Safe Practices for Aviation Operations

Effective
October 2008
Table of Contents

Introduction & Applicability (ALL EPW) ................................................................. 3
Summary of changes in Revision 2.0 ........................................................................ 4
Summary of changes in Revision 3.0 ........................................................................ 6
1.01 - Approved Flight Operating Companies (ALL EPW) ..................................... 7
1.02 - General Responsibilities - Flight Operations .................................................. 10
1.03 - Passenger Transportation ............................................................................ 11
1.04 - Material and Equipment Transportation ....................................................... 13
1.05 - Day, Night, and Instrument Operations ......................................................... 14
1.06 - Unauthorized Personnel, Baggage, and Cargo .............................................. 15
1.07 - Fueling of Helicopters - Operation and Dispensing Systems ..................... 16
1.08 - Landing Areas - Heliports and Helidecks ....................................................... 17
1.09 - Fire Protection Requirements ....................................................................... 20
1.10 - Offshore Heliports - Crane Restrictions ........................................................ 21
1.11 - Emergency Notification ................................................................................ 22
1.12 - Channels of Communication ......................................................................... 23
1.13 –Cold Weather Helicopter Operations ............................................................. 24

Appendix A - Instruction to Passengers
Appendix B - Survival Equipment
Appendix C - Material and Equipment Transportation
Appendix D - Hazardous Materials Transportation
Appendix E - Offshore Heliport Design Guide
Appendix F - Cancelled without replacement – with Rev. 2

Appendix G - Helicopter Procedures Aboard Marine Vessels
Appendix H - HSAC Recommended Procedures
Appendix I - Cancelled without replacement – with Rev. 2

Appendix J - Expanded Procedures for Flight Planning, Arrival, In Flight, and Departure
Appendix K - Fueling Procedures (Primary Contractor)
Appendix L - Helicopter Crew Qualifications
Appendix M - Aircraft Standards
Appendix N - Example Impact Weather Tool
Appendix O - Helicopter Type Float Certification Limits
Introduction & Applicability (ALL EPW)

1. This interim update is issued to bring the Safe Practices for Helicopter Operations Manual into general alignment with current practice. By the end of calendar year 2008, a complete rewrite of the manual will be completed and this interim revision will be cancelled. The new manual will be applicable for all EPW aviation operations.

2. This interim revision of OPS0081 is applicable to SEPCo Offshore operations except for Shell Brazil, unless otherwise noted. The wording “ALL EPW” will indicate where it applies to all EPW aviation operations.

3. EPW Joint Ventures under Shell Operational Control shall comply with the requirements herein.

4. EPW Joint Ventures Not Under Shell Operational Control shall be encouraged to comply with the requirements herein.

5. Projects conducted on behalf of EPW (such as those conducted by SIEP-EPT) shall comply with the requirements herein, and this shall be explicitly stated in any planning documents and company agreements as follows:
   - Projects being conducted on behalf of EPW that began planning prior to September 1, 2008, and have completed contracting shall consult with EPW Aviation regarding their aviation operations, including subcontracted operations.
   - Projects being conducted on behalf of EPW that began planning prior to September 1, 2008, and have not completed contracting prior to September 1, 2008, shall comply with the requirements herein for their aviation operations, including subcontracted operations.

6. Industry Association agreements that provide aviation assets in support of EPW or projects being conducted on behalf of EPW shall be encouraged to comply with the requirements herein.

7. EPW Aviation shall be consulted and included as a technical reviewer on any requests for variance or deviation from this standard.
Summary of changes in Revision 2.0

- **Entire document**: Updated references to “Corporate Aviation” to “EPW Aviation.”
- **Introduction**: Explained duration of interim guidance and outlined applicability of document across EPW.
- **1.01 - Approved Flight Operating Companies**: Updated requirements for aviation contractor approval and emergency use of non-approved aviation providers. Updated auditing requirements. Added process for high-risk airline evaluation.
- **1.02 - General Responsibilities - Flight Operations**: Specified that contractor requirements be contained in their respective contracts. Changed pilot-in-command discretion to a “no” vote from having full autonomy over flight operations.
- **1.03 - Passenger Transportation**: Specified that actual measured weights must be used for manifesting unless otherwise approved by EPW Aviation. Specified that pilots cannot be compelled to exceed weight and balance limits on flights. Deleted redundant instructions for passenger handling on helidecks and referenced governing material in Appendix J. Added current policy for flight of Non-Shell passengers and Shell family members on Shell charters.
- **1.04 - Material and Equipment Transportation**: Deleted redundant instructions and referenced governing material in Appendix C.
- **1.05 - Day, Night, and Instrument Operations**: Deleted entire outdated section superseded by contractual language. Defined normal day aviation operations as the time between the beginning of civil twilight in the morning and the end of civil twilight in the evening. Specified that non-emergency night aviation operations require the approval of EPW Aviation. Specified that emergency (life or limb) night aviation operations shall be governed by the EPW Medical Emergency Response process. Specified that requirements for flight operations are contained in the respective aviation provider contracts.
- **1.07 - Fueling of Helicopters - Operation and Dispensing Systems**: Specified that during rotors turning refueling the passenger door opposite the refueling port in use shall be open if passengers are in the aircraft. Changed fuel system inspection from a biennial requirement to an annual requirement.
- **1.08 - Landing Areas - Heliports and Helidecks**: Changed helideck and heliport inspections from a biennial requirement to an annual requirement. Removed the inadequate requirement for review of new obstacles within 50 feet of helideck center. New requirement is review of all obstacles as specified in Appendix E.
- **1.10 - Offshore Heliports - Crane Restrictions**: Deleted redundant requirements and referenced OPS0055 Lifting and Hoisting, the governing document for crane and lifting operations.

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Summary of changes in Revision 2.0, Continued

- **Appendix A - Instruction to Passengers**: Deleted outdated material and inserted approved passenger responsibilities and requirements for helicopter travel.
- **Appendix B - Survival Equipment**: Deleted all outdated material and specified that aircraft and aircrew emergency equipment be outlined in the respective aviation provider’s contract. Specified that passengers shall wear life vests and seat belts as outlined in the new material.
- **Appendix C - Material and Equipment Transportation**: Deleted outdated reference material and added new heliport procedures for carrying and manifesting all internal cargo. Updated external cargo lifting requirements.
- **Appendix D - Hazardous Materials Transportation**: Deleted the outdated Hazardous Materials (HAZMAT) tables.
- **Appendix E - Offshore Heliport Design Guide**: Deleted all outdated material and referenced the current guidance documents for helideck design. Specified the requirement that all topside changes and helideck marking shall be coordinated with EPW Aviation.
- **Appendix F - Helicopter Seismic Operations (Including Long Line External Lift)**: Cancelled without replacement, as EPW offshore RPD does not currently conduct these operations.
- **Appendix G - Helicopter Procedures Aboard Marine Vessels**: Updated references to “Corporate Aviation” to “EPW Aviation.”
- **Appendix H - HSAC Recommended Procedures**: Deleted outdated recommended procedures (RPs) and added link to Helicopter Safety Advisory Conference (HSAC) page with current RPs. Specified that the RPs are not governing documents.
- **Appendix I - Variance**: Cancelled without replacement as WD-143 is currently using the interim helideck management procedures in Appendix J and EI-158 is no longer an EPW facility.
- **Appendix J - SEPCo OPS0081 Expanded Procedures**: Deleted outdated helicopter control processes and added updated roles and responsibilities of aviation team. Updated Helicopter Landing Officer (HLO), flying pilot, and non-flying pilot responsibilities.
- **Appendix L - Helicopter Crew Qualifications**: Deleted outdated requirements and specified that these requirements are contained in the respective aviation providers’ contracts.
- **Appendix M - Aircraft Standards**: Deleted outdated requirements and specified that these requirements are contained in the respective aviation providers’ contracts.
- **Appendix N – Helicopter Signs Do’s & Don’ts and Pax waiting area sign (Spanish)**: Cancelled without replacement, as the specified signs are out-of-date. Will be replaced at a later date.
Summary of changes in Revision 3.0

- 1.13 Cold Weather Helicopter Operations: Added entire section.
- Appendix N Example Impact Weather Tool: Replaced previously deleted Appendix N.
- Appendix O Helicopter Type Float Certification Limits: New appendix.
1.01 - Approved Flight Operating Companies (ALL EPW)

1. Air transport of Shell employees, Shell core contractors, and Shell or Shell contractor material in support of EPW or during visits to EPW facilities or EPW contractor facilities shall be done using only aircraft operators audited by Shell Aircraft International (SAI) and approved for use by EPW Aviation. The operation shall be flown to requirements specified in a current contract established by EPW Aviation, using approved aircraft.

2. In emergency (life or limb) situations where approved operators are not available, unapproved operators may be used. Every effort shall be made to consult with EPW Aviation prior to such use. Use of unapproved aircraft or providers without consultation with EPW Aviation and any resulting HSE incidents are the sole responsibility of the approving manager. Unapproved use shall be reported to EPW Aviation as soon as possible.

3. Where emergency aviation requirements can be anticipated, proper prior planning shall be done to ensure that approved operators are available, rendering the use of unapproved operators unnecessary.

4. The implementation of EP2005-0110 Contractor HSE Management for contracts with air transport exposure shall be as follows (see EP2005-0110 for definitions of Modes 1, 2, and 3 contracting):

   a. These requirements apply to direct EPW contracting and contracting by projects or other Shell companies in support of EPW.

   b. A contract has air transport exposure if the contractor directly provides or subcontracts for aviation services in the performance of contractual requirements, as follows:

      - This includes transport of contractor or subcontractor personnel, material transport, data collection, emergency response, or other aviation use directly related to contract performance.

      - This includes contracts where the contractor directly provides or subcontracts for aviation facilities for EPW or contractor use, such as airports, heliports, or offshore helidecks.

      - This does not include the transport of contractor personnel or equipment that is not required under the contract, such as vessel visits by contractor management or limited pre-staging of equipment for subsequent non-Shell work.

Continued on next page
1.01 - Approved Flight Operating Companies (ALL EPW), Continued

c. Contracts with air transport exposure shall be categorized as High HSE Risk unless a specific risk analysis endorsed by EPW Aviation demonstrates that a lower risk category is appropriate. Setting a contract risk category lower than High HSE Risk for contracts with air transport exposure requires the concurrence of EPW Aviation.

d. An aviation audit is required during the Contractor Capability Assessment for Mode 1 or Mode 2 contracts that have air transport exposure. SAI shall be the specified auditing entity except for aviation facility audits, which may be conducted by EPW Aviation personnel or their designees.

e. All aviation service contracts shall be categorized as Mode 1, except for the exceptions noted in Mode 3 support below.

f. Non-aviation contracts that include air transport exposure shall have the contractor HSE Management System (HSE MS) audited by SAI to review the contractor’s processes for aviation contracting and management prior to categorizing the contract as Mode 2. If the non-aviation contractor’s HSE MS is found inadequate in the areas of aviation contracting and management, then the provision of aviation support in the contract shall be managed as Mode 1.

g. Mode 2 contractors shall allow SAI audit of their aviation subcontractors and EPW Aviation oversight of their aviation operation as a specific condition of their contract, or the provision of aviation service under the contract shall be managed as Mode 1.

h. Audit costs of contractors and their subcontractors shall be to the account of the using operating company or project.

i. Mode 3 contracts with air transport exposure are limited to the following services:

- Ticketed airline travel on fixed-wing Part 121 carriers. (See following section on airline risk ratings and mitigations.)

- Airfreight shipment on a common carrier that is not identifiable as a sole use EPW service. If a special flight is established to deliver Shell airfreight, then the service is identifiable as a sole use service and cannot be managed as a Mode 3 contract.

5. Flight operating companies who have received approval from EPW Aviation shall be subject to inspection on a continuing basis by EPW Aviation and SAI personnel or their designees to ensure that these standards are maintained.

Continued on next page
1.01 - Approved Flight Operating Companies (ALL EPW), Continued

6. EPW Aviation shall maintain a current list of approved aircraft and flight operating companies.

7. SAI maintains an Airline Risk Database and Traffic Light that can be accessed at the SAI website. If an EPW business unit determines that an airline that they have exposure to is listed in the Traffic Light as red (Below Regional Average) or black (Restricted Use), they shall contact EPW Aviation for assistance. The following steps shall be taken:
   
a. Assess exposure.

b. Evaluate the following alternatives:
   
   • Reduced travel
   • Alternate airline if available
   • Charter operations
   • Shell corporate fleet support
   • Road transport or rail (evaluate risk relative to airline travel)
   • Continued use of red or black rated airline

c. If the decision is to continue use of the red or black rated airline, EPW Aviation will attempt to have the airline audited by SAI. The purpose of the audit is to evaluate the accuracy of the initial rating and to propose changes to the airline if the original rating is determined to be accurate. This audit is subject to the following requirements:

   1. The audit will be funded by the EPW business unit.
   2. If the airline refuses audit or the audit finds significant issues, reconsider other alternates.

d. The final decision to continue use of a red or black rated carrier rests with the EPW business unit.

e. EPW Aviation will formally document final determination identifying the decision process.
1.02 - General Responsibilities - Flight Operations

1. Safety is the paramount objective with regard to the operation of aircraft; all personnel involved in flight operations shall understand this. Management and Operations shall exercise sufficient control such that dispatch/operational decisions will be made with due regard to safety.

2. Flight operations on behalf of EPW business units shall be governed by the contractual requirements developed by EPW Aviation and specified in the applicable contract. Where EPW requirements differ with local regulations, the stricter requirement shall take precedence.

3. The pilot in charge shall have complete authority to refuse a flight based on the unsuitability of weather and landing areas, condition of the aircraft, the manner of flight, and any other factor relating to flight safety.
1.03 - Passenger Transportation

a. The pilot shall ensure that all passengers have been briefed before takeoff. The helicopter passenger safety briefing shall include a discussion of the specific helicopter procedures and the use of emergency and survival equipment (see Appendix A - Instructions to Passengers).

b. Emergency and survival equipment will vary depending on the locale and nature of the flights. A discussion of such equipment is given in Appendix B - Survival Equipment. Familiarity with these items shall be ensured. The pilot shall have the responsibility to refuse transport to personnel who do not comply with the requirements outlined in Appendices A and B.

c. Since weight and its distribution is a critical factor for safe operation of the aircraft, all passengers, baggage, and equipment weights shall be actual measured weights unless the use of estimated weights has been specifically approved by EPW Aviation. Weighing scales shall be provided at all terminals and permanently manned locations to ensure accuracy of the aircraft load.

d. The pilot has the responsibility to ensure that the aircraft is loaded within weight and center of gravity (cg) limits as prescribed in the aircraft flight manuals.

e. Pilots shall not be compelled to carry loads that exceed weight and balance limits.

f. The pilot or dispatcher may require passenger or baggage removal to ensure safe flight operations.

g. Passenger manifests are required and shall contain passenger names, employers, and destinations and the accurate weight of all passengers, baggage, and cargo. Reference Appendix C.

h. Pilots, dispatchers, or other designated individuals are responsible for filling out passenger manifests completely and accurately for all flights originating onshore. For all flights originating offshore, the facility Logistics Clerk or designated individual shall ensure that an accurate manifest is provided to the pilot.

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1.03 - Passenger Transportation, Continued

i. Passenger Management On And About Heliport Facilities
   a. Refer to the instructions in Appendix J.
   b. In accordance with a decision by the Production Leadership Team on May 22, 2008, passenger transfers from turning S-76 helicopters are authorized with the following mitigations:
      • A cyclic stop shall be installed and used in the S-76 aircraft.
      • Passenger control in accordance with Appendix J is required, and the passengers shall be under the strict control of the helideck team and non-handling pilot throughout the passenger movement on and off the helideck.

j. Non-Shell Passengers and Shell Family Members Flying on EPW Charters
   a. Use of Shell Corporate Fleet assets are controlled under a separate process, and those flights are not governed by these restrictions. Consult with the Corporate Fleet Manager for Corporate Fleet usage.
   b. A Non-Shell Passenger is a person other than a Shell employee or contractor traveling on a Shell contracted charter. Employees and contractors of other companies traveling on a Shell charter under a formal aircraft sharing agreement are considered Shell Passengers.
   c. As a general rule, Non-Shell Passengers and Shell Family Members shall not fly on EPW charters (including offshore helicopter flights) unless there is a clear business reason for them to do so. This restriction does not apply to invited industry, press, and governmental representatives visiting EPW locations. This restriction does apply to the family and friends of the invited industry, press, and governmental representatives.
   d. If there is a business reason for these individuals to be flown by EPW, first consideration will be for the sponsoring EPW business unit to purchase a commercial airline ticket for their travel.
   e. If there is a compelling reason why the passenger cannot fly by commercial airline travel, then a joint authorization shall be obtained from the responsible EPW Asset Manager and the responsible Directorate VP or his/her delegate. The EPW Offshore RPD VP delegate is the SEPCo Operations Services Manager.
   f. Employees should note that Spousal/Companion Travel at Company Expense might result in personal tax liabilities. Refer to the current Travel Expense Policy.
1.04 - Material and Equipment Transportation

Refer to the instructions in Appendix C.
1.05 - Day, Night, and Instrument Operations

1. Normal aviation operations are conducted during the day, which is defined as the time between the beginning of civil twilight in the morning and the end of civil twilight in the evening.

2. Non-emergency night aviation operations require the approval of EPW Aviation.

3. Emergency (life or limb) night aviation operations shall be governed by the EPW Medical Emergency Response process.

4. Requirements for flight operations are contained in the respective aviation provider contracts and are based on the requirements in the Shell Standards and Guidelines for Aircraft Operations (SGAO), Part 1: Standards.
1.06 - Unauthorized Personnel, Baggage, and Cargo

1. The possession or transportation of illegal drugs, drug paraphernalia, or alcoholic beverages is absolutely prohibited.

2. A pilot or an aviation dispatcher has complete authority to refuse passage/boarding to any person whose action might be abnormal or irrational, as if under the influence of drugs, alcohol, etc.

3. Prescription drugs may be carried as part of the passengers’ baggage, but it is the passengers’ responsibility to have appropriate proof that such drugs have valid prescriptions.

4. Firearms, ammunition, or weapons are not to be carried on any flight, except by duly authorized employees, officials of government agencies, certain other employees specifically authorized by the operating company and by Shell, or when required as survival equipment.

5. Plastic bags may not be used as baggage and may not be used for handling clothing and/or cargo in the vicinity of aircraft.
1.07 - Fueling of Helicopters - Operation and Dispensing Systems

1. Operation
   
a. Fueling operations may be performed by the contracted helicopter company’s personnel. The local person in charge may designate personnel be trained and authorized to conduct fueling operations. In all cases, only trained and authorized persons shall be involved in fueling operations.

b. Reference the primary contractor’s refueling guide (See Appendix K).

c. A pilot shall man the controls at all times while the rotor is turning.

d. Helicopter Rapid Refueling (HRR), (engine(s)/rotors operating), shall be conducted only while using trained personnel and observing safe practices.

e. During HRR operations, passengers are authorized to remain on board the helicopter with approval of the Pilot-in-Command. The passengers are to be briefed on the evacuation route to a clear area. The helicopter’s passenger door on the side of the aircraft opposite to the refueling port in use is to remain open.

f. Passengers shall not be on board the helicopter during refueling operations when the engine(s) are shut down.

2. Fuel Dispensing Systems
   Fuel dispensing systems located on Shell facilities shall be designed to minimize the possibility of fuel contamination and to reduce the possibility of meltdown in the event of fire. All fueling systems owned, contracted, or routinely used by Shell will be inspected at least annually by EPW Aviation or their designated representative.

3. Fuel Dispensing Standards
   Procedures outlined in CAP-437 Offshore Helicopter Landing Areas, chapter 7; UK HSE Offshore Helideck Design Guidelines; API Bulletin No. 1500 Storage and Handling of Aviation Fuels at Airports; NFPA 407 Standard for Aircraft Fuel Servicing; and FAA Advisory Circular 150/5230 Aircraft Fuel Storage, Handling and Dispensing on Airports, and Primary Contractor procedures, should be used as guidelines in the design and operation of dispensing systems. Prior to their installation, EPW Aviation Department shall review fuel system designs.
1.08 - Landing Areas - Heliports and Helidecks

Often it will be EPW’s responsibility to design, furnish, and maintain suitable landing areas at each base of operation and each offshore platform to be serviced by helicopters. There are, however, many exceptions (e.g. construction barges, drilling rigs, seismic vessels, and the planned landing of helicopters on beaches, meadows, roadways, etc.) as part of remote activities or geophysical crew work.

1. EPW Installations

Shell engineers and operations personnel are routinely involved in design of offshore heliports and, occasionally, land-based helipads. Guidance is available from EPW Aviation and in Appendix E.

The following rules are to be followed:

a. New Offshore Heliports

   New heliports on Shell facilities located offshore shall be designed, built, and operated in accordance with Appendix E.

b. Existing Offshore Heliports/Helidecks

   EPW helidecks shall be inspected in calendar year 2008, and an engineering study will be completed for each location to bring the helideck facilities into compliance with the Shell Global Aviation standard.

   All offshore heliports shall be re-inspected by EPW Aviation or designated representatives with a 1-year maximum period between inspections.

   **Helicopters with wheels shall not land on wooden helidecks.**

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1.08 - Landing Areas - Heliports and Helidecks, Continued

c. Land Based and Joint Use Heliports

The Department responsible for design of such a landing area will have its design reviewed to ensure compliance with all appropriate regulations and approved by EPW Aviation. EPW Aviation shall be responsible for providing advice to the Department.

EPW Aviation will review any changes in a land-based heliport particularly with regard to new obstructions. The Department will be responsible for requesting such reviews. These heliports shall be re-inspected by EPW Aviation or designated representatives with a 1-year maximum period between inspections.

d. Heliports/Helidecks on Marine Vessels

EPW Aviation shall be included early in the design process of marine vessel heliports/helidecks. In this regard, it will be responsible for providing advice pertaining to flight operations and safety along with ensuring compliance with appropriate regulations.

2. Third Party Installations

On many occasions, Shell personnel will be transported to and from third party helicopter landing facilities. When this is a routine case (e.g. drilling rigs, construction barges, seismic vessels, and land bases), the Department and EPW Aviation or their designated representative shall establish, prior to initiating flight operations, whether the facility conforms to the existing safety/operations standards appropriate to the facility, as stated in this manual. In those cases where such facilities do not meet standards herein, the Department and EPW Aviation or their designated representative shall establish the appropriate restrictions to be placed during its period of use or the helideck shall not be used.

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1.08 - Landing Areas - Heliports and Helidecks, Continued

3. Operational Aspects

  a. Heliport Obstructions

     Before erecting any structure near or storing equipment on a helicopter landing facility, Operations shall review and coordinate the change with EPW Aviation or their designated representative. Any encroachment of approach/departure paths or helideck operational clearance, such as workover rigs, wireline apparatus, antennas, or other obstructions are to be reviewed and approved by EPW Aviation or their designated representative for compliance. If approved, aviation operations may be restricted.

  b. Maintenance

     During periods of maintenance, including sandblasting or painting work, appropriate restrictions shall be imposed. Operations shall consult with EPW Aviation to establish these restrictions.

  c. Assistance

     Helicopters shall carry their own tie-down devices. Shell personnel shall render all available assistance if required, should additional rope or other materials be required during an emergency.
1.09 - Fire Protection Requirements

1. A fire alarm or emergency shutdown (ESD) station shall be provided near the heliport stair landings and shall be conspicuously marked.

2. Effective hose stream coverage of the heliport landing decks and parking areas may be required in certain situations. The landing deck shall be of solid construction. Landing decks built of grating, expanded metal, or any such type of perforated material are not acceptable.

3. At least one 30 lb multi-purpose Class ABC dry chemical fire extinguisher shall be provided adjacent to all heliport and helipad access/egress routes. One 30 lb Class BC fire extinguisher shall be located near the helicopter re-fueling station unless the re-fueling equipment is co-located near the access/egress routes.

*A review of firefighting equipment requirements will be conducted in 2008. Therefore the equipment requirements listed here are subject to change.*

1. Designated personnel that are assigned to a heliport facility with a helideck or helipad shall be trained in the operation of the fire extinguishing equipment provided.

2. All fire protection equipment shall be protected against extremes of weather (freezing temperatures, snow, icing, and severe exposure to the sun) so as to be fully operational at all times.
1.10 - Offshore Heliports - Crane Restrictions

1. When helicopters are approaching, taking off, or with engine(s) operating on the heliport, the pilot must determine that cranes located within reach of the heliport are not a hazard before continuing approach, takeoff, or engine operation. Crane operating requirements and restrictions are contained in OPS0055 Lifting and Hoisting.

2. VHF (Air band) shall be available between the Helicopter Pilot and designated platform helicopter coordinator.
1.11 - Emergency Notification

The rules pertaining to aircraft accidents, incidents, overdue aircraft, and safety investigations are contained in the National Transportation Safety Board Regulations, Part 830. All aircrew members and the supervisory personnel of contract operators must be familiar with these rules.

1. Procedures

If an aircraft accident or incident occurs involving contract/charter aircraft and/or personnel, the pilot in command, if physically able, shall be responsible for the following:

3. Take every precaution to avoid further hazard or injury; remove the persons involved and obtain medical attention for them, if required.

4. Protect the wreckage from further damage and prevent the removal or disturbance of any cargo, wreckage, or mail from the accident site.

5. Protect the public from injury.

6. Report immediately to his/her company’s main office. The pilot in command or his/her company’s main office will ensure that all other interested parties are notified as soon as possible. This includes the Federal Aviation Administration (FAA), police or sheriff’s office having jurisdiction at the site, and the customer the aircraft was working for at the time of the accident (Shell Oil Company, subsidiary, or joint venture company).

2. News Media

a. Personnel working for the news media are charged with the responsibility of getting news stories. They are well aware of their rights and duties of editing. They should be told a news release will be given as soon as the facts are known. Their names and phone numbers should be taken. The news release should be by the contract/charter operator management personnel only.

b. No cause or speculation as to the cause of the accident should be given, as it is most likely not known at that time. No names are to be given out until cleared with the contractor’s management personnel.

3. Reporting Accidents and Incidents

All accidents and incidents involving aircraft operations, whether contracted or company-operated, shall be reported immediately to the Manager EPW Aviation.
1.12 - Channels of Communication

The intent of this manual is to provide a basic set of safety requirements for aircraft usage. It is intended to enhance communication between pilot and Party Supervisor or Foreman. However, there will be cases where disagreements or misunderstandings develop. In such cases, the following approach is advised:

1. If the Shell supervisor is displeased with the pilot’s performance, he/she shall make his/her feelings known through the normal chain of command. The helicopter transportation representative or the EPW Aviation Safety Representative will, after ascertaining the facts, pursue the matter with the helicopter operator. Shell supervisors will not bring pressure on the pilot to do anything that the pilot has already reviewed and chosen not to do.

2. If the pilot feels that pressures, implied or direct, are being brought to bear on him/her to do things not in accord with his/her professional judgment, it is his/her obligation to refuse and to report such through his/her own organization.
1.13 –Cold Weather Helicopter Operations

1. Introduction

a. **Purpose** - This section describes the mitigation of the following hazards related to operating helicopters in cold weather conditions:
   - Environmental exposure
   - Hypothermia

b. **Applicability** - This section applies to ALL:
   - Contracted Air Operators providing air transportation services to UA offshore locations in the Gulf of Mexico.
   - Shell employees and core contractors flying offshore on any helicopter,
   - Shell contractors and subcontractors flying offshore while working under UA contract.
   - Other passengers, including visitors, flying on UA contracted helicopters to UA offshore locations in the Gulf of Mexico:
   - Visitors are personnel who are not employees of Shell, Core Contractors, and Subcontractors, including, but not limited to, guests of Shell, government officers, statutory inspectors and auditors, dignitaries, and journalists.
   - This Standard is applicable during the cold weather season starting on the first Monday on or after 15 November and ends on the first Sunday on or after 15 April each year.

c. **Clarifications** - The Shell Group Requirements for Air Operations Part 1 Section 8 mandates that immersion suits shall be provided and worn by helicopter passengers:
   - at all times for overwater flight when the sea temperature is +10°C or below;
   - whenever the expected rescue time (for all survivors) exceeds the expected survival time for the ambient conditions

UA Logistics Aviation performed an assessment on the use of immersion suits. The results showed that the average offshore winter water temps in the GoM are 18° to 21° Celsius (~64° to 70° Fahrenheit), with a small band along the coast that occasionally gets down to 10°C (50°F) or below. The assessed risk of a fatality based on a 10°C post water landing hypothermia event is 1 event every 2000 years.

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1.13 –Cold Weather Helicopter Operations, Continued

UA in the GoM has the following mitigations in place to reduce exposure:
• contract Search and Rescue (SAR) assets in place to reduce rescue time
• aircraft satellite tracking and emergency locator beacons in place to reduce rescue time
• aircraft equipment fit that includes aircraft floats and external life rafts to reduce potential water entry after controlled aircraft landing on the water

Based on the situation in the GoM and the available mitigations that are in place, Shell Aircraft International agreed that UA take a permanent exception to the use of immersion suits in the GoM, however this does not prevent UA from further mitigation of the remaining risks.

Additional mitigations are:
• reduce or stop flying when conditions meet hazard criteria
• winter dress flight requirement
• introduction of personnel locator beacons (PLB)

Pending the outcome of the project that looks into the introduction of PLBs this Standard will depict the processes and procedures regarding the flight restrictions that are put in place when conditions meet hazard criteria and the winter dress requirements for flight crew and passengers of UA offshore helicopter flights.

d. Target Audience - Primary users of this Standard are Shell contracted air operators and Shell employees, contractors, and subcontractors who:
• travel to and from offshore locations in the Gulf of Mexico,
• supervise employees who travel to and from offshore locations in the Gulf of Mexico, or arrange transport of employees to and from offshore locations in the Gulf of Mexico.

e. Key Milestones

<table>
<thead>
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<th>Approval Date:</th>
<th>14 November 2012</th>
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1.13 –Cold Weather Helicopter Operations, Continued

f. Deleted documents - None

g. Auditing Requirements

- Compliance Audits - The compliance with this Standard shall be monitored during the applicable season and audited on an annual basis by the Local Aviation Contract Manager.
- The Local Aviation Contract Manager shall verify successful audit compliance and report verification to the UA Regional Aviation Manager annually.

h. Management of Change - The document management process is used to manage change related to:

- stakeholder approval,
- management approval, and
- communication/roll-out.

2. Identification of conditions that meet hazard criteria.

a. Introduction - As mentioned previously, the global standard requires immersion suit use if water temperature is less than +10°C/50°F. Additionally the US Coast Guard (USCG) recommends wet or dry suit use on water if the combined air/water temperature is 120°F or less. Table 1 shows an indicative summary of air and water temperatures around the GoM. Especially the lower air temperatures drive the USCG recommendation to wear adequate clothing.

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<tr>
<td>Avg low air temp Belle Chasse (°F)</td>
<td>42</td>
<td>45</td>
<td>51</td>
<td>58</td>
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<td>71</td>
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<td>73</td>
<td>70</td>
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<td>Avg water temp Eugene Island (°F)</td>
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<td>53</td>
<td>60</td>
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<td>76</td>
<td>83</td>
<td>85</td>
<td>85</td>
<td>82</td>
<td>74</td>
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<tr>
<td>Combined air/water temp (°F)</td>
<td>93</td>
<td>98</td>
<td>111</td>
<td>126</td>
<td>142</td>
<td>158</td>
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<tr>
<td>Avg low air temp Galveston (°F)</td>
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<td>57</td>
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<td>Avg water temp Galveston (°F)</td>
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<td>Combined air/water temp (°F)</td>
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<td>118</td>
<td>136</td>
<td>150</td>
<td>160</td>
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<td>165</td>
<td>158</td>
<td>143</td>
<td>126</td>
<td>110</td>
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</table>

Table 1: Average Air/Water Temperatures around GoM – Data from 2008 study

Continued on next page
1.13 –Cold Weather Helicopter Operations, Continued

b. Trigger Identification - The two hazard criteria thresholds to trigger actions are identified as follows:
   - The local surface water temperature below 50°F.
   - The local combined surface water temperature and air temperature at 2 meters above sea level below 120°F.

A monitoring and mapping tool for these thresholds has been developed to identify if local conditions meet the identified hazard criteria. This tool will provide a message containing the maps once a threshold has been crossed. Examples of these maps can be found in Appendix N.

3. Controls

   a. Identify Controls - The following controls for the specific hazards are put in place to manage each hazard to As Low As Reasonably Practicable (ALARP). Water temp <50°F (10°C).

   - If possible, the air operator will plan route around cold water areas and continue flying from/to affected heliport-offshore location pair(s) (Use maps from ImpactWeather email).

   - If flights over water <50°F cannot be avoided:

     o Suspend flights from/to affected heliport-offshore location pair(s).
     o Convene Review team (VP UA DW HSSE or representative, PLT representative, Wells representative and Aviation Logistics representative) to identify essential flights.
       - if sea state does not exceed aircraft floats certification limits (Appendix O shows the applicable helicopter float certification limitations.), and combined air/water temp >100°F:
         - Conduct identified essential flights
         - SAR assets will be put on high alert during these times for quicker response
       - Contracted air operators conduct stringent flight following of Shell aircraft.
       - if sea state does not exceed aircraft floats certification limits (Appendix O shows the applicable helicopter float certification limitations.), and combined air/water temp <100°F:
         - Postpone identified essential flights until combined air/water temp >100°F.
       - If sea state exceeds aircraft float certification limits (Appendix O shows the applicable helicopter float certification limitations.)
         - Cease all flight operations from/to affected heliport-offshore location pair(s).

   - Water temp ≥50°F (10°C).

   - No specific controls are in place for this temperature range.
1.13 –Cold Weather Helicopter Operations,  Continued

- Combined Air/Water temperature $<120^\circ$F.
  - Passengers (Pax) and flight crew wear an appropriate outer garment during flights from/to affected heliport-offshore location pair(s).
    - Pax not wearing an appropriate outer garment will be denied carriage.
- Icing conditions.
  - No flight operations.

b. Preventative Measures - During the cold weather season flight crew and passengers including visitors, flying on UA contracted helicopters to UA offshore locations shall carry with them an appropriate outer garment that shall be worn on the flight when the combined Air/Water temperature is below $120^\circ$F along the flight route from/to affected heliport-offshore location pair(s). The information whether an appropriate outer garment shall be worn will be displayed at the heliports and will be communicated to the passengers departing offshore locations during check-in for their flight.
  - Helicopter Landing Officers are responsible for the compliance with the outer garment requirement and shall deny carriage for passengers that do not wear an appropriate outer garment when this requirement has been put in place for the flight.
  - An appropriate outer garment is defined as an additional layer of clothing with long sleeves, like a jacket or coat, which the passenger would wear for protection against cold and wet conditions (the passenger should ask and be able to positively answer the question “Would I wear this outer garment when hunting or boating in the winter?”)
  - A knit cap or other thermal headgear is allowed/recommended, but may only be brought onto an aircraft if completely secured within the pocket of a person’s outer garment. Baseball caps and other type of hats are prohibited. Heliport personnel and logistics coordinators are expected to strictly enforce these rules.
  - In addition to the personal protection from the elements in case of an on water landing with life raft entry by wearing an appropriate outer garment, Search and Rescue services shall be on high alert in order to reduce rescue time when the combine Air/Water temp drops below $120^\circ$F. Repositioning of SAR assets might be needed to optimize response times

Continued on next page
1.13 –Cold Weather Helicopter Operations, Continued

c. **Decision Making** - Shell contracted air operators will receive the actual weather maps once a relevant threshold has been crossed and will attempt to plan a flight route around cold water areas (<50°F) in order to be able to continue flying from/to affected heliport-offshore location pair(s). It is the air operator flight crew responsibility to notify Shell UA Aviation Logistics in the event flight planning cannot meet these criteria. In this case Shell UA Aviation Logistics will convene a Review team.

When flights over water <50°F cannot be avoided a Review team will decide if essential flights need to be conducted in this situation, while the remaining non-essential flights are suspended. Essential flights will only be authorized after approval from the Review team. Additionally the actual sea state shall not exceed aircraft floats certification limits along the flight route, and combined air/water temp along the route exceed 100°F. This may result in delay of the essential flights to a warmer part of the day.

4. Delivery

a. **Document Delivery** - Once approved the document will be made available as outlined in the following table to individuals in the identified groups that require access to the document.

<table>
<thead>
<tr>
<th>Group</th>
<th>Delivery Method</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA employees, SIEP, and SOPUS leadership, and UA contractors with access to LiveLink</td>
<td>Document will be made available on LiveLink and communicated via email and communications at safety meetings.</td>
<td>UA Regional Aviation Manager</td>
</tr>
<tr>
<td>UA contractors without access to LiveLink</td>
<td>Document will be available in the Standards / Procedures / Guidelines section on the homepage of the <a href="#">Upstream Americas Contractor Website</a>.</td>
<td>UA HSE Contractor Safety Management Process Team</td>
</tr>
<tr>
<td>Sub-Contractors</td>
<td>An uncontrolled hardcopy of the document may be provided to all contractors working for UA contractors.</td>
<td>UA Contractors</td>
</tr>
</tbody>
</table>
Appendix A – Instructions to Passengers

1. PRIOR TO ARRIVAL AT THE HELIPORT
   a. All passengers must have a valid government picture ID. Acceptable IDs include:
      - U.S. passport
      - U.S. passport card
      - Department of Homeland Security (DHS) “Trusted Traveler” cards (NEXUS, SENTRI, FAST)
      - U.S. Military ID (active duty or retired military and their dependents, and Department of Defense [DOD] civilians)
      - Permanent Resident Card
      - Border Crossing Card
      - DHS-designated enhanced driver’s license
      - Driver’s licenses or other state photo identity cards issued by Department of Motor Vehicles (or equivalent)
      - A Native American Tribal Photo ID
      - An airline or airport-issued ID (if issued under a Transportation Security Agency [TSA] approved security plan)
      - A foreign government-issued passport (Non-U.S./Canadian citizens having U.S. issued documents such as Permanent Resident Cards may carry these instead of passports.)
      - Canadian provincial driver’s license or Indian and Northern Affairs Canada (INAC) card
      - Transportation Worker Identification Credential (TWIC)

   An expired or out-of-date ID will not be accepted.

   b. For unescorted travel offshore, all passengers must have a valid TWIC card (see OPS0189 TWIC for more information).

   c. Passengers that might not be fit to fly shall notify the Logistic Coordinator as soon as possible. Medical protocol applicability will be assessed with the helicopter operator, and if the passenger is deemed unfit, other transportation will be arranged.

