

**200.5 REFUELING TRUCK LOADING STATION**

All truck loading stations must be equipped with:

- a. A handheld Deadman control devise is required for all truck loading operations. Pressure control provisions if necessary to prevent damage to the refueling truck during high-level shutdown of truck mounted valves. Pressure controls should limit the shutdown pressure spikes from exceeding 75PSI and flow should be limited to S00GPM
- b. Static bonding connections shall be provided between truck and fill stand at all truck loading points. Bottom loading control systems do not negate the need to bond with a separate bonding cable.
- c. Bottom-loading nozzles and couplers must be equipped with 60 mesh or finer screens. These screens are not required if an upstream strainer is installed and no hoses are used between the strainer and the nozzle/coupler i.e., "swing-arm" applications. The bottom loading nozzle/coupler swivel collar locking screws shall be safety wired and have a locking ring installed, where applicable. Safety wire must be looped and twisted and pulled in the direction of tightening.
- d. Fire extinguishers with inspection (Monthly & Annual) tags must be positioned in accordance with applicable safety requirements. Where the open hose discharge capacity of the aircraft fueling system or equipment is more than 200 gpm (750 lpm), at least one listed wheeled extinguisher having a rating of not less than 80-B:C and a minimum capacity of 125lb (55kg) of agent shall be provided. The maximum travel distance to extinguishers is 50ft (the distance between extinguishers should not be over 100 ft).
- e. All fuel loading hoses and couplings shall meet EI 1529, Grade 2, Type C, latest edition. Hydrostatic pressure test certificates for each loading hose shall be maintained on file at all times. Hoses shall be installed within two years of the date of manufacture, and have a maximum service life of 10 years from the date of manufacture. When a hose is installed, the location and date of installation shall be recorded on the hose certificate.

Reusable couplings shall not be installed on the loading/pressure hoses, unless specifically requested by the third-party owner of the facility. Company personnel shall not re-attach reusable couplings to any loading/pressure hose, new or used. If reusable couplings are utilized, the couplings and hose shall meet EI 1529, and be tested in accordance with EI 1540.

Fuel unloading hoses shall be compatible with the product being received and suitable for local conditions but are not required to meet EI 1529 requirements.

- f. Dust covers or other protective devises must be used to prevent debris from accumulating on mating surfaces of fuel unloading/loading couplers/nozzles.
- g. Product meters (calibrated) for dispensing product into refuelers.

**NOTE**

**It is permissible for maintenance personnel to break a meter seal for the purpose of making adjustments to any component other than the calibrator. Maintenance must immediately replace the seal upon completion of the task. Any in-service meters lacking the required seal will require re-calibration.**

**200.6 FUEL FACILITY CHECKS AND INSPECTIONS**

**200.6.1 General.** The following tests and inspections shall be performed on all fuel storage facilities servicing aircraft and at the frequencies specified. Reference the applicable frequency tables below associated to the standard in use. Direct references to standards will be listed. Items referenced to FSM identify that inspection/check is required on a frequency other than that listed in the associated standard. Inspection/check procedures are available on the Fuel Quality Control Intranet. Additional tasks or more frequent tests and inspections may be required based on local conditions.

- a. All fuel facility quality control checks and tests shall be performed by fully trained and qualified personnel.
- b. The facility and equipment operator shall establish written procedures for the reporting of any observed deficiencies or safety hazards by its employees to their supervisors.
- c. Maintenance requirements specified in this section are generally limited to those items pertaining to fuel quality and safety. Additional programs should be established to ensure mechanical reliability of all local facility equipment.
- d. Any facility equipment not in daily use must have all daily, weekly, monthly, quarterly, semi-annual, and annual tests and inspections current and recorded before the equipment is returned to service.
- e. Records, paper or electronic, must be completed by the person performing the tasks, or by the person accepting responsibility for performance of the tasks.
- f. At all times, proper PPE (Personal Protective Equipment) must be worn.

**200.7 FUEL FACILITY DAILY QUALITY CONTROL CHECKS**

Perform daily fuel facility checks at the beginning of each work day including weekends and holidays. Record the results of all checks on the appropriate paper or digital form. The daily checks required by ATA 103 are listed in the following table.

**NOTE**

**Alert Pressure: If Filter Separator or Monitor element observed differential pressure reaches 12 PSI. Maintenance personnel should be notified as to prepare for a filter element replacement.**

**ATA 103 Fuel Storage Daily Checks**

<b>Required Checks</b>	<b>Reference</b>
General Condition	2.5.3.1(a)
Security, Fire & Safety Deficiencies	2.5.3.2 (a)
Fuel Leaks	2.5.3.1 (b) & 2.5.3.2 (b)
Gates, Access Doors, Fences	2.5.3.2 (c) & 2.5.3.2 (d)
Equipment in Unsecured Areas	2.5.3.2 (e)
Reclaim Tank Sumps	2.5.3.3; 3.1
Tank Sumps	2.5.3.3; 3.1
Sump Separators	2.5.3.4; 2.4.14.2
Filter Sumps	2.3.3.5; 3.1; 3.7
Filter Differential Pressure	2.5.3.6; 3.9
Hoses, Swivels, Nozzles, & Couplers	2.5.3.7
Static Reels, Cables, & Clamps	2.5.3.8
Fire Extinguishers	2.5.3.9
Relaxation Chambers	2.5.3.10; 3.1
Bulk Air Eliminators	2.5.3.10; 3.1

**200.8 FUEL FACILITY WEEKLY QUALITY CONTROL CHECKS**

Perform weekly fuel facility checks once every calendar week and within one week +/- one day of the previous weekly check (ATA 103 Revision 2023.1, section 2.1). For instance, weekly checks conducted on the 8<sup>th</sup> of the month would require the next week's checks to be conducted between the 14<sup>th</sup> and the 16<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The weekly checks required by ATA 103 are listed in the table below.

**ATA 103 Fuel Storage Weekly Checks**

<b>Required Checks</b>	<b>Reference</b>
Bonding System Continuity	2.5.4.1
Corrected Filter Differential Pressure	2.5.4.2

**200.9 FUEL FACILITY MONTHLY QUALITY CONTROL CHECKS**

Perform monthly fuel facility checks once every calendar month and prior to the end of the third week of the month. The monthly check must be within one month +/- five days of the previous month's check. For instance, a monthly check conducted on the 8<sup>th</sup> of the month would require the next month's checks to be conducted between 3<sup>rd</sup> and the 13<sup>th</sup> of the next month. Record the results of all checks on the appropriate paper or digital form. The monthly checks required by ATA 103 are listed in the following table.

**ATA 103 Fuel Storage Monthly Check**

<b>Required Checks</b>	<b>Reference</b>
Filtration Test	2.5.5.1; 3.2; 3.3
Nozzle Screen	2.5.5.2; 3.17
Signs, Labels, & Placards	2.5.5.3
Floating Suctions	2.5.5.4
Fire Extinguishers	2.5.5.5
Clay Filtration Test	2.5.5.6; 3.5
FSII Concentration (if applicable)	2.5.5.7

**200.10 FUEL FACILITY QUARTERLY QUALITY CONTROL CHECKS**

Perform quarterly fuel facility checks once every three calendar months and within three months +/- 10 days of the previous check. For instance, quarterly checks conducted on February 14<sup>th</sup> would require the next quarter's checks to be conducted between May 4<sup>th</sup> and May 24<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. This flexibility does not allow for less than four quarterly checks per calendar year. The quarterly checks required by ATA 103 are listed in the table below.

**ATA 103 Fuel Storage Quarterly Checks**

<b>Required Checks</b>	<b>Reference</b>
Emergency Shutoff System	2.5.6.1
Water Defense System	2.5.6.2; 3.12
Tank High Level Controls	2.5.6.3
Product Reclaim Tank & Sump Separator Interior Visual	2.5.6.4; 3.11

**200.11 FUEL FACILITY SEMI-ANNUAL QUALITY CONTROL CHECKS**

Perform semi-annual fuel facility checks once every six months and within six months +/- ten days of the previous check. For instance, a semi-annual check conducted on April 9<sup>th</sup> would require the next semi-annual check to be conducted between September 29<sup>th</sup> and October 19<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The semi-annual checks required by ATA 103 are listed in the table below.

**ATA 103 Fuel Storage Semi-Annual Checks**

<b>Required Checks</b>	<b>Reference</b>
Hose Pressure Check @ 225 psi	2.5.7.1
Static Stock Quality Check	2.5.7.2

**200.12 FUEL FACILITY ANNUAL QUALITY CONTROL CHECKS**

Perform annual fuel facility checks once every twelve months and within twelve months +/- ten days of the previous check. For instance, annual check conducted on July 4<sup>th</sup> would require the next semi-annual check to be conducted between June 24<sup>th</sup> and July 14<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The annual checks required by ATA 103 are listed in the following table.

**ATA 103 Fuel Storage Annual Checks**

Required Checks	Reference
Storage Tank Interiors	2.5.8.1; 3.11
Filter DP Gauges	2.5.8.2
Filter Elements	2.5.8.3; 3.13; 3.14
Filter Vessel Heater	2.5.8.4
Tank Vents	2.5.8.5
Cathodic Protection	2.5.8.6
Line Strainers	2.5.8.7
Water Defense System	2.5.8.8; 3.12
Single Stack Coalescers (Haypacks)	2.5.8.9
Filter Vessel Pressure Relief Devices	2.5.8.10

**200.13 HYDRANT SYSTEM QUALITY CONTROL CHECKS**

The following checks shall be performed on all hydrant-fueling systems servicing aircraft and at the frequencies specified. Additional tasks or more frequent checks may be required based on local conditions.

- a. All personnel engaged in ramp operations shall be continuously observant of abnormal conditions that may exist in and around fuel pits. Any fuel leaks, fire/safety hazards, or adverse conditions must be reported immediately.
- b. Hydrant systems or segments of hydrant systems not in daily use shall have all daily, monthly, semi-annual and annual checks current and recorded before the system or segment is returned to service. Based on fuel test results, flushing may be required by aircraft operator prior to use. Records shall indicate when systems are out of service and why. When necessary, hydrant systems must be flushed per requirements listed in Appendix E and applicable EI standards.
- c. Only fully trained and qualified personnel shall perform any and all fuel facility quality control checks and tests.
- d. At all times, proper PPE (Personal Protective Equipment) must be worn.

**NOTE**

Each location is to have blue prints and/or diagrams on hand and accessible for all personnel that work on the hydrant system to review and use. The blue prints and diagrams shall show the entire system and location of all pits and vaults including, but not limited to; hydrants, isolation vaults, control pits, low point and high point valve pits, emergency shut off vaults, etc. All hydrants, isolation vaults, control pits, low point and high point valve pits, emergency shut off vaults, etc., shall be clearly identified by location and function.

**200.14 HYDRANT SYSTEM DAILY QUALITY CONTROL CHECKS**

Perform daily fuel facility checks at the beginning of each work day including weekends and holidays. Record the results of all checks on the appropriate paper or digital form. The daily checks required by ATA 103 are listed in the table below.

**ATA 103 Fueling Hydrant Daily Checks**

Required Checks	Reference
Hydrant Pit	2.7.3.1
EFSO – Placard and Access	2.7.3.2

**200.15 HYDRANT SYSTEM WEEKLY QUALITY CONTROL CHECKS**

There are no weekly hydrant checks required by ATA 103.

**200.16 HYDRANT SYSTEM MONTHLY QUALITY CONTROL CHECKS**

Perform monthly fuel facility checks once every calendar month and prior to the end of the third week of the month. The monthly check must be within one month +/- five days of the previous month's check. For instance, a monthly check conducted on the 8th of the month would require the next month's checks to be conducted between 3rd and the 13th of the next month. Record the results of all checks on the appropriate paper or digital form. The monthly checks required by ATA 103 are listed in the table below.

**ATA 103 Fueling Hydrant Monthly Checks**

Required Checks	Reference
Isolation Valve Pit & Control	2.7.4.1
Vaults Hydrant Valve Assembly	2.7.4.2
Hydrant Low Point Drains	2.7.4.3; 3.1
EFSO	2.7.4.4

**200.17 HYDRANT SYSTEM QUARTERLY QUALITY CONTROL CHECKS**

Perform quarterly fuel facility checks once every three calendar months and within three months +/- 10 days of the previous check. For instance, quarterly checks conducted on February 14<sup>th</sup> would require the next quarter's checks to be conducted between May 4<sup>th</sup> and May 24<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. This flexibility does not allow for less than four quarterly checks per calendar year. The quarterly checks required by ATA 103 are listed in the table below.