Continued on next page
Appendix A – Instructions to Passengers, Continued

d. Refer to Shell’s list of prohibited items prior to packing your baggage (available on heliport notification boards and in Annex 1).

e. All baggage must be suitable for aircraft transport with minimal wear and tear and no exposed contents. Overweight or excessively large baggage may be bumped from a flight.

   • Zippered duffle bags are the preferred baggage.
   • Plastic bags (e.g. trash bags, shopping bags) may not be used as baggage, but may be used to line baggage to protect contents from moisture, as long as no plastic bag is exposed.
   • Purses will not be allowed in the passenger cabin of the aircraft and should be suitable for use as baggage or packed within other baggage.

f. Computers and other fragile devices shall be packed in an impact resistant case designed to protect them for air transport, or suitably protected in other baggage. Helicopter operator may refuse to carry improperly-packaged fragile items. Identify computers and fragile items to the heliport check-in personnel. Ensure that your bag is marked with a computer tag.

g. Lithium ion batteries cannot be transported unless installed in their intended device. Spares of other battery types may be transported in original packaging (preferred) or packed so that battery terminals are isolated from contact with metal and batteries are protected from pressure and puncture. Battery-powered devices must be packaged to prevent activation while packed (e.g. in protective cases with trigger locks engaged or on/off/safety switches taped in the “off” position).

h. Declare all hazardous materials to the dispatchers at check-in. It is the passengers’ responsibility to comply with the procedures in Appendix D.

i. Prescription medicine must be packed in its original packaging material with the original label that includes the passenger’s name.

j. All loose items shall be packed in your baggage. You will be asked to store cell phones and small electronic devices in your baggage at the heliport (see paragraph 3.c.).

k. Pack light and provide accurate baggage/cargo weight to your Shell contact to ensure that proper reservations and weight allowances are made for your flight. If baggage is excessively heavy (generally, over 40 lbs) or large, you must obtain approval for from the Logistics Coordinator at your destination before baggage is brought to the heliport.

Continued on next page
Appendix A – Instructions to Passengers, Continued

1. All passengers must wear work clothing in accordance with SEPCo HSE0078 Personal Protective Equipment (PPE).
   - Long pants and sleeved shirts must be worn, at a minimum.
   - All headwear shall be stowed in passenger baggage.
   - Passengers’ footwear must fully enclose the toes and the heel of the foot.
   - In the cold weather season, ask your destination’s Logistics Coordinator or the heliport check-in clerk about additional clothing requirements before departure for the airport.

2. ARRIVAL AT HELIPORT
   a. Passengers must check in for their flight as directed by their facility’s logistics clerk. Report time is generally 60 minutes before flight departure. Passengers arriving later than the required time may not be guaranteed a seat on the aircraft.
      - Late arrivers must notify their Shell supervisor or contact the Shell dispatcher no later than 60 minutes before scheduled flight departure.
      - Aircraft will only be held with the approval of the passenger’s PIC, the concurrence of all PICs on the flight route, and, if required, all destinations scheduled for that aircraft for the remainder of the day. Notification of late arrival must be made by telephone with sufficient time allowed for coordination with all affected destinations. The PIC is responsible for acquiring the previously mentioned approvals before an overall approval for delay will be granted.
   b. Passengers must check in at the check-in counter upon arrival at the heliport. During check-in, passengers shall declare all hazardous material cargo.
   c. Passenger must conform to all instructions at airports.
   d. Passengers showing signs of impairment or aggression toward others will not be allowed to fly, and will be reported to Shell HR and the required authorities.

Continued on next page
Appendix A – Instructions to Passengers, Continued

3. SECURITY AND BOARDING
   a. Once the flight is called, passengers shall proceed to the designated security checkpoint.
   b. Passengers must comply with current Marine Security (MARSEC) and security-screening requirements, including baggage screening and pat-down search. Keep your ID on your person, as it will be required for identification purposes at the security portal. Remember to place all metal and other loose items in the appropriate basket before entering the screening portal.
   c. Electronic devices (cell phones, MP3 players, etc.) shall be turned off packed in baggage.
   d. Purses shall not be carried into the passenger cabin. Ensure that valuables (watch, wallet, etc.) are securely carried on your person.
   e. Headwear and other loose items not stowed in passenger baggage will be collected and stowed in a transport bag.
   f. Jackets/sweaters shall be worn or placed in baggage; they may not be carried on the flight line.
   g. Passengers are not permitted on the flight line unless escorted by a Helicopter Landing Officer (HLO).
   h. Life vests shall be on and securely fastened before entering the flight line.
   i. Reading materials carried in the passenger cabin must be bound and compact in size (e.g. books, magazines, day planners, note pads). Newspapers are not allowed.
   j. Cameras must be secured in baggage unless prior approval for use in the cabin is obtained from both PHI and Shell (see Appendix O for approval process).
   k. Hearing protection is provided and shall be worn before entering the flight line.

Continued on next page
Appendix A – Instructions to Passengers, Continued

4. PASSENGERS ON BOARD/IN-FLIGHT
   a. Passengers shall be silent during departure/approach briefings and during pilot commands or briefings.
   b. Passengers shall keep their seatbelts and lifejackets on for the duration of the flight and until advised by the pilot, flight attendant, or HLO that they may be removed.
   c. Do not lean against or try to open emergency exits or any windows as these are designed to open with little force.
   d. It is against federal law to tamper with aircraft safety devices.
   e. It is against federal law to tamper with aircraft first-aid equipment.
   f. Passenger(s) should relay safety concerns to pilot(s) at any time. However, non-safety related communications with the pilot during critical flight operations (take off and landing) are prohibited.
   g. Passengers shall not open the helicopter door unless authorized by the pilot, flight attendant, or HLO.
   h. Disruptive behavior or interference with the flight is prohibited and might be classified as a Federal offence. Incidents will be investigated, and could result in the passenger being placed on the No Fly List.

5. ARRIVAL AT OFFSHORE FACILITY
   a. Passengers shall remain seated with seatbelts securely fastened until told to disembark the aircraft by the pilot or HLO.
   b. Passengers shall follow all HLO directions on the helideck.
   c. NEVER WALK TOWARD THE TAIL OR 12 O’CLOCK POSITION OF THE AIRCRAFT
   d. Be advised of the wind and deck conditions, as the deck might be slippery.
   e. Do not open baggage on the helideck
   f. If an item is blown away by the wind, do not chase it.
   g. Wear life vest fully fastened until clear of the helideck; only remove life vest when directed by the HLO.

Continued on next page
Appendix A – Instructions to Passengers, Continued

6. PASSENGER FLYING IN FROM OFFSHORE
   a. Identification credentials (see section 1) are required to board the helicopter.
   b. Only properly manifested passengers and baggage will be allowed on flights.
   c. Comply with all requirements from the outbound passenger instructions.
   d. Passengers shall have life vests securely fastened prior to entering the helideck.
   e. Passengers shall not enter the helideck without proper supervision by either the
      HLO/HDA or the pilot.
   f. NEVER WALK TOWARD THE TAIL OR 12 O’CLOCK POSITION OF THE
      AIRCRAFT.
   g. Be advised of the wind and deck conditions, as the deck might be slippery.
   h. Baggage will be brought to the helicopter by the HLO/HDA.
   i. If an item is blown away by the wind, do not chase it.
   j. Passengers shall follow all HLO/HDA or pilot directions while on the helideck. Once
      inside, securely fasten restraint harness and follow all previously stated procedures for in-
      flight conduct.

7. ARRIVAL AT ONSHORE FACILITY
   a. Passengers shall remain seated and seatbelts securely fastened until told to disembark the
      aircraft by the pilot or HLO.
   b. Passengers shall wear life vests fully fastened off of the flight line unless otherwise
      directed by the HLO.
   c. Passengers shall follow all HLO directions on the flight line.
   d. NEVER WALK TOWARD THE TAIL OR 12 O’CLOCK POSITION OF THE
      AIRCRAFT.
   e. Passenger bags will be moved by flight line personnel into the heliport for pickup. DO
      NOT attempt to retrieve your bags on the flight line.
   f. For Quality Assurance purposes, passenger/baggage weight checks might occur.
      Compliance is mandatory. Slight delays may occur, and we apologize for any
      inconvenience.
Appendix A - Instructions to Passengers – Annex 1

Shell UA Aviation Operations

The following items are either prohibited from being flown or require special handling. Additional DOT and TSA regulations may apply. If in doubt, declare item at check-in.

Prohibited Items
- Contraband: illegal drugs, drug paraphernalia, otherwise legal but illicitly used substances, prescriptions or over-the-counter drugs not being used for their intended or authorized purpose, and alcoholic beverages.
- Explosives or fireworks.
- Weapons - including Firearms/Ammunition, Tear Gas, CS Gas, pepper spray, tasers, clubs, martial arts items, cutting or chopping tools including knives with a blade longer than 3" (except legitimate tools, see below).
- Cigarette lighters.
- Lithium-Ion batteries (when that are not installed in their intended device)
- Wet Cell Batteries.
- Other items that could be deemed inappropriate for travel offshore. If in doubt, declare the item at check-in.

Items that must be declared at check-in
Must be processed through dispatcher
- Dangerous goods (Hazmat paperwork and packaging required, quantities may be limited by DOT regulation).
  - Flammable gases, liquids and solids
  - Corrosives and flammable corrosives
  - Poisons and toxic materials
  - Oxidizers and organic peroxides
  - Compressed gas
  - Dry ice
  - Magnetic materials
  - Radioactive material
- Cutting and chopping tools including knives that are tools of trade (i.e. chef’s and divers’ knives, box cutters, etc.).
- Fragile items and computers.
- Other items that could be deemed inappropriate for travel to Shell sights. If in doubt, declare the item at check-in.
Appendix B - Survival Equipment

Interim Guidance

Required helicopter emergency equipment and aircrew survival equipment is specified in the respective helicopter provider contracts and are based on the requirements in the Shell Standards and Guidelines for Aircraft Operations (SGAO), Part 1: Standards (access the documents via this link).

Personal survival equipment requirements are:

- All helicopter passengers shall wear a Shell approved life preserver when flying over water. The passenger shall don the life vest when instructed by the heliport attendant, offshore Helicopter Landing Officer (HLO), or pilot, and will wear it completely buckled and snapped until instructed to remove it at the destination. If directed, the passenger will wear the life vest off the helideck or heliport flight line.

- All aircraft passengers shall wear their seat belts and shoulder harnesses from the time they enter the aircraft until directed to unbuckle by the heliport attendant, offshore HLO, or pilot upon arrival at destination.
Appendix C - Material and Equipment Transportation

1. Internal Loads
   a. The pilot shall always be advised before loading anything on or unloading anything from a helicopter.
   b. Use extreme caution when loading or unloading materials from a helicopter while the rotor blades are turning. Hold pipe, poles, and other long items horizontally so they do not strike rotor blades. Helicopter rotors must be stopped when loading items more than 4 ft long unless qualified personnel are used and a procedure has previously been discussed with the pilot.
   c. The Helicopter Landing Officer (HLO) or pilot is responsible for the loading, positioning, and securing of material and equipment inside the helicopter. Passengers should assist as requested.
   d. Weight of material and equipment to be transported is a critical factor. Scales (which are annually certified) shall be provided at all terminals and permanently manned facilities.
   e. No effort shall be made to influence the pilot to carry any freight, regardless of weight, above what the pilot considers to be a safe gross weight load.

2. External and Sling Loads

   Interim Guidance

   External and sling loads are not authorized during normal operations in the Gulf of Mexico. They shall be coordinated during the planning process with EPW Aviation.
Appendix D - Hazardous Materials Transportation

1. Pilot Advisement and Authority

The pilot shall be advised, prior to flight, of any hazardous materials to be transported on the aircraft. Hazardous Materials are referenced in the International Air Transportation Association (IATA) Dangerous Goods Regulations. The Federal Government Department of Transportation (DOT) enforces regulations concerning the transportation of hazardous materials on all aircraft. These regulations include the requirement for shipping papers, packaging, marking, and labeling. A copy of this regulation is available at the SEPCo heliports. The shipper (SEPCo/contractor) is responsible for compliance with IATA regulations for shipping documents/placards for packages/cargo. The pilot(s) have final authority/approval over shipping of hazardous cargo.

2. Hazardous Materials Baggage Regulations

Shell employees, especially those having occasion to travel by air, should be aware that the DOT regulates the carriage of certain items in packages or luggage aboard aircraft. These regulations are designed to protect passengers, the crew, and the general public from potential dangers associated with those items, which for transportation purposes are referred to as “hazardous materials.” The regulations apply whether these materials are transported on commercial or company-operated aircraft, regardless of whether the packages or luggage are carried on board or checked. There are some hazardous materials that are exempt from the DOT regulations for transportation in luggage. However, these exemptions are limited to medicinal and toilet articles in specified maximum quantities and small quantities of certain radioactive materials.

3. Penalties

Individuals who violate the DOT regulations expose both themselves and the company to the possibility of severe penalties. Civil as well as criminal actions are possible with fines for each ranging to $10,000 and $25,000, respectively, and a possible prison term of up to 5 years on a criminal action. These penalties are applicable for violations of regulations for surface modes as well as for air transportation.
Appendix D - Hazardous Materials Transportation, Continued

4. Shipping Papers

It will be noted that shipping papers are required for all hazardous materials transported. A shipping paper is a document prepared by the person who offers a hazardous material for transportation and is maintained in the possession of or immediately available to the pilot. It is intended to provide emergency information needed for the proper control of transportation accidents involving hazardous materials to police and fire departments. The shipping paper contains the basic description of the hazardous material transported. This includes the proper shipping name, the hazard class of the material, the 4-digit identification number preceded by “UN” or “NA,” the total weight or volume, and a description of the packaging used, such as boxes, drums, etc. The required shipping description on a shipping paper used for transportation purposes must be legible and printed (manually or mechanically) in English.

5. Marking

Each person (shipper) who offers a package containing a hazardous material for transportation shall mark the package with the proper shipping name and the “UN” or “NA” identification number. The marking must be described in English and printed on or affixed to the surface of a package on a label, tag, or sign. Liquid hazardous materials shall be packed with closures upward and legibly marked “THIS SIDE UP” or “THIS END UP” to indicate the upward end of the inside packaging. Portable tanks must be marked in lettering 2 inches or more in height. Portable tank markings must be legibly displayed on two opposing sides.

Continued on next page
Appendix D - Hazardous Materials Transportation, Continued

6. Labeling

Each person (shipper) who offers a package, overpack, or freight container containing a hazardous material for transportation shall label it as required. Labels are not required on a package containing a combustible liquid. Each required label must be printed on or affixed to the surface of the package near the marked proper shipping name. Labels must meet specific design standards as to size, symbols, print, and color. These specifications are enumerated in 49 CFR, Section 172 of the DOT Regulations.

7. Contact your Supervisor or HSE Representative for additional requirements.

Interim Guidance

The outdated hazardous material tables have been deleted from this document. Consult the current DOT regulations for guidance.
Appendix E - Offshore Heliport Design Guide

Interim Guidance:

Heliport design requirements for new helidecks shall be coordinated with EPW Aviation during the initial design stage. Design guidance shall be based on the CAP-437 Offshore Helicopter Landing Areas - Guidance on Standards and UK HSE Offshore Helideck Design Guide, modified as necessary to meet local regulatory requirements.

Marking and repainting of existing helidecks shall be coordinated with EPW Aviation. Marking schemes shall be based on the current version of the HSAC helideck marking recommended procedure. Helideck marking designs require EPW Aviation approval.

EPW Aviation shall review topside changes on existing offshore facilities for impingement on helicopter approach and departure paths and clearance zones around the helideck.

Obstacles to aviation on offshore facilities shall be marked and lighted using guidance from the current FAA Advisory Circular for obstruction marking. Assistance with interpreting this document may be obtained from EPW Aviation.
Appendix G - Helicopter Procedures Aboard Marine Vessels

Specific procedures for helicopter operations aboard marine vessels will be handled on a case-by-case basis by contacting EPW Aviation at the beginning of the planning process.
Appendix H - HSAC Recommended Procedures

The Helicopter Safety Advisory Conference (HSAC) is an industry body representing many of the Gulf of Mexico helicopter providers and offshore operators, including Shell. The HSAC Recommended Procedures (RPs) are not governing for EPW operations, but may be accessed at this [LINK](#) for reference.
Appendix J - Expanded Procedures for Flight Planning, Arrival, In Flight, and Departure

Contents
A. Definitions
B. General Roles and Responsibilities
C. Arrival
D. Departure
E. Hand and Arm Signals
F. In Flight
A. Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling Pilot</td>
<td>Pilot remaining at the controls of the helicopter during ground operations on the helideck. May be either the Aircraft PIC or second-in-command (SIC).</td>
</tr>
<tr>
<td>Helideck Assistant (HDA)</td>
<td>Person designated by the facility OIM/PIC to act as a helideck team member under the supervision of the HLO.</td>
</tr>
<tr>
<td>Helideck Team</td>
<td>The group of people who conduct helideck operations on an offshore facility.</td>
</tr>
<tr>
<td>Offshore Helicopter Landing Officer (HLO)</td>
<td>Person designated by the facility OIM/PIC to lead the helideck team. The HLO is responsible for and is in charge of activities on the helideck.</td>
</tr>
<tr>
<td>Non-handling Pilot</td>
<td>Pilot who exits the helicopter on the helideck and acts as a member of the helideck team in cooperation with the HLO. May be the Aircraft PIC or SIC.</td>
</tr>
<tr>
<td>Pilot in Command (Aircraft PIC)</td>
<td>The Aircraft PIC is responsible for and in charge of all aircraft specific functions.</td>
</tr>
</tbody>
</table>
### B. General Roles and Responsibilities

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
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</thead>
</table>
| **Logistics Aviation Planner** | • Producing and ensuring compliance with the daily flight schedule.  
• Fielding and requesting special flight requests and working through the heliport dispatchers to ensure the flight schedule is executed. |
| **Heliport Dispatcher**     | • Work with the offshore logistics clerks to populate and ensure each flight is maximized.  
• Coordinate special flights with the Logistics Aviation Planner.  
• Coordinate aircrews to maximize availability and efficiency.  
• Conduct a morning and afternoon safety and operation meeting with all Shell staff.  
• Ensure all passengers are checked-in and weighed and baggage checked before entering the designated briefing area.  
• Ensure all passengers view the safety brief each time they fly offshore.  
• Ensure passengers have received Helicopter Underwater Egress Training (HUET) within 3 years of their flight or that a variance is requested and approved by the facility management.  
• Ensure passengers are made aware of the timing and status of their departure flights. |
| **OIM/PIC**                 | Appoint a person to ensure:  
• All passengers are accurately weighed and manifested.  
• All passengers view safety “going ashore” video (implementation TBA). |
| **Offshore HLO**            | Conduct a brief with the individual manning the base radio before the first helicopter flight to include:  
• Number of flights for the day and scheduled arrival time.  
• Number of passengers departing and arriving on each flight. |
### C. Arrival

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot and Radio Operator</td>
<td>1</td>
<td>Once initial radio contact is made with the pilots, two-way communication shall be continuously maintained.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>During the initial <strong>20-minute call</strong>, the following information shall be relayed:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acknowledge aircraft call sign.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Number of passengers arriving/departing on the flight.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Weather (if weather equipment is available).</td>
</tr>
<tr>
<td>Radio Operator (if not the HLO)</td>
<td>3</td>
<td>Relay to the HLO that an aircraft is inbound and positively hand-off radio control to the HLO prior to the 5-minute call.</td>
</tr>
<tr>
<td>Pilot</td>
<td>4</td>
<td>Monitor the facility radio frequency once initial radio communication has been established.</td>
</tr>
<tr>
<td>HLO</td>
<td>5</td>
<td>During the <strong>5-minute call</strong>:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Advise approaching aircraft to either continue or circle.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>CAUTION: DO NOT give green deck at 5-minute call.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide any informational updates not relayed during the 20-minute call.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sample radio call.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pilot: “MC 807, Shell 4 is five minutes out.  MC 807”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HLO: “Shell 4, MC 807, copy five minutes out continue, MC 807”</td>
</tr>
</tbody>
</table>
### C. Arrival, Cont.

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landing Team</td>
<td>6</td>
<td>After the 5-minute call, reposition to the Helideck if not already in position and follow these procedures:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Inspect helideck to ensure it is ready for helicopter arrival.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remove any loose items, which may be on or near the helideck.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reposition off of the helideck but maintain a position where</td>
</tr>
<tr>
<td></td>
<td></td>
<td>helicopter and helideck operations can be positively controlled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- When the aircraft is in sight and the deck is clear and ready for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>helicopter landing, make an “Aircraft in Sight, Green Deck” call.</td>
</tr>
</tbody>
</table>

**Sample radio call:**

HLO: “Shell 4, MC 807 aircraft in sight, green deck, MC 807.”

Pilot: “MC 807, Shell 4 copy insight, green deck, MC 807.”

**NOTES:**

- This is the final affirmation that the HLO has taken control of the helideck.
- Pilot must respond with an affirmation of the “in-sight/green deck” call or he SHALL NOT LAND.
- The only exception to this rule is if no radio contact has been made prior to the landing and all “no-communication” procedures have been followed.
- The HLO shall wear the radio headset and monitor the radio frequency at all times once he has assumed positive control and while the helicopter is on the helideck.
C. Arrival, Cont.

**HLO Passenger Movement and Handling Requirements (Figs. 1 and 2)**

**Figure 1:** Unloading Under Control of HLO, HDA, and Pilot

**Figure 2:** Unloading Under Control of HLO and Pilot
### C. Arrival, Cont.

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| Passengers                  | 1    | **Shall NOT:**  
- unbuckle safety belts or debark the helicopter until under positive control of the non-handling pilot or the HLO.  
- remove life vests until clear of the helideck and directed by HLO.                                                                                                                                                                                                                                                                                                                                                                                                   |
| HLO/HDA                     | 2    | **WARNING:** Do not enter helideck until signaled by pilot. If aircraft is shutting down - DO NOT ENTER HELIDECK UNTIL BLADES HAVE COMPLETELY STOPPED.  
Prior to any helideck activity, chock the tires closest to the baggage compartment on the side of the aircraft closest to the exit.                                                                                                                                                                                                                                                                                                                                                                             |
| Non-handling Pilot          | 3    | If the helicopter lands at a non-Shell facility, chock the aircraft before any activity begins.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| HLO                         | 4    | Only after the wheels are chocked, establish positive communication with the non-flying pilot and deliver the outbound manifest to the pilot. Communication with the pilot shall include:  
- Intended exit point  
- Intended order of business (procedure for baggage handling, how the non-handling pilot will assist in directing passengers, who will lead the passengers to exit, etc.)  
**CAUTION:** The non-handling pilot shall not be asked to work with or assist in the handling of any baggage.                                                                                                                                                                                                                                                                                                                                 |
| HLO/HDA                     | 5    | Prior to passengers debarking the helicopter, empty the cargo compartment and either lines the baggage toward the designated exit for passenger pick up or transport the cargo to a staging area.                                                                                                                                                                                                                                                                                                                                                                           |
| If more than one HLO/HDA    | 6    | One tends to the baggage while the other tends to the helicopter door and passengers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| If both an HLO and HDA      | 7    | During inclement weather, HLO may stand outside the rotor arc and await the passengers while the HDA hands the passengers their bags as they depart the aircraft.                                                                                                                                                                                                                                                                                                                                                                               |
| Non-handling Pilot          | 8    | Man the door during inclement weather.  
**CAUTION:** This may not be done if there is only an HLO and a Non-handling Pilot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Helideck Team Member Manning the Cabin Door | 9    | Only after the baggage compartment is empty, open the door and allow passenger movement to occur.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                             | 10   | Stand between the passengers and the 12 O’clock position and direct the passengers, in a single-file line, at a 90-degree angle to the helicopter to the HLO/HDA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
C. Arrival, Cont.

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLO/ HDA</td>
<td>11</td>
<td>Stand outside of the rotor-arc at a 90-degree angle to the helicopter, collect the passengers, and direct them in a single-file line to the designated exit.</td>
</tr>
<tr>
<td>Helideck Team Member Manning the Cabin Door</td>
<td>12</td>
<td>Collect any extra life vests needed for the next flight and pass them to the HLO/HDA standing outside the rotor-arc once all passengers have passed.</td>
</tr>
<tr>
<td>HLO</td>
<td>13</td>
<td>Once below the helideck or a safe distance from the helideck, ensure all life vests are redistributed between the passengers debarking and embarking.</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Ensure all extra life vests are securely stored in the cabin.</td>
</tr>
</tbody>
</table>

**CAUTION:** When using MK-28 vests, ensure that the crotch strap is fastened prior to any passenger movement to avoid tripping/entanglement hazard.
## D. Departure

### Prior to escorting passengers to the helideck:

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLO</td>
<td>1</td>
<td>Ensure passengers remove all headgear.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Ensure all passengers have correctly donned and fastened life vests.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Form passengers into a single file line.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Make radio call informing the pilot of passenger movement to the helideck.</td>
</tr>
</tbody>
</table>

### Escorting passengers to helicopter: *Heliports with at least one HLO and one HDA*

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLO</td>
<td>1</td>
<td>Ensure passengers remain in single-file line and lead passengers to a point outside the rotor arc at a ninety-degree angle to the helicopter. At that point, direct the passengers to the non-handling pilot monitoring the cabin door.</td>
</tr>
<tr>
<td>Passengers</td>
<td>2</td>
<td>Hand baggage to helideck team member (this may not be the Pilot) standing adjacent to the baggage compartment (between the passengers and the tail) upon entering the helicopter. This may be omitted if the baggage has been previously transported to the helicopter.</td>
</tr>
<tr>
<td>Non-handling pilot at the door</td>
<td>3</td>
<td>Monitor passenger loading and proper usage of restraint harnesses.</td>
</tr>
<tr>
<td>HLO</td>
<td>4</td>
<td>When all passengers are properly loaded and restrained, secure any loose items in the cabin and close and secure the cabin door.</td>
</tr>
</tbody>
</table>

### Escorting passengers to helicopter: *Helidecks with only an HLO and the Non-handling Pilot*

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLO</td>
<td>1</td>
<td>Ensure passengers remain in single file line and lead passengers to the helicopter door from a point outside the rotor arc at a 90-degree angle to the non-handling pilot monitoring the door of helicopter.</td>
</tr>
<tr>
<td>Non-handling Pilot</td>
<td>2</td>
<td>Ensure passengers maintain a straight line to the door.</td>
</tr>
<tr>
<td>Passengers</td>
<td>3</td>
<td>Hand baggage to the HLO upon entering the cabin of the helicopter.</td>
</tr>
<tr>
<td>HLO</td>
<td>4</td>
<td>Load baggage.</td>
</tr>
<tr>
<td>Non-handling Pilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLO</td>
<td>5</td>
<td>When all passengers are properly loaded and restrained, secure any loose items in the cabin and close and secure the cabin door.</td>
</tr>
</tbody>
</table>
D. Departure, Cont.

Prior to aircraft take off

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLO</td>
<td>1</td>
<td>Ensure Non-handling Pilot is in aircraft.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Confirm the deck is still clear.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Remove and physically show chocks to the pilot. Wait for “thumbs up” reply from one of the pilots.</td>
</tr>
</tbody>
</table>
|      | 4    | Give “Green Deck” call only after chocks have been visually presented, the thumbs up confirmed, and chocks and all remaining helideck team members have cleared the helideck. Sample radio call:  
HLO: “Shell 4, MC 807 you have a green deck for take off, MC 807.”  
Pilot: “MC807, Shell 4, copy green deck, MC 807.” |
|      | 5    | Maintain radio communications and stay within the vicinity of the helideck until the helicopter has completely departed the helideck. |
D. Departure, Cont.

HLO Passenger Movement and Handling Requirements (Figs. 3 and 4)

**Figure 3**: Boarding Under Control of HLO, HDA, and Pilot

**Figure 4**: Boarding Under Control of HLO and Pilot
### E. Hand and Arm Signals

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gain attention</strong></td>
<td>Wave hand above shoulder height (<a href="#">Warning - When under rotor arc - no higher than head height</a>)</td>
<td>Given by Pilot, HLO, or HDA - Give me your attention</td>
<td><img src="image" alt="Gain attention" /></td>
</tr>
<tr>
<td><strong>Stop or Hold</strong></td>
<td>Hold up one or both fists</td>
<td>Given by HLO/HDA to Pilot - STOP, maintain current state until advised</td>
<td><img src="image" alt="Stop or Hold" /></td>
</tr>
<tr>
<td><strong>Stop or Hold</strong></td>
<td>Hold up one or both fists</td>
<td>Given by HLO/HDA to Helideck Team Member or Passenger - STOP, remain in place</td>
<td><img src="image" alt="Stop or Hold" /></td>
</tr>
</tbody>
</table>
### E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
</table>
| Wave Off  | Wave arms over head  
**[Warning - Give from a location where you can reach safety if Pilot continues landing]** | WAVE OFF, do not land | ![Wave Off](image) |
| Fire      | Make figure 8 in front of body with hand  
**[Warning - Give from a location where you can reach safety]** | You are on fire! | ![Fire](image) |
| HLO/HDA requests to enter / leave rotor arc | Touch hand to head, then point toward / away from aircraft  
**[Do not enter / leave rotor arc until acknowledged]** | Given by HLO/HDA - I want to enter / leave the rotor arc | ![HLO/HDA](image) |
| Approval for HLO/HDA to enter rotor arc | Beckoning motion, palm of hand toward face and repetitively bring hand toward face | Given by Pilot - Enter the rotor arc | ![Approval](image) |
### E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval for HLO/HDA to leave rotor arc</td>
<td>Point away from aircraft</td>
<td>Given by Pilot - Leave the rotor arc</td>
<td><img src="image1" alt="Signal Image" /></td>
</tr>
<tr>
<td>Insert Chocks</td>
<td>Hands up, thumbs inward. Move thumbs together.</td>
<td>Given by Pilot – Put chocks in place</td>
<td><img src="image2" alt="Signal Image" /></td>
</tr>
<tr>
<td>Chocks in place</td>
<td>Arms extended palms facing inward, then swung from the extended position inward</td>
<td>Given by HLO/HDA - Chocks have been put in place on landing gear</td>
<td><img src="image3" alt="Signal Image" /></td>
</tr>
<tr>
<td>Aircraft shutdown</td>
<td>Wave hand on edge in front of throat in a cutting motion</td>
<td>Given by Pilot - I am ready to shut down [Do not shut down until acknowledged]</td>
<td><img src="image4" alt="Signal Image" /></td>
</tr>
</tbody>
</table>
### E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aircraft shutdown</strong></td>
<td>Wave hand on edge in front of throat in a cutting motion</td>
<td>Given by HLO - The helideck is ready for you to shut down [Expect pilot to shutdown upon receiving signal]</td>
<td><img src="image" alt="Hand Signal" /></td>
</tr>
<tr>
<td><strong>Passenger unload / load</strong></td>
<td>Two fingers pointed down and moved backwards and forwards in opposite directions as if walking</td>
<td>Given by HLO - Ready to unload / load passengers</td>
<td><img src="image" alt="Hand Signal" /></td>
</tr>
<tr>
<td><strong>Passenger unload / load</strong></td>
<td>Beckoning motion, palm of hand toward face and repetitively bring hand toward face</td>
<td>Given by Pilot - Enter the rotor arc</td>
<td><img src="image" alt="Hand Signal" /></td>
</tr>
<tr>
<td><strong>Fueling</strong></td>
<td>Forefinger pointed horizontally and rotated in a circular motion</td>
<td>Given by Pilot - Begin fueling</td>
<td><img src="image" alt="Hand Signal" /></td>
</tr>
</tbody>
</table>
### E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fueling</td>
<td>Forefinger pointed horizontally and rotated in a circular motion</td>
<td>Given by HLO – We are beginning fueling</td>
<td><img src="signal.png" alt="Signal" /></td>
</tr>
<tr>
<td>Fueling</td>
<td>Hand horizontal palm down, wave hand side to side</td>
<td>Given by Pilot, HLO, I or Refueler – Stop fueling</td>
<td><img src="signal.png" alt="Signal" /></td>
</tr>
<tr>
<td>Starting engines or turning rotors</td>
<td>Hand overhead in a circular motion</td>
<td>Given by Pilot – I am ready to start engines / turn rotors</td>
<td><img src="signal.png" alt="Signal" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Do not start engines / turn rotors until acknowledged]</td>
<td></td>
</tr>
<tr>
<td>Starting engines or turning rotors</td>
<td>Hand overhead in a circular motion</td>
<td>Given by HLO – The helideck is ready for you to start engines / turn rotors</td>
<td><img src="signal.png" alt="Signal" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Expect pilot to start engines / turn rotors upon receiving signal]</td>
<td></td>
</tr>
</tbody>
</table>
### E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remove chocks</strong></td>
<td>Hands in front of face, thumbs outward. Move hands outward.</td>
<td>Given by Pilot - Remove my chocks</td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repeated by HLO - Acknowledge Pilot’s signal to remove chocks</td>
<td></td>
</tr>
<tr>
<td><strong>Chocks removed (Facility chocks)</strong></td>
<td>Hold chocks up so pilot can see them</td>
<td>Given by HLO/HDA - Chocks have been removed</td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Chocks removed (Aircraft chocks)</strong></td>
<td>Arms down, thumbs facing outward, then swung outwards</td>
<td>Given by HLO/HDA - Chocks have been removed</td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Rotors turning - Preparation for takeoff</strong></td>
<td>Thumbs up</td>
<td>Given by Pilot - I am ready to takeoff [Do not takeoff until acknowledged]</td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
</tbody>
</table>
E. Hand and Arm Signals, Cont.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Meaning of signal and action</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotors turning - Preparation for takeoff</td>
<td>Thumbs up</td>
<td>Given by HLO - The helideck is ready for you to takeoff [Expect pilot to commence takeoff upon receiving signal]</td>
<td><img src="Image" alt="Thumb up" /></td>
</tr>
</tbody>
</table>

F. IN FLIGHT

<table>
<thead>
<tr>
<th>Role</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flying Pilot</td>
<td>1</td>
<td>Ensure all flight operations are conducted in a safe and efficient manner.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Observe all Shell standards and requirements for flight operations to include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Duty hour limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Flight time limits</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Review daily flight schedule with dispatcher.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Compute weight and balance limits for each leg based on flight schedule and preliminary manifests.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Observe the following Shell required flight operations requirements:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transmit a 20-minute call to the facility indicating the helicopter is 20 minutes from landing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transmit another call five minutes from the platform.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maintain 1,000 ft above ground level (weather permitting) while circling the platform to ensure all cranes are stowed, the helideck is clear, and the facility is visually verified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Return “Green deck, clear to land” radio call prior to landing on any facility.</td>
</tr>
</tbody>
</table>
## CONTENTS

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>Log of Revisions</td>
<td>6</td>
</tr>
<tr>
<td>List of Effective Pages</td>
<td>7</td>
</tr>
<tr>
<td>Fuel Responsibilities Flow Chart</td>
<td>9</td>
</tr>
<tr>
<td>Chapter 1 General</td>
<td>9</td>
</tr>
<tr>
<td>1-1 Purpose</td>
<td>9</td>
</tr>
<tr>
<td>1-2 Responsibilities</td>
<td>9</td>
</tr>
<tr>
<td>1-2.1 Managers</td>
<td>9</td>
</tr>
<tr>
<td>1-2.1.1 Managers Responsibilities</td>
<td>9</td>
</tr>
<tr>
<td>1-2.2 Pilots</td>
<td>9</td>
</tr>
<tr>
<td>1-2.3 Fuel Systems Coordinator</td>
<td>9</td>
</tr>
<tr>
<td>1-2.3.1 Fuel Systems Coordinator Responsibilities</td>
<td>9</td>
</tr>
<tr>
<td>1-2.4 Offshore Manager</td>
<td>9</td>
</tr>
<tr>
<td>1-2.4.1 Offshore Manager responsibilities</td>
<td>9</td>
</tr>
<tr>
<td>1-3 Filter Change</td>
<td>10</td>
</tr>
<tr>
<td>1-4 Variance/Waiver</td>
<td>10</td>
</tr>
<tr>
<td>1-5 Reference Material</td>
<td>10</td>
</tr>
<tr>
<td>1-6 Fuel Information Notices</td>
<td>10</td>
</tr>
<tr>
<td>Chapter 2 Fuel Handler Training Requirements</td>
<td>10</td>
</tr>
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<td>2-1 PHI Employees</td>
<td>10</td>
</tr>
<tr>
<td>2-1.1 Pilots</td>
<td>10</td>
</tr>
<tr>
<td>2-1.2 Fuel Handling Personnel</td>
<td>10</td>
</tr>
<tr>
<td>2-1.3 Offshore Assigned Airframe and Power Plant Maintenance Technicians</td>
<td>10</td>
</tr>
<tr>
<td>2-1.4 Supervisors</td>
<td>10</td>
</tr>
<tr>
<td>2-1.5 Area/Base Manager</td>
<td>10</td>
</tr>
<tr>
<td>2-1.6 Recurrent Training</td>
<td>10</td>
</tr>
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<td>2-2 Customer Training</td>
<td>11</td>
</tr>
<tr>
<td>Chapter 3 Fuel Handler Training Syllabus</td>
<td>11</td>
</tr>
<tr>
<td>3-1 Familiarization With The Facility</td>
<td>11</td>
</tr>
<tr>
<td>3-1.1 Ramp familiarization</td>
<td>11</td>
</tr>
<tr>
<td>3-1.2 Fuel farm familiarization</td>
<td>11</td>
</tr>
<tr>
<td>3-1.3 Mobile equipment familiarization</td>
<td>11</td>
</tr>
<tr>
<td>3-1.4 Hangar familiarization</td>
<td>11</td>
</tr>
<tr>
<td>3-1.5 Customer facility familiarization</td>
<td>11</td>
</tr>
<tr>
<td>3-2 Familiarization With Airports</td>
<td>11</td>
</tr>
<tr>
<td>3-3 Familiarization With Emergency Procedures</td>
<td>11</td>
</tr>
<tr>
<td>3-3.1 Fires</td>
<td>11</td>
</tr>
<tr>
<td>3-3.2 Fuel Spills</td>
<td>11</td>
</tr>
<tr>
<td>3-3.3 First Aid</td>
<td>11</td>
</tr>
<tr>
<td>3-4 Familiarization With Aviation</td>
<td>12</td>
</tr>
<tr>
<td>3-5 Familiarization With Quality Control</td>
<td>12</td>
</tr>
<tr>
<td>3-6 Introduction to Safety</td>
<td>12</td>
</tr>
<tr>
<td>3-6.1 Static Electricity Bonding</td>
<td>12</td>
</tr>
<tr>
<td>3-6.2 Fire Safety</td>
<td>12</td>
</tr>
<tr>
<td>3-6.3 Lightening/Severe Weather</td>
<td>12</td>
</tr>
<tr>
<td>3-6.4 Leaks and Spills</td>
<td>12</td>
</tr>
<tr>
<td>3-6.5 Aircraft Hand Signals</td>
<td>12</td>
</tr>
<tr>
<td>SUBJECT</td>
<td>PAGE</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
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</tr>
<tr>
<td>3-6.6 Rotor/Propeller/Jet Blast Safety</td>
<td>12</td>
</tr>
<tr>
<td>3-6.7 Night Operations</td>
<td>12</td>
</tr>
<tr>
<td>3-6.8 Foreign Object Damage</td>
<td>12</td>
</tr>
<tr>
<td>3-6.9 Hearing/Eye Protection</td>
<td>12</td>
</tr>
<tr>
<td>3-6.10 Passenger Safety</td>
<td>12</td>
</tr>
<tr>
<td>3-6.11 Clothing</td>
<td>12</td>
</tr>
<tr>
<td>3-6.12 Chocking and Securing Aircraft</td>
<td>12</td>
</tr>
<tr>
<td>3-6.13 Hazardous Materials</td>
<td>12</td>
</tr>
<tr>
<td>3-7 Introduction to The Fuel Farm and Bulk Storage</td>
<td>12</td>
</tr>
<tr>
<td>3-7.1 Fuel Farm Layout</td>
<td>12</td>
</tr>
<tr>
<td>3-7.2 Filtration System Operation</td>
<td>13</td>
</tr>
<tr>
<td>3-7.3 Receipt Procedures</td>
<td>13</td>
</tr>
<tr>
<td>3-7.4 Storage Inspection Procedures</td>
<td>13</td>
</tr>
<tr>
<td>3-7.5 Quality Control</td>
<td>13</td>
</tr>
<tr>
<td>3-7.6 Delivery to Mobile Equipment</td>
<td>13</td>
</tr>
<tr>
<td>3-7.7 Record Keeping</td>
<td>13</td>
</tr>
<tr>
<td>3-7.8 Waste Disposal</td>
<td>13</td>
</tr>
<tr>
<td>3-7.9 Spill Prevention/Response</td>
<td>13</td>
</tr>
<tr>
<td>3-7.10 Leak Detection</td>
<td>13</td>
</tr>
<tr>
<td>3-7.11 House Keeping</td>
<td>13</td>
</tr>
<tr>
<td>3-7.12 Security</td>
<td>13</td>
</tr>
<tr>
<td>3-8 Mobile Fueling Equipment</td>
<td>13</td>
</tr>
<tr>
<td>3-8.1 Safety Equipment</td>
<td>13</td>
</tr>
<tr>
<td>3-8.2 Driving</td>
<td>13</td>
</tr>
<tr>
<td>3-8.3 Mobile Fueler Operation</td>
<td>14</td>
</tr>
<tr>
<td>3-8.4 Transporter Identification and Inspection</td>
<td>14</td>
</tr>
<tr>
<td>3-8.5 Quality Control of Mobile Equipment</td>
<td>14</td>
</tr>
<tr>
<td>3-8.6 Record Keeping</td>
<td>14</td>
</tr>
<tr>
<td>3-8.9 Mobile Refueller Maintenance</td>
<td>14</td>
</tr>
<tr>
<td>3-8.10 Mobile Refueling Aircraft</td>
<td>14</td>
</tr>
<tr>
<td>3-9 Confirming Quantity</td>
<td>14</td>
</tr>
<tr>
<td>3-9.2 Over Wing Fueling</td>
<td>14</td>
</tr>
<tr>
<td>3-9.3 Single Point Fueling</td>
<td>14</td>
</tr>
<tr>
<td>3-9.4 Helicopter Fueling Procedures</td>
<td>14</td>
</tr>
<tr>
<td>3-9.5 Bonding Procedures</td>
<td>14</td>
</tr>
<tr>
<td>3-9.5 Fuel Filler Cap</td>
<td>14</td>
</tr>
<tr>
<td>3-9.6 Defueling</td>
<td>15</td>
</tr>
<tr>
<td>3-9.7 Fuel Additives</td>
<td>15</td>
</tr>
<tr>
<td>3-9.8 Rapid Refueling</td>
<td>15</td>
</tr>
<tr>
<td>3-9.9 Chocking Aircraft and Fuel Truck</td>
<td>15</td>
</tr>
<tr>
<td>3-9.10 Fire Extinguisher Location</td>
<td>15</td>
</tr>
<tr>
<td>Chapter 4 Identification and Properties of Aviation Fuel</td>
<td>15</td>
</tr>
<tr>
<td>4-1 Jet (Turbine) Fuels</td>
<td>15</td>
</tr>
<tr>
<td>4-1.1 Jet A and A-1</td>
<td>15</td>
</tr>
<tr>
<td>4-1.2 Jet B</td>
<td>15</td>
</tr>
<tr>
<td>4-1.3 Water Contamination</td>
<td>15</td>
</tr>
<tr>
<td>4-1.4 Jet A Markings</td>
<td>15</td>
</tr>
<tr>
<td>4-1.5 Jet A-1 Markings</td>
<td>15</td>
</tr>
<tr>
<td>4-1.6 Jet B Markings</td>
<td>15</td>
</tr>
<tr>
<td>4-2 Avgas</td>
<td>15</td>
</tr>
<tr>
<td>4-2.1 Identification of Avgas</td>
<td>15</td>
</tr>
<tr>
<td>4-2.2 Handling Avgas</td>
<td>15</td>
</tr>
<tr>
<td>4-2.3 Avgas 80 Markings</td>
<td>15</td>
</tr>
<tr>
<td>SUBJECT</td>
<td>PAGE</td>
</tr>
<tr>
<td>---------------------------------------------</td>
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<tr>
<td>4-2.4 Avgas 100 Markings</td>
<td>15</td>
</tr>
<tr>
<td>4-2.5 Avgas 100LL Markings</td>
<td>15</td>
</tr>
<tr>
<td><strong>Chapter 5</strong> Safety and Emergency Procedures</td>
<td>15</td>
</tr>
<tr>
<td>5-1 Fires</td>
<td>15</td>
</tr>
<tr>
<td>5-1.1 Three Elements</td>
<td>16</td>
</tr>
<tr>
<td>5-1.2 Fire Control Procedures</td>
<td>16</td>
</tr>
<tr>
<td>5-1.3 Fire Extinguishers</td>
<td>16</td>
</tr>
<tr>
<td>5-2 Fuel Spills</td>
<td>17</td>
</tr>
<tr>
<td>5-2.1 Spill Size</td>
<td>17</td>
</tr>
<tr>
<td>5-2.2 Spill Prevention Control and Countermeasures Plan (SPCC)</td>
<td>17</td>
</tr>
<tr>
<td>5-3 First Aid</td>
<td>17</td>
</tr>
<tr>
<td>5-4 Emergency Response Contact Numbers</td>
<td>18</td>
</tr>
<tr>
<td><strong>Chapter 6</strong> Aircraft Identification and Fueling Procedures</td>
<td>18</td>
</tr>
<tr>
<td>6-1 Aircraft Identification</td>
<td>18</td>
</tr>
<tr>
<td>6-2 General Fueling Procedures</td>
<td>18</td>
</tr>
<tr>
<td>6-2.1 Helicopter and Over Wing Procedures (Engines Shut Down)</td>
<td>18</td>
</tr>
<tr>
<td>6-2.2 Helicopter and Over Wing Procedures (Engines Running) <strong>Rapid Refueling</strong></td>
<td>19</td>
</tr>
<tr>
<td>6-2.3 Single Point Refueling</td>
<td>19</td>
</tr>
<tr>
<td>6-2.4 Defueling</td>
<td>19</td>
</tr>
<tr>
<td><strong>Chapter 7</strong> Quality Control</td>
<td>19</td>
</tr>
<tr>
<td>7-1 Jet Fuel Specifications</td>
<td>19</td>
</tr>
<tr>
<td>7-2 Fuel Contaminates</td>
<td>20</td>
</tr>
<tr>
<td>7-2.1 Water</td>
<td>20</td>
</tr>
<tr>
<td>7-2.2 Solids</td>
<td>20</td>
</tr>
<tr>
<td>7-2.3 Surfactants (Surface Active Agents)</td>
<td>20</td>
</tr>
<tr>
<td>7-2.4 Micro-Organisms</td>
<td>20</td>
</tr>
<tr>
<td>7-2.5 Intermixing</td>
<td>20</td>
</tr>
<tr>
<td><strong>Chapter 8</strong> Inspections and Checks</td>
<td>20</td>
</tr>
<tr>
<td>8-1 Receiving Fuel</td>
<td>20</td>
</tr>
<tr>
<td>8-2 Bulk Plant</td>
<td>21</td>
</tr>
<tr>
<td>8-3 Flight Line Fuel Point</td>
<td>21</td>
</tr>
<tr>
<td>8-4 Mobile Fuel Unit</td>
<td>22</td>
</tr>
<tr>
<td>8-5 Offshore Fuel</td>
<td>22</td>
</tr>
<tr>
<td>8-6 Transporter Preloading Inspections</td>
<td>23</td>
</tr>
<tr>
<td><strong>Chapter 9</strong> Loading Mobile Fuel Units and Transporters</td>
<td>23</td>
</tr>
<tr>
<td>9-1 Mobile Fuel Unit</td>
<td>23</td>
</tr>
<tr>
<td>9-2 Transporters</td>
<td>23</td>
</tr>
<tr>
<td><strong>Chapter 10</strong> Fuel Truck, Fuel Trailer and Transporter Inspections</td>
<td>23</td>
</tr>
<tr>
<td>10-1 Transporter Inspections required under USCG and DOT Regulations</td>
<td>23</td>
</tr>
<tr>
<td>10-1.1 Marine Portable Tanks (MPT)</td>
<td>23</td>
</tr>
<tr>
<td>10-1.2 Intermediate Bulk Containers (IBC, UN-31)</td>
<td>24</td>
</tr>
<tr>
<td>10-1.3 IM-101/102 Transporters</td>
<td>24</td>
</tr>
<tr>
<td>10-2 Transporter Placards</td>
<td>24</td>
</tr>
<tr>
<td>10-3 Fuel Truck and Trailer DOT Inspections</td>
<td>25</td>
</tr>
<tr>
<td>10-3.1 Fuel Trucks and Trailers</td>
<td>25</td>
</tr>
<tr>
<td>10-4 Fuel Truck and Trailer Placards</td>
<td>25</td>
</tr>
</tbody>
</table>
Chapter 11  Fuel components 25
11-1  General Equipment 25
11-2  Fuel Point Components 25
11-3  Bulk Plant components 26
11-4  Heliport Piping 26
11-5  Fuel Trucks 26
11-6  Fuel Trailers 26
11-7  Offshore System 26

SUBJECT  PAGE

Chapter 11  Intentionally Left Blank 25
Chapter 12  Terms and Definitions 25
Index 28

FUEL CAP IDENT. TAB
   Aircraft Identification and Fuel Cap Operations

EMERGENCY PROCEDURES TAB
   Local Emergency Phone Numbers
   Emergency Shut Off Valve Location Schematic

AIRPORT PROCEDURES TAB
   Airport/Heliport Procedures (If applicable)

FUEL FORMS TAB
   All Required Fuel Forms

ATA-103 TAB
   ATA-103, “Standards For Jet Fuel Quality Control at Airports”

NFPA-407 TAB

JET FUEL MSDS TAB
   Material Safety and Data Sheet for Jet Fuel

MEMO TAB
   Fuel Procedures Notice (FPN)
INTRODUCTION

PHI, Inc. recognizes the importance of using quality jet fuel to help insure the highest degree of flight safety. To achieve this goal the “PHI Fuel Management Manual” was developed utilizing the applicable parts of ATA-103, “Standards for Jet Fuel Quality Control at Airports”, NFPA 407, “Standard for Aircraft Fuel Servicing” as reference material.

This manual identifies commonly recognized industry inspection procedures and safety checks of jet fuel storage and distribution facilities that will help minimize introduction of contaminated or unacceptable jet fuel into aircraft. It is important to note that special fuel system maintenance procedures may be implemented due to fuel system complexity, local operating conditions, and manning levels.

Please submit any recommended changes, alterations or comments of this document to:

PHI, Inc
Offshore Manager
P.O. Box 90808
Lafayette, La. 70508
(337)235-2452
## LOG OF REVISIONS

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### LIST OF EFFECTIVE PAGES

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</tr>
</tbody>
</table>

### SECTIONS: (TABS)

- **FUEL CAP IDENTIFICATION** 04/14/2006 006
- **EMERGENCY PROCEDURES** BASE USE
- **AIRPORT PROCEDURES** BASE USE
- **FUEL FORMS** 04/14/2006 006
- **ATA 103** CURRENT EDITION CURRENT EDITION
- **NFPA 407** CURRENT EDITION CURRENT EDITION
- **MSDS JET FUEL** 02/15/96 REV 02/15/96
- **MEMO (FPN)** AS ISSUED

04/14/2006 REV. 006
FUEL RESPONSIBILITIES FLOW CHART

Director of Operations
(Carlin Craig)

Manager International

Manager Gulf Coast Oil and Gas

EMS Operations Manager

Offshore Manager

International Area/Base Managers

Gulf Coast Oil and Gas Area/Base Managers

EMS Area/Base Managers

Fuel Systems Coordinator

Area/Base Fuel Handler Supervisor

Base Fuel Handler

Director of Facility Maintenance
Chapter 1 General

1-1 Purpose. The purpose of this manual is to provide a reference for and the standardization of Aircraft Fuel Handling Procedures to include:
   b. Aircraft Fueling Procedures.
   c. Quality Control.
   d. Safety.
   e. Fuel Handler Training.

Note: This manual does not cover filling or draining of aircraft fuel tanks incidental to aircraft fuel system maintenance operations.

1-2 Responsibilities. All PHI employees involved in the handling of aviation fuels are responsible for ensuring that correct and clean fuel is provided for any aircraft in an approved, safe and environmentally responsible manner.

1-2.1 Managers. Throughout this manual the term “Manager” shall refer to the Oil and Gas Area/Base Manager, Aeromedical Services Area/Base Manager and International Area/Base Managers. Oil and Gas Area/Base Managers are directly responsible to the Manager Gulf Coast, Oil and Gas Division, who is directly responsible to the Director of Operations. Aeromedical Services Area/Base Managers are directly responsible to the Manager EMS and International Area/Base Managers are directly responsible to the Manager International. Each manager is responsible for the overall operation of the fuel facilities at the bases they are assigned, as well as any remotely based facilities in their operating area. The manager may delegate these responsibilities to any qualified person: i.e. Maintenance Manager, Lead Pilot, or other qualified and designated PHI employee assigned to the facility, but doing so does not relieve the manager of the overall responsibility.

1-2.1.1 Managers Responsibilities:
   a. The daily inventory of all fuels at the base, recording the inventory, and determining the amount delivered to aircraft, off base fuel facilities and offshore locations. Records of this information are to be maintained by the Manager or his designated representative.
      b. A documented inventory of all fuel system components. This inventory should include makes, models, and quantities.
      c. Recording the scheduled and on condition filter element changes. The filter element changes are to be recorded on the Bulk Plant Filter Change Annual Inspection Record (PHI-142-BPFCAIR-00?), Fuel Point Filter Change Annual Inspection Record (PHI-142-FPFCAIR-00?) and Offshore Filter Change/Annual Inspection Record (PHI-142-OFCAIR-00?). A copy is to be maintained at the controlling base and a copy sent to the Fuel System Coordinator.
   d. The selection and training of personnel assigned to the handling of aviation fuels.
   e. Maintaining a Training Record of all company personnel, except pilots, receiving Fuel Handler Training.
   f. Maintaining a record of all daily sumping of filters, separators, tanks, fuel trucks and fuel trailers. The records shall be maintained at the controlling base.
   g. Maintain a record of all required inspections.
   h. Document in writing the approval of a Fuel Handler to receive fuel at a specific base. This document will be maintained at the Fuel Handlers assigned base in their training file.
      i. Witness fuel receiving procedures on a monthly basis. Record the witness on form “Fuel Receiving Check List”, PHI-142-FRCL-00?, and maintain for one year.

1-2.2 Pilots. Must insure that only correct and clean fuel is provided for their aircraft.

1-2.3 Fuel System Coordinator. The Fuel System Coordinator is directly responsible to the Director of Facility Maintenance, but will coordinate all fuel activities with the Offshore Manager.

1-2.3.1 Fuel System Coordinator responsibilities:
   a. Establishing fuel system and component criteria that will comply with industry standards.
   b. Maintain a record system that will track fuel systems, components and filter changes.
   c. Insuring that all required inspections are complete and current.
   d. Coordinate the installation of fuel systems, repairs and testing.
   e. Coordinating the installation of offshore fuel systems, repairs and testing with the Offshore Manager.

1-2.4 Offshore Manager is directly responsible to the Director of Operations and will coordinate all fuel activities with the Area/Base Managers.

1-2.4.1 Offshore Manager responsibilities:
   a. Establish a record system for fuel installations.
   b. Establish an audit procedure for fuel installations.
   c. Establish Fuel Handler Training.
   d. Establish an annual filter change procedure.
   e. Establish fuel quality assurance.
   f. Coordinate fuel activities with the Fuel System Coordinator.
1-3 Filter changes shall be completed annually. Filter changes will begin May 1st and should be completed by June 30th. Filter change compliance will be indicated by color coded tags attached to the filter housing. A NOTAM will be issued through the Director of Operations indicating the current color tag after the filter changes have been completed. Any filter changed due to poor performance prior to the annual filter change will still require the annual filter change.

1-4 Variance/Waiver procedures are provided for as long as fuel quality will not be compromised. A request for variance or waiver must be made in writing to the respective Business Unit Manager who will consult with the Fuel Systems Coordinator or Offshore Manager. The written request will include:
   a. Requirement from which the variance or waiver is being requested.
   b. Explanation as to why compliance 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.

1-5 Reference materials have been selected to enhance this manual and therefore are an integral part. The following manuals will be used as reference material. It is important to note that the information contained in these manuals are recommendations and not regulations. Due to local conditions, operational considerations and manning levels, some of PHI’s procedures may differ.
   a. ATA-103, “Standards for Jet Fuel Quality Control at Airports”, is the recognized standard for the airlines. Detailed inspection criteria and procedures are available. This manual will give detailed instructions on how to perform the different inspection procedures.
   b. NFPA-407, “Standard for Aircraft Fuel Servicing”, is the reference for fuel system design, primarily relating to fire safety.

1-6 Fuel Procedures Notices (FPNs) will be maintained in the Memo Section of the Fuel Management Manual. The FPNs are a method of providing information and instructions on fuel handling procedures. The FPNs and FPN Index are to be maintained in the Memo Section until they are reissued, cancelled or incorporated into the Fuel Management Manual.

Chapter 2 Fuel Handler Training Requirements.

2-1 PHI and Contract Employees involved in the handling of aviation fuels shall receive class room or On the Job Training relating to their specific fuel handling responsibilities as outlined in Chapter 3, Fuel Handler Training Syllabus.

2-1.1 Pilots who have completed PHI Initial or Recurrent Training shall be considered as having completed Fuel Handling Training.

2-1.2 Fuel handling personnel shall be given training in the handling of aviation fuels and the emergency procedures associated with those fuels. To assure prompt action in the event of a spill, fire, or other hazardous condition developing during fueling operations, fuel handling personnel shall be trained in the operation of emergency fuel shutoff controls and fire extinguishers. A record of the training received shall be included in the persons information file and also maintained at the assigned base.
   a. Fuel Handlers will receive at least 3 supervised receiving fuel procedures and found to be competent before being authorized to receive fuel unsupervised. A base specific Letter of Authorization to Receive Fuel will be issued by the Area/Base Manager and will be kept in the fuel handlers training file.

2-1.3 Offshore and EMS Assigned Airframe and Power Plant Maintenance Technicians shall receive Fuel Handler Initial and Recurrent Training if required to maintain or perform quality control procedures on a fuel system. This training may be tailored for the specific system being maintained.

2-1.4 Supervisors shall be given training in the more technical aspects of fuel handling and emergency procedures. This information will be required when conducting On the Job Training for assigned fuel handlers. Records of the supervisor training shall be maintained in their information file and also at their assigned base. Supervisor training will be conducted by the Offshore Manager, Fuel Systems Coordinator or their designee.

2-1.5 Area/Base Managers will be given training in the procedures required to receive fuel at their specific base.

2-1.6 Recurrent Training shall be required of all PHI personnel involved in the handling of aviation fuel on an annual basis. The purpose of Recurrent Training is to correct any misconceptions, errors in procedures, and training on new procedures. Recurrent Training shall be recorded on the Fuel Handler Training Record form PHI-142-FHTR-00? for fuel handlers and supervisors. This form shall be placed in the persons information file and a copy maintained at their assigned base. All of the information on the training form shall be covered to some extent as required by the knowledge level of the trainee.
Base fuel system audit results shall be reviewed as a training aid. Fuel Handler Recurrent Training shall preferably be completed by December 31st of the current year. Training may be deferred up to an additional 2 months due to scheduling difficulties. Pilots shall receive fuel handler recurrent training during their scheduled recurrent training classes.

2-2 Customer Training is required for personnel other than PHI employees and they shall be given instruction in the proper procedures for fueling aircraft, by make and model. This instruction can be given by a qualified PHI pilot, mechanic or fuel handler. A PHI “Helicopter Fueling Authorization” card shall be issued to the person receiving the training and signed by the person giving the training. Information in this manual or in the PHI General Operations Manual shall be used as a reference when giving the training.

a. A list of all Non-PHI personnel receiving a Helicopter Fueling Authorization card shall be forwarded to the Offshore Manager. This list shall contain the name, company, date, aircraft make and model and person giving the training.

Chapter 3 Fuel Handler Training Syllabus.

This chapter is a syllabus of the training required for fuel handlers. The information presented here will follow the Fuel Handler Training Record. (PHI-142-FHTR-00?)

3-1 Familiarization with the facility will be base specific. The individual should be taken on a tour of the facility and be provided with the following information.

3-1.1 Ramp familiarization should cover the following areas.

a. Access routes to the ramp area.

b. Aircraft parking and tie down locations.

c. Fuel, water, electrical and air points.

3-1.2 Fuel farm familiarization should be general in nature, and cover component locations and a brief description of each.

3-1.3 Mobile equipment familiarization should be general in nature, and cover equipment descriptions, location and use.

3-1.4 Hangar familiarization should be general in nature and the following areas should be covered.

a. Hangar layout to include all rooms, and exits.

b. Location of light switches and emergency equipment.

3-1.5 Customer facility familiarization should cover each customer facility where fuel handling or PHI fuel systems are required. This tour is to be given with the approval of the person in charge of the customer facility, and if possible, with a customer representative present. The tour should consist of the following.

a. Approved customer safety briefing.

b. Description of fuel system components.

c. Approved fuel handling areas.(Transporter filling.)

3-2 Familiarization with airports is required when one of PHI’s heliports is located on an airport. A tour of the airport should be given showing access routes, restricted areas, airport administration buildings and location of emergency services.

3-3 Familiarization with Emergency Procedures is a critical part of fuel handler training. Proper training will insure that the response to an emergency is prompt and correct.

3-3.1 Fires are a major concern in any fuel handling operation. This training should cover the following information.

a. Emergency shut-off systems.

b. Reporting procedures.

c. Operation of fire extinguishers.

d. Personal safety.

3-3.2 Fuel Spills are hazardous to personnel, the environment and are very costly. This training should cover the following information.

a. Personal safety.

b. Proper procedures for containment and clean up.

c. Reporting procedures.

d. SPCC Plan use.

3-3.3 First Aid relating to fuel is essential for safety of all personnel. This training should cover the following information.

a. First aid treatment as outlined in the Material Safety and Data Sheet for aviation fuels. This training should cover skin exposure, eye exposure, inhalation and ingestion.

b. First Aid Kit location and use.

c. Emergency telephone numbers.

d. Hospital/clinic locations.

e. Reporting procedures.

f. Employees that are First Aid Trained.

g. Eye wash stations and their use.

h. Shower locations and their use.

3-4 Familiarization with Aviation is essential for the new fuel handler. Training should cover the following information.

a. Safe operations and practices around aircraft.

b. Terminology such as, top it off, flight line and rotor wash.
c. The importance of proper fueling.
d. Value of aircraft.
e. Aircraft identification.
f. Radio operation if applicable.
g. Fuel types used in aviation.

3-5 **Introduction to Quality Control** is essential to insure that only clean and correct fuel is introduced into an aircraft. Training should cover the following information.
   a. Fuel distribution from the delivery truck to the fuel nozzle.
   b. Fuel identification methods.
   c. Contaminant identification.
   d. Filtration methods and purpose.

3-6 **Introduction to Safety** will cover aspects relating to fuel handling. Training should cover the following information.

3-6.1 **Static Electricity Bonding**
   a. Generation of static electricity.
   b. Methods to reduce a static electric charge.
   c. Bonding procedures.

3-6.2 **Fire Safety** procedures.
   a. Fire Triangle.
   b. Sources of ignition.
   c. Fire extinguisher location and use.
   d. Emergency shut-off location and use.
   e. Smoking policy.

3-6.3 **Lightening/Severe Weather.**
   a. Fueling during electrical storms.
   b. Personal safety.

3-6.4 **Leaks and Spills.**
   a. Spill sources.
   b. Spill hazards.
   c. Personal safety.
   d. Reporting procedures.
   e. Containment and Clean-up.

3-6.5 **Aircraft Hand Signals.**
   a. Taxi man positioning.
   b. Airplane hand signals.
   c. Helicopter hand signals.
   d. Night procedures and equipment.

3-6.6 **Rotor/Propeller /Jet Blast Safety**
   a. Jet exhaust velocity and avoidance.
   b. Propeller precautions and avoidance.
   c. Main and tail rotor precautions and avoidance.

3-6.7 **Night Operations.**
   a. Equipment such as flashlights and wands.

b. Clothing.
  c. Driving precautions.
  d. Reduced visibility.

3-6.8 **Foreign Object Damage.**
   a. Sources of F.O.D.
   b. Damage and cost.

3-6.9 **Hearing/Eye Protection.**
   a. Dangers from jet/prop rotor wash.
   b. Use of sound attenuates.
   c. Proper type and use of eye protection.
   d. Safety equipment usage policy.
   e. Eye wash locations.

3-6.10 **Passenger Safety.**
   a. Sources of danger.
   b. Policy regarding passengers during fueling.

3-6.11 **Clothing.**
   a. Static generation by clothing.
   b. Danger of metal on shoe soles.
   c. Contents of pockets as F.O.D.
   d. Loose clothing and rags.

3-6.12 **Chocking and Securing aircraft.**
   a. Tie Down procedures.
   b. Chocking procedures.
   c. Rotor/Propeller tie down procedures.

3-6.13 **Hazardous Materials**
   a. Types of hazardous materials associated with Turbine Fuel (Prist).
   b. Handling procedures.
   c. Spill/Leak procedures.
   d. Personal safety.
   e. Emergency phone numbers.
   f. Reporting procedures.

3-7 **Introduction to the Fuel Farm and Bulk Storage** should insure that the location, maintenance and operation of the storage system is understood.

3-7.1 **Fuel Farm Layout. (Location and Operation of installed components)**
   a. Storage Tanks.
      1. Markings.
      2. Floating Suction.
      3. Drains.
      4. Vents.
      5. Flame Arrestors.
   b. Pumps.
      1. Pressure settings.
      2. Relief valves.
   c. Filtration equipment.
      1. Separator types, if installed.
d. Meters, if installed.
e. Emergency Shut Off.
f. Bonding Reels.
g. Valve identification and operation.

3-7.2 Filtration System Operation.
a. Filter element operation.
b. Differential pressure.
c. Maintenance.

d.  
3-7.3 Receipt Procedures.
a. Comply with Fuel Receiving Checklist, Form PHI-142-FRCL-00?.
   1. Paperwork verification.
   2. Product quality assurance.
   3. Fuel transfer procedures.
   4. Paperwork disposition.

3-7.4 Storage Inspection Procedures.
a. Component inspections to include:
   1. Storage Tanks.
   2. Floating Suctions. (if installed)
   3. Tank Vents.
   5. Bonding Wires.
   6. Fire Extinguishers.
   8. Meters.

3-7.5 Quality Control
a. Discuss the purpose and demonstrate the testing procedures for quality control.
   1. Clear and Bright Test.
   2. White Bucket Test.
   4. Membrane (Millipore) Test, if required.
   5. API Gravity Check if required.

3-7.6 Delivery to Mobile Equipment
a. Discuss required procedures for transferring fuel to mobile refueling equipment.
   1. Bonding.
   2. Deadman Controls.
   3. Top-Loading.
   5. Emergency Shut-Off equipment.
   6. Fire Safety.

3-7.7 Record Keeping.
a. Discuss the purpose and method of record keeping.
   1. Inspection.
   2. Inventory.
   3. Component.

3-7.8 Waste Disposal
a. Discuss the companies waste disposal procedures.
   1. Disposal of different products.

3-7.9 Spill Prevention/Response.
a. Discuss companies spill prevention policy and clean up methods.
   1. SPCC Plan.
   2. Cleanup procedures.
   3. Reporting procedures.

3-7.10 Leak Detection.
a. Visible signs.
b. Pipeline leak detection.
c. Liability

3-7.11 Housekeeping
a. Explain how housing keeping relates to.
   1. Safety.
   2. Fuel quality.
   3. Company policy.

3-7.12 Security.
a. Cover security requirements as they pertain to:
   1. Company Heliports.
   2. Public Airports.

3-8 Mobile Fueling Equipment should cover the operation, maintenance and inspection of fuel trucks and trailers.

3-8.1 Safety Equipment.
a. Demonstrate or explain the use of the following safety equipment and procedures.
   1. Smoking Policy.
   2. Deadman controls.
   3. Fire extinguishers.

3-8.2 Driving.
a. Discuss driving issues on airport/PHI ramps and in the vicinity of aircraft to include.
   1. Spotters.
   2. Rights of way.
   3. Positioning relating to aircraft.

3-8.3 Mobile Fueler Operations
a. Operation, maintenance and inspection of mobile refuelers.
   1. Operation of valves and controls.
   2. Visual checks.
   3. Dome covers.
   5. Bonding wires and clamps.
   6. Static and pressure leak checks.
   7. Filters.
   8. Differential pressure.
11. Dead-man controls.
12. Water detection.

3-8.4 Transporter Identification and inspection.
a. Discuss the different types of transporters and the inspection requirements of each.
   1. Inspection.
   2. Filling.
   3. Preparing for shipment.
   4. Paperwork.
   5. Inspection intervals.

3-8.5 Quality Control of Mobile Equipment.
a. Discuss the same requirements for Quality Control as Bulk Storage Plant.

3-8.6 Record keeping.
a. Discuss the purpose and company policy of record keeping.
   1. Purpose.
   3. Inspection.

3-8.7 Mobile Refueler Maintenance.
a. Discuss preventative maintenance of mobile equipment.
   1. Vehicle appearance.
   2. Engine Oil.
   3. Engine Coolant
   4. Exhaust System.
   5. Lights.
   6. Air Reservoir Tanks.
   7. Tires.
   8. Battery.
   10. Electrical System.

3-9 Refueling Aircraft training should insure a thorough understanding of aircraft fueling procedures.

3-9.1 Confirming Quantity
a. Discuss the methods available for determining fuel quantity needed.
   1. Verbally.
   2. Hand signals.
   3. Written.

3-9.2 Over Wing Fueling.
a. Discuss methods of over wing fueling.
   1. Aircraft identification.
   2. Fuel cap location.
   3. Fuel cap operation.
   4. Bonding locations.
   5. Disconnect procedures.

3-9.3 Single Point Fueling
   a. Discuss methods of Single Point (Under wing) fueling.
      1. Items included in Over Wing fueling.
      2. Connecting procedures.
      3. Air vents.
      5. Pumping pressure.
      6. Disconnect procedures.

3-9.4 Helicopter Fueling Procedures.
a. Insure that it is understood that Helicopter Fueling is very similar to Over Wing Fueling with a few minor differences.
   b. Discuss methods of over wing fueling.
      1. Aircraft identification.
      2. Fuel cap location.
      3. Fuel cap operation.
      4. Bonding locations.
      5. Disconnect procedures.
      6. Preventing damage from hoses and nozzles.
   c. Cautions concerning Rapid Refueling.

3-9.5 Bonding Procedures.
a. Discuss the importance of and proper procedures for Bonding.
   1. Fuel equipment to aircraft.
   2. Reasons for bonding.

3-9.5 Fuel Filler Cap.
a. Insure that the identification, location and operation of the different fuel filler caps by aircraft model are understood.

3-9.6 Defueling
a. Demonstrate the proper procedures for defueling aircraft.
   1. Reasons for defueling.
   2. Defueling procedures.
   3. Disposing of fuel.

3-9.7 Fuel Additives
a. Discuss the different fuel additives, cautions and procedures for mixing.
   1. Types.
   2. Use of additives.
   3. Injection method.
   4. Personal Safety.

3-9.8 Rapid Refueling
a. Discuss procedures for Rapid Refueling with regard to special safety precautions.
   1. Personal safety.
   2. Passenger safety.
   3. Safety Equipment.
   4. Appropriate clothing.

3-9.9 Chocking Aircraft and Fuel Truck.
   a. Discuss the reasons for chocking wheeled aircraft and fuel trucks.
      1. Installing chocks.
      2. removing chocks.

3-9.10 Fire Extinguisher Location.
   a. Insure that the reason for the proper placement of fire fighting equipment is understood.

Chapter 4 Identification and Properties of Aviation Fuel

4-1 Jet (Turbine) Fuels consist of several types, Jet A, Jet A-1 and Jet B are the most common. Jet A is the type of Jet Fuel used at PHI and available in the U.S.A.

4-1.1 Jet A and A-1 are kerosene distillates with relatively high flash points, 100 degrees Fahrenheit minimum. The maximum freezing temperature of Jet A is -40 degrees Fahrenheit and Jet A-1 is -53 degrees Fahrenheit. Other than the freezing temperatures, Jet A and A-1 are identical and both will be referred to as Jet A in this manual. Jet A and A-1 are clear to straw in color.

4-1.2 Jet B is a blend of Kerosene and Naphtha with a maximum freezing point of -58 degrees Fahrenheit. Jet B is inherently more hazardous to handle than Jet A due to the wide flash point range of -10 to 80 degrees Fahrenheit. Jet B is clear to straw in color.

4-1.3 Water contamination is a greater problem with Jet Fuel than Avgas. Jet Fuels have a tendency to hold water in suspension, which is not a problem as long as the water stays in solution with the Jet Fuel. Free water must be removed by draining and filtration to prevent bacterial growth and aircraft fuel system contamination.

4-1.4 Jet A markings when required on pipe will be 1 black band with Jet A in white letters on a black background. Valves will be marked with Black.

4-1.5 Jet A-1 markings when required on pipe will be 2 black bands with Jet A-1 in white letters on a black background. Valves will be marked with Gray.

4-1.6 Jet B markings when required on pipe will be 3 yellow bands with Jet B in white letters on a black background. Valves will be marked with Yellow.

4-2 Avgas consists of three grades, 80/87, 100/130 and 100LL and is used in reciprocating engines. The first number indicates the Lean Mixture Performance number and the second number indicates the Rich Mixture performance number. Under most circumstances aviation gasoline will be identified as AVGAS 80, 100 or 100LL. PHI does not use Avgas at this time.

4-2.1 Identification of Avgas is accomplished by adding a dye to change the color. 80 is RED, 100 is GREEN, and 100LL is BLUE.

4-2.2 Handling Avgas can be more critical than Jet A due to the lower flash point of -30 degrees Fahrenheit, which increases the risk of fire.

4-2.3 Avgas 80 markings when required on pipe will be 1 Red band with Avgas 80 in white letters on a Red background. Valves will be marked with Red.

4-2.4 Avgas 100 markings when required on pipe will be 1 Green band with Avgas 100 in white letters on a Red background. Valves will be marked with Green.

4-2.5 Avgas 100LL markings when required on pipe will be 1 blue band with Avgas 100LL in white letters on a Red background. Valves will be marked with Blue.

Chapter 5 Safety and Emergency Procedures

5-1 Fires are a major consideration due to the flammability of aviation fuels.

5-1.1 Three elements are required to start and maintain a fire. These are Fuel in vapor form (Aviation Fuel), Oxygen, and Heat. Remove any one of these elements and the fire can not start or maintain itself.

5-1.1.1 Heat can be generated from numerous sources.
   a. Smoking shall be restricted to designated areas and shall be at least 50 feet from any fuel point, storage area, or mobile fuel unit.
   b. Open fires shall not be permitted on the premises unless approved by a supervisor.
   c. Power equipment such as drills, grinders, polishers, etc. shall not be used in areas of flammable vapors unless approved explosion proof types.
   d. Static spark can be minimized by electrically bonding the fuel delivery equipment to the fuel receiving equipment. The bond shall be made prior to the fuel transfer operation.
5-1.3 Fire Extinguishers

Associated with the fuel facility.

Valves, pumps and emergency shut down systems

c. Control the flow of any flammable liquid that is

b. Summon the nearest available fire department.

a. Alert all other personnel at the facility.

as a minimum, must be able to:

5-1.2 Fire-Control procedures

- understood by all line service personnel. Each employee,

should be thoroughly understood by all line service personnel. Each employee,

as a minimum, must be able to:

a. Alert all other personnel at the facility.

b. Summon the nearest available fire department.

c. Control the flow of any flammable liquid that is

involved in the fire. This will include the operation of all valves, pumps and emergency shut down systems associated with the fuel facility.