**ATA 103 Fueling Hydrant Quarterly Checks**

Required Checks	Reference
Isolation Valve Pits & Control Vaults	2.7.5.1

**200.18 HYDRANT SYSTEM SEMI-ANNUAL QUALITY CONTROL CHECKS**

Perform semi-annual fuel facility checks once every six months and within six months +/- ten days of the previous check. For instance, a semi-annual check conducted on April 9<sup>th</sup> would require the next semi-annual check to be

## AIRPORT STORAGE

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conducted between September 29<sup>th</sup> and October 19<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The semi-annual checks required by ATA 103 are listed in the table below. Additional checks may be listed, Reference is “FSM”, even though they are not required by ATA 103.

### ATA 103 Fueling Hydrant Semi-Annual Checks

Required Checks	Reference
Leak Detection & Piping Isolation Systems	2.7.6.1
Surge Absorbers	2.7.6.2

### 200.19 HYDRANT SYSTEM ANNUAL QUALITY CONTROL CHECKS

Perform annual fuel facility checks once every twelve months and within twelve months +/- ten days of the previous check. For instance, annual check conducted on July 4<sup>th</sup> would require the next semi-annual check to be conducted between June 24<sup>th</sup> and July 14<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The annual checks include, but are not limited to: Additional checks may be listed, Reference is “FSM”, even though they are not required by ATA 103.

### ATA 103 Fueling Hydrant Annual Checks

Required Checks	Reference
Cathodic Protection	2.7.7.1
Pit Valve Wear	2.7.7.2
EFSO Control Devices	2.7.4.4

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**300.1 GENERAL**

This section covers quality control and safety requirements for receiving fuel into airport storage. These requirements can vary depending on method of delivery and facility layout. Dedicated or multi-product pipelines, and highway transport trucks normally make deliveries of fuel. There are some airports receiving product directly from railroad tank cars or marine vessels. It is important that the facility operator recognizes that each of these transportation methods has different delivery requirements and that they be addressed in local receiving procedures to ensure fuel quality and safety.

**300.1.1** Fuel Receipts shall be in accordance with the applicable standard the facility is operated under. Reference **ATA 103** for requirements not covered in this manual.

**300.1.2** It is not acceptable to receive and dispense fuel from the same tank simultaneously.

**NOTE**

In the event of a natural disaster or unforeseeable circumstances, reference AFQC-040 Airline/Customer Notifications and AFQC-020 Waiver Request for guidance on alternate methods and precautions for dispensing fuel.

**300.1.3** Fully trained and qualified personnel shall handle all fuel receipts. It is the responsibility of our local management and their training resources to ensure that all applicable personnel follow the requirements Section 900 of this manual and are given on the job training with all pertinent documentation being completed prior to releasing them to perform these duties.

**300.1.4** At all times, proper PPE (Personal Protective Equipment) must be worn.

**300.2 JET FUEL RECEIVING SPECIFICATION AND PURITY STANDARDS**

- a. Jet fuel shall conform to ASTM D-1655 latest revision, or military contract requirements.
- b. In all phases of fuel handling, appearance of jet fuel shall be clear and bright (visually free of water, sediment and suspended matter). The odor of the fuel shall not be nauseating or irritating.
- c. The color of jet fuel generally ranges from water white to light straw or amber. Other colors may be an indication that the fuel has been contaminated by other products or unauthorized additives. In such cases, it shall be the facility operator's responsibility to discontinue fuel transfer and/or quarantine product until the fuel has been determined acceptable for aircraft use.

**300.2.2** The following jet fuel purity and specification parameters should apply **UPSTREAM** of airport receiving filtration.

**NOTE**

It is important that the facility operator assigned the task and responsibility to receive jet fuel into storage tanks sample inbound deliveries upstream of receiving filtration for potential contamination or excessive water/dirt levels. Inbound jet fuel purity shall permit reasonable receiving filtration performance and service life. Upstream appearance ratings less than Clear & Bright may indicate excessive contamination levels which could result in shortened receiving filtration life and may increase operational costs.

Unacceptable operational and economic issues based on upstream jet fuel purity levels are to be resolved between applicable shipper, facility operator and/or customer.

TEST PROPERTY	MAXIMUM ALLOWABLE	TEST METHOD	SEE NOTES
APPEARANCE	CLEAR & BRIGHT	VISUAL	
RED DYE	VISUALLY NONE	VISUAL	b.
API GRAVITY (DENSITY)	37° - 51° API (775 - 840 Kg/m³)	ASTM D-1298 or D-4052	

**300.2.3** The following jet fuel purity and specification limits shall apply **DOWNTREAM** of the receiving and dispensing filtration as:

- a. Received into airport storage tanks, which will issue product directly to hydrant systems and to aircraft Refueler loading racks.
- b. From airport storage facility, which will issue product directly to hydrant systems and to Refueler loading racks.
- c. Dispensed into aircraft.

TEST PROPERTY	MAXIMUM ALLOWABLE	TEST METHOD	SEE NOTES
FREE WATER	15 PPM	ANY	
PARTICULATE COLOR	A, B or G SCALE 2 DRY or 3 WET	APPROVED ASTM D-2276	a. 1
PARTICULATE			

**300.2.4 Notes**

- a. A color membrane rating of 3-dry or greater may indicate a particulate contaminant problem. If a color rating of 3-dry is observed, proceed as follows:
  - 1) Perform a subsequent particulate test consisting of two membranes (piggyback) in plastic holder to compare color difference between top and bottom membranes. If top and bottom membranes have a color rating difference of 2 or less, fuel is to be considered clean and acceptable. If difference is 3 or greater, conduct a gravimetric (weight) analysis. Fuel is unacceptable if gravimetric test ASTM D2276 results exceed 2.0mg/G or 0.5 mg/L based on test sample size taken.
  - 2) A Particulate 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.
- b. The following action is required if RED DYE is detected.
  - 1) The Appearance Test (White Bucket) shall be used to inspect for red dye contamination. The referee Appearance Test (White Bucket) shall be the white porcelain bucket obtained from Gammon Technical Products, #GTP - 1746B or GTP - 1746C. This test requires collecting approximately a 2-gallon sample with a fuel depth of 8 inches +/- 1.0 inch. The inspector (with normal vision or wearing corrective non-tinted lenses) performs a visual examination of the fuel for color under normal daylight conditions, or in any well-lighted room such as an office with fluorescent lighting. If the inspector is not sure of the fuel color, a consensus of the color should be obtained from several individuals.
  - 2) Jet fuel with no visible red tint should be judged acceptable for use in aircraft.
  - 3) A red tint resulting from refinery processing will usually disappear when exposed to light. Jet fuel is acceptable for use if the red tint disappears in less than 30 minutes after being exposed to light.
  - 4) Jet fuel produced by blending a red dyed fuel with a non-dyed fuel may be acceptable, providing the resulting fuel has no visible red tint, and fuel satisfies applicable specifications. Blending is not to be performed at an airport fuel storage facility without prior authorization by affected airlines.

**300.3 AVGAS FUEL RECEIVING SPECIFICATION AND PURITY STANDARDS**

- a. Avgas fuel shall conform to ASTM D-910, latest revision.
- b. In all phases of fuel handling, appearance of Avgas fuel shall be clear and bright (visually free of un-dissolved water, sediment and suspended matter). The odor of the fuel shall not be nauseating or irritating.
- c. The color of Avgas varies with the different grades:
  - 1) **Blue** = Grade 100LL
  - 2) **Green** = Grade 100
  - 3) **Red**= Grade 80
- d. Other colors may indicate that other products may have contaminated the fuel. In such cases, it shall be the facility operator's responsibility to discontinue the fuel transfer and/or quarantine product until the fuel has been determined acceptable for aircraft use.

**300.3.1** The following Avgas fuel purity and specification parameters shall apply anywhere in the system, i.e., both upstream and downstream of all filtration.

TEST PROPERTY	MAXIMUM ALLOWABLE	TEST METHOD
API GRAVITY (DENSITY)	64° - 75° (685 - 723 Kg/m³)	ASTM D-1298 or D-4052
APPEARANCE	CLEAR & BRIGHT	VISUAL

**300.4 FUEL RECEIPT BY TRANSPORTTRUCK****NOTE**

The fuel facility operator shall receive a certification document from the fuel supplier or shipping agent certifying the product being delivered to the facility meets the applicable Jet fuel specification or ASTM D-910 (Avgas) specification requirements.

Jet fuel receipts shall indicate the following select property values listed as measured by specified ASTM test methods within the limits of the specification. A single certification document can represent multiple transport truck deliveries.

- a. Visual Appearance in White Bucket
- b. API Gravity/Density, Corrected to 60° F (15° C)

- c. Distillation
  - I 0% Recovered
  - 50% Recovered
  - 90% Recovered
  - Final Boiling Point
  - Residue
  - Loss
- d. Flash Point
- e. Freezing Point
- f. Water Separation (Microseparometer)
- g. Copper strip Corrosion
- h. Existent Gum

Prior to rejecting fuel receipts based upon incomplete certification documentation, contact the supplier to obtain a faxed copy. If the certification documentation cannot be delivered prior to delivery, affected airlines must be notified.

**300.4.1** Check all shipping documents (bill of lading, transport manifest, release certificate, etc.) to ensure that the documents - correctly include the following:

- a. Correct destination.
- b. Correct type and grade of product.
- c. Correct number of gallons ordered.
- d. API Gravity/Density corrected to 60° F (15° C).
- e. Document number.
- f. Product batch number or shipping tank number.

**300.4.2** At time of delivery and prior to connecting truck discharge hoses, transport truck driver and facility operator are to review and agree that fuel delivery documentation and procedures are in place to ensure satisfactory fuel receipt.

**300.4.3** Delivery trucks must set for a minimum of ten minutes with tank internal valves open to allow the product to settle prior to testing and unloading.

**300.4.4** During the ten-minute settling time check and/or perform the following:

- a. Transport seals, if applicable, and product identification tags/placards.
- b. Connect grounding/bonding cable.
- c. Isolate receiving tank (close all inlet and outlet valves to the receiving tank).
- d. Gauge the designated receiving tank to ensure the tank will hold the quantity of product being delivered. Record product depth and gallons.
- e. Sump all receiving tank and filter sump drains to ensure system is free of water and other contamination.
- f. Open the receiving tank inlet valve and set fuel facility valves for receiving.

- g. Check condition of off load hose(s) and fittings for deficiencies, pending failures and cleanliness prior to connection to transport truck and fuel facility receiving connections.

#### NOTE

**The maximum working capacity (max fill level) of the tank shall be 88% of rated capacity or less.**

**300.4.5** Upon the completion of the ten-minute settling time perform the following tests on fuel samples received from each highway transport truck tank compartment and record the results (vehicles with a common manifold will be considered as a single compartment for sample taking purposes; a composite sample of up to three compartments is acceptable for the API Gravity/Density check):

- a. Visual Appearance in White Bucket.
- b. API Gravity/Density, Corrected to 60° F (15°C).
- c. FSII % of Concentration Test (This test is performed only if the product (Jet-A/A1) being received has already been pre-mixed with Fuel System Icing Inhibitor additive). The concentration percentage shall be between .1 % and .15% measured by an approved refractometer. (Utilizing the B-2 Test Kit or Aviation Labs FSII Test Kit).

#### NOTE

**Use extreme care and vigilance when performing the Visual Appearance test. Slight traces of water, solids or color may indicate the presence of product mixes or other contaminants that could cause fuel to be off-specification and unacceptable for aircraft use. Any unusual results must be investigated.**

**300.4.6** If visual contamination is observed in white bucket, more than one sump sampling may be required to clear it. If contamination remains after approximately five (5) one gallon individual samples from any one tank truck compartment, the load must be rejected (prior to rejecting fuel load contact Fuel Quality Control Department). If a load is rejected, affected aircraft operators are to be notified if it is anticipated that such rejections may impact aircraft operations. A representative sample of the rejected product, including supporting documentation, shall be retained in a clean approved container for future reference (retain sample for 45 days). Documentation shall include a copy of the Bill of Lading, truck/trailer number and reason for rejection.

If Jet A/A-I fuel is unacceptable and must be rejected if API Gravity/Density, corrected to 60° F (15°C), is not between 37° and 51° APJ (775-840 Kg/m<sup>3</sup>). For Avgas receipts, the corrected API Gravity/Density should be between 64° and 75° API (685-723 Kg/m<sup>3</sup>). Discontinue fuel transfer or receipt and initiate an immediate investigation to determine if there is fuel contamination or a specification problem if there is a change of more than 1° API (3 Kg/m<sup>3</sup>) from source as shown on shipping document.