5-1.3 Fire Extinguishers

are the primary tool for fighting fires available to the Line Service Person. The use of the proper fire extinguisher for the particular fire

and it’s placement are very important. Fire extinguishers reduce the temperature, oxygen or both to extinguish a fire.

a. When fueling an aircraft from a mobile fuel unit the fire extinguisher should be placed upwind from the aircraft and between the aircraft and the mobile fuel unit.

b. When fueling from a fixed fuel point the fire extinguisher should be located in the immediate vicinity of the fuel point, but not next to it. If a fire occurs at the fuel point and the fire extinguisher is located next to it, the fire would prevent access to the fire extinguisher.

c. 20 pound Dry Chemical Class BC fire extinguishers are located at the fuel points and on mobile fuel units at PHI.

d. 100 and 150 pound class BC fire extinguishers are located at fuel storage areas at PHI.

e. All fire extinguishers are maintained in accordance with the manufactures recommendations.

5-1.3.1 Fire extinguisher types

are determined by the type of fire, whether wood (Class A), liquid (Class B), electrical (Class C) or metal (Class D). Class B fires involve flammable and combustible liquids, paint, solvents, oils, grease and flammable gasses, for example. Jet fuel would be a Class B fire and since this is the subject of this manual, we will concentrate on Class B fires.

a. Fire extinguishers rated Class BC are used at PHI in the vicinity of fuel operations. These extinguishers are suitable for class B and C fires. They can be identified by a square containing a B and a circle containing a C and are of the dry powder type.

b. Fire extinguishers are rated as to the size of fire that they can extinguish. An example of the rating would be a fire extinguisher rated 5B, 5A or 5A:5BC. This would indicate that this fire extinguisher is 5 times more effective in controlling this type of fire than a 1B, 1A or 1A:1BC fire extinguisher.

c. AFFF extinguishers (Aqueous Film Foam) are suitable for Class A and B fires. Since this is a liquid type fire extinguisher it is not suitable for freezing temperatures. An advantage of this type agent is it’s ability to cover the liquid surface and prevent reignition.

d. Carbon Dioxide is suitable for Class B fires and might also be rated Class C. Since this agent is dispensed in the form of a gas/snow cloud it is suitable for only short ranges, 3 to 8 feet, and where little or no wind exists.

e. Halon can be of three types: 1301, 1211 and a mixture of the two. The agent forms a gas/mist which interrupts the chemical reaction of the fire. This agent can be rated for Class A, B and C fires. This agent has about twice the range as Carbon Dioxide but is also very susceptible to winds. The biggest advantage is that there is no residue after use.
d. Dry Chemical fire extinguishers contain Sodium Bicarbonate, Potassium Carbonate (Purple K) or Monoammonium Phosphate, which is A:B:C rated. Since Monoammonium Phosphate is very corrosive we do not use it at PHI. Dry chemical fire extinguishers have a range of 10 to 30 feet and perform well under windy conditions.

5-1.3.2 Fire Extinguisher Inspections are accomplished under the following procedures, which were developed to meet all applicable fire codes. The program is divided into three procedures; monthly, servicing and general rules. 

a. Monthly inspection shall include each fire extinguisher at a PHI facility to determine it’s serviceability. The Monthly Inspection procedure is covered in the PHI HS&E Manual.

b. Servicing CO2, stored pressure and cartridge extinguishers shall be accomplished by the Accessory Shop in Lafayette. Unless the fire extinguisher is unsafe for use, a replacement fire extinguisher shall be received prior to returning an unserviceable unit for inspection. Wheeled carts will be sent in for service, then returned to the same facility due to the lack of spare units.

c. General rules for fire extinguishers at PHI. Further information can be obtained from the PHI Safety Manual.

1. Only BC extinguishers shall be used on mobile fuel units. CO2 units are not acceptable.

2. CO2 extinguishers may be used inside the hangar where a BC extinguisher is suitable.

3. In office type environments ABC rated extinguishers should be used.

4. Cartridge operated fire extinguishers must be returned to Lafayette for annual maintenance.

5. Extinguishers with a pressure gauge do not need an annual inspection and will be maintained under the monthly inspection criteria.

6. Any extinguisher which has an illegible data/instruction plate should be returned to Lafayette for repair.

7. Any questions concerning the inspection requirements and placement of fire extinguishers should be directed to the PHI Director of Safety in Lafayette.

5-2 Fuel Spills present an extremely hazardous fire and environmental situation. Because of the many possible variables, no two spills will present identical hazards, therefore the response will be on a case by case bases. However, prompt action and good judgment will always be required.

If fuel is discovered spilling from equipment or aircraft, the fuel operation shall be stopped immediately and the source of the leak shut off. Every spill should be reported immediately to the Area/Base Manager and remedial action taken. The Area/Base Manager should determine if the operations in progress can be continued safely and continue with appropriate notifications.

5-2.1 Spill size will determine what corrective action is necessary due to fire and environmental considerations. All spills, regardless of the size, will be contained immediately and cleaned up as soon as possible.

1. Small spills under a pint require no emergency action. These spills must be cleaned up as soon as possible.

2. Spills from 2 to 6 feet in diameter require a fire guard to maintain a restricted area around the fuel spill to keep unauthorized persons away. The fire guard should be equipped with a 15 pound or larger dry chemical, AFFF Foam or Carbon Dioxide fire extinguisher.

3. Spills larger than 6 feet in diameter or that are continuous in nature are very hazardous. The manager of the facility should be notified immediately. Fire fighting equipment should be moved upwind of the spill, the spill contained and the source of the spill eliminated. Personnel in the vicinity of the spill should be evacuated to a safe area. No aircraft, vehicle, electrical equipment or switches should be started until the area is made safe. If a vehicle engine is running at the time of the spill, it is normally good practice to drive it from the hazard area.

5-2.2 The Spill Prevention Control and Countermeasures Plan is available at all PHI locations. The SPCC Plan gives instruction for the containing, cleaning and reporting of spills.

5-3 First Aid relating to Jet Fuel is covered in the Material Safety Data Sheet, located in this manual and in the MSDS Manual at each base.

a. If splashed into the eyes flush for 15 minutes with clear water or until the irritation subsides. If irritation persists, call a physician.

b. In case of skin contact remove any contaminated clothing and wash with soap and water. If the product is injected under the skin, or into any part of the body, the individual should be evaluated immediately by a physician.

c. If the product is ingested do not induce vomiting, seek medical attention immediately.

d. If overcome by fuel vapors remove to an open area, perform CPR if appropriately trained, give oxygen and call for medical assistance.

5-4 Emergency response contact numbers should be posted by telephones and are also located in the base specific section of this manual.
Chapter 6 Aircraft Identification and Fueling Procedures.

6-1 Aircraft identification is imperative before fueling begins. The aircraft type will determine the type of aviation fuel, required additives, bonding locations, fuel cap location/operation and whether over wing or under wing procedure are to be used. The Aircraft Identification section of this manual contains photographs, descriptions, fuel cap locations and fueling procedures for the aircraft operated by PHI. If the fuel handler is unfamiliar with the aircraft requiring fuel, it is mandatory that instruction and assistance is received from a knowledgeable fuel handler or aircraft crew member.

6-2 General fueling procedures will relate to all aircraft fueling operations. If there is a conflict between this manual and the PHI, Inc. FAR 135, General Operations Manual, concerning aircraft operations during fueling, the Operations Manual will take precedence.
   a. Weather Radar shall not be used during fueling operations.
   b. Prior to making any fuel connections to the aircraft, the fuel equipment shall be bonded to the aircraft with a cable. The bond shall be maintained until the fueling connections have been removed.
   c. If it is necessary to use a funnel for aircraft fueling, the funnel shall be kept in contact with the filler opening. Only metal funnels shall be used.
   d. Fuel servicing shall not be preformed on a fixed wing aircraft while an onboard engine is operating. Exception: If the onboard auxiliary power unit on a jet/turbine aircraft is inoperaable and in the absence of suitable ground support equipment, an engine mounted on the rear of the aircraft or on the wing opposite the fueling point may be operated during fueling.
   e. Helicopters being fueled with Jet A only, may be fueled with engines running.
   f. Equipment, other than that performing aircraft fueling, shall not be permitted within 50 ft. of the aircraft during fueling operations.
   g. Equipment performing aircraft servicing functions shall not be positioned within 10 ft of the aircraft fuel system vents.
   h. Battery chargers shall not be connected, operated, or disconnected while fuel servicing is in progress.
   i. Ground power generators or other electrical ground power supplies shall not be connected or disconnected while fuel servicing is in progress.
   j. Electrical tools or similar tools likely to produce a spark shall not be used while fuel servicing is in progress.
   k. Fuel servicing operations shall be suspended when there are lightning flashes in the immediate vicinity, 3 miles, of the airport/heliport.
   l. Aircraft fuel servicing vehicles shall be positioned so that a clear path of egress from the aircraft for the fuel vehicle is maintained.
   m. Aircraft fuel servicing vehicles should be parked upwind of the aircraft being fueled.
   n. Fire extinguisher should be removed and placed between the aircraft and the mobile fuel unit.
   o. No person shall fuel from a drum or other unusual fuel system without specific authorization and specific instructions from a PHI Manager who can exercise Operational Control.

6-2.1 Helicopter and Over Wing fueling procedures with all engines shut down. These procedures apply to fueling from a stationary fuel point or mobile unit.
   a. Insure that the fuel system is ready to deliver fuel by insuring that the required checks and inspections have been completed.
   b. Identify type and model of aircraft that is to be fueled.
   c. Determine the type and quantity of fuel needed.
   d. Do not board or discharge passengers during fuel operations.
   e. Passengers should be discharged prior to the fueling operations. If it is necessary for the passengers to remain onboard, a company representative shall be present, other than the person doing the fueling, to insure that no smoking is adhered to and to give assistance in the event of an emergency. The pilot can fill this function.
   f. Position fuel servicing vehicles so that they can be moved in the event of an emergency.
   g. Fuel servicing vehicles shall not be positioned under the wing of any aircraft during over wing fueling.
   h. Fuel servicing vehicles shall not be positioned within 10 feet of an aircraft fuel system vent opening.
   i. Parking brakes shall be set on fuel service vehicles and wheels chocked.
   j. The following fueling sequence should be followed.
      1. Open mobile fuel unit fuel system supply valve.
      2. Turn on the mobile fuel unit pump.
      3. Bond the fuel nozzle to the aircraft.
      4. Open the aircraft fuel cap.
      5. Insert the nozzle and begin fueling.
      6. Remove the nozzle and close the aircraft fuel cap.
      7. Remove the bonding wire.
      8. Replace the hose and nozzle in their proper locations.
      9. Turn off the mobile fuel unit’s fuel pump.
     10. Close the mobile fuel unit system supply valve.
     11. Inspect the area for evidence of leakage.
12. Check the security of the aircraft to include:
   b. All doors closed to include cargo doors.
   c. Accessible cowlings.
   d. No loose objects hanging from aircraft.
   e. No fluid leaks evident. (dripping from aircraft or wet spots on the deck)
   f. Report to the pilot or supervisor that the aircraft is secure or report any discrepancies.

13. **Do not move toward Tail Rotor** during this inspection.

### 6-2.2 Helicopter and Over Wing fueling procedures

**ENGINES RUNNING. (RAPID REFUELING)** will include the information in 6-2.1 plus the following.

a. Only helicopters and airplanes fueled with Jet A or equivalent Jet Fuel shall be Rapid Refueled.

b. A pilot qualified in that model aircraft shall be at the controls.

c. The person fueling the aircraft shall be a properly trained PHI employee or an individual who has completed Helicopter Fueling Training and has a properly completed “Helicopter Fueling Authorization” card.

d. Aircraft power should be reduced to idle to reduce noise and the possibility of confusion. The General Operations Manual has exceptions to this requirement due to aircraft and weather considerations.

   e. All doors, windows, and access points to the interior of the aircraft that are located adjacent to the fuel point should be kept closed if at all possible.

   f. Passengers should be discharged to a safe location when ever possible. When it is necessary for passengers to remain onboard, passengers will be briefed on the evacuation route to follow. Additionally, the door or doors opposite the fueling point should be opened to facilitate emergency egress.

   g. Do not board or disembark passengers, load or unload cargo during fueling.

   h. Weather radar should be placed in standby and radio transmitters should not be used.

   **The fueling steps are the same as fueling with the engines shut down.**

   i. Indicate to the pilot that the fueling operation is complete, the aircraft is secure and the fueling equipment is stored.

**During the exterior checks do not move toward the Tail Rotor**

### 6-2.3 Single Point Fueling

**is a procedure where fuel is introduced into an aircraft under pressure, which substantially reduces the time required to fuel the aircraft.** PHI operates airplanes and helicopters that utilize single point or closed circuit refueling. Due to the differences in fueling procedures between aircraft types utilizing single point fueling, training will be accomplished using the specific aircraft maintenance and operators manuals. Aircraft identification and the operation of the fuel caps and single point fuel nozzle will be covered in the Fuel Cap Identification Section of this Manual.

### 6-2.4 Defueling

**is very similar to fueling an aircraft and the same procedures and safety precautions are to be utilized.** The following considerations need to be followed.

a. Fuel removed due to weight adjustments or maintenance may be reused if filtered prior to being returned to the storage tank or aircraft.

b. Fuel removed due to contamination must not be reused.

c. Contaminated fuels should be defueled into an empty compartment of the fuel truck tank or suitable drum to prevent contamination of large quantities of fuel.

d. All defueling operations shall be performed in the open air. Never inside a hangar or other enclosure.

### Chapter 7 Quality Control

#### 7-1 Jet fuel specifications


a. The appearance of jet fuel shall be clear and bright (visually free of undissolved water, sediment and suspended matter) during all phases of fuel handling. The fuel shall not have a nauseating or irritating odor.

b. Color of jet fuel generally ranges from water white to straw or amber. Other colors may be an indication that the fuel has been contaminated by other products or unauthorized additives. In such a case, the fuel operation shall be discontinued until the fuel has been determined acceptable for aircraft use.

#### 7-2 Fuel Contaminants

**can be in the form of water, solids, surfactants, micro-organisms and the intermixing of different grades and types of fuels.** All of these contaminants can be detected and controlled. Detailed instructions for testing procedures can be found in the ATA-103, “Standards for Jet Fuel Quality Control At Airports”.

a. Dissolved water is similar to humidity in air. All aviation fuel will dissolve water to a certain extent. Dissolved water is not detrimental to aircraft operations as long as the water remains in solution. Water will come out of solution and become free water due to a drop in
temperature at a rate of about 1 ppm per 1 degree Fahrenheit.

b. Free water is visible and very detrimental to aircraft operations. Free water will causing filter stoppage and engine operation problems. Free water can be in the form of “water slugs” which are large quantities of visible water or a water layer in the fuel sample. Entrained water is suspended in tiny droplets in the fuel, and will cause the reflection of light. When present in large numbers, the fuel appears cloudy or hazy. The entrained water will settle out in time and can be removed by the use of filter/separators.

1. Visual detection is the best method for detecting large quantities of free water. The water will appear as a haze, cloud or water layer at the bottom of the sample. Adding a measured quantity of water to a fuel sample will determine if the sample is all water or fuel. A clear glass jar is ideal for this test.

2. Water sensitive paste may be used to indicate the presence of free water. The paste is normally applied to a gauging stick when checking storage tank bottoms for large amounts of free water. The manufactures instructions shall be followed when using these products.

3. Water detector kits can detect free water from 60 ppm down to as low as 1 ppm, depending on the type and manufacture of the kit. The Hydro Kit is the choice of PHI and will detect free water down to 30 ppm. Regardless of the kit used, the manufactures instructions must be followed.

c. Moisture Ratings are:

1. Bright – Quality independent of the color and refers to the lack of suspended or free water. Bright fuel tends to sparkle.

2. Hazy – Find droplets of moisture throughout the sample. Produces a dull hazy appearance. Could be a temporary condition brought about by a drop in temperature.

3. Cloudy – Extremely fine droplets of water giving a milky appearance.

4. Wet – Any form of free water in the form of droplets or bulk water on the bottom of the bucket or clinging to the sides.

5. Surfactants – slime in the bottom of the bucket, appears as a dark brown layer or scum.

7-2.2 Solids in fuel samples can be dirt, rust, paint chips, etc. Excessive amounts of these types of contaminants should be investigated to determine their origin.

   a. A clear glass jar, white or stainless steel bucket should be used to collect the fuel sample and check for solids. The White Bucket Test is the procedure to follow to determine solids contamination.

   b. Solids are rated as the following:

      2. Slight – contains several fine to moderate size particles.
      3. Moderate – contains many small particles floating or settled on the bottom.
      4. Dirty – Discoloration or many particles floating or on the bottom.

7-2.3 Surfactants (Surface Active Agents) can appear as slime, dark brown/black layer, scum or lacy material in the bottom of the sample container or at the water/fuel interface. This contaminant can disarm the filter/separator and cause the water removal capabilities to become ineffective. Surfactants in fuel can be the result of naphthenate or sulfonate carry over from the refinery, or can be in the form of additives such as corrosion inhibitors, dispersants, and static dissipaters.

   a. The White Bucket Test is the procedure to follow to determine surfactant contamination.

   b. Micro-Organisms come in a wide variety. They can enter aviation fuel systems via air, sea or fresh water, soil, or other means. Contamination from these micro-organisms may result in sludge, slim and corrosion problems. Since water is needed for microbial growth, removal of water from aviation fuel systems is the preferred method to limit contamination.

      a. Visual testing for micro-organisms is made using the White Bucket Test.

      b. The Hum-Bug Detector Kit is also available. The manufactures instructions must be followed to prevent a false indication.

7-2.4 Intermixing of different grades and types of fuel is a form of contamination. This can occur when non-dedicated transport equipment is used and it was not thoroughly cleaned between product shipments.

   a. Visual testing may detect this contamination. The color of the fuel will not fall when in the accepted range.

   b. API Gravity Test would be another method to determine product mixing. A significant change in the specific gravity, 1 degree or greater, would cause the product to be suspect. Rejection and further laboratory testing would be required. Specific instructions for the API Gravity Test can be found in ATA-103, “Standards for Jet Fuel Quality Control At Airports”.

Chapter 8 Inspections and Checks

8-1 Receiving fuel from a transport truck should follow the instructions on the PHI Fuel Receiving Check List, PHI-142-FRCL-007. The form will insure quality control and vendor surveillance.

   a. Complete all entries on the form.

   b. Allow the tank truck to stand idle for at least 15 minutes to allow settling of the fuel load.

   c. Insure the proper paperwork has accompanied the shipment. Invoice/Manifest, Bill of Lading and Freight
Ticket could be on the same form or any combination of the three. It is important to insure that what was ordered is what is received.

d. Complete an API Gravity Check on each trailer tank compartment and record on the “Fuel Receiving checklist”. A gravity reading in excess of + or - 1 of the gravity listed on the Certificate of Analysis will require confirming the load through the refinery or rejecting the load.

e. Brief the driver on the procedures to follow during the fuel transfer and in the event of a spill or leak.
   1. The driver is to be at the trucks primary shut down control during the entire transfer operation.
   2. If the driver or fuel handler will be out of sight or hearing of each other at any time, walkie talkie radios should be used to maintain communication.
   3. If a spill or leak is detected immediately notify the driver that you are shutting down the transfer and close the bulk plant receiving valve. This will give the driver the opportunity to close his valve at approximately the same time that the bulk plant valve is closed.

   4. Either the PHI Fuel Handler or the Truck Driver can initiate the shut down procedure.

   f. Inspect the tractor and note the unit number.

   g. Inspect the trailer and note the unit number.

   h. Verify the product and check trailer security. Sump trailer compartments and tractor pump. Check samples for contamination.

   i. Prepare to transfer fuel by:
      1. Checking dike drain valves closed.
      2. All tank delivery valves closed.
      3. Gauge receiving tank and all other tanks. Record on the Fuel Receiving Check List.
      4. Open delivery valve on receiving tank. Insure all other valves are in the correct position as indicated by the Valve Position Diagram.
      5. Connect bonding cables to truck.
      6. Check transfer hose connects are clean .
      7. Connect transfer hose from trailer to fuel system.
      8. Transfer fuel from trailer to tank. Monitor receiving separator differential pressure (if installed). Discontinue receiving fuel if differential pressure exceeds 15 psig.
      9. During the transfer operation insure that the correct tank is filling by gauging all tanks approximately 5 minutes after fuel receiving has started. Compare readings with values recorded on Fuel Receiving Checklist. A leaking valve could allow an unscheduled tank to overfill. Discontinue receiving fuel if the wrong tank is filling.
     10. The primary position for the fuel handler during the receiving process is at the bulk plant fuel receiving valve. It may be necessary to frequently inspect the areas of the bulk plant that are not readily visible to insure that a leak or spill has not occurred.

   11. After the transfer is completed, secure the system.

   12. Complete the Fuel Receiving Check List and maintain for 12 months.

   13. Settling times:
      a. Receiving fuel through a Filter – 1 hour minimum, 1 hour per foot of the total fuel height in the tank is preferred.
      b. Receiving fuel directly into the tank – 1 hour per foot of the total fuel height in the tank. If the final filter is an approved Go-No-Go type a 1 hour minimum may be approved.

8-2 Bulk Plant inspections are comprised of a Daily and Annual Inspection.

a. Daily inspections will utilize the Bulk Plant Daily Check List, PHI-142-BPDCL-00?, and the instruction are located on the back of the form. The form is to be maintained for 12 months.

   1. Sump each tank checking for contamination.
   2. Sump each filter/separator under pressure checking for contamination.
   3. Record the differential pressure of the delivery filter/separator daily and the receiving separator during receiving operations.
   4. Check the condition and operation of the bonding equipment. Monthly check continuity and record.
   5. Check pump for leaks.
   6. Check all electrical components for condition.
   7. Check valves, gauges, lines and tanks for leaks.

   8. Complete a general condition check, which will include checking components for rust, house keeping, paint condition, etc.

   9. Verify that the system has been inspected and is suitable for service by initialing the form.

b. Bulk Plant annual inspection is extensive and the Bulk Plant Filter Change Annual Inspection Record, PHI-142-BPFCAIR-00?, shall be used. Follow the instructions located on the back of the form. A copy of the most recent form shall be maintained and shall not be older than 12 months. Send the original to the Fuel Systems Coordinator, Lafayette Facility Maintenance.

   1. Tanks annual inspection shall include removing the tank lid and inspecting the interior for contamination and liner condition.
   2. Remove the cover from the filter separator, inspect the internal components and lining. Replace the filter and seals.
   3. Calibrate pressure gauges that indicate system pressure.
   4. Function check the Gammon DP Gauge.
8-3 Flight Line Fuel Point inspections are comprised of a Daily and Annual Inspection.
   a. Daily fuel point inspections will use the Flight Line Daily Check List, PHI-142-FDCL-00?, and the instructions are on the back of the form.
      1. Sump the filter under pressure and check sample for contamination.
      2. Check filter housing for leaks.
      3. Check hose for condition.
      5. Check nozzle for condition.
      6. Remove the screen quarterly and check for condition and cleanliness.
      7. Check reel for condition if installed.
      8. Every January, April, July and October, remove the nozzle screen and check for cleanliness and damage.
      9. Verify that all fuel points have been inspected and are suitable for service by initialing the form.
   b. Annual fuel point inspection is extensive and the Fuel Point Filter Change Annual Inspection Record, PHI-142-FPFCAIR-00?, is to be used. Instructions are on the back of the form. A copy of the most recent form shall be maintained and shall not be older than 12 months. Send the original to the Fuel Systems Coordinator, Lafayette Facility Maintenance.
      1. Replace all filters.
      2. Inspect filter housing interiors for deterioration.
      3. Check gauges (if installed) for condition and leaks. Calibrate if pressure gauges.
      4. Check all valves for operation and positive shutoff under system pressure.
      5. Remove nozzle screen and check condition and cleanliness.
      6. Check nozzle for proper operation.
      7. Check reels for leaks and operation.
      8. Check hoses for condition and slippage of fittings.
      9. Sign off form by filter location.
     10. Verify that all fuel points have been inspected and are suitable for service by initialing the form.

8-4 Mobile Fuel Units will be inspected under a Mobile Refueler Daily/Weekly Preventative Maintenance form, PHI-142-MRDWPM-00?, Mobile Fuel Unit Quality Control Record, PHI-142-MFUQCR-00?, and Mobile Fuel Unit Filter Change Annual Inspection Record, PHI-142-MFUFCAIR-00?. Instructions are on all forms. A copy of the most recent form shall be maintained and shall not be older than 12 months. Send the original to the Fuel Systems Coordinator, Lafayette Facility Maintenance.
   a. Mobile Refueler Daily/Weekly Preventative Maintenance, PHI-142-MRDWPM-00?, form will insure that the unit is kept in a safe and operable condition, that is capable of delivering a quality product to aircraft. Instructions are provided on the form, indicating what item to inspect and what to check for. Deficiencies are to be noted in the space provided on the back of the form.
   b. Annual Mobile Fuel Unit inspection is extensive and the Mobile Fuel Unit Filter Change Annual Inspection Record, PHI-142-MFUFCAIR-00?, shall be used. Instructions are located on the back of the form. This inspection will cover the fueling portion of the unit only. The truck portion will be referred to Lafayette Facility Maintenance or other approved vehicle maintenance shop. A copy of the most recent form shall be maintained and shall not be older than 12 months. Send the original to the Fuel Systems Coordinator, Lafayette Facility Maintenance.
      1. Replace all filters.
      2. Inspect filter housing interiors for deterioration.
      3. Check condition of all gauges. Calibrate pressure gauges and function check Gammon Differential Pressure Gauge.
      4. Remove nozzle screens and check condition and cleanliness.
      5. Check nozzle for operation, leaks and condition.
      6. Check tank compartment interiors for cleanliness and condition.
      7. Check tank compartment lids for operations, seals and condition.
      8. Check reels for operation and condition.
      9. Check hosed for condition and fittings for slippage.
     10. Check all valves for operation and leaks.
     11. Verify that checks have been made and that the unit is suitable for service by initialing the form.
   c. Mobile fuel unit quality control will be completed prior to the first use of each day. Mobile Fuel Unit Quality Control Record, PHI-142-MFUQCR-00?, will be used and the instructions are on the back of the form.
      1. Fuel samples will be taken at the tank compartment sump drains, filter sump drains and nozzle.
      2. Checks will be made for color, odor, water, sediment and differential pressure.
      3. Verify that all checks have been made and that the product is suitable for aircraft use by initialing the form.
   d. Single point fuel trucks will have their primary and secondary pressures and flow rate checked quarterly. Utilize form Single Point Fuel Truck Pressure and Flow Check”, PHI-142-SPFTPFC-00?.
8-5 Offshore fuel systems maintained by PHI shall be maintained under a daily and annual inspection program.
   a. Offshore daily inspections shall use the Offshore Daily Check List, PHI-142-ODCL-00?. The inspection shall be completed prior to the first use of the day. The instructions on the back of the form shall be followed.
      1. Sump the tank.
      2. Sump the filter/separator if installed.
      3. Check the hose condition.
      4. Check the nozzle condition to include the screen.
      5. Check the reel condition.
      6. Check all valves for proper operation and leaks.
      7. Verify that all checks have been made and that the system is suitable for use by initialing the form.
     b. Offshore annual inspections are extensive and the Offshore Filter Change Annual Inspection Record, PHI-142-OFCAIR-00?, shall be used. The instructions are located on the back of the form. Anytime a filter is changed due to condition a new Offshore Filter change Annual Inspection Record shall be completed. Discrepancies shall be noted in the space provided for correction.
      1. Replace the filter.
      2. Check the filter housing interior for deterioration and contaminates.
      3. Check gauges for leaks and operations.
      4. Inspection nozzle for proper operation.
      5. Remove the nozzle screen and check for cleanliness and condition.
      6. Check reel for operation and leaks.
      7. Check hose for condition and slippage of end fittings.
      8. Check tank interior for condition of lining and contaminates.
      9. Verify that all checks have been made and that the system is suitable for use by initialing the form.
     c. List the Serial number of the transporter.
     d. List the quantity of fuel loaded into the transporter.
     e. Inspect the condition of the outlet valve and list whether satisfactory or unsatisfactory.
     f. Inspect the condition of the relief valve and list whether satisfactory or unsatisfactory.
     g. Inspect the condition of the skid and tank to include the presence of required placards, their legibility and condition. Indicate whether satisfactory or unsatisfactory. **Missing, peeling or illegible placards must be repaired prior to shipment.**
      h. Inspect the general condition of the transporter to include the currency of the inspection date. Indicate whether satisfactory or unsatisfactory.
      i. Transporters with an inspection item noted as unsatisfactory should not be offered for shipment. Schedule unsatisfactory transporters for shipment to Lafayette for repair.

8-7 Fuel Sample Procedures
   a. Tanks
      1. One half to three quarters of a gallon shall be taken from the tank sump.
      2. Inspect the sample for water, sediment or surfactants. If any contamination is found a second sample is to be taken. If a third sample is necessary and does not meet Clear and Bright, free of water and sediment the Base Manager is to be notified and the tank taken out of service for further investigation and repair.
   b. Filters and Filter/Separators
      1. All filters are to be sumped under pressure.
      2. Sump approximately a pint of fuel from fuel point filters and one quart from filter/separators.
      3. Apply the same standards and procedures as with the tank samples (8-7.a.2)
   c. Hose End Samples (where required)
      1. Take approximately one quart from the fuel nozzle. **ANY contamination will require taking that fuel point out of service until the condition is corrected.**

Chapter 9 Loading Mobile Fuel Units and Transporters

9-1 Mobile Fuel Unit loading requires the same precautions as fueling aircraft.
   a. The refueler must have all required inspections completed.
   b. Brakes set and wheels chocked before loading operation begins.
   c. Refueler must be bonded to the loading facility piping.
d. If top loading, the loading tube shall be extended to the bottom of the tank to prevent splash loading.

e. If bottom loading, an observer must be on top of the tank to prevent overfilling and an additional person at the shut off valve.

f. “Dead Man” nozzle, valve or similar device must be used when loading Mobile Fuel Units.

9-2 Transporter loading requires the same precautions as fueling aircraft.

a. Transporter must have all required inspections completed. Replace missing, damaged or difficult to read placards.

b. Inspect transporter interior for any residual liquid and sediment. Transporter must be clean and empty prior to filling.

c. Insure that the outlet valve is closed and plug is installed.

d. Position the fuel truck next to the transporter, set the brake and chock the rear tires.

e. Position a fire extinguisher between the fuel truck and transporter.

f. Bond the transporter to the fuel truck.

g. Leave approximately 10 percent of the transporter empty to facilitate expansion.

h. Apply anti-tampering device to fill opening.

i. “Dead Man” nozzle, valve or similar device must be used when loading transporters.

Chapter 10 DOT and USCG Inspections

10-1 Transporter Inspections required under USCG and DOT Regulations:

10-1.1 Marine Portable Tanks (MPT) are required to have a 12 month, 30 month and 60 month inspection in accordance with 46CFR98.30-3, 6.79, 64.81 and 64.83.

a. 12 Month Inspection.
   1. Pressure and Vacuum Relief Valves will be disassembled, visually inspected for defects, tested for accuracy or pressure settings and reinstalled.
   2. A metal tag will be attached giving date of inspection.

b. 30 Month Inspection.
   1. Internal and external inspection for cracking, corrosion and weld defects.
   2. Visual and manual inspection of all devices except relief valves.
   3. Stencil date of inspection near identification plate in 1.25 inch letters.

c. 60 Month Inspection and Weld Repairs.
   1. Perform a Hydrostatic Test.
      a. Close all covers and other openings using procedures as in normal operations.

   b. Use same gasket material as normal operations where required.

   c. Fill with water and pressurize to test pressure as indicated on the identification plate. (NO LEAKS ALLOWED)

   d. Stamp date and initials of person completing the passed test on the identification plate.

10-1.2 Intermediate Bulk Containers (IBC, UN-31) ARE REQUIRED TO HAVE A 30 Month Inspection in accordance with 49CFR180.352, 178.705 © (1) (iv) (A), 178.813 and 178.703.

a. 30 Month Inspection.
   1. Replace missing, damaged or difficult to read markings.
   2. Service equipment is to be fully functional and not damaged.
   3. Minimum wall thickness shall comply with 49CFR178.705 (c) (1) (iv).
      a. Seal vent closures.
      b. Apply air pressure to 2.9 psig.
      c. Coat all seams and joints with a soap and water solution.
      d. NOT LEAKS ALLOWED.
   5. Stamp identification plate with the inspection date.

10-1.3 IM-101/102 Transporters are required a Condition Inspection, 2.5 Year Intermediate Periodic Inspection and a 5 Year Periodic Inspection and Test in accordance with 49CFR180.605, 49CFR107 subpart E, 49CFR178.270, 178.271 and 178.273.

a. Condition Inspection shall be completed when it is found that:
   1. Dents corrosion or leakage exists that might render the tank unsafe.
   2. Tank has been damaged in an accident that might render the tank unsafe.
   3. Tanks has been out of service for one year.
   4. Tank has been modified from it’s original design specifications.

b. 2.5 Year Intermediate Periodic Inspection.
   1. Required 2.5 years after a new IM 102 or IM 101 tank has been placed into service.
   2. Inspection requirements are the same as the 5 Year Periodic Inspection.

   c. 5 Year Periodic Inspection.
      1. Witnessed or completed by a DOT Approved Authority in accordance with 49CFR396 and 571.
      2. Internal and External Inspection.
         a. Tank shell for pitting, corrosion, dents, distortion, weld defects and leakage.
b. Piping, valves and gaskets for corrosion, defects, and leakage.
   c. Missing or loose bolts and nuts.
   d. Emergency devices and valves for corrosion, distortion and damage preventing normal operations.
   e. Required markings are legible and not damaged in accordance with 49CFR172.326.
   f. Frame work is in satisfactory condition.

3. Hydrostatic Pressure Test.
   a. All piping, valves and accessories (except relief valves) are installed.
   b. Filled with water and pressurized to 150% of the maximum allowable working pressure.
   c. NO LEAKS ALLOWED.

4. Records.
   a. Date and results of all required inspections and tests on file.
   b. Name and address of authorized Person performing or witnessing the inspection and test.
   c. Records shall be maintained as long as PHI owns the transporter.

10-2 Transporter Placards (49CFR172.326)
   a. Proper shipping name “FUEL, AVIATION. TURBINE ENGINE” on two sides.
   b. Owner or Lessee’s name “PHI, INC” on two sides.
   c. Identification number placard “1863” for bulk packaging on four sides. 49CFR172.514
   d. Additional PHI required placards.
      1. “HELICOPTER FUEL” near outlet valve.
      2. “VENT TANK BEFORE DEFUELING” and “REPLACE ALL PLUGS AFTER DEFueling” near outlet valve.
      3. “JET A” decal on four sides.
      4. “NO SMOKING WITHIN 50 FEET” on two sides.
      5. “CAUTION TAKE A SAMPLE” near outlet valve.
   e. Additional PHI required markings for IBC (UN-31) Transporters.
      1. All four sides of the IBC will have all decals listed in 10-2, 1, 2, 3, 4 (c) & (d).
      2. Valve operation decal near outlet valve.

10-3 Fuel Truck and Trailer DOT Inspections.

10-3.1 Fuel Trucks and Trailers are required a Condition Inspection and 12 Month Inspection in accordance with 49CFR180.407, 180.409, 180.411 and 180.415.
   a. Conditions Inspection requirements.
      1. Bad dents, corrosion, leakage, that would render the unit unsafe.
   2. An accident and damage that would render the unit unsafe.
   3. Out of service for hazardous materials for one year.
   4. Modified from original design.
   b. 12 Month Periodic Inspection 49CFR180.407.
      1. External visual Inspection.
         a. Tank shell inspected for corrosion, dents, distortion, weld defects, leakage that would render the unit unsafe.
         b. Piping, valves and gaskets shall be inspected for corrosion, weld defects, and leakage that would render the unit unsafe.
         c. Devices shall be inspected for operation and manhole covers shall be operational with no leaks.
         d. Emergency devices including self closing valves shall be inspected for corrosion, distortion, damage and function checked for operation.
         e. Inspect for missing or loose nuts and bolts.
         f. Markings shall be correct, legible and not damaged.
      g. Inspect major accessories and structure for condition.
   h. Results must be recorded.
   2. Internal Visual Inspection.
      a. Tank shell inspected for corrosion, dents, weld defects that would render the unit unsafe.
      b. Corroded or abraded areas shall be tested for wall thickness.
      c. Results must be recorded.
   3. Pressure Test.
      a. Self closing pressure and relief valves must be removed inspected and reinstalled.
      b. Hydrostatic Pressure Test will require the tank to be filled with water and tested to no less that 80 percent of the maximum allowable working pressure. Pressure must hold for 10 minutes.
      4. Tank valves and piping shall be inspected for leaks.
   5. 12 Month Periodic Inspection must be performed by a DOT approved authority.

10-4 Fuel Truck and Trailer Placards shall be applied in accordance with 49CFR172.328 and PHI.
   a. Identification number placard (1863) on four sides of the trailer tank and three sides of the truck tank and on the front of the truck. Cab
      1. Legal name of owner on both sides located on the doors.
      2. Motor Carrier Identification Number preceded by USDOT on both sides located on the doors.
      3. Must be in contrasting colors and legible from 50 feet with the vehicle stationary.
c. Additional Placards and Labels as per PHI and recommended by ATA-103.
   1. Product Identification (JET A) on both sides and rear of truck and both sides, front and rear of trailer tank.
   2. “NO SMOKING WITHIN 50 FEET” on sides and rear of tanks.
   3. “NO SMOKING” in fuel truck cab.
   4. “EMERGENCY FUEL SHUTOFF” adjacent to emergency fuel shut off valve.
   5. “FIRE EXTINGUISHER” adjacent to fire extinguisher if the extinguisher is not visible or installed in a cabinet.
   6. Placards indicating procedures to engage pumping system adjacent to control.
   7. OEM placards and labels as supplied with the fuel truck.
   8. “THIS VEHICLE STOPS AT RR CROSSINGS” on rear of fuel truck and trailer bumper.