**300.4.7** Begin off-loading fuel, monitor and record the following:

- a. For Jet A/A-1 fuel, perform color membrane/particulate filtration and free water tests on the **first** load and/or batch/tank received from each supplier each day (downstream of filtration).
- b. Differential pressure of receiving filter
- c. Check system for leaks
- d. Monitor tank level

**CAUTION**

**Do not leave the fuel facility unattended anytime during a product receipt or transfer.**

**Fuel facility personnel must be present during all receipts.**

**300.4.8** Upon completion of product receipt, perform the following:

- a. Close receiving tank inlet valve and return all other valves to the proper position.
- b. Disconnect and stow hose.
- c. Disconnect ground/bond cable.
- d. Gauge receiving tank and record volume.
- e. Perform the following checks and record results after allowing for settling time.
  - 1) Sump receiving filter and perform White Bucket Test.  
(Sumping each receiving filter vessel after each receipt will assist the facility operator in identifying a particular delivery of product, which may have contained unacceptable levels of water prior to off-loading, but which were undetectable during initial visual receiving checks.)
  - 2) Sump receiving tank and perform White Bucket Test.  
(A minimum of 1 hour between the end of transport truck receiving and storage tank sumping is recommended to allow any water and/or solids stirred up during tank receiving to settle to the tank sump for removal.)

**CAUTION**

**All manual valves that block receiving or transfer lines shall be closed after a receipt or transfer. Only valves that are needed to allow a normal disbursement from working storage shall be left open.**

**NOTE**

It is recognized that some facilities receive fuel by simultaneous off-loading transport trucks, making sumping of inbound filter vessels after each individual delivery, unfeasible. Therefore, multiple deliveries into a product receiving tank, during a single day, may be considered a single receipt, provided the tank does not change from receipt to delivery status during that time.

The receiving tank shall be allowed to settle as long as possible before dispensing fuel from it. To help improve fuel purity, it is desirable to have one-hour settling time per vertical foot of product.

**300.5 PIPELINE DELIVERIES (DEDICATED)**

This section covers quality control and safety requirements for receiving fuel into airport storage by dedicated pipeline.

Pipelines are considered "dedicated" only if they do not have inlet connections to any other product from the last point the fuel was certified as jet fuel meeting the applicable specification.

**NOTE**

**Fuel Storage Facility Record of Receipt by Dedicated Pipeline or equivalent.**

**300.5.1** Prior to delivery, airport facility operator shall receive a shipping document from jet fuel supplier or shipping agent certifying product to be delivered to airport meets specification requirements with at least the following select property values listed as measured by specified ASTM test methods:

- a. Visual Appearance in White Bucket
- b. API Gravity/Density, Corrected to 60° F (15° C)
- c. Distillation
  - 10% Recovered
  - 50% Recovered
  - 90% Recovered
  - Final Boiling Point
  - Residue
  - Loss
- d. Flash Point
- e. Freezing Point
- f. Water Separation (MSEP)
- g. Copper Strip Corrosion
- h. Existent Gum

Shipping documents shall also include all delivery information, i.e. destination; batch number; fuel grade or type; quantity to be shipped.

**NOTE**

**Fuel receipts should not be rejected based upon incomplete certification documentation; contact the supplier to obtain a faxed copy. If the certification documentation cannot be delivered prior to delivery, affected airlines must be notified.**

**NOTE**

**The maximum working capacity (max fill level) of the tank shall be 88% of rated capacity or less.**

**300.5.2** Designate and isolate the receiving tank (close all inlet and outlet valves to the receiving tank). Gauge receiving tank to determine that there is sufficient room to accommodate the pipeline delivery.

**300.5.3** Prior to receipt the following must be performed:

- a. Sump all receiving tank and filter sump drains and ensure sumps are clear and bright.
- b. Open inlet valve on receiving tank and set facility valves for receiving.
- c. Coordinate communications between pipeline shipping and facility receiving personnel to ensure applicable documentation, notifications and procedures are in place to ensure satisfactory fuel receipt. Verify correct destination, grade of fuel, and volume to be delivered and AP! Gravity/Density corrected to 60°F (15°C).

**300.6.4** Begin Fuel Delivery (Receipt).

**CAUTION**

**Do not leave the fuel facility unattended anytime during a product receipt or transfer. A fuel facility attendant/operator must be present during all receipts. Personnel must be able to communicate with the pipeline company during fuel receipt.**

**300.5.5** Perform the following tests:

**NOTE**

**Calculate by using line fill and flow rate, how much product must be moved before the pipeline is cleared of last load.**

- a. At the beginning, midpoint and near end of a delivery the facility operator shall conduct the following tests and record the results.
  - 1) Visual condition - Upstream & Downstream of receiving filtration.
  - 2) API Gravity/Density - Corrected to 60° F (15°C) - Downstream of filtration
  - 3) Color Membrane and Particulate Tests - Downstream of receiving filtration
  - 4) Free Water Test - Downstream of receiving filtration.
- b. This series of tests is to be repeated for each shipper tank or batch. The mid-point test may be omitted on shipments of less than four hours in duration.

Jet A/A-1 fuel is unacceptable and must be rejected if API Gravity/Density, corrected to 60° F (15°C), is not between 37° and 51° API (775-840 Kg/m). Discontinue fuel transfer or receipt and initiate an immediate investigation to determine if there is fuel contamination or a specification problem if there is a change of more than 1° API (3 Kg/m<sup>3</sup>) from source as shown on shipping document.

**CAUTION**

**Use extreme care and vigilance when performing the Visual Appearance test. Slight traces of water, solids or color may indicate the presence of product mixes or other Contaminants that could cause jet fuel to be off-specification and unacceptable for aircraft use. Any unusual results must be investigated immediately.**

**CAUTION**

**If the product fails any of the above receiving tests, the receiving tank(s) must be quarantined and not released for aircraft use pending further investigation and corrective actions as required.**

**300.5.6** Fuel receiving process must be monitored at all times by qualified personnel.

Monitor the following during receipt:

- a. Differential pressure on all receiving filter vessels.
- b. Tank fill levels to prevent overfill or unintentional shutdown by high-level control systems.
- c. Inspect fuel system for leaks.

**300.5.7** Upon completion of the delivery the receiving tank inlet valves shall be closed and all valves returned to their proper position. Allow a minimum of 30 minutes for settling, gauge tank and record volumes

**CAUTION**

**All manual valves that block receiving or transfer lines shall be closed after a receipt or transfer. Only valves that are needed to allow a normal disbursement from working storage shall be left open.**

**NOTE**

**The receiving tank shall be allowed to settle as long as possible before dispensing fuel from it. To help improve fuel purity, it is desirable to have one-hour settling time per vertical foot of product.**

300.5.9 After observation of the settling time, perform the following checks:

- a. Sump receiving tank using white bucket method.
- b. Sump all receiving filters using the white bucket method

**NOTE**

**Immediately report to the Fuel Facility Manager/Supervisor or General Manager abnormal amounts of contamination condition.**

**CAUTION**

**Tank changes: when, during the course of a pipeline receipt, it is necessary to switch from one tank to another, the second tank shall be opened to receive pipeline before the first tank is shut off. If possible, tank changes should be avoided.**

**CAUTION**

**If while receiving there is doubt about the quality of the product being received and it is felt that contamination will occur if pumping continues, ask the pipeline operator to shut down the pipeline.**

**WARNING**

**Shutting down a pipeline transfer against the pipeline should be done only in an emergency and then only if the piping is adequately protected for the shock that will result.**

**300.6 PIPELINE DELIVERIES (MULTI-PRODUCT)**

There is a significant increase in exposure to fuel contamination problems when airports receive jet fuel by "multi-product" pipeline as compared to "dedicated" pipelines. Additional steps must be taken to ensure the receiving fuel meets specification values.

**NOTE****Fuel Storage Facility Record of Receipt by Multi- Product Pipeline or equivalent.**

**300.6.1** Prior to delivery, airport facility operator shall receive a shipping document from jet fuel supplier or shipping agent certifying product to be delivered to airport meets specification requirements with at least the following select property values listed as measured by specified ASTM test methods:

- a. Visual Appearance in White Bucket
- b. API Gravity/Density, Corrected to 60° F (15° C)
- c. Distillation
  - 10% Recovered
  - 50% Recovered
  - 90% Recovered
  - Final Boiling Point
  - Residue
  - Loss
- d. Flash Point
- e. Freezing Point
- f. Water Separation (MSEP)
- g. Copper Strip Corrosion
- h. Existent Gum
- i. Shipping document shall also include all delivery information, i.e., destination, batch number, fuel grade or type, quantity to be shipped.

**300.6.2** Designate and isolate receiving tank (close all inlet and outlet valves to the receiving tank). Gauge receiving tank to determine that there is sufficient room to accommodate the pipeline delivery.

**NOTE**

**The maximum working capacity (max fill level) of the tank shall be 88% of rated capacity or less.**

**300.6.3** Prior to receipt the following must be performed:

- a. Sump all receiving tank and filter sump drains and ensure sumps are clear & bright.
- b. Open inlet valve for receiving tank and set facility valves for receiving.
- c. Coordinate communications between pipeline shipping and facility receiving personnel to ensure applicable documentation, notifications and procedures are in place to ensure satisfactory fuel receipt. Verify correct destination, grade of fuel, and volume to be delivered and API Gravity/Density corrected to 60°F (15°C).

**300.6.4** Begin Fuel Delivery (Receipt).**CAUTION**

**Do not leave the fuel facility unattended anytime during a product receipt or transfer. A fuel facility attendant/operator must be present during all receipts. Personnel must be able to communicate with the pipeline company during fuel receipt.**

**NOTE**

**At flow start-up take a line sample from the previous shipment left in the pipeline and perform a White capacity and flow rate, how much time is involved before the pipeline is cleared of last load. Bucket Appearance Test and API Gravity/Density corrected to 60°F (15°C). Calculate by using line**

**300.6.5** Perform the following tests:

- a. At the beginning, mid-point and near end of a delivery the facility operator shall conduct the following tests and record the results.
  - I) Visual condition- Upstream & Downstream of receiving filtration.
  - 2) API Gravity/Density, Corrected to 60° F (15°C) - Downstream of filtration
  - 3) Color Membrane and Particulate Tests - Downstream of receiving filtration
  - 4) Free Water Test - Downstream of receiving filtration.
  - 5) Flash Point

**300.6.6** This series of tests is to be repeated for each shipper tank or batch. The mid-point test may be omitted on shipments of less than four hours in duration.

**CAUTION**

**Fuel is unacceptable and must be rejected if API Gravity/Density, corrected to 60°F (15° C), is not between 37° and 51 ° API (775-840 Kg/m<sup>3</sup>) and/or Flash Point is less than 100° F (38° C). Discontinue fuel transfer or receipt and initiate an immediate investigation to determine if there is fuel contamination or a specification problem if there is a change of more than 1° API (3 Kg/m<sup>3</sup>) or 5°F (3°C) in Flash Point from source as shown on shipping document.**

**300.6.7** Fuel receiving process must be monitored at all times by facility personnel.

Monitor the following during receipt:

- a. Differential pressure on all receiving filter vessels.
- b. Tank fill levels to prevent overfill or unintentional shutdown by high-level control systems.
- c. Inspect fuel system for leaks.

**300.6.8** Upon completion of the delivery the receiving tank inlet valves shall be closed and all valves returned to their proper position.

**CAUTION**

**Tank changes: When, during the course of a pipeline receipt, it is necessary to switch from one tank to another, the second tank shall be opened to receive pipeline before the first tank is shut off. If possible, tank changes should be avoided.**

**CAUTION**

**All manual valves that block receiving or transfer lines shall be closed after a receipt or transfer. Only valves that are needed to allow a normal disbursement from working storage shall be left open.**

**300.6.9** Allowing a minimum of 30 minutes for settling, gauge tank and record volumes.

**CAUTION**

**The receiving tank shall be allowed to settle as long as possible before dispensing fuel from it. A settling time of one hour per vertical foot of product depth is desirable to help improve fuel purity.**

**300.6.10** After observation of the settling time per applicable standard, perform the following checks:

- a. Sump receiving tank using white bucket method.
- b. Sump all receiving filters using the white bucket method.

**300.6.11** Upon completion of jet fuel receipt into airport storage via a multi-product pipeline, the facility operator must immediately conduct applicable tests as required by the standard in use for comparison to the shipping documents and for meeting specification requirements prior to releasing the tank for aircraft use. Full specification testing is required if any of the following test properties exceeds the maximum allowable difference from the shipping documents. Fuel not meeting specification is to be quarantined and affected carriers notified.

If a certification document was not obtained prior to receipt, into airport storage, the facility operator must immediately conduct full recertification testing prior to releasing the tank for aircraft use. Fuel not meeting specification is to be quarantined and affected carriers notified.

**NOTE**

**Immediately report to the Fuel Facility Manager or General Manager, abnormal amounts of contamination condition.**

**CAUTION**

**If while receiving there is doubt about the quality of the product being received and it is felt that contamination will occur if pumping continues, ask the pipeline operator to shut down.**

**WARNING**

**Shutting down against the pipeline shall be done only in an emergency and then only if the piping is adequately sized for the shock that will result.**

**300.7 RAILROAD TANK CAR DELIVERIES**

Airport facility operators should follow the AFQC manual **Section 300.4 FUEL RECEIPT BY TRANSPORT TRUCK** for guidance procedures.

Utilize applicable FSM forms and/or approved local forms.

**300.8 MARINE VESSEL DELIVERIES**

Airport facility operators should follow the AFQC manual **Section 300.6 PIPELINE DELIVERIES (MULTI-PRODUCT)** for guidance procedures.

Utilize applicable FSM forms and/or approved local forms.

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**400.1 AIRCRAFT FUELING EQUIPMENT REQUIREMENTS**

- A. Aircraft fueling equipment, including refueling trucks, hydrant vehicles, hydrant carts, fueling cabinets, and fuel stands shall meet the following requirements, unless otherwise indicated. Reference ATA 103 as applicable for requirements not covered in this manual.
- B. Waiver requests shall be submitted in accordance with the guidelines established within AFQC-020. Approved waivers must be kept on file at the location and uploaded to the Facility Documents for review as long as the waiver request is valid.
- C. Third-party owned equipment (regardless of location) may be operated and maintained in accordance with the Owner's Specifications and/or stipulated Contract Standard. In such instances, the alternative standards must be readily available for corporate review. Fueling equipment leased for the purpose of conducting Company business must meet the AFQCM standards but shall not be modified without the consent of the OEM and leasing agent.
- D. **NOTIFICATION OF NEW OR MODIFIED EQUIPMENT**  
Affected airlines are to be notified whenever new, additional, replacement or modified storage, distribution facilities or aircraft refueling equipment is placed into operation. The affected airlines shall receive the written notice at least two weeks in advance of the changes, when permitted. The affected airlines have the option to inspect and approve all fueling systems/equipment and our procedures for use prior to servicing the airline's aircraft.
- E. When new or replacement equipment is received or existing systems and/or equipment has undergone major modifications, all required quality control checks and tests shall be completed and up to date, prior to placing the system and/or equipment in service. Equipment that has been out of service for > one month and/or has been repaired must have all quality control checks and tests before it can be returned to service.
- F. Each location shall establish a Location Specific Customer Notification List. This list shall include the following information:
  - (a) Aircraft Operator (Company Name)
  - (b) Contacts (Name of Contacts - Local Manager and Quality Assurance Representative)
  - (c) Telephone Number (Telephone numbers for contacts, include email addresses if available)
  - (d) A copy of the Location Specific Customer Notification List shall be maintained in each AFQC Manual.
- G. All electrical equipment, including lights, light lenses and wiring, must be maintained in

good safe condition at all times. Electrical equipment and wiring must be reasonably protected from heat, abrasion, or other impact, which could cause failure of insulation, open spark, or other ignition source. Electrical equipment and wiring must be of a type or design approved for use in Class I, Group D, and Division I hazardous locations (explosion proof, i.e., free of exposed conductors, contacts, switches, connectors, motors, etc., which could generate open spark or other ignition source during normal operations). Battery terminals must be covered and not exposed.

- H. There must be no visible fuel leaks.
- I. Tires, wheels, wheel studs/nuts and axle studs/nuts shall be maintained in good safe condition at all times. To prevent spinning a rim, either a properly rated torque wrench or a torque multiplier is required.
- J. Windows must be clean and free of cracks and crazing.

#### CAUTION

**Zinc galvanized materials shall not be used in Jet fuel service. No copper alloys, cadmium plating or plastic materials shall be permitted for main fuel piping. The use of copper or copper alloy materials for other components shall be minimized.**

#### 400.1.1 FILTER/SEPARATOR OR FULL-FLOW MONITOR

All aircraft fueling equipment shall have a Filter/Separator or a Full-Flow Fuel Monitor. All filter elements (coalescers, separators, monitors) shall be changed annually or when Differential Pressure reaches 15 PSI for filter/separator and monitor elements.

- A. All new filter/separators shall meet the requirements of El 1581, latest edition. Existing vessels and element conversions shall meet, by test or similarity, the latest edition of El 1581/1582. For existing vessels, conversion to the latest edition shall occur within 12 months of qualified elements becoming available for a specific vessel. Filter/separator vessel/element combinations qualified by test or similarity, require a similarity data sheet to be maintained locally and a data plate reflecting such qualification be attached to the filter vessel.
  - I) Filter/separators shall be equipped with an automatic water defense system, which will cause fueling to stop when activated by excessive water.

- 2) Float or electronic probe systems shall include provisions for an operational test.
- B. Full Flow Fuel Monitors must meet the requirements of EI 1583 7<sup>th</sup> Edition "Specifications and Qualification Procedures - Aviation Fuel Filter Monitors with Absorbent Type Elements". A letter of element qualification from the filter manufacturer must be maintained on file locally, a conversion data plate (placard) reflecting the current elements installed must be affixed to the vessel.
  - 1) Full-Flow Fuel Monitors must be equipped with a pressure limiting devise that will prevent excessive differential pressure from damaging elements in the event of complete blockage.

**CAUTION**

**All equipment filters should be operated at a flow rate of at least 50% of vessel rated flow, if this is not occurring consult the filter manufacturer to determine a configuration that will downgrade the rated flow of the vessel to comply with this requirement. The rated flow of any vessel cannot be exceeded.**

**CAUTION**

**Full Flow Monitors shall not be used with fuels containing Fuel System Icing Inhibitors. The water removal performance of Full Flow Monitors may be reduced with fuel containing FSII.**

**C. All filtration vessels shall include:**

- 1) Air elimination provisions. Each filter vessel shall be fitted with a means for automatically venting trapped air from the top of the vessel. If associated piping would permit the vessel to drain and air to enter via the air eliminator, a soft-seated non-return (check) valve with an opening pressure of one pound must be installed.
- 2) Direct reading pressure differential gauges. Piston type pressure differential gauges shall have a scale that can give a reading up to 30 PSI differential. Piston type direct reading pressure differential gauges shall be equipped with provisions for testing full deflection of indicating piston. To prevent fuel from venting to the ground and/or recording erroneous pressure measurements, test valves must be spring-loaded or safety wired in the normal operating position except while the gauge is being tested.

- 3) Manual sump drains - With valves having handles that are spring loaded to the closed position.
- 4) Upstream and downstream membrane sampling connections, including probes and dust covers. Sampling connection locations must be labeled. The direction of flow markings on the probes must be visible (not painted) at all times.
- 5) Pressure relief valves or other devices, which will prevent over pressurization due to thermal expansion of fuel, including a means for accommodating relieved fuel.
- 6) Placards indicating month and year of the last filter change of vessel.
- 7) Nameplate - A stainless steel or nonferrous metal nameplate shall be securely attached to the vessel proper. As a minimum, the nameplate shall include the following information:
  - a. The manufacturer's name and address.
  - b. The vessel's serial number and unit number.
  - c. The vessel's API/EI classification.
  - d. The Vessel's rated capacity for Jet A, Jet A-1, or Avgas.
  - e. The date of manufacture.
  - f. The number of and model numbers of the elements installed.
  - g. If the vessel has been converted to utilize elements other than what is on the original Nameplate, a Conversion Data Tag must be posted adjacent to the original (not covering it) indicating the model numbers and quantities of elements currently installed.
  - h. The manufacturer's recommended element-change pressure differential.
- 8) All vessel interiors of mild steel shall be protected with an approved epoxy coating.

#### 400.1.2 PRESSURE CONTROLS

All aircraft fueling equipment shall have separate and independent primary and secondary fuel pressure control devices that limit the pressure to 50 psi or less at the nozzle under constant flow conditions.

- a. Primary fuel pressure control is intended to protect the aircraft under conditions of constant flow and also from pressure surge caused during aircraft valve closure.
- b. Secondary fuel pressure control is intended to protect the aircraft in the event of primary fuel control failure. Secondary controls must limit the fueling pressure (at the fuel nozzle) to 45 psi or less under conditions of constant flow.
- c. Fuel pressure control systems may utilize the following
  - 1) Pressure controlling hydrant pit valves.

- 2) Pressure controlling hydrant pit couplers.
- 3) In-line pressure control valves.
- 4) Hose End Pressure Control Valves (HEPCV).
- 5) Pressure switches, which will cause rapid shutdown of fuel flow in the event of high fueling pressure.

### CAUTION

**FUELING PRESSURE CONTROL SYSTEMS SHALL NEVER ALLOW THE ACTUAL FUEL PRESSURE, MEASURED AT THE FUEL NOZZLE, TO EXCEED THE PRESSURE INDICATED BY THE OPERATOR'S GAUGE.**

#### 400.1.3 DEADMAN CONTROL SYSTEM

All aircraft fueling equipment shall have a hand-held Deadman control system, which must completely stop fuel flow within 5% of the fuel flow rate at the time the Deadman is released. At flow rates below 50% of rated flow, a shutdown in 10% of the fuel flow rate is allowed.

#### EXAMPLE:

**If actual fuel flow rate at the time of deadman control release is 500 gpm, total overrun must not exceed 25 gallons. If actual fuel flow rate at the time of deadman control release is 300 gpm, total overrun must not exceed 15 gallons.**

#### 400.1.4 EMERGENCY FUEL SHUTOFF SYSTEM

- a Hydrant trucks, hydrant carts and fueling cabinets shall be equipped with an emergency fuel shutoff system in addition to the Deadman control.
  - 1) Each unit shall have an emergency fuel shutoff control accessible from the ground.
  - 2) Units equipped with a lift or platform shall have an emergency fuel shutoff control accessible from the lift or platform, in addition to the one accessible from the ground.
  - 3) The system should stop the fuel flow by automatically closing the hydrant pit valve upon activation.
- b Refueling trucks shall be equipped with an emergency fuel shutoff control in addition to the deadman control.
  - 1) Each unit shall have an emergency fuel shutoff control accessible from each side of the truck.
  - 2) Units equipped with a lift or platform shall have an emergency fuel shutoff control accessible from the lift or platform, in addition to the one accessible from the ground.

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- 3) The emergency fuel shut-off system should also close the tank outlet (internal) valve(s).
- c. Each emergency fuel shutoff control, when activated, shall completely stop fuel flow within a maximum of 5 percent overrun. At flow rates below 50% of rated flow, a shutdown in 10% of the fuel flow rate is allowed.

**400.1.5 FIRE EXTINGUISHERS**

- a. Hydrant trucks, hydrant carts and fueling cabinets shall be equipped with a minimum of one fire extinguisher having a rating of at least 201b/9kg UL 120 BC, or equivalent, securely mounted and readily accessible.
- b. Refueling trucks shall be equipped with a minimum of two fire extinguishers, each having a rating of at least 201b/9kg UL 120 BC, or equivalent, securely mounted on opposite sides of the truck and readily accessible.
- c. Fueling cabinets shall have a minimum of one 201b UL 120 BC rated fire extinguisher readily accessible.
- d. Where the open hose discharge capacity of the aircraft fueling system or equipment is more than 200 gpm (750 lpm), at least one listed wheeled extinguisher having a rating of not less than 80-B:C and a minimum capacity of 125 lb. (55kg) of agent shall be located within 50-ft of AC being serviced.
- e. Extinguishers shall be kept clear of ice, snow, etc. Extinguishers located in enclosed compartments shall be readily accessible and their location shall be clearly marked.
- f. Safety pin(s), if applicable, and safety seals shall be intact.
- g. Fire extinguishers shall be marked with identity numbers. A record showing location and number for each extinguisher shall be maintained up to date. Records must also be maintained to track monthly inspections and include; date, initials of inspector, and any required corrective actions.
- h. Current inspection (monthly & annual), testing and recharging record tags must be attached.