Chapter 11 FUEL COMPONENTS

11-1 General Equipment
   a. Plastic buckets, jars, hoses, funnels, etc. are not permitted in fuel handing operations.
   b. Sampling buckets shall be stainless steel equipped with bonding wires and clamps.
   c. Sample jars shall be glass.
   d. Wetted components made of copper alloys shall be held to an absolute minimum.
   e. Wetted components made of galvanized metal shall be held to an absolute minimum.
   f. Water test kits shall be the Velcon Hydro-Kit or the Kolor Kuts Modified paste

11-2 Fuel Point Components
   a. Ball valve preferably stainless steel.
   b. Filter housing shall be Go-No-Go type preferably a Velcon filter element and VF-61 housing or equivalent.
   c. Fuel hoses shall be API-1529 or equivalent.
   d. Nozzle shall be equipped with a 100 mesh screen.
   e. Bonding clamps and pins shall be non-corroding.
   f. Bonding wire shall be stainless steel.
   g. Continuity from the piping to the aircraft shall be provided by a stainless steel bonding wire.
   h. Valve bypass line and check valve around shutoff valve to prevent excessive pressurization of the filter.
   i. digital meter or equivalent if required.

11-3 Bulk Plant Components
   a. Tanks shall be UL listed, meet NFPA 30, epoxy lined and exterior coated with PHI Carboline paint system.
   b. Tanks shall have provisions for sumping.
   c. Tanks shall have a slope. ¼” per foot preferred.
   d. Tanks shall be equipped with a suction drop pipe located 8 inches off the bottom and offloading pipe 1 inch off the bottom.
   e. Electrical components shall be rated for hazardous locations.
   f. Containments if required shall meet applicable regulations.
   g. Filter/Separator of the appropriate flow rating shall be provided for receiving fuel and be equipped with:
      1. Pressure relief valve.
      2. Air eliminator preferable stainless steel.
      3. Gammon differential pressure gauge with peak hold feature and function test button.
      4. Sump drain.
      5. Coalescer and Separator elements.
   h. Filter/Separator of the appropriate flow rating shall be provided for delivering fuel and be equipped with:
      1. Pressure relief valve.
      2. Air eliminator preferable stainless steel.
      3. Gammon differential pressure gauge with peak hold feature and function test button.
      4. Sump drain.
   i. Fuel truck hookup for receiving fuel and bottom loading of PHI fuel trucks and contain:
      1. Cabinet for hookup points to prevent spills.
      2. Quick disconnect and valve for delivery fuel truck.
      3. Dry Break disconnect for bottom loading fuel trucks.
      4. Dead Man Valve for truck bottom loading.
   j. Piping will be 316 stainless steel and welded where possible. Screw connections shall be held to a minimum. Piping design shall allow for recirculation and transferring fuel between tanks.
   k. Catwalks to provide access to the top of the tanks.
   l. Bonding reel attached to piping.

11-4 Heliport Piping
   a. Shall be above ground preferably in a trough.
   b. Shall be 316 stainless steel minimum size 2” dia.
   c. Stainless steel ball valves shall be provided to isolate rows or sections.
   d. Flow control valves shall be provided for individual rows where necessary.

11-5 Fuel Trucks
   a. Shall be DOT approved for highway use.
   b. Tanks shall be stainless steel or aluminum and built to DOT MC-406.
   c. Features and equipment shall meet recommendations of ATA-103 and aircraft model requirements.
11-6 Fuel Trailers
a. Shall be DOT approved for highway use.
b. Tanks shall be stainless steel or aluminum and built to DOT MC-406. (New Equipment)
c. Filter shall be the Go-No-Go type preferable Velcon with a VF-61 housing or equivalent.
d. Tank and filter shall be equipped with a drain.
e. Equipped with a bonding cable reel.
f. Gammon differential pressure gauge with peak hold and function check button.
g. API 1529 hose or equivalent.
h. Nozzle with 100 mesh screen.
i. Stainless steel nozzle bonding cable.
j. Bonding clamps and pins shall be non-corroding.
k. Bonding reel attached to frame.
l. Trailer shall be DOT inspected.
m. Pump shall be a centrifugal or diaphragm type, approved for hazardous locations, and may be engine or electric driven.
n. Piping shall be 316 stainless steel and welded. Screw connections will be held to an absolute minimum.
o. Wetted copper alloy equipment shall be held to an absolute minimum.

11-7 Offshore Systems
a. Helideck Equipment
   1. Helideck box shall be standard PHI design.
   2. Filter shall be the Go-No-Go type preferable Velcon with a VF-61 housing or equivalent.
   3. Piping and ball valves shall be 316 stainless steel. Welded where possible.
   4. Hose shall be API-1529 or equivalent.
   5. Nozzle with 100 mesh screen.
   6. Gammon differential pressure gauge with peak hold and function check button.
   7. Stainless bonding wires.
   8. Bonding clamps and pins shall be non-corroding type.
   9. Reel shall be stainless steel sized for the hose with spring assist rewind.
b. Tank and Pump Package
   1. Galvanized skid pan with 6” preferably 1 ft clearance around all components. Combing shall be minimum 6” measured inside height.
   2. Tank shall be UL-142 with a ¼ inch per foot slope, painted with the PHI Carboline Paint System, Epoxy lined and equipped with:
      a. Suction drop tube 8 inches from the bottom.
      b. Offloading tube 1” off the bottom.
      c. Emergency Vent.
      d. Flame Arrestor.
      e. Sump drain.
      f. Anti-siphon valve where necessary.
   b. Pump shall be electric centrifugal or pneumatic diaphragm and designed for hazardous locations.
   c. Separator shall have both separator and coalescer elements, sized for the application and a Superflex is preferred. Components will include:
      1. Stainless steel air eliminator.
      2. Pressure relief valve.
      3. Sump drain.
      4. Gammon differential Pressure Gauge with peak hold and function test button.
   d. Piping will be 316 stainless steel and welded where possible. Screw connections shall be held to a minimum. Piping design shall allow for recirculation and offloading transporters with the system pump.

Chapter 12 Terms and definitions.

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

API Degrees Units for fuel density measurement.

API Gravity The petroleum industry’s scale and method of measuring density of liquid petroleum products.

Ambient Temperature The air temperature surrounding a specific area.


Clay Treatment Vessel A filtration vessel equipped with bulk clay, clay bags, or clay canisters used for removing surfactants (surface-active-agents) from jet fuel.

Coalescence The property of a coalescer element to bring together very fine droplets of free and entrained water to form large 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 vessel that removes solid particles and coalesces free water from jet fuel. It is upstream of the separator cartridge.

Contaminants Substances either foreign or native which may be present in jet fuel that detracts from its performance.
**Cyclone Separator**  A device that uses the principal of centrifugal force to cause the contaminate in jet fuel to settle to the bottom of a vessel without the use of filtration media.

**Deadman Control**  A 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 material.

**Differential Pressure (Delta P)**  The measured difference in pressure between any two points, generally between inlet and outlet connections on filtration vessels.

**Direct Reading Differential Pressure Gauge**  A pressure gauge which automatically displays the differential pressure between the inlet and outlet connections of filtration vessels.

**Disarming Action**  The rendering of elements in filtration systems incapable of performing their designed functions; e.g., coalescers incapable of coalescing water and separator elements incapable of separating water from fuel.

**Dissolved Water**  Water which is in solution in jet fuel. This water is not free water and cannot be removed by conventional means.

**Effluent**  Stream of fluid at the outlet of filtration vessels.

**Elements**  A generic term given to different types of decontamination media installed in various types of filtration vessels.

**Emulsion**  A dispersion of two dissimilar immiscible droplets in a continuous liquid phase.

**Entrained Water**  Small droplets of free water in suspension which may make jet fuel appear hazy or cloudy.

**Filter**  A decontamination device to remove solid particles from fuel.

**Filter Membrane (Millipore) Test**  A standard test in which jet fuel is passed through a small filter membrane housed in a plastic holder. The cleanliness of the fuel can be determined by measuring the residue or amount of solid contaminates left on the membrane.

**Filter/Separator**  A filtration vessel which removes solids and coalesces free water from jet fuel. All filter/separators are equipped with two types of cartridges; Coalescer elements (first stage) and separator elements (second stage).

**Fixed Base Operator (FBO)**  Common title for aircraft fueling agents or vendors at airports.

**Flash Point**  The lowest fuel temperature at which the vapor above the fuel will ignite.

**Floating Suction**  Pump suction piping with floatation capability used to draw the cleanest product from the upper level of the fuel in a jet fuel storage tank.

**Free Water**  Water in fuel other than dissolved water. Free water may be in the form of droplets or haze suspended in fuel (entrained water or an emulsion) and/or water layered at the bottom of the container holding the fuel.

**Freeze Point**  The coldest fuel temperature at which the last fuel wax crystals disappear when fuel physically changes from a solid back to a liquid when warmed.

**Hydropilic**  Attracts water or is water wetting. Has an affinity for water. Opposite of hydrophobic.

**Hydropobic**  Repels water or is non-water wetting. Resists attracting water. Opposite of hydrophilic.

**Immiscible**  Liquids which are mutually insoluble. Opposite of miscible.

**Influent**  Stream of fluid at the inlet of filtration vessels.

**Joint Use Fueling Systems**  Where two or more users share and receive fuel from a common pipeline system.

**Micronics Filter**  A filtration vessel equipped with pleated paper cartridges designed to remove solid particles from aviation fuels.

**Micron (Micrometer)**  A unit of linear measurement. One micron is equal to 0.000039 inches and approximately 25,400 microns equals one inch.
Miscible  Liquids which are mutually soluble. Opposite of immiscible.

NIST  National Institute of Standards and Technology

NFPA  National Fire Protection Association

Particulates  Solid contaminates found in jet fuel, ie: dirt, rust, sand, fibers, etc.

Pre-Check Valve  A device used to check the operation of the automatic high level shut-off equipment on tank trucks for preventing fuel spills.

Prefilter  A high dirt holding capacity Micronic Filter with pleated paper cartridges installed upstream of other filtration units. Prefilters are designed to extend the useful life of other more expensive filtration media in a fuel distribution system exposed to high solid levels.

Pressure Drop  See Differential Pressure

Product  Unless indicated otherwise, it will mean jet fuel.

PSI  Pounds per Square Inch

Relative Density  The ratio of weight of any volume of fuel to the weight of an equal volume of water. Sometimes referred as Specific Gravity.

Separator Element  The second stage cartridge or shroud in a filter/separator vessel that allows passage of jet fuel but repels free water. It is located downstream of the Coalescer cartridge.

Settling Time  The time allowed for water or dirt entrained in jet fuel to drop to the bottom (sump) of the fuel storage tank.

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 contaminates.

Sump Fuel  Fuel removed from storage tanks, filtration vessels, and aircraft refuelers while performing routine quality control tests and equipment maintenance.

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 hydrant trucks.

Thermohydrometer  A hydrometer with a built-in thermometer used in determining fuel density and measuring fuel temperature simultaneously.

Thief (Sump) Pump  A small pump having a suction line which extends to the low point of a fuel storage tank for the purpose of drawing off water which may have accumulated.

Turbine Fuel  Various kerosene and naphtha based fuels manufactured to be used in jet engines
# Fuel Management Manual

## Fuel Components
- Fuel Contaminants, 19
- Fuel farm familiarization, 11
- Fuel Farm Layout, 12
- Fuel Filler Cap, 14
- Fuel Handler Training Requirements, 10
- Fuel Handler Training Syllabus, 11
- Fuel handling personnel, 10
- Fuel Procedures Notices (FPNs), 10

## Fuel Responsibilities Flow Chart
- Fuel Sample Procedures, 23
- Fuel Spills, 3, 11, 17
- Fuel System Coordinator, 9
- Fuel System Coordinator responsibilities, 9
- Fuel Truck and Trailer DOT Inspections, 25
- Fuel Truck and Trailer Placards, 25

## Introduction
- Identification of Avgas, 15
- IM-101/102 Transporters, 24
- Inspections and Checks, 20
- Intermediate Bulk Containers (IBC, UN-31), 24
- Intermixing, 20

## Jet (Turbine) Fuels
- Jet A and A-1, 15
- Jet A markings, 15
- Jet A-1 markings, 15
- Jet B, 15
- Jet B markings, 15
- Jet fuel specifications, 19

## Firing and Eye Protection
- Hearing/Eye Protection, 12

## Helicopter and Over Wing Fueling Procedures
- Engines Running, (Rapid Refueling), 19
- Helicopter and Over Wing fueling procedures with all engines shut down, 18
- Helicopter Fueling Procedures, 14
- Housekeeping, 13

## Housing, Over Wing, fueling procedures
- Engines Running, (Rapid Refueling), 19
- Helicopter and Over Wing fueling procedures with all engines shut down, 18
- Helicopter Fueling Procedures, 14
- Housekeeping, 13

## DOT and USCG Inspections
- Driving, 13

## Filtration System Operation
- Filter changes, 10

## Fire Extinguisher Inspections
- Fire Extinguisher Inspections, 17

## Fire Extinguisher Location
- Fire Extinguisher Location, 15

## Fire extinguisher types
- Fire extinguisher types, 16

## Fire Safety
- Fire Safety, 12, 13

## Fire-Control procedures
- Fires, 3, 11, 15
- First Aid, 3, 11, 17

## Flight Line Fuel Point
- Flight Line Fuel Point, 21

## Foreign Object Damage
- Foreign Object Damage, 12

## Fuel Additives
- Fuel Additives, 14

## Fuel Sample Procedures
- Fuel Sample Procedures, 23

## Fuel Spills
- Fuel Spills, 3, 11, 17

## Fuel System Coordinator
- Fuel System Coordinator responsibilities, 9
- Fuel System Coordinator, 9

## Fuel Truck and Trailer DOT Inspections
- Fuel Truck and Trailer DOT Inspections, 25

## Fuel Truck and Trailer Placards
- Fuel Truck and Trailer Placards, 25

## Bonding Procedures
- Bonding Procedures, 14
- Bulk Plant, 21

## Chocking Aircraft and Fuel Truck
- Chocking Aircraft and Fuel Truck, 15
- Chocking and Securing aircraft, 12

## Clothing
- Clothing, 12

## Confirming Quantity
- Confirming Quantity, 14

## Customer facility familiarization
- Customer facility familiarization, 11

## Customer Training
- Customer Training, 11

## Defueling
- Defueling, 14, 19
- DOT and USCG Inspections, 24
- Driving, 13

## Emergency response contact numbers
- Emergency response contact numbers, 17

## Familiarization with airports
- Familiarization with airports, 11

## Familiarization with Aviation
- Familiarization with Aviation, 11

## Familiarization with Emergency Procedures
- Familiarization with Emergency Procedures, 11

## Familiarization with the facility
- Familiarization with the facility, 11

## Filter changes
- Filter changes, 10

## Filtration System Operation
- Filtration System Operation, 13

## Fire Extinguisher Location
- Fire Extinguisher Location, 15

## Fire extinguisher types
- Fire extinguisher types, 16

## Fire Safety
- Fire Safety, 12, 13

## Fire-Control procedures
- Fires, 3, 11, 15

## First Aid
- First Aid, 3, 11, 17

## Flight Line Fuel Point
- Flight Line Fuel Point, 21

## Foreign Object Damage
- Foreign Object Damage, 12

## Fuel Additives
- Fuel Additives, 14

## Fuel Components
- Fuel Contaminants, 19
- Fuel farm familiarization, 11
- Fuel Farm Layout, 12
- Fuel Filler Cap, 14
- Fuel Handler Training Requirements, 10
- Fuel Handler Training Syllabus, 11
- Fuel handling personnel, 10
- Fuel Procedures Notices (FPNs), 10

## Fuel Responsibilities Flow Chart
- Fuel Sample Procedures, 23
- Fuel Spills, 3, 11, 17
- Fuel System Coordinator, 9
- Fuel System Coordinator responsibilities, 9
- Fuel Truck and Trailer DOT Inspections, 25
- Fuel Truck and Trailer Placards, 25

## Bonding Procedures
- Bonding Procedures, 14
- Bulk Plant, 21

## Chocking Aircraft and Fuel Truck
- Chocking Aircraft and Fuel Truck, 15
- Chocking and Securing aircraft, 12

## Clothing
- Clothing, 12

## Confirming Quantity
- Confirming Quantity, 14

## Customer facility familiarization
- Customer facility familiarization, 11

## Customer Training
- Customer Training, 11

## Defueling
- Defueling, 14, 19
- DOT and USCG Inspections, 24
- Driving, 13

## Emergency response contact numbers
- Emergency response contact numbers, 17

## Familiarization with airports
- Familiarization with airports, 11

## Familiarization with Aviation
- Familiarization with Aviation, 11

## Familiarization with Emergency Procedures
- Familiarization with Emergency Procedures, 11

## Familiarization with the facility
- Familiarization with the facility, 11

## Filter changes
- Filter changes, 10

## Filtration System Operation
- Filtration System Operation, 13

## Fire Extinguisher Inspections
- Fire Extinguisher Inspections, 17

## Fire Extinguisher Location
- Fire Extinguisher Location, 15

## Fire extinguisher types
- Fire extinguisher types, 16

## Fire Safety
- Fire Safety, 12, 13

## Fire-Control procedures
- Fires, 3, 11, 15

## First Aid
- First Aid, 3, 11, 17

## Flight Line Fuel Point
- Flight Line Fuel Point, 21

## Foreign Object Damage
- Foreign Object Damage, 12

## Fuel Additives
- Fuel Additives, 14
Leaks and Spills, 12  
Lightening/Severe Weather, 12  
LIST OF EFFECTIVE PAGES, 7  
Loading Mobile Fuel Units and Transporters, 23  
LOG OF REVISIONS, 6

**M**

Managers, 9, 10  
Managers Responsibilities, 9  
Marine Portable Tanks (MPT), 24  
Micro-Organisms, 20  
Mobile Equipment, 13  
Mobile equipment familiarization, 11  
Mobile Fuel Unit, 23  
Mobile Fuel Units, 22  
Mobile Fueler Operations, 13  
Mobile Fueling Equipment, 13  
Mobile Refueler Maintenance, 14

**N**

NFPA-407, 4, 10  
Night Operations, 12

**O**

Offshore fuel, 22  
Offshore Manager, 9  
Offshore Manager responsibilities, 9  
Over Wing Fueling, 14

**P**

Passenger Safety, 12  
PHI Employees, 10  
Pilots, 9, 10  
Purpose, 9

**Q**

Quality Control, 1, 3, 4, 5, 9, 10, 12, 13, 14, 19, 20, 22

**R**

Ramp familiarization, 11  
Rapid Refueling, 3, 14  
Receipt Procedures, 13  
Receiving fuel, 20  
Record keeping, 14  
Record Keeping, 13  
Recurrent Training, 10  
Reference materials, 10  
Refueling Aircraft, 14  
Responsibilities, 9  
Rotor/Propeller Jet Blast Safety, 12

**S**

Safety and Emergency Procedures, 15  
Safety Equipment, 13  
SECTIONS, 7  
Security, 13  
Single Point Fueling, 14, 19  
Solids, 20  
Spill Prevention Control and Countermeasures Plan, 17  
Spill Prevention/Response, 13  
Spill size, 17  
Static Electricity Bonding, 12  
Storage Inspection Procedures, 13  
Supervisors, 10  
Surfactants (Surface Active Agents), 20

**T**

Terms and definitions, 27  
Transporter, 23  
Transporter Preloading Inspections, 23  
Transporter Identification and inspection, 14  
Transporter Placards, 25

**V**

Variance/Waiver, 10

**W**

Waste Disposal, 13  
Water, 19  
Water contamination, 15
HELIICOPTER FUELING AUTHORIZATION:

1. Platform or Vessel Safety Procedures must be followed during helicopter fueling operations.
2. All Non-PHI personnel must have completed Helicopter Fueling Training and received a Helicopter Fueling Authorization Card prior to refueling any PHI Helicopter. This training can be given by a PHI Pilot or Mechanic.

HELIICOPTER FUELING WITH ENGINES RUNNING (RAPID REFUELING):

1. Never approach the helicopter unless directed to do so by the pilot. Approach the helicopter from the side, never from the rear or front. Be cautious of the main rotor blades. On some model helicopters the blades can dip very low. This is especially true of the S-76.
2. Passengers should be discharged to a safe location prior to Rapid Refueling. When it is necessary for the passengers to remain on board during Rapid Refueling, they will be briefed on evacuation routes. Additionally, the doors opposite the fueling point should be opened to facilitate emergency egress.
3. Remove the fuel nozzle from the fueling point and check the nozzle for cleanliness. Clean if necessary. Open the valve and turn on the pump.
4. Receive instructions from the pilot on the quantity of fuel that is needed. To indicate that the fuel tank will be filled to capacity the pilot may tap the top of his head indicating TOP OFF the fuel tank. The refueler may also give this signal to solicit a response from the pilot. If this signal is not given, the pilot will indicate when to cease fueling.
5. Move to the fuel fill opening and install the bonding clip or pin.
6. Open the fuel cap.
7. Insert the nozzle and begin fueling. If the tank is to be fill to capacity your attention must be on the fill opening to insure that the tank is not overfilled resulting in a spill and a fire hazard. If the tank will not be filled to capacity your attention must be divided between the fill opening and the pilot. The pilot will indicate when the correct amount of fuel has been delivered ending the fueling operation. **DO NOT BLOCK THE FUEL NOZZLE OPEN OR LEAVE UNATTENDED.**
8. Close the fuel cap.
9. Remove the bonding clip or pin while holding the nozzle away from the helicopter ground point.
10. Store the nozzle in the proper location, close valve and turn off the pump.
11. Check doors closed (baggage and cargo).
13. No loose objects hanging from doors or compartments.
14. No fluid leaks evident from aircraft or on deck.
15. Give the pilots a “Thumbs Up” if all is correct or notify that there is a problem.
16. **Never move towards the Tail Rotor.**

HELIICOPTER FUELING WITH ENGINES SHUT DOWN:

The procedures are essentially the same as Rapid Refueling. Also, a pilot will normally assist during the fueling procedure when the engines are shut down. Passengers and cargo shall not be loaded during the fueling operation.
HELICOPTER FUELING PROCEDURES: (Example aircraft is a 206L-3)

Bonding Clip or Pin Attached.

Fuel Cap Latch opened and turned Left.

Fuel Cap is opened.

Helicopter is fueled.

The nozzle is removed, cap is closed. The bonding clip is the last item removed.
The fuel fill opening is located on the right side of the helicopter, behind the sliding passenger door.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The S-76 has two fuel caps. One on the left and right sides, located behind the rear passenger door.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The fuel cap on the 412 is located on the right side behind the sliding passenger door.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The fuel cap is located on the right side of the helicopter. The 206L-3 and L-1 look the same. The 206BIII has two side windows instead of three and no winglets.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The fuel cap is located on the left side behind the aft passenger door.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The fuel cap is located on the left side between the left cargo compartment and the aft baggage compartment.

The fuel cap latch on the AS-350 is different than the other helicopter latches we have seen so far. The Tee handle in the center of the cap is rotated counter clockwise and the cap is lifted out of the filler hole. To reinstall the cap, it is placed in the filler hole and the Tee handle rotated clockwise to lock the cap in place.
The fuel cap is located on the left side just forward of the aft cross tube.

To remove, the Tee Handle is rotated counter clockwise. Then the cap is rotated counter clockwise and lifted out of the fuel opening.

To close, the cap is inserted into the fuel opening and rotated clockwise until it is completely secure. The Tee Handle is rotated clockwise until it is tight.

To insure that the cap is secure try to wiggle it to check that there is no movement. If movement is found, the cap was not seated fully clockwise before the Tee Handle was tightened.
The Cap and Bonding Point are located on the right side behind the aft cross tube.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The fuel cap is located on the left side of the helicopter behind the sliding door.

**TO OPEN:** The latch is lifted, turned to the left and the cap removed.

**TO CLOSE:** The cap is replaced in the opening, latch rotated to the right and pressed down.
The ranger extender cap is slightly different in appearance that the normal 206 series cap, but the operation of this style cap is essentially the same.

The cap lock is lifted and rotated to the left. The cap is lifted out of the fuel opening.

When replacing the cap insure that the lock is pressed down towards the rear of the aircraft.
The main fuel cell cap is located on the right hand side of the aircraft just behind the rear window. The Bonding Point is located just below the cap and to the left.

The Auxiliary Fuel Cell Cap is located on the left hand side of the aircraft, behind the rear window. The Bonding point is located below the
Bell 430/230/222

**MAIN FUEL CELL CAP**

**MAIN FUEL CELL BONDING POINT**

**AUXILLARY FUEL CAP**

**AUXILLARY CELL BONDING POINT**

**TO OPEN:** The latch is lifted, turned to the left and the cap removed

**TO CLOSE:** The cap is replaced in the opening, latch is rotated to the right and pressed down
The EC-135 has one fuel servicing point and bonding point located on the left side of the aircraft.

**FUEL ACCESS DOOR**
Pressing the latch and swinging the door outward will provide access to the fuel cap.

**BONDING POINT**
The Bonding Point provides electrical continuity between the bonding cable and fuel system. A socket is provided for a bonding pin and a tab is provided to attach a bonding clamp.
OPENING ACCESS DOOR
The fuel cap is accessed by pressing the latch and allowing the fuel door to swing forwards.

CLOSING ACCESS DOOR
When closing, insure that the door is fully shut then press the latch closed.

OPEN THE FUEL CAP
Lift the “T” Handle and rotate fully counterclockwise.
Rotate the cap counterclockwise and remove.

CLOSE THE FUEL CAP
Install the cap and rotate fully clockwise.
Lift the “T” and rotate fully clockwise until snug.
Caution: Insure that the cap is installed straight and fully rotated clockwise before rotating the “T” handle clockwise. If the cap is installed incorrectly it may come loose.

The bonding point is equipped with a socket for a bonding pin and a tab for a bonding clamp. Either may be used.
DESCRIPTION:

The S-92 consists of two fuel tanks located in the left and right side sponsons. Each tank will hold 380 gallons of Jet Fuel for a total of 760 gallons when utilizing pressure fueling and 355 gallons of jet fuel for a total of 710 gallons when utilizing over wing fueling. The left side contains the pressure fueling point, high level precheck switch, over wing fueling point and the bonding location. Pressure fueling is accomplished from the left side and will fill both tanks simultaneously. The right side contains the over wing fueling point and bonding point. Each tank (right and left) must be filled independent of each other.
The bonding points are located in the same locations on the right and left sponsons. The receptacle is designed to take a bonding pin.

The over wing fill point is accessed by opening an access door. A standard push type latch is utilized to secure and unsecure the door and the door swings upward.

The over wing fill cap is a standard type. The latch is lifted, turned counter clockwise and the cap removed from the opening. The cap is attached to the aircraft by a plastic lanyard. The procedure is reversed to install the cap.

A high level warning indicator is incorporated into the over wing tank caps on the left and right sides. After the tanks are filled to capacity utilizing pressure fueling the fuel level will be above the over wing fill caps. It is imperative to check the indicator prior to removing the cap to insure that it has not turned black. A black indicator signifies that the fuel level is above the cap opening and if opened will result in a fuel spill and a fire hazard.
The pressure fuel point is accessed by opening an access door utilizing 3 standard latches. The door is hinged and swings down.

The high level precheck switch is accessed by opening an access door utilizing 2 thumb screw type DZUS Fasteners. The door is hinged and swings down.

The pressure fueling cap is equipped with a combination vent and latch. The latch is pressed in at the wide portion and held in this position while the cap is turned counter clockwise and removed. When the cap is replaced and turned clockwise the latch will snap back into the closed position. It is important to insure that the latch is flush with the top of the cap prior to closing the access door. This insures that the cap is fully closed and latched.

The pressure fill opening has lugs that mate with the pressure fuel nozzle.

The high level precheck switch checks the operation of the high level fuel level shut off circuit and is utilized each time the aircraft is pressure fueled. This is a three position switch:
- **UP** = PRIMARY CHECK POSITION.
- **CENTER** = NORMAL OPERATION.
- **DOWN** = SECONDARY CHECK POSITION.

The switch is spring loaded in the normal position.
Pressure Refueling Main Tanks Procedures:

A. Pressure Refuel Main Fuel Tanks.
   (1) Park helicopter in a level area.
       **WARNING:** TO PREVENT ELECTRICAL SHOCK OF PERSONNEL, MAKE SURE TO DEENERGIZE ELECTRICAL POWER.

   (2) Deenergize all electrical power.
       **WARNING:** TO PREVENT INJURY TO PERSONNEL, MAKE SURE ROTOR BRAKE IS ENGAGED BEFORE WORKING ON HELICOPTER.

   (3) Engage rotor brake.
   (4) Bond helicopter as follows:
       **WARNING:** TECHNICIANS WORKING ON HELICOPTER SHOULD PERIODICALLY DISSIPATE STATIC POTENTIAL BY GRIPPING STATIC BONDING LINE. THIS SHOULD BE DONE PERIODICALLY DURING SERVICING OPERATION.

   (c) Connect static bonding cable from refueler to ground receptacle on helicopter.

   (5) Connect refuel/defuel nozzle as follows:
       (a) Open pressure refuel/defuel access door.
       (b) Electrically bond refueler pressure fuel nozzle to helicopter by attaching static bonding clip and jack assembly.
       **WARNING:** REFUELER NOZZLE MUST ALWAYS BE BONDED TO HELICOPTER BEFORE PRESSURE REFUELING ADAPTER CAP IS REMOVED. THIS CONNECTION MUST REMAIN IN PLACE UNTIL AFTER TANK CAP IS REPLACED.

       (c) Remove cap from refuel/defuel adapter.
       (d) Connect refueler fueling nozzle to refuel/defuel adapter.
       **CAUTION:** TO PREVENT DAMAGE TO EQUIPMENT, MAKE SURE FUELING SYSTEM DOES NOT EXCEED 55 PSI AND 120 GPM.

   (6) Pressure refuel as follows:
       (a) Zero totalizer on refueler unit if it is equipped with one. Confirm meter reads zero.
       (b) Open refuel nozzle shut off valve.
       **WARNING:** CHECK FOR LEAKS AT NOZZLE TO RECEPTACLE INTERFACE DURING FUELING. NO LEAKS ARE PERMITTED.

       (c) Begin pressure refueling helicopter. Verify flow is established as indicated on refueler unit totalizer.

       **NOTE:** High level precheck switch is spring loaded in NORM position.
(d) Place and hold high level precheck switch in PRI position.

**WARNING: IF FUEL FLOW DOES NOT STOP WITH PRECHECK SWITCH IN PRI POSITION, TERMINATE PROCEDURE TO AVOID DAMAGE TO FUEL CELL AND INVESTIGATE PROBLEM.**

(e) Verify fuel flow into helicopter has stopped by monitoring refueler unit totalizer. Refueling hose will jerk when precheck switch is actuated indicating fuel tank shut off valves closed.

(f) Release switch and confirm fuel flow resumes into helicopter.

**WARNING: IF FUEL FLOW DOES NOT START, TERMINATE PROCEDURE AND INVESTIGATE PROBLEM.**

(g) Place and hold high level precheck switch in SEC position.

**WARNING: IF FUEL FLOW DOES NOT STOP WITH PRECHECK SWITCH IN SEC POSITION, TERMINATE PROCEDURE TO AVOID DAMAGE TO FUEL CELL AND INVESTIGATE PROBLEM.**

(h) Verify fuel flow into helicopter has stopped by monitoring refueler unit totalizer. Refueling hose will jerk when precheck switch is actuated indicating fuel tank shut off valves closed.

(i) Release switch and confirm fuel flow resumes into helicopter.

**WARNING: IF FUEL FLOW DOES NOT START, TERMINATE PROCEDURE AND INVESTIGATE PROBLEM.**

**NOTE:** When helicopter fuel tanks are full, fueling will stop automatically.

**NOTE:** Fuel capacity is 760 US gallons (2,873 Liters) total, 380 US gallons (1,436 Liters) in each fuel tank.

(j) Continue fueling until helicopter is full or desired fuel quantity is reached.

(k) Shutdown fueler unit to stop helicopter fueling.

(7) Remove fuel nozzle and helicopter grounds as follows:

**WARNING: FUELING NOZZLE MUST REMAIN BONDED TO HELICOPTER UNTIL PRESSURE REFueling ADAPTER CAP IS INSTALLED.**

(a) Remove refueler unit nozzle from helicopter refuel/defuel adapter and install cap.

(b) Remove fueling nozzle static clip and jack assembly.

(c) Close and secure pressure refuel/defuel access door.

(d) Disconnect static bond from refueler to helicopter.

(e) Close and secure High Level Test Switch Access Door.
Gravity Refueling Main Tanks Procedures:

Gravity Refuel Main Tanks.

**NOTE:** Gravity refueling of left and right main fuel tanks is the same.

(1) Park helicopter in a level area.

**WARNING:** TO PREVENT ELECTRICAL SHOCK OF PERSONNEL, MAKE SURE TO DEENERGIZE ELECTRICAL POWER.

(2) Deenergize all electrical power.

**WARNING:** TO PREVENT INJURY TO PERSONNEL, MAKE SURE ROTOR BRAKE IS ENGAGED BEFORE WORKING ON HELICOPTER.

(3) Engage rotor brake.

(4) Static bond the helicopter as follows:

**WARNING:** TECHNICIANS WORKING ON HELICOPTER SHOULD PERIODICALLY DISSIPATE STATIC POTENTIAL BY GRIPPING STATIC GROUND LINE. THIS SHOULD BE DONE PERIODICALLY DURING SERVICING OPERATION.

(a) Connect static bonding cable from refueler to approved grounding source on helicopter.

(5) Electrically bond gravity fueling nozzle to helicopter fuel sponson by attaching static ground clip and jack assembly.

(6) Open left or right gravity refuel access door.

**WARNING:** GRAVITY FUELING NOZZLE MUST ALWAYS BE BONDED TO HELICOPTER BEFORE INITIATING FUEL FLOW. FUEL NOZZLE MUST REMAIN IN PLACE UNTIL AFTER FUEL FLOW HAS STOPPED.

**WARNING:** VIEW FUEL LEVEL THROUGH GRAVITY FILL CAP SIGHT GLASS TO MAKE SURE FUEL LEVEL IS BELOW GRAVITY REFUELING PORT.

(7) Remove fill cap and insert fuel nozzle into fill port.

(8) Start fueler pump and begin filling tank.

**NOTE:** Fuel capacity is 710 US gallons (2,684 Liters) total, 355 US gallons (1,342 Liters) in each fuel tank.

(9) Fill tank until fuel reaches bottom of gravity fuel port or to desired fuel quantity.

(10) Shutdown fueler and remove nozzle from gravity fill port.

(11) Install fill cap with arrow pointing up.

(12) Close and secure left or right gravity fuel access door.
(13) Remove fueling nozzle static clip and jack assembly.
(14) Disconnect static bond from refueler to helicopter.

**Pressure Defuel Main Tanks Procedure:**

(A) Pressure Defuel Main Tanks.

(1) Park helicopter in a level area.

**WARNING: TO PREVENT ELECTRICAL SHOCK OF PERSONNEL, MAKE SURE TO DEENERGIZE ELECTRICAL POWER.**

(2) Deenergize all electrical power.

**WARNING: TO PREVENT INJURY TO PERSONNEL, MAKE SURE ROTOR BRAKE IS ENGAGED BEFORE WORKING ON HELICOPTER.**

(3) Engage rotor brake.
(4) Configure fuel tanker truck for pressure defuel.
(5) Bond helicopter as follows:

**WARNING: TECHNICIANS WORKING ON HELICOPTER SHOULD PERIODICALLY DISSIPATE STATIC POTENTIAL BY GRIPPING STATIC GROUND LINE. THIS SHOULD BE DONE PERIODICALLY DURING SERVICING OPERATION.**

(a) Connect static bonding cable from refueler/defueler to approved grounding source on helicopter.

(6) Connect refuel/defuel nozzle as follows:

(a) Open pressure refuel/defuel access door.
(b) Electrically bond defueler pressure fuel nozzle to helicopter by attaching static ground clip and jack assembly.

**WARNING: DEFUELER NOZZLE MUST ALWAYS BE BONDED TO HELICOPTER BEFORE PRESSURE REFUELING ADAPTER CAP IS REMOVED. THIS CONNECTION MUST REMAIN IN PLACE UNTIL AFTER TANK CAP IS REPLACED.**

(c) Remove cap from refuel/defuel adapter.
(d) Connect defueler fuel nozzle to refuel/defuel adapter.

**CAUTION: TO PREVENT DAMAGE TO EQUIPMENT, MAKE SURE DEFUELING SYSTEM DOES NOT EXCEED 3 PSI NEGATIVE PRESSURE (SUCTION) AND 20 GPM.**

(7) Pressure defuel helicopter as follows:

(a) Start fuel tanker truck pump and open nozzle shutoff valve.
(b) Continue defueling until low level shutoff occurs.
(c) Close nozzle shutoff valve and shut down fuel tanker truck pump.
(d) Remove fuel nozzle from refuel/defuel adapter.
<table>
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<tr>
<th>FORM NUMBER</th>
<th>FORM NAME</th>
<th>DISPOSITION</th>
<th>MAINTAIN</th>
<th>OBTAINING</th>
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<td>2. Copy in Base Fuel Records.</td>
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<td>PHI-142-OFCAIR-003</td>
<td>OFFSHORE FILTER CHANGE/ANNUAL INSPECTION RECORD</td>
<td>1. Original to Fuel systems Coordinator, Lafayette Facility Maintenance.</td>
<td>12 Months</td>
<td>1. PHI Intranet.</td>
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<td>PHI-142-MFUCAIR-003</td>
<td>MOBILE FUEL UNIT FILTER CHANGE/ANNUAL INSPECTION RECORD</td>
<td>1. Original to Fuel systems Coordinator, Lafayette Facility Maintenance.</td>
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PHI-142-FR-003  
06/23/2008
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<td>PHI-142-ODCL-002</td>
<td>OFFSHORE DAILY CHECK LIST</td>
<td>1. Original at Offshore Location</td>
<td>12 Months</td>
<td>1. PHI Intranet.</td>
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<td>PHI-142-UWFTPFC-001</td>
<td>UNDER WING FUEL TRUCK</td>
<td>1. Original in fuel truck.</td>
<td>No older than 90 days</td>
<td>1. PHI Intranet.</td>
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<td>SHIPMENT SUMP RECORD</td>
<td>2. No copy required.</td>
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<td>PHI-142-BPTLR-001</td>
<td>BP TRANSPORTER LOADING RECORD</td>
<td>1. Original to BP dispatcher</td>
<td>No Requirement</td>
<td>1. PHI Intranet.</td>
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<td>2. No copy required.</td>
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<td>PHI-142-ODCL-001</td>
<td>SHELL LOCATIONS: OFFSHORE DAILY</td>
<td>1. Original at Offshore Location.</td>
<td>12 Months</td>
<td>1. PHI Intranet.</td>
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<td>CHECKLIST</td>
<td>2. Copy to Operations manager, Shell – Lafayette Operations.</td>
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<td>2. PHI Publications.</td>
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<td>PHI-142-BPFLDCL-001</td>
<td>BULK PLANT/FLIGHT LINE</td>
<td>1. Original at On-shore Location.</td>
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<td>1. PHI Intranet.</td>
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<td>FUEL POINT DAILY CHECKLIST</td>
<td>2. No copy required.</td>
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<td>2. PHI Publications.</td>
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PHI-142-FR-003

04/14/2006
(e) If necessary to remove remaining fuel, drain fuel from sumps.
(f) Install cap on refuel/defuel adapter.
(g) Close and secure pressure refuel/defuel access door.
(h) Unplug fuel nozzle static bonding clip and jack assembly.
(i) Disconnect static bonding cable between helicopter and servicing unit.