**400.1.6 SAFETY INTERLOCK SYSTEM**

- a. All aircraft fueling vehicles, **except non-motorized (towable) hydrant carts**, shall have a safety interlock system that will prevent the equipment from being moved when:
  - 1) Any fueling nozzle and/or hydrant couplers are not in their stowed position.
  - 2) The pumping system is activated on tank trucks.

- 3) Lift decks are in the extended position.
- 4) Platform rails (collapsible/folding) are in the extended position.
  - b. The interlock system may stop the engine on motorized equipment, but should also apply the vehicle brakes. If an engine stop system is installed, there must be a means of testing the vehicle brakes when the interlock system shuts engine down.
  - c. Refueling trucks with bottom loading provisions shall incorporate a brake interlock system that will prevent the movement of the vehicle until the bottom loading coupler has been disconnected from the vehicle.
  - d. Interlock systems shall be equipped with an override device i.e., push-button, spring loaded toggle switch, lever device, etc. Regardless of the type and location, it shall be secured in the normal position, with a breakaway seal. Placards must identify normal and override positions. A light, indicating override activation is recommended and should be prominently located in the vehicle cab. This is a requirement for newly purchased equipment.

**400.1.7 AIRCRAFT FUELING HOSES**

- a. Hoses and couplings must meet the following standard when purchased by the end user:
  - [EI 1529, latest edition]. Grade 2, Type C, or Grade 2, Type CT.  
Hoses shall be installed within 2 years of the date of manufacture and have a maximum service life of 10 years from the date of manufacture.  
If reusable couplings are installed on hoses, the couplings and hose shall meet the requirements of [EI 1529] and operator shall abide by the periodic pressure testing requirements of [EI 1540] latest edition.

**Company personnel shall not re-attach reusable couplings to any loading/unloading hose, new or used.**

**CAUTION:**

**PRIOR TO THE PERIODIC PRESSURE TESTING OF AN AIRCRAFT FUELING HOSE, THE MAXIMUM ALLOWABLE PRESSURE RATING OF THE ATTACHED VALVES, METERS, OR SWIVELS SHOULD BE CHECKED TO PREVENT POSSIBLE INJURY TO THE OPERATOR OR DAMAGE TO THE EQUIPMENT. IT MAY BE NECESSARY TO REMOVE THE FUELING HOSE PRIOR TO TESTING. FOLLOWING THE SAFETY PRECAUTIONS OUTLINED IN EI1540 IS HIGHLY RECOMMENDED.**

- b. Each hose shall have durable identification labels at intervals not exceeding 2.0 meters (6.5 feet). Each label shall include the following information:
  - 1) The designation "Aircraft Fueling Hose – EI 1529/ (Edition date it meets; e.g., 1529/2004)."
  - 2) Manufacturer's name or trademark or both.
  - 3) Hose type, grade, and serial or reference number.
  - 4) Quarter and year of manufacture; e.g., 3Q/2004.
  - 5) Maximum working pressure in kilopascals (pounds per square inch).
- c. Hose Hydrostatic Pressure Test Certificates shall be maintained on file for the life of the hose. The Certificate shall include but not be limited to the following:
  - a) Manufacturer's name (hose)
  - b) Manufacturer's name (coupling)
  - c) Hose type
  - d) Hose grade
  - e) Size and length of hose
  - f) Serial number or reference number of hose
  - g) Quarter and year of manufacture of hose
  - h) Model number of couplings
  - i) Sizes of coupling ferrules
  - j) Hydrostatic test pressures
  - k) Coupled length serial number
  - l) Identification of individual responsible for coupling the hose
  - m) Name and address of company responsible for coupling the hose
  - n) Date of certification

#### **400.1.8 MANUAL ISOLATION VALVES**

Equipment with multiple aircraft delivery hoses shall have a manual isolation valve installed upstream of each delivery hose.

#### **400.1.9 DUST COVERS**

Dust covers or other protective devices shall be used to prevent debris from accumulating on mating surfaces of hydrant couplers and aircraft fueling nozzles.

**400.1.10 NOZZLE I NOZZLE STRAINERS**

- a. Aircraft fueling nozzles shall be equipped with 100 mesh screens.
- b. In order to ensure that the correct grade of fuel is delivered when using an over-wing (trigger) nozzle, all Jet Fuel over-wing fueling nozzles shall be equipped with a "Duckbill" or "J" anti-misfueling style spout only (black handles).
  - Minimum Nozzle Spout Length is 67.6 mm or 2.66 inch
  - Maximum Nozzle Spout Width is 29.7 mm or 1.17 inch
- c. All Avgas over-wing fueling nozzles shall be equipped with a round style spout only (red handles).
  - Maximum Nozzle Spout Diameter is 50 mm or 1.97 inch

**NOTE**

For additional details, refer to SAE Aerospace Standard AS 1852, titled "Nozzles and Ports-Gravity Fueling Interface Standard for Civil Aircraft".

- d. Each over-wing servicing nozzle shall have a cable with a plug or clip for bonding to the aircraft. A bonding jumper-cable is permissible. The "jumper" must be equipped with a "remove before flight" tag and be maintained with the vehicle.
- e. Nozzles for under-wing (single point) fueling must be designed so to attach securely to the aircraft adapter before the nozzle can be opened. It shall not be possible to disengage the nozzle from the aircraft adapter until the nozzle is fully closed.
- f. Hydrant coupler and aircraft fueling nozzle swivel retention devices shall be equipped with at least two levels of redundancy, such as collar lock rings and collar retention screws secured by safety wire. Safety wire must be looped and twisted and pulled in the direction of tightening.

**400.1.11 AIRCRAFT FUELING PRESSURE GAUGES**

- a. A pressure gauge is required for monitoring aircraft fueling pressures on under-wing (single point) fueling systems.
- b. Gauges shall be located where they will be visible to the Fueler during aircraft fueling operations.
- c. Gauges shall have a minimum face diameter of 4 inches and shall have an accuracy of +/- 2 % of full scale.
- d. Gauge indicator dials must be marked in 2-pound increments or less.
- e. Digital pressure displays shall have a minimum character height of 3/4 inch.

**400.1.12 FUEL QUANTITY MEASUREMENT METER**

- a. Meters shall be capable of maintaining accuracy of 1/10 of one percent (0.1 %) and repeatability of 1/20 of one percent (0.05%) at flow rates ranging from the minimum rated flow to the maximum rated flow of the fueling equipment.

- b** Meters shall have N.I.S.T. calibration capabilities.
- c** Calibrator/adjuster access plate or cover shall be sealed.
- d** totalizer

**NOTE:**

It is permissible for maintenance personnel to break a meter seal for the purpose of making adjustments to any component other than the calibrator. Maintenance must immediately replace the seal upon completion of the task. Any in-service meters lacking the required seal will require re-calibration.

**400.1.13 ELECTROSTATIC GROUNDING/BONDING SYSTEM**

- a. All fueling equipment shall be equipped with an electrostatic grounding/bonding system.
- b. Electrostatic grounding/bonding system shall have 25 ohms or less total resistance.

**400.1.14 SIGNS, PLACARDS AND LABELS**

The following signs, placards or labels shall be placed on the equipment as indicated:

- a. Product identification on each side, rear and in cab. Lettering on placards posted on the outside of the unit shall be a minimum of 3" in height. Jet A, Jet A-1 and Jet B product identification decals shall have a Black background and White lettering. 100LL product identification decals shall have a *RED* background, White lettering and a Blue band.
- b. Flammable on all sides. Lettering on placards shall be a minimum of 3" in height.
- c. No Smoking on all sides and in cab. Lettering on placards posted on the outside of the unit shall be a minimum of 3" in height.
- d. EMERGENCY FUEL SHUTOFF placard adjacent to each emergency fuel shutoff control. Lettering on placards shall be a minimum of 2" in height.
- e. Mode of operation placards adjacent to each emergency shutoff control, i.e., PUSH, PULL, and TURN etc.
- f. Fire extinguishers located in enclosed compartments shall have the location clearly marked, such as, "Fire Extinguisher Inside".
- g. Aircraft fueling pressure and filter differential pressure gauges shall be identified.
- h. Filter, air and tank drains shall be identified.
- i. A placard indicating the date (Month and Year) during which the filter elements were last changed shall be posted on the filter vessel housing.
- j. A Conversion Data Tag shall be posted on all filter/separators and monitors noting the current number of and model of elements installed.
- k. A sign or placard indicating proper procedure for engaging the pumping system shall be prominently displayed adjacent to pump controls.

- m.** DOT Hazmat placards or signs on all four (4) sides of tank truck, i.e., 1863 (Jet A/A-1) or 1203 (AvGas & MoGas) etc.
- n.** All FSII (Fuel System Icing Inhibitor) reservoirs must be labeled or placarded as such.
- o.** "No Defueling" decal posted in cab and near pump controls on- trucks equipped with monitors.
- p.** Placards must identify normal and override positions of brake safety interlock override devices.
- q.** Tank truck high-level pre-check devices and method of operation must be labeled.

**NOTE**

**Your local governing authorities may require additional signs and placards.**

#### **400.1.15 ADDITIONAL REQUIREMENTS FOR TANK TRUCKS**

- a.** Cargo tanks shall be constructed of stainless steel, aluminum or internally light color epoxy coated carbon steel.
- b.** Dome covers shall be provided with:
  - 1)** A forward mounted hinge and latches that will automatically cause the lid to close and latch with forward motion of the vehicle.
  - 2)** Watertight, fuel resistant seals and gaskets.
- c.** Each tank compartment shall be equipped with a water (sump) drain located at the lowest point of the tank.
  - 1)** Water drain (sump) valves must be spring loaded to the closed position.
  - 2)** Extension piping from the tank water drain must have a valve with a cap.
- d.** Tank outlets should be equipped with shutoff valves located inside the tank shell.
- e.** Tank trucks with bottom loading capability shall be equipped with a high- level shutoff system, including provisions for ensuring the satisfactory operation of the system (known as a "Pre-Check" system). The system may activate a shutoff device that is mounted on-board the truck or on the loading station. The pre-check system should simulate a high-level condition in the truck by submerging the sensing devise in fuel.
- f.** Re-circulation connections are recommended. If equipped, recirculation systems shall be arranged so that all fuel is re-circulated into the product tank, i.e., fuel cannot be re-circulated into the pump suction.
- g.** The refueler must have a means of ensuring that the internal valve is closed except when bottom loading or fueling.

#### **400.1.16 MISCELLANEOUS ITEMS**

All mobile fueling tank trucks and hydrant trucks and carts shall be equipped with:

- a.** A set of wheelchocks.
- b.** A safety flag or cone for hydrant trucks and carts (flag or cone to be placed at the

- fuel pit).
- c. A safety cone for fuel trucks to be placed behind tanker when parked, servicing aircraft, or being loaded.
  - d. A back up beeper/alarm system (powered units).
  - e. A spill kit, which includes absorbent pads, portable dikes and/or bags of cob/speedy-dry. There should be sufficient materials onboard each vehicle to contain/clean-up incidental releases in accordance with Company policy.
  - f. Protective drive shaft shroud (powered units).
  - g. All lift deck assemblies shall be equipped with a transition alarm kit. This alarm will sound whenever the lift deck is moving up or down.
  - h. Lift deck assemblies shall be equipped with electrical stop sensor switches (wobble head Micro-Switch actuators). The wobble switches shall be installed on the highest points of the elevated system - all 4 corners.
  - 1. Lift deck doors will be self-closing. Chains used as fall protection devices must have spring-loaded clips.

#### **400.2 FUELING EQUIPMENT CHECKS AND INSPECTIONS**

The following tests and inspections shall be performed on all fueling equipment servicing aircraft and at the frequencies specified. Reference the applicable frequency tables below associated to the standard in use. Direct references to standards will be listed. Items referenced to FSM identify that inspection/check is required on a frequency other than that listed in the associated standard. Inspection/check procedures are available on the Fuel Quality Control Intranet. Additional tasks or more frequent tests and inspections may be required based on local conditions.