**NOTE:** When tanks are pressure defueled, 1.5 gallons of fuel will remain in tank sumps.
1. Familiarization with Facility
   a. Ramp
   b. Fuel Farm
   c. Mobile Equipment
   d. Hangars
   e. Customer facilities

2. Familiarization with Airport
   a. Airport layout
   b. Security regulations
   c. Driving regulations
   d. Airport regulations

3. Familiarization with Emergency Procedures
   a. Fires
   b. Fuel spills
   c. Injuries / First Aid
   d. Emergency telephone
   e. Accident reporting

4. Familiarization with Aviation
   a. Terminology
   b. Importance of fueling
   c. Value of aircraft
   d. Aircraft identification
   e. Radio operation

5. Introduction to Quality Control
   a. Fuel distribution
   b. Fuel identification
   c. Contaminants
   d. Filtration

6. Introduction to Safety
   a. Static electricity
   b. Grounding / Bonding
   c. Fire safety
   d. Lighting
   e. Leaks / Spills
   f. Hand signals
   g. Rotor / Propeller safety
   h. Night operations
   i. FOD
   j. Hearing / Eye protection
   k. Passenger safety
   l. Clothing
   m. Chocking / Securing

NOTE: Retain original @ location in the Fuel Handler Training Records file, and send copy to Lafayette Operations.
### PHI Inc. Fuel Handler Training Record

**Approved by Title:** Manager, Quality Systems Compliance  
**Approved by Name:** Leonard W. LeBlanc

<table>
<thead>
<tr>
<th>Trainee Initials</th>
<th>Instructor Initials</th>
<th>Date of Instruction</th>
</tr>
</thead>
</table>

#### 7. Fuel Farm / Bulk Storage
- a. Farm layout
- b. Valve identification
- c. Filtration systems
- d. Filter maintenance
- e. Receipt procedures
- f. Storage procedures
- g. Quality control tests
- h. Delivery to mobile fuel unit
- i. Record keeping
- j. Waste disposal
- k. Spill prevention
- l. Spill response
- m. Leak detection
- n. Inventory control
- o. Housekeeping
- p. Security

#### 8. Mobile Fueling Equipment
- a. Safety equipment
- b. Driving
- c. Mobile fuel operation
- d. Mobile fuel equipment maintenance
- e. Transporter inspection
- f. Transporter filling
- g. Quality control tests
- h. Record keeping
- i. Truck maintenance

#### 9. Ramp Service Equipment
- a. Tug operation
- b. Tow bar
- c. Ground power unit

#### 10. Fueling Aircraft
- a. Confirm quantity
- b. Helicopter fueling
- c. Grounding / Bonding
- d. Fuel filler cap
- e. Defueling
- f. Fuel additive
- g. Hot refueling
- h. Chocking truck
- i. Chocking aircraft
- j. Fire extinguisher location

---

**Trainee Signature**  
**Date**

**Instructor Signature**  
**Date**
FUEL RECEIVING CHECK LIST

LOCATION: __________________________ DATE: ______________

RECEIVING TANK NUMBER: ______________________

INSTRUCTIONS: 1. Inspect the tractor and tank trailer in accordance with this check list.
                  2. Report fuel shortages to Lafayette, Purchasing Department, Ext. 4255)
                  3. Report Tractor, Tank Trailer, Fuel Quality, or Paper Work discrepancies to
                     Lafayette, Fuel Systems Coordinator, Ext. 4242 or Offshore Manager, Ext.
                     4230.

CAUTION: The Tank Trailer must be allowed to stand idle for at least 15 minutes prior to
          sumping.

TRUCKING COMPANY NAME: __________________________

DRIVERS NAME: __________________________

DELIVERY TIME: _________ ON TIME: ☐ YES ☐ NO

PAPERWORK VERIFICATION:

<table>
<thead>
<tr>
<th>DOCUMENT</th>
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<tr>
<td>INVOICE/MANIFEST:</td>
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<tr>
<td>BILL of LADING:</td>
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<tr>
<td>QUALITY CONTROL LOG:</td>
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<tr>
<td>CERTIFICATE OF ANALYSIS:</td>
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</table>

PRODUCT QUALITY ASSURANCE:

TRACTOR NUMBER: __________________________

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<tr>
<th>CONDITION</th>
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<tr>
<td>CLEAN?</td>
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<td>DAMAGED?</td>
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</table>

TRAILER NO: _________ DEDICATED TO JET A OR A-1 ☐ YES ☐ NO

<table>
<thead>
<tr>
<th>CONDITION</th>
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<tr>
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<td>DAMAGED?</td>
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Describe any discrepancies found with the Tractor or Trailer:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

PHI-142-FRCL-005           PAGE 1 of 3           Date 04/14/2006
PRODUCT VERIFICATION: AVJET  □ YES □ NO

API Gravity Check (each trailer compartment corrected to 60 degrees)

API Gravity from Certificate of Analysis

#1 API  #2 API  #3 API  #4 API

NOTE: Sample API readings must be within + 1 degree for listed API on the Certificate of Analysis.

TRAILER COMPARTMENTS: SEALED: □ YES □ NO

QUANTITY: □ YES □ NO GALLONS

SUMPED: □ YES □ NO

SUMP SAMPLE: CLEAR and BRIGHT: □ YES □ NO

CONTAMINATION: □ YES □ NO

TRACTOR PUMP: SUMPED: □ YES □ NO

PUMP SAMPLE: CONTAMINATION: □ YES □ NO

CAUTION: If the samples are not clear and bright or there is contamination present, allow the tank trailer to settle, flush the compartments or pump and take another sample. If the samples are not acceptable the load must be rejected. If the quantity is less then stated on the Bill of Lading, Lafayette purchasing must be notified.

FUEL TANK OVER FILL PROCEDURES:

These procedures will be followed to assist in preventing a tank from overflowing due to a leaking or incorrectly opened valve.

1. Prior to receiving fuel, stick each tank and record the fuel quantity in the space provided.
2. Approximately 5 minutes after the receiving process begins, stick each tank a second time and record the fuel quantity in the space provided.
3. If any tank increased in quantity, except the designated receiving tank, the receiving operation must be stopped until the cause can be determined and corrected.

<table>
<thead>
<tr>
<th>TANK #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td>START QTY</td>
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<td>5 MIN QTY</td>
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</table>

FUEL TRANSFER PROCEDURES:

1. Check dike drain valves closed. Initials: ________________
2. Check all tank delivery valves closed. Initials: ________________
3. Gauge receiving tank. Initials: ________________
   a. Tank Capacity: _______ Inches _______ Gallons
   b. Tank Level: _______ Inches _______ Gallons
   c. Tank will accept: _______ Inches _______ Gallons
      Subtract line 3b from 3a and enter in 3c.
   d. Delivery Trailer Quantity: _______ Gallons
      Line 3d must be less then line 3c.
4. Open delivery valve on receiving tank: Initials: 

5. Connect grounding cables to the truck: Initials: 

6. Transfer Hose and connections clean: Initials: 

7. Transfer fuel from truck to tank: Initials: 


CAUTION: Monitor fuel transfer procedure to insure the tanks are not overfilled and no leaks are present.

9. Close delivery valve opened in line 4.: Initials: 

10. Gauge receiving tank. Initials: Inches Gallons

11. Enter number from line 3b. Initials: Inches Gallons

12. Subtract line 11 from line 10. Initials: Inches Gallons

Line 12 should equal the fuel quantity on the Bill of Lading. Any shortages should be reported the Lafayette Purchasing Department.

DISPOSITION OF PAPERWORK:

**LAFAYETTE PURCHASING DEPT.** Invoice/Manifest, Bill of Lading and Freight Bill.

**BASE FUEL RECORDS.** Invoice/Manifest, Bill of Lading, Freight Bill, Fuel Received Check List, Quality Control Log, and Certificate of Analysis. (Staple together and file) Maintain at base for 12 months.

<table>
<thead>
<tr>
<th>(Print Name)</th>
<th>(Employee Number)</th>
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Monthly witness information:

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**NOTE:** Instructions for each column are on the back of this form.
| COLUMN A: | The days of the month have been added. Leave the end of the month days that are not needed blank. |
| COLUMN B: | Sump the Tank. Check for water and sediment. Continue to sump until the sample is clear. |
| COLUMN C: | Sump the filter at the fuel point and Separator at the tank (if installed) under pressure into a clean glass jar. Check for water and sediment. Continue to sump until the sample is clear. Check the filter and separator housing for leaks and general condition and filter change tag. |
| COLUMN D: | Check the hose for weathering, blistering, fuel saturation and leaks at the fittings. Pay particular attention to the last two feet before the nozzle. This area receives the highest stress. |
| COLUMN E: | Check the nozzle for general condition. Check the nozzle screen for presence and tightness. Check the valve stem for leaks. Check the handle for freedom of movement. |
| COLUMN F: | Check the reel for general condition, freedom of the spool and for leaks. |
| COLUMN G: | Check the bonding cable for fraying, attachment to hose for tightness and corrosion. Check the clamp for tightness and corrosion. |
| COLUMN H: | Check the valves for proper operation and leaks. |
| COLUMN I: | By initialing this column, you are stating that all of the Fuel Components have been inspected and are serviceable. |

**NOTE:** Discrepancies with the Fuel Components must be corrected as soon as possible. Send the completed form to the Fuel Systems Coordinator in Lafayette Facility Maintenance.
FLIGHT LINE FUEL POINT
DAILY CHECK LIST

Location: ________________  Month: ________________  Year: ____________

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Nozzle Screen Removal and Inspection: January____ , April____, July____, October ____.

Monthly Continuity Check (ALL FUEL POINTS):  Init: _________  Date: ___________

NOTE: Instructions for each column are on the back of this form.

PHI-142-FLDCL-003  04/14/2006
**COLUMN A:** The days of the month have been added. Leave the end of the month days that are not needed blank.

**COLUMN B:** Sump the filter, under pump pressure, into a clean glass jar. Check for water and sediment. Continue to sump until the sample is clear.

**COLUMN C:** Check the filter housing for leaks and general condition and filter change tag.

**COLUMN D:** Check the hose for weathering, blistering, fuel saturation, leaks at the fittings, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists, sharp bends or any other defect that may indicate impending failure. Pay particular attention to the last two feet before the nozzle and where it attaches to the filter or reel. This area receives the highest stress.

**COLUMN E:** Check the nozzle for general condition. Check the nozzle screen for presence and tightness. Remove nozzle screen and inspect every January, April, July and October. Check the valve stem for leaks. Check the handle for freedom of movement.

**COLUMN F:** Check the reel for general condition, freedom of the spool and for leaks.

**COLUMN G:** Check the bonding cable for fraying, attachment to hose for tightness and corrosion. Check the clamp for tightness and corrosion.

**COLUMN H:** Check the valves for proper operation and leaks.

**COLUMN I:** By initialing this column, you are stating that all of the Flight Line Fuel Components have been inspected and are serviceable.

**NOZZLE SCREEN CHECK:** As indicated, remove the nozzle screen, check for debris and condition, reinstall and check for leaks. Initial in the space provided.

**CONTINUITY CHECK:** Using a Volt/Ohm Meter set on the lowest scale, check the bonding cable continuity from the bonding clamp/pin to the fuel system piping. The continuity shouldn’t be higher than 20 ohms depending on the cable length. Optimal is 10 ohms or less.

**NOTE:** Discrepancies with the Flight Line Fuel Components must be corrected as soon as possible.
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<tbody>
<tr>
<td>DATE</td>
<td>CUSTOMER</td>
<td>SERIAL NUMBER</td>
<td>FUEL QTY</td>
<td>OUTLET VALVE</td>
<td>RELIEF VALVE</td>
<td>SKIDS &amp; TANK</td>
<td>GEN COND</td>
<td>SLING COND</td>
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Instructions are listed by column:

A Place the date that the transporter was filled or inspected.
B List the name of the customer the fuel will be shipped for. (UNOCAL, Kerr McGee, etc.)
C List the serial number of the transporter.
D List the total quantity of the fuel in the transporter after filling.
E Describe the condition of the Outlet Valve. S=Satisfactory, U=Unsatisfactory
F Describe the condition of the Relief Valve. S=Satisfactory, U=Unsatisfactory
G Describe the condition of the Skids and Tank. S=Satisfactory, U=Unsatisfactory
H Describe the condition of the transporter in general and the inspection date is current. S=Satisfactory, U=Unsatisfactory
I Inspect the sling (if installed) for fraying, kinks, condition of fitting, slippage at fittings, corrosion, presence of data tag and inspection date within 12 months. If any unsatisfactory condition exists or if the sling inspection date has expired the sling must be removed from service. Mark column S=Satisfactory or U=unsatisfactory.
J Print the name of the person completing the Transporter Inspection.

Definitions:
Unsatisfactory
- Severe rust or pitting
- Leaking
- Relief valve damaged or out of date
- Tank and Skid moderately damaged, tank interior damaged.
- Tank contaminated
- Any condition that would require removing the transporter from service.
- Decals faded or missing.

A TRANSPORTER FOUND TO BE UNSATISFACTORY MUST BE REMOVED FROM SERVICE OR REPAIRED.

Satisfactory
- To the best of your ability the transporter is serviceable.

Filling Instructions:
- Requires same precautions as fueling aircraft.
- Required inspections must be complete.
- Interior must be clean and empty.
- Outlet valve closed and plug installed
- Truck parking brake and chock installed.
- Fire extinguisher placed between truck and transporter.
- Bond transporter to truck or fuel system.
- Leave 10% empty for expansion.
- Apply anti-tampering device to fill opening.

More detailed instructions are contained in the Fuel Management Manual.
Complete Bonding Cable and Clamp Continuity Check at each fuel point. Record ohms reading in Column C on reverse side of this form.

NOTE: INSTRUCTION ON REVERSE SIDE.

Maintain a copy at your base and send the original to the Fuel Systems Coordinator in Lafayette.
## INDIVIDUAL FUEL POINT FILTER CHANGE CONFIRMATION

<table>
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<th>A</th>
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<tbody>
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**INSTRUCTIONS:**

**COLUMN A:** Identify each fuel point location with a unique identifier and enter in this column.

**COLUMN B:** Insert the date the fuel point filter was changed.

**COLUMN C:** Record the OHMS reading recorded from the bonding clip to the nozzle.

**COLUMN D:** The person changing the filter in this fuel point will initial this block.
LOCATION:
The location would be Morgan City PHI, Intracoastal PHI, Intracoastal Samedan, etc.

SIGNATURE:
The person signing this form is certifying that the inspections and filter changes are complete and correct.

FILTER ANNUAL INSPECTION:

<table>
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<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
<th>COLUMN F &amp; G</th>
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<tbody>
<tr>
<td>Replace the filter gasket or O Ring.</td>
<td>Check the filter bowl lining for cracking, flaking and rust through.</td>
<td>Check the filter bowl interior for water, sediment and fungus/bacteria.</td>
<td>Check the filter drain valve for leaks and operation.</td>
<td>Check gauges for operation and leaks.</td>
<td>Initial and date when all filter inspections have been completed.</td>
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Problems with the filter bowl lining or the presence of fungus/bacteria will require bowl replacement or cleaning.

NOZZLE ANNUAL INSPECTION:

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<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
<th>COLUMN F</th>
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<tbody>
<tr>
<td>Remove the nozzle screen, clean and replace.</td>
<td>Check the nozzle valve for freedom of operation and leaks.</td>
<td>Check the nozzle handle for freedom of movement.</td>
<td>Check the nozzle housing for corrosion, cracks and general condition.</td>
<td>Initial when all nozzle inspections have been completed.</td>
<td>Date when all nozzle inspections have been completed.</td>
</tr>
</tbody>
</table>

REEL/HOSE ANNUAL INSPECTION

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
<th>COLUMN F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the reel seals for leaks.</td>
<td>Check the valve for freedom of operation and leaks.</td>
<td>Check the reel housing for rust and the spool for freedom of movement.</td>
<td>Check the hose for weathering, blistering, fuel saturation, leaks at the fittings, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists, sharp bends or any other defect that may indicate impending failure. Pay particular attention to the last two feet before the nozzle and where it attaches to the filter or reel. Complete a hose surge test. (While pumping release nozzle handle five time. Check for bulges or leaks.)</td>
<td>Initial when all hose and reel inspections have been completed.</td>
<td>Date when all hose and reel inspections have been completed.</td>
</tr>
</tbody>
</table>

FILTER ANNUAL FILTER CHANGE:

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check when all filters have been changed.</td>
<td>Indicate the color of the tag installed.</td>
<td>Initial when all filters have been changed.</td>
<td>Date that all of the filters have been changed.</td>
</tr>
</tbody>
</table>

BONDING CABLE CONTINUITY CHECK:

Using a Volt/Ohm Meter, check Ohms reading between the bonding cable clamp and hose fitting. Indicate on form the actual Ohms reading. Maximum recommended Ohm reading is 10. Repair system if Ohms reading is above 10.
OFFSHORE 
FILTER CHANGE/ANNUAL 
INSPECTION RECORD

Location: ____________________________ Date: ____________

Name: ____________________________ Signature: ____________________________

Employee Number: ________________

FILTER HOUSING ANNUAL INSPECTION

<table>
<thead>
<tr>
<th>A</th>
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<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>GASKET</td>
<td>LINING</td>
<td>INTERIOR</td>
<td>VALVE</td>
<td>GAUGE</td>
<td>INIT</td>
<td>DATE</td>
</tr>
<tr>
<td>CHECK</td>
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</tbody>
</table>

NOZZLE ANNUAL INSPECTION

<table>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCREEN</td>
<td>VALVE</td>
<td>HANDLE</td>
<td>HOUSING</td>
<td>INIT</td>
<td>DATE</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
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REEL/HOSE ANNUAL INSPECTION

<table>
<thead>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEALS</td>
<td>VALVE</td>
<td>HOUSING</td>
<td>HOSE</td>
<td>INIT</td>
<td>DATE</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

FUEL TANK INSPECTION

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTERIOR</td>
<td>INTERIOR</td>
<td>VALVES</td>
<td>INIT</td>
<td>DATE</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FILTER ANNUAL FILTER CHANGE

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILTER CHANGE (Y/N)</td>
<td>TAG COLOR</td>
<td>INIT</td>
<td>DATE</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bonding Cable Continuity Check: OHMS = ______ Init - ______ Date - ______

NOTE: INSTRUCTION ON REVERSE SIDE.

PHI-142-OFCAIR-003 09/24/2003
**LOCATION:**
The location would be Eugene Island 52, South Marsh 130, etc.

**SIGNATURE:**
The person signing this form is certifying that the inspections and filter changes are complete and correct.

**FILTER ANNUAL INSPECTION:**

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace the filter gasket or O Ring.</td>
<td>Check the filter bowl lining for cracking, flaking and rust through.</td>
<td>Check the filter bowl interior for water, sediment and fungus/bacteria.</td>
<td>Check the filter drain valve for leaks and operation.</td>
<td>Calibrate pressure gauges and function check Gammon Style Differential Pressure Gauges and check for leaks.</td>
</tr>
</tbody>
</table>

**COLUMN F & G:** Initial and date when all filter inspections have been completed.

*Problems with the filter bowl lining or the presence of fungus/bacteria will require bowl replacement or cleaning.*

**NOZZLE ANNUAL INSPECTION:**

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
<th>COLUMN F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect the nozzle screen, clean or replace.</td>
<td>Check the nozzle valve for freedom of operation and leaks.</td>
<td>Check the nozzle handle for freedom of movement.</td>
<td>Check the nozzle housing for corrosion, cracks and general condition.</td>
<td>Initial when all nozzle inspections have been completed.</td>
<td>Date when all nozzle inspections have been completed.</td>
</tr>
</tbody>
</table>

**COLUMN E:** Initial when all nozzle inspections have been completed.

**REEL/HOSE ANNUAL INSPECTION**

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
<th>COLUMN F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the reel seals for leaks.</td>
<td>Check the valve for freedom of operation and leaks.</td>
<td>Check the reel housing for rust and the spool for freedom of movement.</td>
<td>Check the hose for weathering, blistering, fuel saturation, leaks at the fittings, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists, sharp bends or any other defect that may indicate impending failure. Pay particular attention to the last two feet before the nozzle and where it attaches to the filter or reel. Complete a hose surge test. (While pumping release nozzle handle five time. Check for bulges or leaks.)</td>
<td>Initial when all hose and reel inspections have been completed.</td>
<td>Date when all hose and reel inspections have been completed.</td>
</tr>
</tbody>
</table>

**COLUMN E:** Initial when all hose and reel inspections have been completed.

**FUEL TANK INSPECTION**

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
<th>COLUMN E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check for rust and amount, dints and leaks.</td>
<td>Look through tank opening with a bright flashlight. Check for liner condition, water, fungus or dirt.</td>
<td>Inspect valves for freedom of operation and damage.</td>
<td>Initial when the filter change and inspection have been completed.</td>
<td>Date when the tank was inspected.</td>
</tr>
</tbody>
</table>

**FILTER ANNUAL FILTER CHANGE:**

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
<th>COLUMN C</th>
<th>COLUMN D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check when all filters have been changed.</td>
<td>Indicate the color of the tag installed.</td>
<td>Initial when all filters have been changed.</td>
<td>Date that all of the filters have been changed.</td>
</tr>
</tbody>
</table>

**BONDING CABLE CONTINUITY CHECK:**

Using a Volt/Ohm Meter, check Ohms reading between the bonding cable clamp and hose fitting. Indicate on form the actual Ohms reading. Maximum recommended Ohm reading is 10. Repair system if Ohms reading is above 10.

*Maintain a copy at your base and send the original to the Fuel Systems Coordinator in Lafayette.*

PHI-142-OFCAIR-003 09/24/2003
BULK PLANT
FILTER CHANGE/ANNUAL INSPECTION RECORD

Location: ___________________________  Date: ___________________________

Name: ___________________________  Signature: ___________________________

Employee Number: ___________________________

**TANK ANNUAL INSPECTION**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LID GASKET</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>LINING</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>INTERIOR</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>CHECK</strong></td>
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</tbody>
</table>

**SEPARATOR ANNUAL INSPECTION**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<tbody>
<tr>
<td><strong>LINING</strong></td>
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</tr>
<tr>
<td><strong>INTERIOR</strong></td>
<td>REC</td>
<td>DEL</td>
<td>REC</td>
<td>DEL</td>
<td>REC</td>
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<tr>
<td><strong>GAUGE</strong></td>
<td>REC</td>
<td>DEL</td>
<td>REC</td>
<td>DEL</td>
<td>REC</td>
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<tr>
<td><strong>DIFF PRESS</strong></td>
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<tr>
<td><strong>CHECK</strong></td>
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</table>

**SEPARATOR ANNUAL FILTER CHANGE**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td><strong>FILTER CHANGE</strong></td>
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<tr>
<td><strong>TAG COLOR</strong></td>
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<tr>
<td><strong>INIT</strong></td>
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<tr>
<td><strong>DATE</strong></td>
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<tr>
<td><strong>DELIVERY</strong></td>
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<tr>
<td><strong>RECEIVING</strong></td>
<td></td>
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</tr>
</tbody>
</table>

**Bonding Cable Continuity Check:**  OHMS: ______  Init: _____  Date: ______

**NOTE:** INSTRUCTION ON REVERSE SIDE.

Maintain a copy at your base and send the original to the Fuel Systems Coordinator in Lafayette.

PHI-142-BPFCAIR-004  04/14/2006
BULK PLANT FILTER CHANGE/ANNUAL INSPECTION RECORD INSTRUCTIONS

LOCATION:

The location would be Morgan City PHI, Intracoastal PHI, Intracoastal Samedan, etc.

SIGNATURE:

The person signing this form is certifying that the inspections and filter changes are complete and correct.

TANK ANNUAL INSPECTION:

| COLUMN A: | Check the lid gasket for cracks, tears, and general condition. |
| COLUMN B: | Check the tank lining for cracking, flaking and rust through. |
| COLUMN C: | Check the tank interior for water, sediment and fungus/bacteria. |
| COLUMN D: | Initial and date when all tank inspections have been completed. |

Problems with the tank lining or the presence of fungus/bacteria should be reported to Mike Wickware or Sean Bodin as soon as possible.

SEPARATOR ANNUAL INSPECTION:

| COLUMN A: | Check the separator lining for cracking, flaking and rust through. |
| COLUMN B: | Check the separator interior for water, sediment and fungus/bacteria. |
| COLUMN C: | Calibrate all Pressure Gauges and function check the Gammon Style Differential Pressure Gauge. |
| COLUMN D: | Record the differential pressure of the delivery and receiving separators after the new filters have been installed. The receiving separator differential pressure will have to be recorded during fuel receiving. |
| COLUMN E: | Initial and date when all separator inspections have been completed. |

Problems with the separator lining or the presence of fungus/bacteria should be reported to Mike Wickware or Sean Bodin as soon as possible.

SEPARATOR ANNUAL FILTER CHANGE:

| COLUMN A: | Which separator is receiving the new filters. |
| COLUMN B: | Check that all filters have been changed. |
| COLUMN C: | Write in the color of the filter change tag that is being installed. |
| COLUMN D: | Initial and date when the separator filters have been changed. |

BONDING CABLE CONTINUITY CHECK:

Using a Volt/Ohm Meter set on the lowest scale, check continuity between the bonding cable clamp and system piping. Ohms reading should be 10 ohms or less.
BULK PLANT  
DAILY CHECK LIST

Location: ___________________  Month: ___________  Year: ___________

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>SUMPING</td>
<td>GRND</td>
<td>PUMP</td>
<td>LEAKS</td>
<td>COND</td>
<td>DRAIN</td>
<td>INIT</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>TANKS</th>
<th>SEPARATOR</th>
<th>REL/TANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>31</td>
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</tr>
</tbody>
</table>

NOTE: Instructions for each column are on the back of this form.

Monthly Continuity Check (ALL FUEL POINTS):  Init: ___________  Date: ___________

PHI-142-BPDC-005  04/14/2006
## DAILY BULK PLANT CHECK LIST INSTRUCTIONS

### COLUMN A:
The days of the month have been added. Leave the end of the month days that are not needed blank.

### COLUMN B:
Sump each tank by opening the sump valve fully. This will create a vortex, which will aid in water and sediment removal. Inspect the sample for water and sediment, continue to sump until clean. Check off the blocks for the appropriate tanks.

Sump the Delivering Separator by pressurizing with pump pressure. Open the sump valves fully to create a vortex which will aid in water and sediment removal. Inspect the sample for water and sediment, continue to drain until clear. Check off the blocks under SUMP. Record the differential pressures under DIFF PR. Daily 15 PSI, at rated flow, is the maximum differential pressure allowed. Receiving Separator and Relaxation Tank (if installed) shall receive the same checks prior to receiving fuel and will be recorded on the Fuel Receiving Check List.

### COLUMN C:
Check the condition of the ground/bonding system as follows:

1. Grounding cable for fraying.
2. Cable attachment to ground for tightness and corrosion.
3. Grounding clamps for tightness and corrosion.
4. Cable recoil system for operation.(If Installed)
5. Measure and record continuity in Ohms monthly.

**NOTE:** Discrepancies with the grounding system should be corrected immediately.

### COLUMN D:
Check the pump as follows:

1. Pump seal for leaks.
2. Excessive corrosion.
3. Condition of electrical conduit.

### COLUMN E:
Check the entire bulk plant system for leaks as follows:

1. All piping valves and joints.
2. Pump seals.
3. Separator fittings, gauges, valves and split lines.
4. Tank weld lines and valves.
5. Berm walls and drain valve.

### COLUMN F:
This is a general condition check. An example of items to look for are: corrosion, cleanliness, security, paint condition, decal condition, vent condition and concrete condition.

### COLUMN G:
Insure that the tank containment drain is closed. **Valves must be locked closed and plugs must be tool tight.**

### COLUMN H:
By initialing this column you are stating that the system has been inspected and is suitable for service.

### CONTINUITY CHECK:
Using a Volt/Ohm Meter set on the lowest scale, check the bonding cable continuity from the bonding clamp/pin to the fuel system piping. The continuity shouldn’t be higher than 20 ohms depending on the cable length. Optimal is 10 ohms or less.

**ALL FUEL LEAKS AND SEEPS MUST BE CORRECTED IMMEDIATELY**
# Mobile Refueler – Daily, Weekly & Monthly Preventive Maintenance

**Location:**

**Truck/Trailer No:**

**Date:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Employee No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Daily Operations Adjusted</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire Extinguishers. (In place, filled, operable)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Static Bonding Cables. (Good Condition)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fuel Marker Signs. (In place and legible)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Fuel Color Check. (Agrees with Fuel Marker Signs)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Hose. (No cracks, cuts, or breaks)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Nozzle Screen. (Tight and clean)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Exhaust. (leaks and cracks)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Muffler - Flame Arrester. (Leaks and noise)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Tanks. (Leaks or damage)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Separators - Filters. (Leaks or damage)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Leaks. (Tanks, Valves, Hoses, Filters, Piping, etc.)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Emergency Valves. (Labeled and proper operation)</td>
<td></td>
</tr>
</tbody>
</table>

Initial below the day to certify that the above items have been completed.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 |

## II. During Pumping Operation

<table>
<thead>
<tr>
<th>Item</th>
<th>During Pumping Operation Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Pumps. (Leaks, noise and overheating)</td>
</tr>
<tr>
<td>15</td>
<td>Meters. (Leaks and Noise)</td>
</tr>
<tr>
<td>16</td>
<td>Differential Pressure. (15 psi max.)</td>
</tr>
<tr>
<td>17</td>
<td>Leaks. (Tanks, piping, valves, pumps, etc.)</td>
</tr>
</tbody>
</table>

Initial below the day to certify that the above items have been completed.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 |

## III. After Filling Refuealer

<table>
<thead>
<tr>
<th>Item</th>
<th>After Filling Refuealer Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Water check. (Settle for 15 minutes, check tank for water.)</td>
</tr>
</tbody>
</table>

Initial below the day to certify that the above items have been completed.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 |

## IV. Weekly Services

<table>
<thead>
<tr>
<th>Item</th>
<th>Weekly Services Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nozzle screens. (Inspect)</td>
</tr>
<tr>
<td>2</td>
<td>General Inspection. (Operating check of all equipment)</td>
</tr>
<tr>
<td>3</td>
<td>Tank cover. (check seals for condition and leaks)</td>
</tr>
<tr>
<td>4</td>
<td>Tank Interior. (Visually check for condition and sediment)</td>
</tr>
</tbody>
</table>

Initial below the day to certify that the above items have been completed.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 |

## V. Monthly Continuity Check

<table>
<thead>
<tr>
<th>Item</th>
<th>Monthly Continuity Check Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bonding Reel Ohms:</td>
</tr>
<tr>
<td></td>
<td>Nozzle Bonding Cable Ohms:</td>
</tr>
</tbody>
</table>

**PHI-142-MRDWPM-004**

04/14/2006
V. GENERAL (List deficiencies not itemized above)

<table>
<thead>
<tr>
<th>DATE</th>
<th>DEFICIENCIES</th>
<th>CORRECTED</th>
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<tbody>
<tr>
<td></td>
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<td>YES</td>
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PHI-142-MRDWPM-004

04/14/2006
MOBILE FUEL UNIT FILTER CHANGE/ANNUAL INSPECTION RECORD

Location: ___________________  Unit Number: ________  Date: ___________________

Name: ________________________  Signature: ______________________________________

Employee Number: ______________________

FILTER HOUSING ANNUAL INSPECTION

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>GASKET</td>
<td>LINING</td>
<td>INTERIOR</td>
<td>VALVE</td>
<td>GAUGE</td>
<td>INIT</td>
<td>DATE</td>
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<td>CHECK</td>
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</table>

TANK ANNUAL INSPECTION

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<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td>LID GASKET</td>
<td>LINING</td>
<td>INTERIOR</td>
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<td>TANK</td>
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<td>CHECK</td>
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NOZZLE ANNUAL INSPECTION

<table>
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<th>F</th>
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</thead>
<tbody>
<tr>
<td>SCREEN</td>
<td>VALVE</td>
<td>HANDLE</td>
<td>HOUSING</td>
<td>INIT</td>
<td>DATE</td>
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<tr>
<td>CHECK</td>
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</table>

REEL/HOSE ANNUAL INSPECTION

<table>
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<tr>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>SEALS</td>
<td>VALVE</td>
<td>HOUSING</td>
<td>HOSE</td>
<td>INIT</td>
<td>DATE</td>
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<td>CHECK</td>
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FILTER ANNUAL FILTER CHANGE

<table>
<thead>
<tr>
<th>A</th>
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<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>FILTER CHANGE (Y/N)</td>
<td>TAG COLOR</td>
<td>INIT</td>
<td>DATE</td>
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<tr>
<td>CHECK</td>
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</table>

Bonding Cable Continuity Check:  OHMS: ________  Init: ________  Date: __________

Nozzle Cable Continuity Check:  Ohms: ________  Init: ________  Date: __________

NOTE: INSTRUCTION ON REVERSE SIDE.
Maintain a copy at your base and send the original to the Fuel Systems Coordinator in Lafayette.

PHI-142-MFUFCAIR-003  04/14/2006
LOCATION:
The location would be Morgan City PHI, Intracoastal PHI, Intracoastal Samedan, etc.

SIGNATURE:
The person signing this form is certifying that the inspections and filter changes are complete and correct.

FILTER HOUSING ANNUAL INSPECTION:

| COLUMN A: | Replace the filter gasket or O Ring. |
| COLUMN B: | Check the filter bowl lining for cracking, flaking and rust through. |
| COLUMN C: | Check the filter bowl interior for water, sediment and fungus/bacteria. |
| COLUMN D: | Check the filter drain valve for leaks and operation. |
| COLUMN E: | Calibrate pressure gauges and function check Gammon Style Differential Pressure Gauges, check for leaks. |
| COLUMN F&G: | Initial and date when all filter inspections have been completed. |

Problems with the filter bowl lining or the presence of fungus/bacteria will require bowl replacement or cleaning.

TANK ANNUAL INSPECTION:

| COLUMN A: | Check the lid gasket for cracks, tears, and general condition. |
| COLUMN B: | Check the tank lining for cracking, flaking and rust through. |
| COLUMN C: | Check the tank interior for water, sediment and fungus/bacteria. |
| COLUMN D: | Initial and date when all tank inspections have been completed. |

Problems with the tank lining or the presence of fungus/bacteria should be reported to Mike Wickware or Sean Bodin as soon as possible.

NOZZLE ANNUAL INSPECTION:

| COLUMN A: | Remove the nozzle screen, clean and replace. |
| COLUMN B: | Check the nozzle valve for freedom of operation and leaks. |
| COLUMN C: | Check the nozzle handle for freedom of movement. |
| COLUMN D: | Check the nozzle housing for corrosion, cracks and general condition. |
| COLUMN E: | Initial when all nozzle inspections have been completed. |
| COLUMN F: | Date when all nozzle inspections have been completed. |

REEL/HOSE ANNUAL INSPECTION

| COLUMN A: | Check the reel seals for leaks. |
| COLUMN B: | Check the valve for freedom of operation and leaks. |
| COLUMN C: | Check the reel housing for rust and the spool for freedom of movement. |
| COLUMN D: | Check the hose as per the Fuel Management Manual for conditions that indicate impending failure. |
| COLUMN E: | Initial when all hose and reel inspections have been completed. |
| COLUMN F: | Date when all hose and reel inspections have been completed. |

FILTER ANNUAL FILTER CHANGE:

| COLUMN A: | Check when all filters have been changed. |
| COLUMN B: | Indicate the color of the tag installed. |
| COLUMN C: | Initial when all filters have been changed. |
| COLUMN D: | Date that all of the filters have been changed. |

BONDING CABLE CONTINUITY CHECK:

1. Using a Volt/Ohm Meter set on the lowest scale, check continuity between the bonding cable clamp and vehicle frame. Continuity should be less than 10 ohms.
2. Using a Volt/Ohm Meter set on the lowest scale, check continuity between the bonding cable clamp and Nozzle. Continuity should be less than 10 ohms.

PHI-142-MFUFCAIR-003 04/14/2006
<table>
<thead>
<tr>
<th>LOCATION:</th>
<th>TRUCK/TRAILER NO.:</th>
<th>DATE:</th>
</tr>
</thead>
</table>

MOBILE FUEL UNIT DAILY QUALITY CONTROL RECORD

**TANK COMPARTMENTS**

<table>
<thead>
<tr>
<th>CHECK POINT</th>
<th>FILTER SEPARATOR</th>
<th>NOZZLE</th>
<th>TANK INT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP. DRAINS</td>
<td>SUMP DRAIN</td>
<td>DIFF. PRESS.</td>
<td>NOZ</td>
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<tr>
<td>DAILY/AFTER EACH LOADING</td>
<td>DAILY</td>
<td>DAILY</td>
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**Q.C. TEST**

<table>
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<tr>
<th>DATE</th>
<th>COLOR</th>
<th>ODOR</th>
<th>WATER</th>
<th>SED</th>
<th>COLOR</th>
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<th>SED</th>
<th>PSI</th>
<th>SPEC. CLEAN</th>
<th>RECORD COND.</th>
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PHI-142-MFUQCR-002

09/24/2003
LOCATION: The location would be PHI Intracoastal, PHI Morgan City, Samedan Intracoastal, ect.