- a. Only properly trained personnel shall perform aircraft fueling equipment quality control checks and tests.
- b. Maintenance requirements specified in this section are generally limited to those items pertaining to fuel quality and safety. Additional programs should be established to ensure mechanical reliability of all aircraft fueling equipment.
- c. Any aircraft fueling equipment not in daily use must have all daily, monthly, quarterly and annual tests and inspections current and recorded before the equipment is returned to service.
- d. Proper PPE (Personal Protective Equipment) must be worn at all times.
- e. When discrepancies are noted with fueling equipment and or systems, management is to be notified. Maintenance shall be notified of discrepancies by radio or phone and also be notified in writing of all discrepancies noted, in a timely manner (Daily). A Vehicle Discrepancy Report (VDR) shall be filled out noting all discrepancies. This form is a three-copy form, retain the top copy in operations and send the other two to maintenance. Maintenance will make the repairs and complete their portion of the VDR and send a completed copy back to operations. Upon receipt of the completed VDR, Operations/QC personnel will close-out the write ups on the QC forms and file the VDR.
- f. Equipment shall be removed from service immediately for certain discrepancies, i.e.:
  - Fuel leaks
  - Inoperative Deadman and/or emergency fuel shut off systems
  - High nozzle and/or filter differential pressure
  - A sudden drop in filter differential pressure
  - Inoperative interlock system
  - Discharged or missing fire extinguishers
  - No bonding capabilities
  - Product contamination

Maintenance shall have supporting documentation for all reported discrepancy repairs

#### 400.3 FUELING EQUIPMENT DAILY QUALITY CONTROL CHECKS

Perform daily fueling equipment checks at the beginning of each work day including weekends and holidays. Record the results of all checks on the appropriate paper or digital form.

Tanker truck tank sumping must be completed prior to or during the first aircraft servicing of the day. Appropriate corrective action must be taken for noted discrepancies. Units

with fuel leaks are not to be used to service aircraft.

The daily checks required by ATA 103 are listed in the table on the following page. Additional checks may be listed, Reference is “FSM”, even though they are not required by ATA 103.

***NOTE: Immediately report any observed deficiencies to the responsible party.***

### ATA 103 Fueling Vehicle Daily checks

Required Checks	Reference
General Condition	2.9.3.1
Filter Sumps	2.9.3.2; 3.1
Filter Differential Pressure	2.9.3.3; 3.9
Deadman Controls	2.9.3.4
Safety Interlocks	2.9.3.5
Nozzle Fueling Pressure	2.9.3.6
Hoses, Nozzles, & Swivels	2.9.3.7
Static Reels, Cables, & Clamps	2.9.3.8
Lift Platforms	2.9.3.9
Fire Extinguishers	2.9.3.10
Surge / Relief Tanks	2.9.3.11
Air Tanks	2.9.3.12
Refueler Tank Troughs	2.9.3.13
Refueler Truck Sumps	2.9.3.14; 3.1
Refueler Bottom Loading Pre-Check	2.9.3.15

To verify proper operation of brake (safety) interlock system.

- a) Remove one nozzle from its storage position and attempt to move unit. Unit should not move.
- b) Repeat task for each additional nozzle, lift deck, platform rail (collapsible/folding), and bottom loading interlock as applicable.
- c) Wheel chocks must be used to prevent forward or aft movement of unit at all times when vehicle is parked.

\*\*\* Defective interlock systems shall be repaired immediately. \*\*\*

#### 400.4 FUELING EQUIPMENT WEEKLY CHECKS

Perform weekly fueling equipment checks once every calendar week and within one week +/- one day of the previous weekly check. For instance, weekly checks conducted on the 8th of the month would require the next week’s checks to be conducted between the 14th and the 16th. Record the results of all checks on the appropriate paper or digital form. The weekly checks required by ATA 103 are listed below.

**ATA 103 Fueling Vehicle Weekly Checks**

Required Checks	Reference
Continuity Test	2.9.4.1
Corrected Filter Differential Pressure	2.9.4.2

**400.5 FUELING EQUIPMENT MONTHLY CHECKS**

Perform monthly fueling equipment checks once every calendar month and prior to the end of the third week of the month. The monthly check must be within one month +/- five days of the previous month's check. For instance, a monthly check conducted on the 8th of the month would require the next month's checks to be conducted between 3rd and the 13th of the next month. Record the results of all checks on the appropriate paper or digital form. The monthly checks required by ATA 103 are listed below. Additional checks may be listed, Reference is "FSM", even though they are not required by ATA 103.

**ATA 103 Fueling Vehicle Monthly Checks**

Required Checks	Reference
Filtration Test	2.9.5.1; 3.2; 3.3
Free-Water Test	2.9.5.1; 3.2; 3.3
Nozzle Screens	2.9.5.2; 3.17
Fuel Hoses	2.9.5.3
Signs, Labels, & Placards	2.9.5.4; 2.8.15
Meter Seals	2.9.5.5
Fire Extinguishers	2.9.5.6
Emergency Fuel Shutoff System	2.9.5.7; 2.8.5
Deadman Controls	2.9.5.8; 2.8.4
Lift Platforms	2.9.5.9
Refueling Truck Interiors	2.9.5.10
Refueling Truck Vents & Dome Covers	2.9.5.11
Refueling Truck Trough Drains	2.9.5.12
Dirt Defense & Electronic Water Sensor System	2.9.5.13

**400.6 FUELING EQUIPMENT QUARTERLY CHECKS**

Perform quarterly fueling equipment checks once every three calendar months and within three months +/- 10 days of the previous check. For instance, quarterly checks conducted on February 14th would require the next quarter's checks to be conducted between May 4th and May 24th. Record the results of all checks on the appropriate paper or digital form. This flexibility does not allow for less than four quarterly checks per calendar year. The quarterly checks required by ATA 103 are listed below. Additional checks may be listed, Reference is "FSM", even though they are not required by ATA 103.

**ATA 103 Fueling Vehicle Quarterly Checks**

Required Checks	Reference
Vehicle Inspection	2.9.6.1
Pressure Controls	2.9.6.2
Water Defense – External Check	2.9.6.3; 3.12
Internal Valve Check	2.9.6.4
Interlock Override Function Check	2.9.6.5
Surge Absorbers	2.9.6.6
Differential Pressure Limiting Devices	2.9.6.7

**400.7 FUELING EQUIPMENT SEMI-ANNUAL CHECKS**

Perform semi-annual fueling equipment checks once every six months and within six months +/- ten days of the previous check. For instance, a semi-annual check conducted on April 9<sup>th</sup> would require the next semi-annual check to be conducted between September 29<sup>th</sup> and October 19<sup>th</sup>. Record the results of all checks on the appropriate paper or digital form. The semi-annual checks required by ATA 103 are listed in the table below.

**ATA 103 Fueling Vehicle Semi-Annual Checks**

Required Checks	Reference
Hose Pressure Checks @225 psi or 300 psi (new)	2.9.7.1

**400.8 FUELING EQUIPMENT ANNUAL CHECKS**

Perform annual fueling equipment checks once every twelve months and within twelve months +/- ten days of the previous check. For instance, annual check conducted on July 4th would require the next semi-annual check to be conducted between June 24th and July 14th. Record the results of all checks on the appropriate paper or digital form. The annual checks required by ATA 103 are listed in the following table.

**ATA 103 Fueling Vehicle Annual Checks**

Required Checks	Reference
Filter Element Change / Vessel Inspection	2.9.8.1; 3.13; 3.14
Fuel Pressure and DP Gauge	2.9.8.2; 3.9
Meter Calibration / Meter Seals	2.9.8.3; 2.1.12.1
Water Defense System Inspection & Test	2.9.8.4; 3.12
Hydrant Pit Couplers	2.9.8.5
Filter Vessel Pressure Relief Devices	2.9.8.6
Electronic Water Sensors	2.9.8.7

**400.9 REFUELER LOADING PROCEDURES**

**CAUTION 1:** DURING LOADING OF THE REFUELING TRUCK, THE EQUIPMENT MUST NOT BE LEFT UNATTENDED AT ANY TIME.

**CAUTION 2:** IT IS NOT ACCEPTABLE TO TRANSFER FUEL INTO A REFUELING TRUCK WHILE IT IS REFUELING AN AIRCRAFT.

**CAUTION 3:** IT IS NOT ACCEPTABLE TO TRANSFER FUEL FROM A TRANSPORT TRUCK INTO A REFUELING TRUCK.

**CAUTION 4:** REFUELING TRUCKS SHALL NOT BE LOADED DIRECTLY FROM HYDRANT SYSTEMS, HYDRANT VEHICLES OR CARTS.

During tank truck (Refueler) bottom loading operations, the following procedures shall be followed:

- A. The Refueler shall be properly positioned at the bottom loading station with engine shut off, the rear passenger-side wheel chocked.
- B. Prior to connecting the bottom loading hose to the Refueler, the Fueler shall check the truck log sheet and determine how many gallons have been dispensed from the Refueler since the last top off. This will be the predetermined amount for fill. The Refueler shall be bonded to the loading facility piping during filling operations.
- C. Bottom loading control systems do not negate the need to bond with a separate bonding cable. Top loading is not allowed.
- D. Open bottom load interlock control on the Refueler, remove dust caps, connect the loading coupler to the bottom-loading adapter on the Refueler.
- E. Open the bottom loading manual shutoff valve and loading coupler.
- F. Insert fuel ticket in meter register ticket printer or in the absence of a ticket printer, record the starting meter register number on the fuel ticket. Set meter register for a zero start.
- G. Energize hand held deadman assembly to initiate flow.

**WARNING**

**It is not permissible at any time to block the deadman in the open or activated position.**

- H. After the start of flow is initiated, the high-level shutoff pre-check shall be operated immediately to ensure proper operation of shutoff system. This includes operations with Scully systems

**WARNING:**

**IF THE PRE-CHECK SYSTEM DOES NOT OPERATE PROPERLY, THE FUEL TRUCK MUST BE IMMEDIATELY REMOVED FROM SERVICE.**

- I. During the bottom loading operation, the operator must constantly monitor the amount of gallons being pumped into the Refueler.
- J. If the amount of fuel being pumped into the Refueler exceeds the pre-determined amount by 20 gallons, and the high-level shutoff has not activated, immediately release the deadman to stop flow. Report situation to management and/or maintenance to have cause investigated and repaired ASAP.
- K. If the amount of fuel being pumped into the Refueler exceeds the pre-determined amount by 20 gallons, and the high-level shutoff has not activated, immediately release the Deadman to stop flow. Report situation to management and/or maintenance to have cause investigated and repaired ASAP.
- L. If the high-level shutoff activates and stops the flow of fuel, release and stow the Deadman assembly.
- M. Close the bottom loading shutoff valve on the Refueler, close and disconnect the bottom loading coupler and stow.
- N. Replace all dust caps.
- O. Close Refueler bottom loading interlock control.
- P. Disconnect bonding wire.
- Q. Complete ticket and log sheet.
- R. Pick up wheel chocks and stow.
- S. Perform walk around inspection.



**500.1 DEFUELING PROCEDURES (General)**

Any operation that involves removing fuel from an aircraft, either for load adjustments or for maintenance purposes, is defined as de-fueling. De-fueling operations require special consideration. When requested to do any de-fuels for load adjustment, maintenance or contamination, the carrier, aircraft owner, etc., shall be responsible for the disposition of the fuel that was removed from their aircraft; whether it is pumped back into their aircraft over a specified agreed time, or disposed of through a waste hauler, etc. This includes the product de-fueled and any product it comes in contact with, i.e., if there is any product in the tanker truck used for de-fuel.

**WARNING!**

**Fuel trucks utilizing monitors for Jet fuel filtration shall not be used for defueling aircraft.**

**NOTE**

Defueling aircraft directly into joint use fueling systems is not authorized unless all system users have unanimously approved a written procedure. The approval must come from the Quality Assurance Departments of each user and must be in writing.

**CAUTION**

Receive fuel into an empty vehicle whenever possible, or other vehicle equipped for this purpose. If the defuel truck is not empty, the ullage (available storage capacity) must be calculated either by inventory records or strapping chart. Any remaining fuel in the defuel truck becomes part of the defueled product and must be returned to the responsible air carrier or owner.

**WARNING!**

**Defueled product shall not be returned to airport storage.**

**500.2 DE-FUELING PROCEDURES FOR LOAD ADJUSTMENT/MAINTENANCE**

**500.2.1 Procedures:** The following procedures shall be complied with when defueling an aircraft for load adjustment/maintenance:

- a) Complete a Visual Appearance Test on sump samples drawn from the filter sump (under pressure) and all tank compartments on the defuel truck.
- b) Complete a Visual Appearance Test on a composite sample utilizing all aircraft tanks to be defueled looking for visible contamination such as water, particulates and microbial growth, if practical.
- c) If results of checks outlined above give, without any doubt, no reason to suspect the quality of the fuel, begin Defueling. Utilize the bottom-load pre-check to determine

## **DEFUEL PROCEDURES**

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that high-level protection is operable. If not, a monitor must be placed on the ladder to monitor the fuel level through an open dome cover.