DATE: The end of the month date that the form is completed.

This form is divided up into four sections, TANK COMPARTMENTS, FILTER SEPARATORS, NOZZLES AND TANK INT.

Under the four sections you will find CHECK POINT, CHECK SCHED and Q.C. TEST.

CHECK POINT: The location where the test is taken.
CHECK SCHED: The interval in which the test is performed. (daily, weekly, ect.)
Q.C. TEST: The method used to determine the quality of the fuel.

Initial the blocks to indicate that the test was satisfactory.
Under Filter Separator, Diff Press., record the actual differential pressure reading.
UNDER WING FUEL TRUCK
PRESSURE and FLOW CALIBRATION

Location: __________ Unit Number: ______ Date: _________________

Name: __________________________ Signature: _______________________

(PRINT)

Employee Number: __________________________

FUEL FLOW GPM: __________ (Less than 120 gpm – Optimal 100 gpm)

PRIMARY PRESSURE PSI: __________ (Hose End Regulator – Factory set to 45 psi)

SECONDARY PRESSURE PSI: __________ (Pump Bypass Regulator or Control Valve 55 psi - 50 psi optimal)

INSTRUCTIONS: (THE CALIBRATIONS SHOULD NOT EXCEED 90 DAYS)
Insure the truck is warmed up and the engine idle rpm is normal.
Install the Calibration Manifold on the Single Point Nozzle.
All fuel during the calibration will be returned to the tank through the tank manway.
Retain this completed form in the fuel truck and send a copy to Sean Bodin, Lafayette Facility Maintenance.

FUEL FLOW CALIBRATION:
1. Place the Test Manifold in the tank man way and secure.
2. Configure truck for single point fueling.
4. Activate dead man and start time.
5. Stop fuel flow after one minute and record gallons above.
6. If fuel flow is above 100 gpm adjust flow control valve and retest.
7. Record final fuel flow in the space provided above.

PRIMARY PRESSURE TEST (HOSE END REGULATOR)
1. Place the Test Manifold in the tank man way and secure.
2. Configure truck for single point fueling.
3. Activate dead man and slowly close the manifold valve.
4. Gauge on the test manifold must be 45 psi or below.

NOTE: The Hose End Regulator is factory set. Any discrepancies will require the truck to be taken out of service until the Hose End Regulator is replaced.

SECONDARY PRESSURE TEST (PUMP PRESSURE REGULATOR)
1. Place the Test Manifold in the tank man way and secure.
2. Configure truck for single point fueling.
3. Install the Hose End Regulator Bypass Pin.
4. Activate dead man and slowly close the manifold valve.
5. Gauge on manifold must be 55 psi or below with 50 psi optimal.
6. Adjust Pump Pressure Regulator to obtain correct reading and retest.
BP TRANSPORTER LOADING RECORD

1. Transporter Number: ___________________________ Date: ___________________________

2. Location: ___________________________ Loaded By: ___________________________

3. Employee Number: ___________________________

Note: Transporter loading requires the same precautions as fueling aircraft.

<table>
<thead>
<tr>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inspect transporter for leaks and damage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Transporter interior clean and empty.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Outlet valve closed and plug installed.</td>
<td></td>
<td></td>
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<tr>
<td>4. Sling condition and date. (within 12 mo.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Truck parking brake set and rear wheels chocked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fire Extinguisher positioned properly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Bonding Cable attached.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Do not overfill transporter. Leave minimum of 10% for expansion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Remove Bonding Cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Replace Fire Extinguisher.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Apply anti-tampering device to fill and drain openings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Remove truck rear wheel chocks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Provide copy of this form to BP Dispatcher.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Note: Transporter loading requires the same precautions as fueling aircraft.

<table>
<thead>
<tr>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inspect transporter for leaks and damage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Transporter interior clean and empty.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Outlet valve closed and plug installed.</td>
<td></td>
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</tr>
<tr>
<td>4. Sling condition and date. (within 12 mo.)</td>
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<td></td>
</tr>
<tr>
<td>5. Truck parking brake set and rear wheels chocked.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12. Remove truck rear wheel chocks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Provide copy of this form to BP Dispatcher.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATE</td>
<td>TIME</td>
<td>TRANS #</td>
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</tbody>
</table>

NOTE: SUMP THE TRANSPORTER PRIOR TO SHIPMENT. RECORD THE DATE, TIME, TRANSPORTER NUMBER, DOCK, WHAT WAS FOUND, WHETHER RELEASE FOR SHIPMENT OR NOT AND SIGNATURE OF PERSON PERFORMING THE SUMP. DISPATCHER WILL CALL FOR THE PRESHIPMENT SUMP AT LEAST 24 HOURS PRIOR TO SHIPMENT.
### PHI, Inc.

**Bulk Plant / Flight Line Fuel Point Daily Checklist**

**NOTE:** For those on-shore locations with bulk storage and a single flight line fuel point.

**Location**

<table>
<thead>
<tr>
<th>Date</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### Sumping

- Date:  
  - 1 2 3 Sump Dp Sump

#### Bulk Plant Ground

- C: Pump
- D: Leaks
- E: Drain

#### Flight Line Fuel Point

- G: Fuel Point Filter
  - Fuel Point
  - In-date
- H: Hose
- I: Reel
- J: Nozzle
- K: Fuel Point Ground
- L: Valves
- M: General Condition
- N: Initials

**Nozzle Screen Removal & Inspection**

<table>
<thead>
<tr>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>________</td>
<td>______</td>
<td>____</td>
<td>________</td>
</tr>
</tbody>
</table>

**NOTE 1:** Weekly Continuity Check (All Fuel Points)

**Initial** _______ **Date** __________________________

Instructions for each column are on the back of this form.
**BULK PLANT / FLIGHT LINE DAILY CHECK LIST INSTRUCTIONS**

| COLUMN A: | Leave the end of the month days that are not needed blank. |
| COLUMN B: | Sump each tank by opening the sump valve fully. This will create a vortex, which will aid in water and sediment removal. Inspect the sample for water and sediment, continue to sump until clean. Check off the blocks for the appropriate tanks. |
| COLUMN C: | Check the condition of the ground/bonding system as follows: 1. Grounding cable for fraying. 2. Cable attachment to ground for tightness and corrosion. 3. Grounding clamps for tightness and corrosion. 4. Cable recoil system for operation. (If Installed) 5. Measure and record continuity in Ohms weekly. |
| COLUMN D: | Check the pump as follows: 1. Pump seal for leaks. 2. Excessive corrosion. 3. Condition of electrical conduit. |
| COLUMN E: | Check the entire bulk plant system for leaks as follows: 1. All piping valves and joints. 2. Pump seals. 3. Separator fittings, gauges, valves and split lines. 4. Tank: weld lines and valves. 5. Berm: walls and drain valve. |
| COLUMN F: | Insure that the tank containment drain is closed. **Valves must be locked closed and plugs must be tool tight.** |
| COLUMN G: | Sump the filter, under pump pressure, into a clean glass jar. Check for water and sediment. Continue to sump until the sample is clear. Check the filter housing for leaks and general condition. |
| COLUMN H: | Check the hose for weathering, blistering, fuel saturation, leaks at the fittings, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists, sharp bends or any other defect that may indicate impending failure. Pay particular attention to the last two feet before the nozzle and where it attaches to the filter or reel. This area receives the highest stress. |
| COLUMN I: | Check the nozzle for general condition. Check the nozzle screen for presence and tightness. Remove nozzle screen and inspect every January, April, July and October, checking for debris and condition, reinstall and check for leaks. Check the valve stem for leaks. Check the handle for freedom of movement. |
| COLUMN J: | Check the reel for general condition, freedom of the spool and for leaks. |
| COLUMN K: | Check the condition of the ground/bonding system as follows: 1. Grounding cable for fraying. 2. Cable attachment to ground for tightness and corrosion. 3. Grounding clamps for tightness and corrosion. 4. Cable recoil system for operation. (If Installed) 5. Measure and record continuity in Ohms weekly. **NOTE:** Discrepancies with the grounding system should be corrected immediately. |
| COLUMN L: | Check the valves for proper operation and leaks. |
| COLUMN M: | This is general condition check. Examples of items to look for: corrosion, cleanliness, security, paint condition, decal condition, vent condition, concrete condition. |
| COLUMN N: | By initialing this column, you are stating that all of the Flight Line Fuel Components have been inspected and are serviceable. **CONTINUITY CHECK:** Using a Volt/Ohm Meter set on the lowest scale, check the bonding cable continuity from the bonding clamp/pin to the fuel system piping. The continuity shouldn’t be higher than 20 ohms depending on the cable length. Optimal is 10 ohms or less. **NOTE:** Discrepancies with the grounding system should be corrected immediately. |

**NOTE:** Discrepancies with the Bulk Plant / Flight Line Fuel Components must be corrected as soon as possible.
ATA Specification 103

Standard for
Jet Fuel Quality Control at Airports

Revision 2000.1

Air Transport Association of America, Inc.
1301 Pennsylvania Ave., N.W., Suite 1100
Washington, D.C. 20004-1707

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1-301-490-7951

For Technical Information and Change Submissions

For technical information or to recommend an alteration or amendment to this specification, please submit the recommendation and any supporting documentation to ATA:

E-mail: pubs@air-transport.org
1-202-626-4000
Fax: 1-202-626-4181
Highlights

Release History

Revision 2000.1

Revision 2000.1 (Revised January 2000)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Updated to ATA Pubs 2000 Style</td>
</tr>
</tbody>
</table>

Preface

This document is intended to provide guidance to the user covering the safe storage and distribution of quality jet fuel at airports as currently practiced in the commercial aviation industry. Due to the wide diversity of airport fueling operations, this document is not intended to be all inclusive. Best technical information, along with competent judgement, should be considered and followed at all times when overseeing aviation fueling operations.
Chapter 1. Introduction

Member airlines of the Air Transport Association of America (ATA) recognize the importance of using quality jet fuel for ensuring the highest degree of flight safety. To achieve this goal, ATA Specification 103, entitled "Standards for Jet Fuel Quality Control at Airports," was developed by member airlines to cover fuel distribution facilities and fuel quality control procedures at airports servicing airline operations.

This standard identifies commonly recognized industry inspection procedures and safety checks of jet fuel storage and distribution facilities at airports that will help minimize introduction of contaminated or unacceptable jet fuel in being delivered to airline aircraft. It is important to note that additional facilities and testing procedures may be required at individual airports based on fuel system complexity and local operating conditions. Alternative procedures and use of non-standard facilities and equipment may also be recognized and determined acceptable for achieving the above safety requirements based on extenuating circumstances.

ATA Specification 103 does not, in itself, impose any performance obligations on any airline, fuel supplier, fuel storage facility, fuel transporter, or any other entity. Its provisions become effective only to the extent they are adopted by an airline and incorporated into its operating manual.
Chapter 2. General

2-1. General

This section covers jet fuel handling issues and procedures that are general in nature and are applicable to all facets of jet fuel handling at airports.

1. Scope

This document contains standards covering airport jet fuel storage facilities, hydrant distribution systems and aircraft refueling equipment to help ensure the safe and dependable flow of quality jet fuel to airline aircraft.

2. Records

All jet fuel quality assurance, airport facility and aircraft refueling equipment maintenance and training records are to be available for inspection and review during normal business hours. All records must be signed, or be adequately identified, by the person performing tasks or by the person accepting responsibility that tasks were performed in accordance to this standard.

3. Notification of New or Modified Equipment

Affected airlines are to be notified well in advance whenever new, additional, replacement or modified airport fuel storage, distribution facilities or aircraft refueling equipment is placed into operation. At airline's option, all airport fueling facilities, into-plane fueling equipment and operator's procedures may be inspected and approved for use prior to servicing airline aircraft.

4. Variance/Waiver

A variance or waiver to the policies and procedures in this document 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 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.

5. Fuel Contamination

If visible fuel contamination is observed or found, aircraft refueling must be discontinued from that source. Notify all affected aircraft operators if it is anticipated that such contamination might impact aircraft operations. Fueling shall not be resumed from the system until the source of fuel contamination is found and removed.

Fuel which is removed from an aircraft because of possible contamination shall be held in quarantine until selected fuel
quality, purity or specification tests have determined it is acceptable for return to 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.

6. Defueled Product

Product defueled from an aircraft for purposes other than contamination should be returned to the airline from which it was removed. Defueled product may not be delivered to another airline’s aircraft without their approval. Defueling aircraft directly into joint use fueling systems is not authorized unless a procedure has been unanimously approved by all system users.

7. Inoperative System

If for any reason a fueling system becomes inoperative so as to impair normal fueling operations, all affected airlines must be notified immediately.

8. Training/Qualification

Facility and fueling equipment operators are responsible for ensuring that all personnel under their direction and control are properly trained and qualified for performing tasks assigned to them as specified in this document. Training and qualification records are to be available for review.

9. Deficiency Reporting

The facility and equipment operator shall establish procedures for reporting of any observed deficiencies or safety hazards by its employees to their supervisors.

10. Maintenance & Operations Manuals

Airport fueling vendors having aviation fuel storage facilities and/or aircraft refueling equipment administrative and operational responsibilities should have maintenance and operation (M & O) manuals. These documents are intended to be used by fuel handling vendors and equipment operators to help ensure the safe and dependable flow of quality fuel to aircraft and they should consist of at least the following guidance material, when and where applicable:

1. Preface
   A. Manual Introduction
   B. Parties Responsible for Manual Content
   C. Manual Revision Policy & Procedure

2. General
   A. Document & Section Overview
   B. Safety & Product Quality Policies
   C. Responsibility Information

1. Specification Requirements

In all phases of fuel handling, appearance of jet fuel shall be clear and bright (visually free of undissolved water, sediment and suspended matter). The odor of the fuel shall not be nauseating or irritating.

Color of jet fuel generally ranges from water white to light straw or amber. Other colors may be an indication 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 fuel has been determined acceptable for aircraft use.

2. Upstream Jet Fuel Purity and Specification Parameters

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

<table>
<thead>
<tr>
<th>Test Property</th>
<th>Maximum Allowable</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPEARANCE</td>
<td>CLEAR &amp; BRIGHT</td>
<td>VISUAL</td>
</tr>
<tr>
<td>API GRAVITY</td>
<td>37° TO 51° API</td>
<td>[ASTM D1298]</td>
</tr>
<tr>
<td></td>
<td>Corrected to 60° F (15° C)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: It is important that the facility operator assigned the task and responsibility to receive jet fuel into airport 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 system 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.

3. Downstream Jet Fuel Purity and Specification Parameters

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

1. Received into airport storage tanks which will issue product directly to hydrant systems and to aircraft refueler loading racks
2. From airport storage facility which will issue product directly to hydrant systems and to aircraft refueler loading racks
3. Dispensed into aircraft

See rejection criteria in reference NOTES or in [Section 2-3] for applicable transportation methods.

<table>
<thead>
<tr>
<th>Test Property</th>
<th>Maximum Allowable</th>
<th>Test Method</th>
<th>See Notes</th>
</tr>
</thead>
</table>

Copyright 2001, Air Transport Association
<table>
<thead>
<tr>
<th>Test Property</th>
<th>Maximum Allowable</th>
<th>Test Method</th>
<th>See Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREE WATER</td>
<td>15 PPM</td>
<td>Ref. [Section 3-5]</td>
<td></td>
</tr>
<tr>
<td>PARTICULATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLOR</td>
<td>2 - DRY or 3 - WET</td>
<td>[ASTM D2276]</td>
<td>1</td>
</tr>
<tr>
<td>ASSESSMENT</td>
<td>A</td>
<td>VISUAL</td>
<td>2</td>
</tr>
</tbody>
</table>

*Sample sizes are either 1 Gallon or 5 Liter*

**NOTE 1.** A color rating of 3-DRY or greater may indicate a particulate contaminant problem. If a color rating of 3-DRY or greater is observed, proceed as follows:

Perform a subsequent particulate test consisting of two membranes 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 2.0 mg/G or 0.5 mg/L based on test sample size taken.

**NOTE 2.** An assessment rating of "B" or greater (reference Gammon Technical Products SGTP-3940 "Color and Particle Assessment Rating Guide" or Shell Oil Company "Filter Membrane Evaluation Guide") 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.

### 2-3. Fuel Receipts Into Airport Storage

#### 1. General

This section covers quality control and safety requirements for receiving jet fuel into airport storage. These requirements can vary depending on method of delivery and facility layout. Receipts of jet fuel at airports are normally made by dedicated or multi-product pipelines, and highway transport trucks. There are some airports receiving product directly from railroad tank cars or marine vessels. It is important that 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.

#### 2. Pipeline Deliveries

Prior to delivery, airport facility operator should receive a **shipping document** from jet fuel supplier or shipping agent certifying product to be delivered to airport meets [ASTM D1655] specification requirements as required in [Section. 2-2] with at least the following select property values listed as measured by specified ASTM test methods:

1. Visual Appearance in White Bucket  
   Ref. [Section 3-7]
2. API Gravity, Corrected to 60° F (15° C)  
   [ASTM D1298]
Shipping document should also include all delivery information, i.e.: destination; batch number; fuel grade or type; quantity to be shipped.

Facility operator shall prepare receiving tank(s) and facility items prior to delivery of product, i.e.: gauging, sumping, correct inlet and outlet valve positioning, etc.

Coordinate communications between pipeline shipping and facility receiving personnel to ensure applicable documentation, notifications and procedures are in place to ensure satisfactory fuel receipt.

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

CAUTION: IT IS NOT ACCEPTABLE TO RECEIVE AND DISPENSE FUEL FROM THE SAME TANK SIMULTANEOUSLY

At the beginning, mid-point and near the end of fuel receipts, the facility operator shall conduct the following test and record the results. 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. Flash-point testing should be performed on deliveries from multi-product pipelines.

(a) Visual Appearance in White Bucket
(b) API Gravity, Corrected to 60° F (15° C)
(c) Color Membrane (Particulate weight to be performed only if necessary per Note 1 of 2.C.)
(d) Free Water Detection Test
(e) Flash Point (Multi-Product Pipeline Deliveries Only)
NOTES:

1. Operators should be aware that pipeline volumes between shipping tanks and sampling points may be from a previous batch. Fuel tests should be timed to coincide with actual arrival of product from shipping tank.

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

3. 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.

Fuel is unacceptable and must be rejected if API Gravity, corrected to 60°F (15°C), is not between 37° and 51° API 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 or 5° F (3°C) in Flash Point from source as shown on shipping document.

While receiving fuel into airport storage, facility operator is to periodically monitor pressure differential of inlet filtration, tank fill levels and check system for product leaks.

Upon completion of fuel receipt into airport storage, facility operator should secure receiving tank(s) and facility items, i.e.: gauging, record results of sampling tanks and filters, set inlet and outlet valves for correct positioning, etc. Tank and filter sump results are to be recorded and retained for 12 months.

NOTE: To help improve fuel purity, it is desirable to have one hour setting per vertical foot of product depth.

Upon completion of jet fuel receipt into airport storage via a Multi-Product pipeline, the facility operator should immediately conduct the following [ASTM D1655] property tests for comparison to the shipping documents and for meeting specification requirements prior to releasing the tank for aircraft use. Full [ASTM D1655] specification testing is required if any of the following test properties exceeds the maximum allowable difference from the shipping documents. Fuel not meeting [ASTM D1655] specification is to be rejected.

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>SPEC LIMIT</th>
<th>MAX DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Visual Appearance in White Bucket</td>
<td>Clear &amp; Bright</td>
<td></td>
</tr>
<tr>
<td>(b) API Gravity, Corrected to 60°F (15°C)</td>
<td>37° to 51° API</td>
<td>1° API</td>
</tr>
<tr>
<td>(c) Distillation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% Recovered</td>
<td>400°F (205°C)</td>
<td>14°F (8°C)</td>
</tr>
<tr>
<td>20% Recovered</td>
<td>Report</td>
<td>14°F (8°C)</td>
</tr>
<tr>
<td>50% Recovered</td>
<td>Report</td>
<td>14°F (8°C)</td>
</tr>
<tr>
<td>90% Recovered</td>
<td>Report</td>
<td>14°F (8°C)</td>
</tr>
<tr>
<td>Final Boiling Point</td>
<td>572°F (300°C)</td>
<td>14°F (8°C)</td>
</tr>
<tr>
<td>Residue</td>
<td>1.5</td>
<td>Spec Limit</td>
</tr>
</tbody>
</table>

Table 2-3.1. ASTM D1655 Property Test
### Table: Properties and Specifications

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>SPEC LIMIT</th>
<th>MAX DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss</td>
<td>1.5</td>
<td>Spec Limit</td>
</tr>
<tr>
<td>(d) Flash Point</td>
<td>100°F (38°C)</td>
<td>5°F (3°C)</td>
</tr>
<tr>
<td>(e) Freezing Point</td>
<td>-40°F (-40°C)</td>
<td>5°F (3°C)</td>
</tr>
<tr>
<td>Jet A</td>
<td>-53°F (-47°C)</td>
<td>5°F (3°C)</td>
</tr>
<tr>
<td>Jet A-I</td>
<td>-53°F (-47°C)</td>
<td>5°F (3°C)</td>
</tr>
</tbody>
</table>

*NOTE:* Pipelines are considered "dedicated" only if they do not have inlet connections to any other product from the last tank or point the fuel was completely re-certified as jet fuel meeting [ASTM D1655] specification. There is a significant increase in exposure to fuel contamination problems when airports receive jet fuel by "multi-product" pipelines as compared to "dedicated" pipelines. Additional care must be taken to prevent the fuel specification values from being impacted.

### 3. Transport Truck Deliveries

Facility operator shall prepare receiving tank(s) and facility items prior to delivery of product, i.e.: gauging, sumping, correct inlet and outlet valve positioning, etc.

Airport facility operator should receive a shipping document from jet fuel supplier or shipping agent certifying product being delivered to airport meets all [ASTM D1655] specification requirements with at least the following select property values listed as measured in specified ASTM test methods:

(a) Visual Appearance in White Bucket

(b) API Gravity, corrected to 60°F (15°C)

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. Shipping document should include all delivery information, i.e.: destination; document number; fuel grade or type; quantity to be shipped; API Gravity, corrected to 60°F (15°C).

Truck unloading hoses and fittings are to be inspected for deficiencies, pending failures and cleanliness prior to connection to airport facility receiving connections.

Prior to testing and unloading of transport truck, allow truck to set for a minimum of 10 minutes with the tank internal valves open.

Facility operator shall conduct the following test on fuel samples received from highway transport truck tank compartments and record the results:

(a) Visual Appearance in White Bucket

(b) API Gravity, corrected to 60°F (15°C)

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 jet
If visible contamination is observed in white bucket, more than one sumping may be required to clear it. If contamination remains after approximately five (5) one gallon individual samples from one tank truck compartment, the load must be rejected. 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, should be retained in a clean container for future reference.

Fuel is unacceptable and must be rejected if API Gravity, corrected to 60°F (15°C), is not between 37° and 51° API. 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 from source as shown on shipping document.

While receiving fuel into airport storage, facility operator is to periodically monitor pressure differential of inlet filtration and check system for product leaks.

Upon completion of fuel receipt into airport storage, facility operator shall secure receiving tank(s) and facility items, i.e.: gauging, record results of sumping tanks and filters, set inlet and outlet valves for correct positioning, etc. Tank and filter sump result records are to be retained for 12 months.

NOTE: To help improve fuel purity, it is desirable to have one hour settling per vertical foot of product depth.

4. Railroad Tank Car Deliveries

Airport facility operator should follow the "TRANSPORT TRUCK DELIVERIES" section for guidance procedures.

5. Marine Vessel Deliveries

Airport facility operator should follow the "PIPELINE DELIVERIES" section for guidance procedures.

2-4. Fuel Storage Facility Requirements

1. General

Fuel storage facilities must meet the following requirements, unless otherwise indicated. Vendors with facilities which do not meet the requirements of this section shall submit a waiver request to the affected customers under subsection 1.I.E. of these standards.

CAUTION: GALVANIZED MATERIALS MUST 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.

2. Storage Tanks

Storage tanks shall include the following equipment;
(a) Floating suction with means of verifying proper operation.
(b) Inlet diffuser
(c) Gauge hatch with slotted tube
(d) Access manway (Two are preferred)
(e) Automatic high liquid level device(s) to prevent tank overfill

Above ground vertical tanks shall also include the following equipment, in addition to 1-4 .B.(1), above, unless otherwise indicated;

(a) Fixed roof
(b) Light color epoxy coated floor and sides up to the top of the first wall panel. Complete internal coating is recommended.
(c) Cone down bottom to positive center sump with drain.
(d) Non-Metallic tanks are not acceptable.

Above ground horizontal tanks shall also include the following equipment, in addition to 1-4 .B.(1), above, unless otherwise indicated;

(a) Carbon steel tanks must have complete internal light colored epoxy coating.
(b) Sloped bottom to positive sump with drain.
(c) Non-Metallic tanks are not acceptable.
(d) Access manways should be equipped with an internal ladder.

Underground tanks shall also include the following equipment, in addition to 1-4 .B.(1), above, unless otherwise indicated;

(a) Carbon steel tanks must have complete internal light colored epoxy coating.
(b) Access manways should be equipped with an internal ladder.
(c) Manways and other tank appurtenances must be extended above ground where possible.
(d) Sloped bottom to positive sump with permanent pump

3. Filters

Filter/Separators are required for receiving fuel into and dispensing fuel from storage that will supply fuel directly into aircraft, refuelers, or hydrant systems. If only one Filter/Separator is available, it must be installed to perform both fuel receiving and dispensing functions.

NOTE: Full-Flow monitors meeting the requirements of IP Specifications And Qualification Procedures-Aviation Fuel Filter Monitors With Absorbent Type Elements, latest edition, may be used in lieu of Filter/Separators with water defense systems.

NOTE: Additional filtration, such as micronic filters, water coalescers (haypacks) or clay treaters, may be
All Filter/Separators must meet the requirements of API 1581, Group II, Class B, latest edition, or be qualified by similarity as defined in Appendix A of that specification. If qualified by similarity, a qualification report must be maintained locally and a data plate reflecting such qualification must be attached to the vessel.

Filter/Separators must be equipped with automatic water defense systems which will stop fuel flow or alert operating personnel when actuated by a high water level.

(a) Float or electronic probe systems must include provisions for an operational test.

All filter vessels must be equipped with;

(a) Provisions for elimination of air
(b) Direct reading differential pressure gauges
(c) Manual sump drains - Valves with handles spring loaded to the closed position are recommended.
(d) Upstream and downstream sampling (Millipore) connections, including probes and dust caps or plugs.
(e) Pressure relief valves
(f) Placard indicating month and year of last filter change.

Use of automatic water drain valves is not recommended. Existing automatic drain valves should be removed.

4. Physically Segregated Systems

Physically segregated systems are required where more than one grade of fuel is stored to prevent accidental mixing of products.

Use of isolation valves or blind flanges are not acceptable methods of product grade separation.

Connections for receiving and dispensing different grades of fuel must be physically incompatible.

5. Emergency Fuel Shutoff System

An Emergency Fuel Shutoff system is required

Fuel flow emergency shut-off valves and switches must be clearly marked in accordance with the requirements of NFPA 407, latest edition, and the area around them must be kept free of obstructions.

6. Deadman Control Device

A deadman control device is required for all truck loading operations.
7. Static Bonding Connections

Static bonding connections must be provided between truck and fill stand at all truck loading points.

8. Bottom-loading Nozzles

Bottom-loading nozzles must be equipped with 60 mesh or finer screens.

9. Fire Extinguishers With Inspection Tags

Fire extinguishers with inspection tags must be positioned in accordance with local requirements.

10. Fuel Loading and Unloading Hoses

All fuel loading hoses must meet API 1529, Type C or BSI 3158, Type C standards. Fuel unloading hoses should be compatible with jet fuel and suitable for local conditions.


"NO SMOKING", "FLAMMABLE", and product identification signs must be prominently displayed.

12. Fuel Storage Facilities

Fuel storage facilities must be properly identified and color coded in accordance with the standards of API 1542, latest edition.

13. Metal Underground Tanks and Piping

Metal underground tanks and piping should be cathodically protected.

14. Relaxation Chambers

Relaxation chambers, where installed, should be equipped with the following:

- Air eliminator
- Pressure relief valve
- Manual sump drain - Valves with handles spring loaded to the closed position are recommended.

15. Placard Indicating the Volume of Tank Drain Piping

A placard indicating the volume of tank drain piping should be placed adjacent to tank drain devices.
2-5. Fuel Facility Checks

1. General

The following checks must be performed on all fuel storage facilities servicing aircraft and at the frequencies specified. Additional tasks or more frequent checks may be required based on local conditions.

Daily checks and inspections should be made at the beginning of each work day including weekends and holidays.

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 facility equipment.

Any facility equipment not in daily use must have all daily, monthly, quarterly and annual checks current and recorded before the equipment is returned to service.

2. Records

Use of Forms 103.01, A through D, is recommended, but not required. No variance authority is needed to use other forms if they meet or exceed the task and frequency requirements specified in this section. Additional copies of Forms 103.01, A through D, may be reproduced locally.

The legible signature, initials or employee identification number of the person performing the task or the person accepting responsibility for the performance of the tasks is required.

(a) If initials or employee identification numbers are used, a record of each person's name and initials/identification number must be maintained and available for review.

(b) Supporting documentation with the signature, initials or identification number of the person actually performing the tasks must be available if another person has signed the form accepting responsibility for accomplishment of the tasks.

Records must indicate when fueling equipment is not in service.

Retain records in local files for 12 months.

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

S = Indicates Satisfactory

C = Indicates Comment. Comment required in remarks section.

N/U = Indicates unit Not Used

N/A = Indicates Task Not Applicable

Sump samples are to be rated according to [Section 3-7].
3. Daily Checks

3.1 General Condition of Tank Yard
(a) Check the general condition of the yard area for appearance and cleanliness.
(b) Report and correct any condition that needs immediate attention, i.e., plugged drainage, weeds, poor housekeeping, etc.
(c) Evidence of any recent fuel spill must be investigated immediately.

3.2. Security, Fire & Safety Deficiencies
(a) Check tank yard and fuel handling facilities for any security, fire or safety deficiencies or unusual conditions requiring immediate corrective actions.
(b) Ensure that all gates and access doors are kept locked when area is unattended.
(c) All broken fences and gates are to be repaired or replaced immediately.
(d) In unsecured areas, all tank openings, valves, sump drains, fill caps, loading/unloading hoses, master electrical switches and other accessible fittings must be kept locked at all times when not in use.

3.3. Fuel Leaks
(a) Check tanks, piping, valves, hoses, meters, filters, and other fuel handling equipment for fuel leaks.
(b) Any visible leaks must be immediately reported and repaired.

3.4. Storage Tank Sumps
(a) Drain fuel, at maximum practical flow, into white bucket. Assure sample quantity is of sufficient size to ensure displacement of sampling line volume.
(b) Perform fuel appearance test of sample.
(c) Record findings of first sample taken, after displacement of sampling line volume, according to [Section 3-7].
(d) Continue draining until clean, dry fuel is obtained.
(e) Remove tank from service if unable to obtain clean, dry fuel. Report unusual contamination to aircraft operators if it is anticipated that such contamination may impact aircraft operations.

3.5. Filter Sumps
(a) Drain minimum of one gallon of fuel under pressure, at maximum practical flow, into white bucket.
(b) Perform fuel appearance test of sample.
(c) Record findings of first sample taken, after displacement of sampling line volume, according to [Section 3-7].
(d) Remove filter vessel from service if unable to obtain clean, dry fuel. Report unusual contamination to aircraft operators if it is anticipated that such contamination may impact aircraft operations.
3.6. Filter Differential Pressure
(a) Under normal flow conditions, check and record differential pressure across all working filters (See [Section 3-9]).

3.7. Hoses, Swivels and Nozzles
(a) Check condition of all fuel hoses, swivels and nozzles for wear, damage and leakage.

1) Check hoses for abrasions, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists and sharp bends that gives the appearance of pending failure.

2) Check tightness of all swivel attachment screws and hose couplings.

3) Check condition of nose and poppet seals on nozzles for cuts, nicks and wear.

(b) Any item that is defective or is leaking must be replaced or repaired immediately.

3.8. Static Reels, Cables & Clamps
(a) Check condition of static reels, cables and clamps.

(b) Any defect that affects conductivity must be corrected prior to use.

1) Continuity should be checked after maintenance to static systems.

3.9. Fire Extinguishers
(a) Verify that fire extinguishers are in proper place with unobstructed access for immediate use.

(b) If scal is broken or inspection tag missing, extinguisher must be taken out of service until recharged and tagged for acceptance.

4. Monthly Checks

4.1. Filtration Test
(a) Perform a color membrane and free water test downstream of all filter/separator vessels (See [Section 3-4] and [Section 3-5]). Record results and attach test membrane to Form 103.08 or equal.

4.2. Bonding Cable Continuity
(a) Perform electrical continuity check on bonding cables and clamps (See [Section 3-10]).

4.3. Nozzle Screens
(a) Remove nozzles and examine screens for particles.

1) If particles are found, investigate sources of contamination which could be from inner hose lining, pipe rust, sand, low point sediment, equipment failure, seals, gaskets, etc.

(b) Screens are to be cleaned or replaced if damaged.
4.4. Signs & Placards
(a) Verify that fueling equipment is clearly marked with the proper type of fuel being dispensed, flammable/no smoking, emergency shutoff and other appropriate information and instructions, signs or decals as required.

4.5. Floating Suctions
(a) Verify satisfactory operation of all tank floating suction.

4.6. Fire Extinguisher
(a) Check fire extinguisher inspection tag dates, seals and verify that extinguishers are properly charged.

5. Quarterly Checks

5.1. Emergency Shutdown System
(a) Operationally check the emergency shutdown system.
   1) Coordinate shutdown test with all persons, agents, airlines, fuel suppliers, and other groups having interest in the operation of the system.
   2) Each control device must be tested at least once a year.
(b) Immediately report any operational discrepancies.

5.2. Water Defense Systems
(a) Check satisfactory operation of water defense systems on all filter/separators (See [Section 3-12]) by mechanically raising the float or float ballast on float-type systems, or injecting water into the probe on probe-type systems. Immediately repair any system deficiencies.

5.3. Tank High Level Controls
(a) Check satisfactory operation of tank high level sensing devices and automatic fuel flow shutoff valves where installed.
(b) Inoperative controls should be adjusted or repaired immediately or have alternate operating procedures in effect that will provide positive spill prevention while tank is in service.

6. Annual Checks

6.1. Storage Tank Interiors
(a) Open fuel storage tanks and check interiors for cleanliness and condition of coating.
(b) Clean as required (See [Section 3-11]).

6.2. Pressure Gauges
(a) Check accuracy of pressure gauges monitoring fuel pressure through filter vessels. Replace or calibrate if found
defective.

6.3. Filter Elements

(a) Replace filter elements per [Section 3-13].

1) However, life of filter elements may be extended to a maximum of two years provided the facility operator has followed criteria outlined in [Section 3-16].

(b) Regardless of filter element replacement frequency, all filter vessels must be opened annually to visually check condition of interior for cleanliness, and integrity of elements.

6.4. Filter/Separator Heaters

(a) Where installed, check filter/separator sump and drain line heaters for proper operation per manufacturer specifications before freezing weather.

6.5. Tank Vents

(a) Where installed, check cleanliness of tank vent screens.

(b) Tanks that have pressure/vacuum vents, check satisfactory operation and condition of poppets and inlet screens.

1) Under freezing conditions, additional checks may be required to assure free movement of poppets.

6.6. Cathodic Protection

(a) Where installed, confirm satisfactory operation of the cathodic protection system for underground steel storage tanks and underground piping. This requirement is generally contracted to businesses specializing in this type of service.

6.7. Facility Condition

(a) Perform thorough inspection of facility.

1) Check for the safe condition of stairways, handrails, ladders, walking surfaces and adequacy of area and access lighting in tank yard and on above ground tanks.

2) Note any electrical deficiencies that are obvious safety and fire hazards.

3) Note any unusual sounds or noises from pumps, motors, meters, control valves and other mechanical devices that might indicate pending failure.

4) Also, check condition of exterior paint covering facilities and equipment for protection and appearance.

6.8. Line Strainers

(a) If installed, check line strainers for cleanliness and damage.

(b) Clean or replace screens as required.

(c) Local conditions may require more frequent check of some strainers, such as those used for truck unloading.
2-6. **Hydrant System Checks**

1. **General**

   The following checks must 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.

   Daily checks and inspections should be made at the beginning of each work day including weekends and holidays.

   All personnel engaged in ramp operations must 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.

   Aircraft operators shall be notified by contracted fueling agent of any modifications, changes, or construction work to hydrant systems. Hydrant systems must be flushed per [Section 3-17].

   Hydrant systems or segments of hydrant systems not in daily use must have all daily, monthly, semi-annual and annual checks current and recorded before the equipment is returned to service. Based on fuel test results, flushing may be required by aircraft operator prior to use. Records must indicate when systems are out of service.

2. **Records**

   Use of Form 103.05 is recommended, but not required. No variance authority is needed to use other forms if they meet or exceed the task and frequency requirements specified in this section. Additional copies of Form 103.05 may be reproduced locally.

   The legible signature, initials or employee identification number of the person performing the task or the person accepting responsibility for the performance of the tasks is required.

   (a) If initials or employee identification numbers are used, a record of each persons name and initials/identification number must be maintained and available for review.

   (b) Supporting documentation with the signature, initials or identification number of the person actually performing the tasks must be available if another person has signed the form accepting responsibility for accomplishment of the tasks.

   Records must indicate when fueling equipment is not in service.

   Retain records in local files for 12 months.

   Upon completion of the checks, record results using the following ratings;

   - **S** = Indicates Satisfactory
   - **C** = Indicates Comment. Comment required in remarks section.
   - **N/U** = Indicates unit Not Used
   - **N/A** = Indicates Task Not Applicable
3. Daily Checks

3.1. Pit Leaks & Cleanliness
   (a) Check hydrant valve pits for fuel leaks and cleanliness.
   (b) Hydrant pits should be kept clean and dry.
   (c) Pits are to be removed from service if liquid level is within 12" of top of pit valve.