- d) After defueling, and prior to uploading the defueled product, allow the fueling vehicle to settle for 10 minutes then drain at least one gallon of fuel from the tank sump(s) into a suitable container and perform a visual inspection.
- e) Upon completion of de-fueling, re-circulate through a re-circulation connection, not the bottom loading connection unless it connects directly into the tank and not through the tank internal valve, a volume equivalent to the contents of the Refueler, and then perform the following:
  - I) Clear and bright test from all tank compartments and filter sump
  - 2) API gravity corrected to 60°F. (Range must be between 37° to 51° API).
  - 3) Filter vessel differential pressure.
  - 4) Free Water Test, utilizing one of the following test kits (Results must be <15ppm):
    - (a)Shell Free Water Test Kit
    - (b)Metrocator Free Water Test
    - Kit (c)Velcon Hydro-kit
  - 5) Record all test results.
- f) If the fuel passes the tests outlined above in Section 500.2 item "e", the fuel may then be pumped back into the same or other aircraft owned by the same carrier. De-fueled product shall not be pumped into another carriers or owners aircraft without the explicit written permission of their Fuel Quality Assurance Department or in the instance of a private aircraft, the owner.

### **CAUTION**

If the fuel is found to be contaminated, the fuel shall be held in quarantine until selected fuel quality, purity or specification tests have determined its acceptability and can be returned to aircraft use. Selected product tests and expected acceptance criteria are to be determined the Fuel Quality Control Department, and mutually agreed upon, by the Air Carrier Quality Assurance Department, if applicable. If it is determined that the fuel has to be disposed of, the carrier representative or aircraft owner shall be notified that they will bear the costs incurred in the disposal of the product as well as costs for cleaning the Refueler tank and filter change.

### **500.3 DE-FUEL FOR POSSIBLE CONTAMINATION**

### **CAUTION**

**Receive fuel into an Empty vehicle whenever possible, or other vehicle equipped for this purpose.**

- a. **Procedures:** The following procedures shall be complied with when defueling

## **DEFUEL PROCEDURES**

**AFQC-500**

an aircraft that is suspected of having contamination. Complete a Visual Appearance Test on sump samples drawn from the filter sump (under pressure) and all tank compartments on the defuel truck.

- b. Complete a Visual Appearance Test on a composite sample utilizing all aircraft tanks to be defueled looking for visible contamination such as water, particulates and microbial growth (mandatory).
- c. Measure API gravity-corrected to 60°F of composite sample collected from AC tanks
- d. Perform Free Water Test on composite sample, utilizing one of the following test kits (Results must be <15ppm):
  - (a) Shell Free Water Test Kit
  - (b) Metrocator Free Water Test Kit
  - (c) Velcon Hydro-kit
- e. De-fuel the product and retain in quarantine. Utilize the bottom-load pre-check to determine that high-level protection is operable. If not, a monitor must be placed on the ladder to monitor the fuel level through an open dome cover.
- f. The vehicle used for the de-fueling operation shall be removed from service and the fuel shall be held in quarantine until selected fuel quality, purity or specification tests have been determined its acceptability and can be returned to aircraft use.
- g. Selected product tests and expected acceptance criteria are to be determined by the Fuel Quality Control Department, and mutually agreed upon, by the Air Carrier Quality Assurance Department, if applicable. If it is determined that the fuel has to be disposed of, the carrier representative or aircraft owner shall be notified that they will bear the costs incurred in the disposal of the product as well as costs for cleaning the Refueler tank and filter change.



**DEFUEL PROCEDURES**

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# AIRCRAFT ACCIDENT/INCIDENT FUEL QUALITY CONTROL PROCEDURES

AFQC-600

## 600.1 EMERGENCY PROCEDURES (General)

In the event of an incident/accident involving an aircraft fueled by our company, the procedures set forth herein must be carried out immediately and will be independent of any other investigation.

### 600.1.1 Preparation & Planning

Each location shall have at least one individual that has been trained and certified in the shipment of hazardous materials.

Each location shall maintain six approved one-gallon epoxy coated shipping cans and two approved five-gallon epoxy coated shipping cans for sample collection. Additionally, each location shall maintain shipping materials (packaging, labels, tape, etc.) for the shipping of sample containers.

## 600.2 UPON NOTIFICATION

Discontinue any additional fueling utilizing the effected grade and type of product until all outlined procedures have been completed and/or the preliminary investigation determines the fuel to be the correct type and grade, clean and dry.

## 600.3 PROCEDURES

Document the following utilizing form FSM 7.2.I0A.

- a) Notify General Manager and Duty Manager
- b) Notify the Fuel Quality Control Department.
- c) Notify your locations appropriate HS&E Manager.
- d) Immediately research what operators of all other aircraft were fueled prior to or since the suspected fueling. This would include the operators fueled by the suspected vehicle(s) and associated fuel storage system.
- e) Perform the following tests on the suspected fuel vehicle and storage system.
  - 1) Downstream Filter membrane color test (Millipore) -Jet systems only.
  - 2) Downstream Free water test -Jet systems only.
  - 3) API Gravity corrected to 60°F -Avgas & Jet systems.
  - 4) Tank and Filter Sump Visual Appearance test (White bucket) -Avgas & Jet systems
  - 5) Record time and results of tests performed.

### NOTE

**Proper PPE (Personal Protective Equipment) must be worn at all times.**

# AIRCRAFT ACCIDENT/INCIDENT FUEL QUALITY CONTROL PROCEDURES

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- f) Obtain two samples (utilize approved epoxy coated shipping containers) from each fueling vehicle in the suspected fueling and two samples from each airport storage tank serving the fueling equipment. If at all possible, draw samples from the aircraft in question. Identify, seal, tag and retain these samples pending further instructions.
  - 1) Refueler Trucks:
    - Collect two samples (Jet - 2 one gallon, Avgas - 1 five gallon and 1 one gallon) from the delivery nozzle.
  - 2) Hydrant Trucks and Carts:
    - Collect two (one gallon samples) from the delivery nozzle.
  - 3) Fuel Facility Storage Tanks:
    - Collect two (one gallon samples) from each storage tank that was on line servicing the fueling equipment.
  - 4) Aircraft involved in incident (if at all possible):
    - Collect a one gallon sample from each main tank.

## CAUTION:

**It is very important when you are drawing samples into the sample cans to flush out the can three times with product from the same source you want your final sample from. This is called 'Pickling' the can. If at all possible, minimize drawing your sample through brass or copper fittings, as this could change the outcome of the Thermo Stability Test.**

## NOTE

**If possible, when taking samples, have a third-party present to witness the sample(s) being taken and the sealing of the sample container(s). If witnessing by a third party is not possible, have another one of our employees witness the procedure. In either instance, you must get a signed and dated statement from the witness verifying the sample collection (how much and from where), and the sealing and labeling of sample container.**

- g) Perform a complete operational check of the suspect fuel vehicle to include surge and pressure controls, nozzle screen checks etc. FSII injectors should be evaluated as independent systems. FSII containers and storage procedures should be evaluated, as appropriate. Record and retain information.

# AIRCRAFT ACCIDENT/INCIDENT FUEL QUALITY CONTROL PROCEDURES

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- h)** Collect and secure the following documents -at a minimum be prepared to produce:

**1) Fuel Storage/ Hydrant System/ Fueling Equipment**

- Daily Inspections for the current and previous 3 months (Daily Inspection and DP record)
- Monthly Inspections for the current and previous 3 months
- Quarterly Inspections for the current and I previous year
- Annual Inspections for the current and previous year
- Similarity Data Sheets for the Filter Vessels
- Completed 7.2.1 OA, I each for the affected equipment, tank, etc.

**2) Fuel Storage**

- Previous 3 receipts into the affected storage tank (Receipt Form, Millipore Testing Sheet, COA, BOL, Release Documents)
- If appropriate, Fuel Farm Records for last time the refueling truck was loaded

**3) Fueling Equipment**

- Fuel Truck Inventory Record from the day the incident aircraft was fueled
- ASR (Fuel Ticket) from the incident aircraft

**4) Other possible documentation requests**

- Witness Statement from employee that fueled the aircraft
- Witness statement from any employee who had contact with the aircraft or crew prior to departure (i.e. Marshaller, Wingwalker, Push back Operator, etc.)
- Training records for the employee who fueled the incident aircraft
- List of the aircraft fueled by the affected equipment throughout the day the incident aircraft was fueled.
- Registration Slip from Incident Aircraft -Copy of signed document (as applicable)
- Point of Sale Receipt from Incident Aircraft (as applicable)

- i)** Record complete detailed notes on reported accident and investigation findings.  
Secure all related materials.
- j)** Obtain written statements from all employees involved.

- k)** Refer to SP # 108 and follow guidelines.

- l)** No information shall be released to external parties unless reviewed and approved by FSM Corporate. Utilize FSM 7.2.1 OB to record released materials.

**AIRCRAFT ACCIDENT/INCIDENT  
FUEL QUALITY CONTROL PROCEDURES**

**AFQC-600**

- n) The determination of when the fueling unit/system can be released for return to service will be made by the Fuel Quality Control Department**

**NOTE**

**If it is determined that the fuel samples will have to be sent to a laboratory for analysis, this process of shipping and handling must only be performed by your location's representative that has successfully completed an approved course in "Transporting Hazardous Materials and Dangerous Goods" in accordance with the provisions set forth in Title 49, Code of Federal Regulations. It is very important to keep accurate tracking of the chain of custody of the sample(s).**

• • •

**700.1 GENERAL**

The forms included in this section shall be utilized to facilitate presentation of the information required in the documentation for each part of the Fuel Quality Control Program.

Any deviations from these forms/formats must be submitted, reviewed and approved through the waiver process before use. Reference AFQC Manual, section 020.

It is necessary to utilize the format shown to achieve system standardization in presentation of the information required.

The legible signature or initials of the person performing the tasks or the person accepting responsibility for the performance of the tasks is required

- a) A record of each person's name or employee number, signature and initials must be maintained on file for review. (Signature Roster)
- b) Supporting documentation with the signature or initials of the person actually performing the tasks must be available if another person signed the form accepting responsibility for accomplishment of the tasks.
- c) When a person accepting responsibility that the tasks were completed and is transferring the information on to the official (final) records, they are to print the last name of the person who actually performed the task and beside it write in their (the transfer person's) initials.
- d) All entries on the Fuel Quality Control Records must be made in **Blue or Black ink only**.

Corrections which are required to be made to fuel quality control records or other paper documentation, which from time to time are subject to scrutiny, review by the airline, fuel supplier, airport or any other local, state or federal enforcement agency having jurisdiction in such matters, shall be accomplished in accordance with the following:

Mark through the entry to be replaced on the form in ink by drawing a single line through it, whereby the entry is still legible. Enter the correct date in ink either immediately

adjacent to the crossed-out entry or as close as formatting permits. Draw an arrow on the form to the point of entry of the new information if it is not obvious where such information is to be introduced.

The person entering the corrected date shall enter their initials next to the correction. It is recommended that at the bottom of the page the initials be, once again, written with the person's full name and title adjacent to it. **ALL ENTRIES MUST BE MADE LEGIBLY.**

**NOTE**

**Under no circumstances should any records or documentation which are subject to governmental or customer review (both periodic and casual) be altered using "white-out", as the validity of the document may immediately be called into question. Quality control, training and other safety-related records have, in the past, been utilized in both the defense and prosecution of claims involving our company's personnel and activities. Consequently, their validity, correctness and completeness must be above reproach at all times.**

**Otherwise, FSM invites allegations of manipulation, misrepresentation and falsification of its records. Our company is routinely required to make representations within its ground handling, into-plane fueling, and M&O contracts that records shall be properly and timely maintained to reflect accuracy at all times and that the airlines, airport and other agencies with regulatory oversight have the right to inspect such records at any time to verify our company's compliance.**

**Evidence of non-compliance is deemed to be an act of default under the terms of most agreements and subjects our company to cancellation of the subject contracts, as well as, constituting a potential default under the terms of its master lease and operating agreement with the airport. In the instance of litigation, it could easily result in the loss of the claim or case being defended; as such documentation is often both singular and pivotal. Please undertake such record keeping tasks with care and diligence at all times.**

**700.2 RECORD KEEPING**

- a) All required forms must be completed in their entirety.
- b) All required checks and tests must be performed and completed at the required frequency limitation
- c) The legible signature or initials of the person performing the task or the employee accepting responsibility for accomplishment of the tasks is required.
  - 1) If initials or employee identification numbers are used, a record (Signature roster) of each person's name (typed), signature and initials shall be maintained on file and available for review.
  - 2) Supporting documentation with the signature or initials of the person actually performing the tasks shall be maintained on file and available for review if another person has signed the form accepting responsibility for accomplishment of the tasks.
  - 3) Records shall indicate when fueling equipment and/or facilities are not in service and why.

**4) Retain records (including all supporting documentation) in local files as follows:**

**TYPE Checks:**

Daily, Weekly, Monthly, Quarterly, Semi-Annual,  
and Annual Checks

**RETENTION (Active File)**

24 Months

**Product Quality Related Documents:**

Test Certificates

24 Months

Product Quality and Inspection Records

24 Months

**Maintenance Related Documents:**

General Housekeeping and Maintenance Records

24 Months

Equipment Calibration Certificates (incl. meters)

Duration of Service

Tank and Filter Vessel Inspections

For the life of the facility

Hose Record

For the life of the hose

**NOTE**

**Once records have been removed from the active file/binder at the end of the prescribed retention period they shall be retained separately per the current FSM Record Retention Policy.**

**5) Upon completion of the checks, record results using the following ratings:**

- S = Indicates Satisfactory
- C = Indicates Comment. A 'C' is to be recorded whenever a discrepancy is noted or when fueling equipment or system (or parts of) are out of service. A description of the discrepancy or reason the vehicle is out of service is required in the Remarks section. The corrective action/return to service must be noted and dated.
- N/U = Indicates unit was in-service but Not Used (no meter roll for the entire day)
- *N/A*= Indicates Task Not Applicable

**6) Sump samples are to be rated:**

- **SOLIDS**
  - 1=CLEAN
  - 2=SLIGHT
  - 3=PARTICULATE
  - 4=DIRTY
- **WATER**
  - A=BRIGHT
  - B=HAZY
  - C=CLOUDY
  - D=WET
  - E=SURFACTANTS

**NOTE**

**The aforementioned ratings are the only rating markings that you are allowed to use, unless the forms indicate otherwise.**

# **DOCUMENTATION (RECORDS)**

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## 700.2.1 DOCUMENTATION

All required quality control documentation (records) must be maintained in a central location. Each fueling vehicle and fuel facility must have an individually tabbed binder set up containing the documentation required by the AFQC manual. Equivalent digital records are also acceptable. A single binder for all Fuel Stand checks is acceptable. Binders should have the following sections:

### **Section 1- Daily/ Weekly/ Monthly Inspections**

Daily and Monthly Fuel Facility Daily and Monthly Hydrant  
Weekly Hydrant  
Daily and Monthly Aircraft Fueling Equipment check sheets.  
Where applicable, this section shall include Refueler Tank Inspection Record

### **Section 2 - Quarterly/ Semi-Annual/ Annual Inspections**

Quarterly and Annual Fuel Facility  
Quarterly Hydrant Checks  
Quarterly and Annual Aircraft Fueling Equipment check sheets.  
Storage Tank Inspection Record  
Tank High Level Control Test Record  
Record of Annual Pressure Gauge Calibration  
DP Gauge Calibration Certificate

### **Section 3 – Fuel Filter Vessel Records**

### **Section 4 -**

Monthly Fuel Quality Test Record  
Fuel Filter Vessel Inspection and Cleaning Record  
Fueling Equipment Return to Service Records

### **Section 5 – Calibration Certificates**

Meter Proving/Calibration Certificates for each meter at/on the facility or equipment.

**Note: Failure to conduct and record annual meter proofing/calibration can result in equipment being removed from service.**

### **Section 6 - Hydrostatic Pressure Test Certificates**

Maintain a certificate for each hose at the facility,  
The hose certification must include:

Facility or Equipment Identification  
Date installed  
Location at / on the facility or equipment

**Note: Failure to have the appropriate certificates can result in equipment being removed from service. If certificates cannot be located then the hose must be changed.**

## **DOCUMENTATION (RECORDS)**

**AFQC-700**

### **Section 7 - Fuel Filter Qualification or Similarity Data Sheets.**

Filter Separators:

    EI 1581 Qualification Data Sheet

    EI 1582 Similarity Data Sheet

Monitors:

    EI 1583 Qualification Data Sheet Date installed

### **Section 8 – Miscellaneous Data and Information**

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**DOCUMENTATION (RECORDS)**

**AFQC-700**

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**800.1 POLICY**

- a. Periodic self-audits of fuel storage facilities, mobile refueling units and into plane fueling operations shall be performed semi-annually at all of our locations. In addition, the quality control, maintenance and personnel qualification records shall also be audited.
- b. Fuel Quality Control Self-Audits shall be performed in accordance with the procedures specified in this section.

**800.2 GENERAL**

- a. Semi-annual Fuel Quality Control Self-Audits shall be performed at all fueling locations including fuel facilities, hydrant systems and all fueling equipment. The Self-Audit should be a sampling to include all aspects of the operation.

**800.3 RESPONSIBILITIES**

- a. The Fuel Quality Control Department shall generate a self-audit checklist that will be available for access on the Fuel Quality Control Intranet site.
- b. The local management is responsible for assuring that the assigned fuel quality control self-audit is accomplished and that the required documentation is kept on file for review.
- c.
- d. Discrepancies require that the General Manager or Designee commit to a plan of corrective measures within 30 days of the Fuel Quality Control Self-Audit.

**800.4 FUEL QUALITY CONTROL SELF-AUDIT CHECKLIST**

- a. The Fuel Quality Control Self-Audit Checklist shall be used when performing a fueling self-audit. Each item shall be checked either "Y" (Yes) or "N" (No) or N/A (Not Applicable).
- b. All "N" (No) entries will require explanation of the deficiency and appropriate corrective action. Items affecting service or safety **must** be corrected immediately.
- c. The General Manager or Designee shall follow-up to assure that the corrective plan has been implemented and the deficiencies corrected.

**800.5 SELF-AUDIT DISPOSITION**

- a. Results of the Self-Audit and any necessary Corrective Actions will be stored.

**800.6 ACTION ITEM RESOLUTION AND FINAL CLOSURE**

- a After resolution of all discrepancies, the location's General Manager or their designee will review the Corrective Actions and close the audit items, as appropriate.

**800.7 FUEL QC SELF-AUDIT CHECKLIST FORMS**

- a The focus of the checklist will be routinely revised to address critical components of the Fuel Quality Control Program, industry updates and changes, and identified deficiency trends.

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**900.1 TRAINEE LEVEL:**

New Hire, Exempt and Non-Exempt Employees, Union and/or Non-Union, who are assigned duties of Fuel Quality Control.

**900.2 TIME REQUIRED:**

The following are estimates for the time required to complete Fuel Quality Control training. Times will vary based on a variety of factors including, but not limited to, assigned duties, employee experience level and/or necessary remediation.

- o **Computer Based Training:** 6 Hours (approx. total)
- o **On the Job:** As Required
- o **Recurrent:** Dictated by OJT Trainer assessment of employee competency and remedial training issued.

**900.3 MATERIALS**

- o Aviation Fuel Quality Control CBT (Modules 1-4)
- o On the Job Training (OJT) / Recurrent Training

**900.4 PROGRAM CONTENT****900.4.1 OJT CONTENT**

The OJT form is divided into 7 chapters (tabs) that encompass the major areas of our AFQC program. The chapters are listed as:

- |                        |                                 |
|------------------------|---------------------------------|
| • AFQC Core -H1        | • Aircraft Fueling Equipment-HS |
| • Daily Inspections-H2 | • Hydrant Systems -H6           |
| • Airport Storage -H3  | • Base Specifics.               |
| • Airport Receipt -H4  |                                 |

For completion, only the required chapters (tabs) for the applicable sections need be printed. And only the sections for the functions assigned and trained need be completed. The program is designed to be modular in this way to reduce paperwork required for training and certification. All employees performing AFQC functions must complete Section H 1 -AFQC Core and additionally the sections involving the duties they are assigned. Example -An employee performing daily inspections on Fuel trucks and Hydrant carts would need Chapters H1 in its entirety, and H2 for the applicable sections to fulfill the OJT documentation requirements.

**900.5 OBJECTIVES:**

QC Personnel will gain a complete understanding of the FSM Quality Control Program, the required policy, procedures and test/inspection methods to ensure delivery of contaminant free fuel.

The objective is as follows:

- a) Basic QC Equipment and Procedures**
  - Define Aviation Fuel Quality Control Roles and Responsibilities
  - Differentiate grades of fuel and their respective specifications
  - Identify and test for fuel contamination
  - Demonstrate required daily, weekly, monthly, quarterly and annual checks for fueling equipment
- b) Aircraft Fueling Equipment Requirements**
  - Recognize required equipment of fueling vehicles
  - Perform the required QC Inspections and Testing
  - Demonstrate required daily, weekly, monthly, quarterly and annual checks for aircraft fueling equipment
- c) Airport Fuel Storage Facility Requirements**
  - Recognize required equipment of a fuel storage facility
  - Perform the required QC Inspections and Testing on fuel receipts
  - Demonstrate required daily, weekly, monthly, quarterly and annual checks for a fuel storage facility
- d) Airport Hydrant System Requirements**
  - Recognize required equipment of an airport hydrant system
  - Perform the required QC Inspections and Testing
  - Demonstrate required daily, monthly, quarterly and annual checks for hydrant system

**900.6 BENEFITS:**

New and existing employees, and employees going through annual recurrent training, will understand FSM's Aviation Fuel Quality Control Program in order to meet governmental requirements and to ensure the QC inspections are performed with strict adherence for the continuing ability of our company to maintain the high standards necessary in the handling of aviation fuels. This section provides the

trainee with the knowledge to perform these inspections thoroughly and accurately, which is essential to ensure the safety of all individuals working with and/or around fuel. As always, our goal is to provide all employees with a safe and healthful work environment.

**900.7 EVALUATION:**

Trainees(s) will demonstrate a general knowledge of the Fuel QC Program through classroom and practical (hands-on) participation.

**INITIAL**

- Ensure that the Employee has completed the course and associated assessment. A score of 80 or above is required to pass. If an Employee fails to pass the assessment, remediation will be required and the Employee must be enrolled in the Remedial Assessment.
- Complete and file an On the Job Training Proficiency Guide (OJT) Proficiency Form for each employee. The form is tabbed for different AFQC disciplines. These tabs may be stacked to include some or all of the tabs depending on the duties assigned. Only sections within each tab pertaining to the Employee's assigned duties require completion.

**ANNUAL RECURRENT**

- On an annual basis (12-months), an AFQC OJT Trainer will assess the abilities of each employee performing QC duties.
- The AFQC OJT Trainer will determine the level of competency and assign remedial training, if necessary, to ensure requisite abilities.
- The AFQC OJT Trainer will complete and file an OJT FSM Proficiency Form for each employee. The form is tabbed for different AFQC disciplines. Only sections within each tab pertaining to the Employee's assigned duties require completion.

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## 1000.1 Manual Responsibilities

The responsibility for updating "regulatory" and industry requirements regarding fuel quality control lies with the Fuel Quality Control Department.

## 1000.2 Annual Review

Due to the changes driven by industry standards, the content of this manual will be evaluated on an annual basis to ensure data is current and consistent.

## 1000.3 Revision Process

If during the evaluation of this manual it is deemed that a revision is necessary, a revision group comprised of members of the management team will be activated to mutually address updates to the manual. This group will ensure affected parties are notified of potential changes and given an opportunity to address any specific business needs or requirements.

### NOTE

**The majority of the changes required in this manual are dictated by changes in industry standards or equipment manufacturer mandates. These changes may have significant impact on contractual and quality control/assurance responsibilities.**

The revision group is responsible for providing a summary of proposed changes and all new/changed manual content to the personnel deemed appropriate to approve the change. The group is responsible to account for all approvals prior to publication and retain this documentation per FSM record retention policies.

Approval by the following parties is necessary to publish any changes to the AFQCM. The personnel in these listed positions may delegate review of the proposed changes but not final approval. Either physical or electronic signature (via email) can be utilized to approve changes.

- 1) Director, Health Safety Environmental
- 2) SVP, Operations
- 3) SVP, Fuel Facilities

## 1000.4 Conflict Resolution

If prior to or during the revision process a conflict develops between the requirements contained in the AFQCM and another FSM manual; the requirements in this manual supersede in areas related to fuel quality control. It is the responsibility of the employee that discovers a conflict to report it their management team for resolution.