3.2. Hydrant Valve Condition
   (a) Check the general condition of the hydrant valve including components for visual deficiencies.
   (b) Report any defects requiring repair.
   (c) Replace missing hydrant valve and sense plug dust covers as required.

3.3. Hydrant Pit Covers
   (a) Check hydrant valve pit covers for safe condition.
   (b) Report broken, cracked, or defective hinges, handles, lids, or unsafe condition requiring repairs.

3.4. EFS Stations
   (a) Check that all emergency fuel shutdown stations on the ramp have;
      1) Clear access
      2) Proper identification
      3) Installed locator lights are working properly.
   (b) Any deficiencies are to be reported and corrected immediately.

3.5. Pressure/Flow Charts
   (a) Where recorders are installed, check pressure/flow charts for abnormal operating conditions. Unusual pressure/flow
       readings and the number of pump start/stop cycles may indicate a fuel leak or pending system failure.
   (b) Report abnormal chart recordings immediately.

4. Monthly Checks

4.1. Hydrant Valve Assembly
   (a) Check the general condition of the hydrant pit valve, sense line connectors, and the satisfactory operation of the
       internal shut-off piston.
   (b) Check for leaks, excessive coupler mating flange wear, and for any loose or missing connecting screws and
mounting bolts.

(c) Repair or replace any deficiencies immediately.

4.2. Isolation Valve Pits
(a) Check isolation valve pits that control the distribution of fuel in the ramp and gate areas for emergency access, lid condition, fuel leaks, cleanliness, and general condition of any electrical components.
(b) Check the freedom of the valve(s) opening/closing operation.
(c) Correct any discrepancies found.

4.3. Low Point Drains
(a) Open all low point drains until all water and/or sediment is removed.
(b) Flush a minimum of two (2) gallons or more at each low point to ensure positive removal of all contaminates.
(c) Replace missing tags or markings to pit lids or low point drain valves as required to ensure proper identification.

4.4. Emergency Shutdown
(a) Verify the satisfactory operation of the emergency shutdown system.
(b) Coordinate the shutdown test with all persons, fueling agents, fuel suppliers, and any other group having an interest in the operation of the facility.
(c) Each control device must be tested at least once a year.
(d) Immediately report and repair any discrepancies.

NOTE: If for any reason the emergency shutdown system cannot be repaired immediately, system operator must have an approved alternate plan in effect for continuing system use until discrepancies are corrected.

5. Semi-annual Checks

5.1. High Point Vents
(a) Bleed all high point vents to ensure the removal of all entrapped air.
(b) Continue to bleed air until clear fuel is present.
(c) It is necessary to bleed high point vents more frequently if pipeline was drained or modified allowing air entry into system.
(d) Replace missing tags or markings to pit lids or high point vent valves as required to ensure proper identification.

5.2. Surge Absorbers
(a) Where installed, check the general condition and operating pressure setting of each unit.
(b) Recharge as required.
5.3. Pipeline Casings

(a) Where installed, check the satisfactory operation of pipeline leak detection systems and pipeline monitoring wells.

(b) Monitoring devices and fuel flow shutdown valves are to be tested.

(c) Immediately report and repair any deficiencies.

NOTE: In critical areas, i.e. baggage rooms, basements, etc., this task may be more frequent based on local needs and exposure.

6. Annual Checks

6.1. Cathodic Protection

(a) Where installed, confirm satisfactory operation of cathodic protection systems. This requirement is generally contracted to businesses specializing in this type of service.

6.2. Instrumentation/Electrical Controls

(a) All major electrical components and system controls are to be inspected and tested to assure satisfactory operation.

(b) Discrepancies are to be reported and corrected immediately.

2-7. Aircraft Fueling Equipment Requirements

CAUTION: GALVANIZED MATERIALS MUST 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.

1. General

All aircraft fueling equipment, including tank trucks, hydrant trucks, hydrant carts and fueling cabinets, must be equipped with the provisions in this section.

There must be no visible fuel leaks.

Tires, wheels, wheel studs/nuts and axle studs/nuts must be maintained in good condition at all times.

Electrical equipment, including lights, light lenses and wiring, must be maintained in a safe and operational condition.

Windows must be clean and free of cracks and crazing.

2. Filter/Separator or Full-flow Fuel Monitor

All aircraft fueling equipment must have a Filter/Separator or a Full-Flow Fuel Monitor.
(a) Filter/Separators must meet the specifications of API 1581, Group II, Class C, latest edition.

1) Filter/Separators must be equipped with an automatic water defense system which will cause fueling to stop when activated by excessive water.

   a) Float or electronic probe systems must include provisions for an operational test.

(b) Full-Flow Fuel Monitors must meet the IP Specifications And Qualification Procedures-Aviation Fuel Filter Monitors With Absorbent Type Elements, latest edition.

1) Full-Flow Fuel Monitors, when used in systems with static fuel pressure in excess of 180 psig, must be equipped with a differential pressure device which will prevent excessive inlet pressure from rupturing elements in the event of complete blockage.

(c) All filtration vessels must include:

1) Air elimination provisions.

2) Direct reading pressure differential gauges.

3) Manual sump drains - Valves with handles spring loaded to the closed position are recommended.

4) Upstream and downstream membrane sampling connections, including probes and dust covers.

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.

3. Pressure Controls

All aircraft fueling equipment must have separate and independent primary and secondary pressure control devices.

(a) Primary pressure control is intended to protect the aircraft under conditions of constant flow and also from pressure surge caused during aircraft valve closure.

(b) Secondary pressure control is intended to protect the aircraft in the event of primary control failure.

| CAUTION: FUELING PRESSURE CONTROL SYSTEMS SHALL NEVER ALLOW THE ACTUAL FUEL PRESSURE, MEASURED AT THE FUEL NOZZLE, TO EXCEED THE PRESSURE INDICATED BY THE OPERATORS GAUGE. |

(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.

(d) Primary pressure control devices must limit fueling pressure, at the fuel nozzle, to 40 psig or less under conditions of constant flow.

(e) Secondary pressure control devices must limit fueling pressure, at the fuel nozzle, to 50 psig or less under...
4. Deadman Control System

All aircraft fueling equipment must have a deadman control system, which must completely stop fuel flow within 5 percent of the fuel flow rate at the time of release.

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

5. Emergency Fuel Shutoff System

Hydrant trucks, hydrant carts and fueling cabinets must be equipped with an emergency fuel shutoff system in addition to a deadman control.

(a) Each unit must have an emergency fuel shutoff control accessible from the ground.

(b) Units equipped with a lift or platform must have an emergency fuel shutoff control accessible from the lift or platform, in addition to one accessible from the ground.

(c) The system should stop the fuel flow by automatically closing the hydrant pit valve upon activation.

Tank trucks must be equipped with an emergency fuel shutoff control accessible from each side of the truck.

(a) Units equipped with a lift or platform must have an emergency fuel shutoff control accessible from the lift or platform, in addition to one accessible from the ground.

(b) The emergency fuel shutoff system should also close the tank outlet valve(s).

Each emergency fuel shutoff control must completely stop fuel flow within a maximum of 5 percent overrun.

EXAMPLE: If actual fuel flow rate at the time of emergency fuel shutoff activation is 500 gpm, total overrun must not exceed 25 gallons.

6. Fire Extinguishers

Hydrant trucks and Carts must be equipped with a minimum of one 20 pound dry chemical fire extinguisher, securely mounted and readily accessible.

Tank trucks must be equipped with a minimum of two 20 pound dry chemical fire extinguishers, securely mounted on opposite sides of the truck and readily accessible.

Fueling cabinets must have a minimum of one 20 pound dry chemical fire extinguisher readily accessible.

Seals must be intact.

Current inspection, testing and recharging records must be attached.

7. Safety Interlock System

All mobile fueling equipment must have a safety interlock system which will prevent the equipment from being moved
when:

(a) Couplers or single point nozzles are not in their stowed position.

(b) The pumping system is activated on tank trucks.

(c) Lift platforms are in the extended position.

The interlock system may stop the engine on motorized equipment, but should also apply the vehicle brakes.

Tank trucks with bottom loading provisions, should incorporate a brake interlock system that will prevent the vehicle from being moved until the bottom loading coupler has been disconnected from the vehicle.

If interlock systems are equipped with a override device, the control should be secured in the normal position with break-away safety wire. Placards should identify normal and override control positions. A light, indicating override activation should be prominently located in the vehicle cab.

8. Aircraft Fueling Hoses

Hoses and couplings must meet one or more of the following standards:

(a) API 1529, Grade 2, Type C, latest edition

(b) BS 3158, Type C, latest edition

(c) API 1529, Grade 2, Type F, latest edition, may be used for "Jac Risor" hoses.

Nozzle swivels must have the collar secured by lock rings or safety wired collar retention screws.


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

10. Dust Covers

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

11. Nozzle Strainers

Aircraft fueling nozzles must be equipped with 100 mesh strainers.

12. Aircraft Fuel Pressure Gauges

A pressure gauge is required for monitoring aircraft fueling pressures.

Gauges should be located where they will be visible to the equipment operator during aircraft fueling operations.

Gauges should have a minimum face diameter of 4 inches and accuracy of +/-2% of full scale.
13. Fuel Quantity Measurement Meter

Meters must 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 100 gpm to the maximum rated flow of the fueling equipment.

Calibrator/adjustor must be sealed.

14. Electrostatic Bonding System

Electrostatic bonding system must have less than 10 ohms total resistance.

15. Signs, Placards & Labels

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

(a) Product identification on each side and rear

(b) FLAMMABLE on each side and rear

(c) NO SMOKING posted prominently in cab of vehicles

(d) NO SMOKING on at least two sides

(e) EMERGENCY FUEL SHUTOFF placard adjacent to each emergency fuel shutoff control. Placards should also indicate method of operation (e.g. Push, Pull, Turn, etc.).

(f) Fire extinguishers located in enclosed compartments shall have their location clearly marked.

(g) Aircraft fueling pressure and filter differential pressure gauges shall be identified.

(h) Filter and tank drain valves shall be identified.

(i) A placard indicating the date (Month and Year) during which the filter elements were last changed shall be placed on the filter housing.

(j) A placard indicating the date (Month and Year) of the last satisfactory single element test, if applicable, shall be placed on the filter housing.

(k) A sign or placard indicating proper procedure for engaging the pumping system should be prominently displayed adjacent to pump controls.

16. Additional Requirements for Tank Trucks

Cargo Tanks must be constructed of stainless steel, aluminum or internally light color epoxy coated carbon steel.

Dome covers must be provided with:

(a) A forward mounted hinge and latches which will automatically cause the cover to close and latch with forward motion of the vehicle.

(b) Water-tight, fuel resistant seals and gaskets.
Each tank compartment must be equipped with a water drain located at the lowest point.

(a) Valves with handles spring loaded to the closed position are recommended.

Tank outlets should be equipped with shutoff valves located inside the tank shell.

Tank trucks with bottom loading capability must be equipped with a high-level shutoff system, including provisions for ensuring the satisfactory operation of the system (known as a "Pre-Check" system).

Recirculation connections are recommended.

2-8. Aircraft Fueling Equipment Checks

1. General

The following periodic checks must be performed by qualified individuals, at the specified frequencies, on all aircraft fueling equipment, including fueling cabinets. Additional or more frequent checks may be required due to local conditions.

Maintenance requirements specified in this section are generally limited to those items required for maintaining fuel quality and safety. Additional programs should be established to ensure mechanical reliability of all equipment servicing aircraft.

Daily checks should be made at the beginning of each day, including weekends and holidays, but must be made prior to, or during the first aircraft servicing of the day.

Any fueling equipment not in daily use must have all daily, monthly, quarterly and annual checks current and recorded before the equipment is returned to service.

2. Records

Use of Forms 103.04, A through C, is recommended, but not required. No variance authority is needed to use other forms if they meet or exceed the task and frequency requirements specified in this section. Additional copies of Forms 103.04, A through C, may be reproduced locally.

The legible signature, initials or employee identification number of the person performing the task or the person accepting responsibility for the performance of the tasks is required.

(a) If initials or employee identification numbers are used, a record of each persons name and initials/identification number must be maintained and available for review.

(b) Supporting documentation with the signature, initials or identification number of the person actually performing the tasks must be available if another person has signed the form accepting responsibility for accomplishment of the tasks.

Records must indicate when fueling equipment is not in service.

Retain records in local files for 12 months.
Upon completion of the checks, record results using the following ratings:

S = Indicates Satisfactory

C = Indicates Comment. Comment required in remarks section.

N/U = Indicates unit Not Used

N/A = Indicates Task Not Applicable

Sump samples are to be rated according to [Section 3-7].

3. Daily Checks

3.1. General Condition

(a) Check the general condition of the fueling vehicle for safety defects, fuel leaks, damage and proper appearance.

(b) Take appropriate corrective action for noted defects.

(c) Units with fuel leaks are not to be used to service aircraft.

3.2. Filter Sumps

(a) Drain minimum of one gallon of fuel under pressure, at maximum practical flow, into a clean white bucket.

(b) Perform fuel appearance test of filter sumps according to [Section 3-7].

(c) Record findings of first sample taken according to [Section 3-7].

(d) Continue to sample until clean, dry fuel is obtained.

(e) Remove unit from service if unable to obtain clean, dry sample after three samples have been drained. Report unusual contamination to aircraft operators if it is anticipated that such contamination may impact aircraft operations.

3.3. Filter Differential Pressure

(a) Observe and record differential pressure with fuel flowing through filter under normal maximum flow conditions (Reference [Section 3-9]).

(b) Remove unit from service if a sudden drop in differential pressure from previous readings is observed or if differential pressure exceeds 15 psi on filter/separators or 25 psi on full flow monitors.

3.4. Deadman Controls

(a) Verify that the deadman control system will completely stop fuel flow before overrun has exceeded 5 percent of actual flow rate at the time of release.

EXAMPLE: If actual flow rate is 400 gpm, fuel flow must completely stop within 20 gallons of deadman control release.

(b) Remove vehicle from service if deadman control does not function properly.
3.5. Brake (Safety) Interlocks

(a) Verify proper operation of brake (safety) interlock system.

1) Remove one nozzle from its storage position and attempt to move unit. Unit should not move.

| NOTE: Some tank trucks may move slightly under heavy engine acceleration due to high gear reduction drive trains. Movement should be minimal and must stop immediately upon returning engine to idle. |

2) Repeat task for each additional nozzle, lift platform and bottom loading interlock, as applicable.

3) Defective interlock systems should be repaired immediately.

4) Wheel chocks must be used to prevent forward or aft movement of unit if interlocks are inoperative.

3.6. Nozzle Fueling Pressure

(a) Check and record nozzle delivery (primary) fueling pressure.

(b) Nozzle Pressure should not exceed 40 psi under conditions of constant flow.

1) Pressure in excess of 40 psi, but less than 50 psi, indicates an out of adjustment or malfunctioning primary pressure control. Investigate and correct as necessary.

2) Pressure should not fluctuate more than +/- 10 psi under conditions of constant flow.

(c) Immediately remove unit from service if pressure exceeds 50 psi.

3.7. Hoses, Nozzles & Swivels

(a) Check condition of all fuel hoses, swivels, nozzles and couplers for damage, leakage or excessive wear.

1) Check hoses for abrasions, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists and sharp bends or other damage that gives the appearance of pending failure.

2) Check the tightness of all swivel attachment screws and hose couplings.

3) Check condition of nose and poppet seals on nozzles for cuts, nicks and wear.

(b) Any item which is defective or leaking must be repaired or replaced before being used to service aircraft.

3.8. Static Reels, Cables & Clamps

(a) Check the condition of static bonding reels, cables, clamps and connections.

(b) Any defect that affects conductivity must be corrected prior to use.

1) Continuity should be checked after maintenance to static bonding/grounding systems.

3.9. Lift Platforms

(a) Check the general condition and verify proper operation of lift platforms.

(b) Remove unit from service if deficiencies are noted.
3.10. Fire Extinguishers
   (a) Minimum Requirements
       1) Hydrant Truck or Cart
          a) One 20-pound dry chemical fire extinguishers
       2) Tank Truck
          a) Two 20-pound dry chemical fire extinguishers
   (b) Verify that fire extinguisher(s) are readily accessible.
   (c) Verify that seal is intact and current inspection records are attached.
   (d) If seal is broken or inspection tag is missing, remove unit from service until extinguisher is inspected or replaced.

3.11. Surge/Waste Tanks
   (a) Check and drain, if applicable, atmospheric surge tanks, thermal relief tanks or waste fuel tanks.

3.12. Air Tanks
   (a) Drain all moisture from air tanks to prevent damage to air system components and freezing during cold weather.

3.13. Tanker Troughs
   (a) Check tanker troughs for water.
   (b) If standing water is present, clean troughs and drains.

   CAUTION: IF STANDING WATER IS FOUND IN TANKER TROUGHS, EXTRA CARE MUST BE USED IN INSPECTING TANK COMPARTMENTS AND FILTER DRAINS FOR WATER.

3.14. Tanker Sumps
   (a) Drain minimum of one gallon of fuel at high flow rate into a clean white bucket.
   (b) Perform fuel appearance test on a fuel sample from each tank compartment. (Reference [Section 3-7])
   (c) Record findings of first sample taken according to [Section 3-7].
   (d) Continue to sample until clean, dry fuel is obtained.
   (e) Additional checks are required during and immediately after inclement weather.
   (f) Remove unit from service if unable to obtain clean, dry sample three samples have been drained. Report unusual contamination to aircraft operators if it is anticipated that such contamination may impact aircraft operations.

3.15. Tanker Bottom Loading Pre-check
   (a) Verify proper operation of high level shutdown systems on tanker trucks which are bottom loaded by operating
pre-check controls during filling.

(b) Trucks should not be bottom loaded with an inoperative high level shutdown system unless alternate procedures are followed.

4. Monthly Checks

4.1. Filtration Test

(a) Perform a color membrane (Millipore) and undissolved water test downstream of each filter/separater and monitor vessel. (Refer [Section 3-4] and [Section 3-5])

4.2. Static System Continuity Test

(a) Perform electrical continuity check of static bonding system.

(b) Resistance must be less than 10 ohms.

(c) Defective equipment must be repaired or replaced prior to servicing aircraft.

4.3. Nozzle Screens

(a) Examine each nozzle screen for particles or other solid contaminants.

1) If particles are found, investigate possible sources of contamination (inner hose lining, pipe rust, sand, seals, gaskets, equipment failure, etc.) and take appropriate corrective action.

(b) Clean screens as necessary

(c) Verify that screens are 100 mesh

(d) Damaged screens are to be replaced.

4.4. Fuel Hoses

(a) Lay hoses out full length with system at full operating pressure and check hoses for abrasions, cuts, soft spots, carcass separation, worn covers, blisters, exposed reinforcement, cracks, twists and sharp bends or other damage that gives the appearance of pending failure.

(b) Check couplings at both ends for cracks and signs of slippage or leakage.

(c) Replace any defective hoses prior to further servicing of aircraft.

4.5. Signs & Placards

(a) Verify that unit is clearly marked with applicable signs, placards and labels.

1) Product identification on each side and rear

2) "FLAMMABLE" on each side and rear

3) "NO SMOKING" on at least two sides

4) "NO SMOKING" posted prominently in cab of vehicles
5) "EMERGENCY FUEL SHUTOFF" adjacent to each emergency fuel shutoff control.
6) Placards indicating method of Emergency Fuel Shutoff operation, e.g. - Push, Pull, Turn, etc.
7) Signs indicating location of fire extinguishers inside enclosed compartments
8) Placards identifying Nozzle Fueling Pressure
9) Placards identifying Filter Differential Pressure
10) Placards identifying Filter and Tank Drain valves.
11) Placard indicating the last date (Month and Year) during which the filter elements were replaced
12) Placard indicating the date (Month and Year) of a satisfactory single element test was performed, if applicable
13) Other information and instructional markings as required by local conditions

4.6. Meter Seals
   (a) Verify that meter calibrators/adjusters are sealed.
   (b) Meters with missing seals may only be used with airline permission and must be calibrated.

4.7. Fire Extinguishers
   (a) Verify that extinguishers are properly charged and sealed.
   (b) Verify that inspection tags are attached and current.

4.8. Emergency Shutdown System
   (a) Verify that each emergency fuel shutdown control device will completely stop fuel flow before overrun has exceeded 5 percent of actual flow rate at the time of release.
   EXAMPLE: If actual flow rate is 400 gpm, fuel flow must completely stop within 20 gallons of emergency shutdown activation.
   (b) Equipment with defective emergency fuel shutdown systems must be removed from service until the system has been repaired.

4.9. Lift Platforms
   (a) Verify the safe and dependable operation of all lift platforms.
   (b) Thoroughly inspect the lift mechanism, emergency let down system, lift interlocks, hydraulic hoses, couplings, lighting, wiring, handrails, steps, working surface and signing.
   (c) Any deficiencies must be repaired prior to returning unit to service.

4.10. Tanker Interiors
   (a) Visually inspect tank interior from dome cover openings for water, debris, surfactants, microbial growth and other contamination.
   (b) Check coating of epoxy coated tanks for deterioration.
(c) Clean and repair as necessary.

4.11. Tanker Vents & Dome Covers

(a) Check tank dome covers, including latches, hinges, seals and gaskets.
(b) Verify that hinges are forward mounted and will close with forward motion of the vehicle.
(c) Verify proper operation of tank vents.
(d) Correct any deficiencies as necessary.

4.12. Tank Trough Drains

(a) Manually check trough drains for plugging.
   1) Use cable or wire to ensure that there are no obstructions present.
(b) More frequent checks may be required during inclement weather.

5. Quarterly Checks

5.1. Vehicle Inspection

(a) Perform a thorough overall inspection of the unit to identify components with excessive wear and pending equipment failure.

5.2. Pressure Controls

(a) Check all primary and secondary pressure control equipment. Adjust as necessary.

| CAUTION: NEVER ADJUST PRESSURE CONTROL EQUIPMENT WHILE FUELING AN AIRCRAFT. |

| NOTE 1: All testing of pressure control equipment should be conducted at a test facility or through test connections on tank trucks. |

| NOTE 2: Use of bottom loading connections on tank trucks for recirculation should be avoided in order to prevent erroneous test results. |

(b) Record secondary fuel pressure setting.

5.3. Meter Verification - Hydrant Trucks and Carts

(a) Verify accuracy of hydrant truck meters.
   1) Meters shall meet an accuracy of +/- 0.10%. Verify repeatability of +/- 0.05%.
   2) Calibrate meters as necessary.
   3) Meter adjusters/calibrators are to be sealed if calibrated.
5.4. Water Defense Systems

(a) Check satisfactory operation of water defense systems on all filter/separators (see [Section 3-12]) by mechanically raising the float or ballast on float-type systems, injecting water into the probe on probe-type systems, or by injecting water into the filter sump on either float or probe systems. Immediately repair any system deficiencies. Water may also be injected into the vessel sump to test the system.

6. Annual Checks

6.1. Filter Element Change

(a) Replace filter/sePARATOR filter elements (Reference [Section 3-13])

1) Coalescer element service life may be extended to a maximum of two years, provided the criteria in [Section 3-16] is followed.

(b) Teflon and synthetic separator elements may be reused, provided that they are cleaned and tested in accordance with the element manufacturers procedures.

(c) Full flow monitor elements are to be replaced every two years.

(d) A visual inspection of all vessel interiors is to be performed on an annual basis regardless of filter element replacement frequency.

1) Verify that the vessel interior is generally clean and free of water, sediment, evidence of microbial growth or other contamination. Clean interior and repair coating as necessary.

2) Verify that all elements are undamaged and secure.

6.2. Pressure Gauges

(a) Verify accuracy of gauges used to monitor fuel delivery to aircraft and filter differential pressure. Accuracy of gauge monitoring fuel pressure to aircraft should be within +/- 2% of full scale. Accuracy of filter differential gauge should be within +/- 1 psi of full scale.

(b) Replace, or repair and calibrate defective gauges.

6.3. Meter Calibration

(a) Check accuracy of all aircraft fueling equipment meters.

(b) Adjust meters to an accuracy of +/- 0.10%. Verify repeatability of +/- 0.05%.

1) Meter adjusters/calibrators are to be sealed upon completion of calibration.

6.4. Water Defense System Test

(a) Verify satisfactory operation of automatic water defense systems on filter/separators in accordance with the procedures outlined [Section 3-12].

(b) Repair any system deficiencies immediately.

(c) Equipment with inoperative automatic water defense system is not to be used to service airline aircraft.
2-9. Refueler Loading Procedures

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

CAUTION 2: IT IS NOT ACCEPTABLE TO RECEIVE AND DISPENSE FUEL FROM THE SAME STORAGE TANK OR REFUELER SIMULTANEOUSLY.

The refueler must be bonded to the loading-facility piping.

If top loading, the loading arm piping shall be bonded to the truck and the loading tubing shall be extended to the bottom of the truck to prevent "splash" loading.

If bottom loading, the loading operation shall be started and the pre-check operated immediately to ensure proper operation of high level shut-off system.

WARNING: IF THE PRE-CHECK SYSTEM DOES NOT OPERATE PROPERLY, THE FUEL TRUCK OPERATOR MUST POSITION AN OBSERVER ON TOP OF THE CARGO TANK SO THAT HE CAN MONITOR THE RISING FUEL LEVEL TO PREVENT OVERFILL.
Chapter 3. Terms & Definitions

3-1. Terms & Definitions

Terms and definitions peculiar to the petroleum and aviation industry in handling jet fuels.

**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

**API Degrees**  
Units for fuel density measurement.

**API Gravity**  
The petroleum industry's scale and method of measuring density of liquid petroleum products.

**Ambient Temperature**  
The air temperature surrounding a specific area.

**ASTM**  
American Society for Testing and Materials.

**Clay Treatment Vessel**  
A filtration vessel equipped with bulk clay, clay bags, or clay canisters used for removing surfactants (surface-active-agents) from jet fuel.

**Coalescence**  
The property of a coalescer element to bring together very fine droplets of free and entrained water to form large 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 vessel that removes solid particles and coalesces free water from jet fuel. It is upstream of the separator cartridge.

**Contaminants**  
Substances either foreign or native which may be present in jet fuel that detracts from its performance.

**Cyclone Separator**  
A device that uses the principal of centrifugal force to cause the contaminate in jet fuel to settle to the bottom of a vessel without the use of filtration media.

**Deadman Control**  
A 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 material.

**Differential Pressure (Delta P)**  
The measured difference in pressure between any two points, generally between inlet and outlet connections on filtration vessels.

**Direct Reading Differential Pressure Gauge**  
A pressure gauge which automatically displays the differential pressure between the inlet and outlet connections of filtration vessels.

**Disarming Action**  
The rendering of elements in filtration systems incapable of performing their designed functions; e.g., coalescers incapable of coalescing water and separator elements incapable of separating water from fuel.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved Water</td>
<td>Water which is in solution in jet fuel. This water is not free water and cannot be removed by conventional means.</td>
</tr>
<tr>
<td>Effluent</td>
<td>Stream of fluid at the outlet of filtration vessels.</td>
</tr>
<tr>
<td>Elements</td>
<td>A generic term given to different types of decontamination media installed in various types of filtration vessels.</td>
</tr>
<tr>
<td>Emulsion</td>
<td>A dispersion of two dissimilar immiscible droplets in a continuous liquid phase.</td>
</tr>
<tr>
<td>Entrained Water</td>
<td>Small droplets of free water in suspension which may make jet fuel appear hazy or cloudy.</td>
</tr>
<tr>
<td>Filter</td>
<td>A decontamination device to remove solid particles form fuel.</td>
</tr>
<tr>
<td>Filter Membrane (Millipore) Test</td>
<td>A standard test in which jet fuel is passed through a small filter membrane housed in a plastic holder. The cleanliness of the fuel can be determined by measuring the residue or amount of solid contaminates left on the membrane.</td>
</tr>
<tr>
<td>Filter/Separator</td>
<td>A filtration vessel which removes solids and coalesces free water from jet fuel. All filter/separators are equipped with two types of cartridges; coalescer elements (first stage) and separator elements (second stage).</td>
</tr>
<tr>
<td>Fixed Base Operator (FBO)</td>
<td>Common title for aircraft fueling agents or vendors at airports.</td>
</tr>
<tr>
<td>Flash Point</td>
<td>The lowest fuel temperature at which the vapor above the fuel will ignite.</td>
</tr>
<tr>
<td>Floating Suction</td>
<td>Pump suction piping with floatation capability used to draw the cleanest product from the upper level of the fuel in a jet fuel storage tank.</td>
</tr>
<tr>
<td>Free Water</td>
<td>Water in fuel other than dissolved water. Free water may be in the form of droplets or haze suspended in fuel (entrained water or an emulsion) and/or water layered at the bottom of the container holding the fuel.</td>
</tr>
<tr>
<td>Freeze Point</td>
<td>The coldest fuel temperature at which the last fuel wax crystals disappear when fuel physically changes from a solid back to a liquid when warmed.</td>
</tr>
<tr>
<td>Hydrophilic</td>
<td>Attracts water or is water wetting. Has an affinity for water. Opposite of hydrophobic.</td>
</tr>
<tr>
<td>Hydrophobic</td>
<td>Repels water or is non-water wetting. Resists attracting water. Opposite of hydrophilic.</td>
</tr>
<tr>
<td>Immiscible</td>
<td>Liquids which are mutually insoluble. Opposite of miscible.</td>
</tr>
<tr>
<td>Influent</td>
<td>Stream of fluid at the inlet of filtration vessels.</td>
</tr>
<tr>
<td>Joint Use Fueling Systems</td>
<td>Where two or more users share and receive fuel from a common pipeline system.</td>
</tr>
<tr>
<td>Micronic Filter</td>
<td>A filtration vessel equipped with pleated paper cartridges designed to remove solid particles from aviation fuels.</td>
</tr>
<tr>
<td>Micron (Micrometer)</td>
<td>A unit of linear measurement. One micron is equal to 0.0000039 inches and approximately 25,400 microns equals one inch.</td>
</tr>
<tr>
<td>Miscible</td>
<td>Liquids which are mutually soluble. Opposite of immiscible.</td>
</tr>
<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
</tr>
</tbody>
</table>
NFPA  National Fire Protection Association

Particulates  Solid contaminates found in jet fuel, i.e., dirt, rust, sand, fibers

Pre-Check Valve  A device used to check the operation of the automatic high level shut-off equipment on tank trucks for preventing fuel spills.

Prefilter  A high dirt holding capacity Micronic Filter with pleated paper cartridges installed upstream of other filtration units. Prefilters are designed to extend the useful life of other more expensive filtration media in a fuel distribution system exposed to high solid levels.

Pressure Drop  See Differential Pressure

Product  Unless indicated otherwise, it will mean jet fuel.

PSI  Pounds per Square Inch

Relative Density  The ratio of weight of any volume of fuel to the weight of an equal volume of water. Sometimes referred as Specific Gravity.

Separator Element  The second stage cartridge or shroud in a filter/seperator vessel that allows passage of jet fuel but repels free water. It is located downstream of the coalescer cartridge.

Settling Time  The time allowed for water or dirt entrained in jet fuel to drop to the bottom (sump) of the fuel storage tank.

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 contaminates.

Sump Fuel  Fuel removed from storage tanks, filtration vessels, and aircraft refuelers while performing routine quality control tests and equipment maintenance.

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 hydrant trucks.

Thermohydrometer  A hydrometer with a built-in thermometer used in determining fuel density and measuring fuel temperature simultaneously.

Thief (Sump) Pump  A small pump having a suction line which extends to the low point of a fuel storage tank for the purpose of drawing off water which may have accumulated.

Turbine Fuel  Various kerosene and naphtha based fuels manufactured to be used in jet engines

Vendor  See Fixed Base Operator (FBO)

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 the predetermined level of free water in filter/separatior sumps and automatically stops the flow of fuel to prevent downstream contamination.

### Water Slug
A large amount of free water

### Working Tank
The fuel storage tank being used to supply fuel to aircraft refueler tanker trucks or to hydrant systems.

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#### 3-2. Waiver/Variance Examples

##### 1. Waiver/Variance Request

*Figure 3-2.1. Waiver/Variance Request*

[VENDOR LETTERHEAD]

______________________________

[DATE]

[AIRLINE]

______________________________

RE: REQUEST FOR WAIVER /VARIANCE

Airline Manual Subsection ________________

Airport: ________________

Effective Through: ________________

Dear ________________:

Your airline has adopted as a part of its manual certain provisions relating to inspection tests and safety procedures which are intended to preclude the introduction of contaminated or impure fuel into the airline's aircraft. [Vendor] is unable to comply with the designated subsection of the airline's manual referenced above at the designated airport, for the following reason:

[Describe why unable to comply]

______________________________

However, in order to ensure an equivalent level of fuel purity to that prescribed in the manual, [Vendor] proposes to adopt the following inspection and testing procedures at that airport until the date above when it will be in compliance with the manual:

[Describe substitute procedures]

______________________________

Accordingly, [Vendor] hereby requests that it be granted a waiver /variance by the airline from the provision of the manual referenced above.

[Signature]

[Type of name]

[Title]
2. Grant of Waiver/Variance

Figure 3-2.2. Grant of Waiver/Variance

[AIRLINE LETTERHEAD]

[DATE]
[VENDOR]

RE: GRANT OF WAIVER /VARIANCE
Manual Subsection __________________________
Vendor: ________________________________
Airport: ________________________________
Effective Through: _______________________

Dear _________________________:

By letter dated ______, you have requested a waiver /variance from the provisions of the subsection of the airline's manual referenced above with respect to operations at the specified airport. In addition, you identified procedures or tests you will substitute for those specified in the manual which you state will ensure that the requisite fuel quality and purity will be achieved. The airline finds these procedures acceptable.

Accordingly, the airline hereby grants a waiver /variance from the manual subsection as described in the reference above, subject to the condition that the substitute procedures or tests will remain in effect during the entire period, as described in your letter.

[Signature]
[Typed name]
[Title]

3-3. Appearance Test

The term "Clear & Bright" means that, when visually examined in a clear glass container, the product is visually free from undissolved water, sediment and suspended matter. A product suitably free from these contaminants produces a bright sparkling appearance.

NOTE Jet A normally ranges in appearance from water white/straw color to amber. A straw-colored product or a product having no color can both be "Clear and Bright," as defined.

The test is performed by drawing a minimum of one quart of product under pressure into a clear glass cylindrical container. Assure that the container and the sampling tap are clean. The sample is then swirled to create a vortex. Visually detectable particulate matter will appear at the lower tip of the vortex. Undissolved (i.e. free) water will appear as a separate layer below the product when the swirling action stops. A hazed sample usually indicates either suspended free water or very fine particulate matter.

Jet fuel must be "Clear and Bright" in all phases of handling.
3-4. **Membrane Color Filtration Test**

This test provides a field method for detection of particulate matter in jet fuel. It is particularly useful in monitoring the cleanliness of fuel received and in evaluating the performance of filter vessels. Because the method produces results which are not quantitative, it is not to be used as the basis for rejection of product. However, it does provide an alert signal, which indicates the need for further investigation using a gravimetric test to determine weight per unit volume or a double membrane test.

If both single and double color/particle ratings exceed maximum allowable limits or are in dispute, a matched-weight gravimetric test will govern or fuel will be rejected.

The operator should be cognizant of the fact that a wet membrane may appear darker than a dry membrane. This must be taken into consideration if there is a need for immediate evaluation. Ratings are to be made after the membrane is completely dry using the [ASTM D2276] Rating Guide, Shell Oil Evaluation Guide or Gammon Evaluation Guide (SGTP 3940).

Whether wet or dry, a membrane with visible particles is cause for concern and requires prompt investigation of the condition of filtration equipment.

3-5. **Free Water Test**

1. **Background**

Dry fuel is a prime contributor to flight safety. There are numerous ways that water enters fuel systems; the most common are leakage at manholes and tank plumbing, water-laden transport deliveries, condensation of atmospheric moisture in partially filled storage tanks.

Water in fuel is in one of two forms: Dissolved water ("water in solution") or free water.

Dissolved water is best described as a condition similar to humidity in the air. The amount of dissolved water in fuel varies with the fuel temperature. The higher the fuel temperature, the higher the potential concentration of dissolved water. When the temperature of the fuel is reduced due to change in ambient temperature or in flight, especially at high altitudes, dissolved water will condense from the fuel and become free water. Free water is heavier than fuel and will settle to the bottom of tanks and accumulate in low points in fuel system.

Free water in fuel causes various problems. The most serious being engine flame-out if a slug of water reaches the engine, and the formation of ice crystals, which may block fuel filters and fuel control units.

Therefore, free water is not permitted to accumulate or remain in fuel systems and free water testing must be performed as scheduled. Over the years, various tests have been developed. However, experience has shown that the human senses cannot be substituted.

2. **Visual Detection**

Large quantities of water in fuel can be visually seen. The water quickly separates from the fuel and settles on the bottom of the sample container. Jet fuel varies in color from dark straw to water white and it is possible to mistake an all water sample
as fuel. Adding a known quantity of water to the sample will determine if it is all water or fuel. If the sample is all fuel, the water will quickly separate and settle to the bottom of the sample. If the sample is all water, the added water will not separate.

For additional clarity, a drop of liquid food coloring may be added to the sample. The food coloring will separate from the fuel and settle to the bottom of the sample and color the water when mixed.

3. Water Sensitive Paste or Paper

Chemically treated paste or paper may be used to indicate the presence of free water. These materials change color when they contact water. They do not readily react to low concentrations of water, such as a hazy fuel sample.

These pastes and papers are normally applied to gauging sticks and tapes when checking storage tank bottoms for bulk water.

4. Water Detection Kits

(1) **Hydro Kit** is one means of checking for free water in fuel. The test consists of adding a pre-measured amount of water-sensitive powder to a sample of fuel; if water is present, the powder turns pink. The chemical powder is sensitive to water concentrations down to 30 ppm.

(2) **Metrocator Kit** is a test which may be used in detecting free water in concentrations from 60 ppm down to 5 ppm. The test consists of adding a pre-measured amount of water-sensitive powder to a sample of fuel in a special bottle. A disc of filter paper is placed in the screw cap of the bottle. After shaking the contents blue spots appear on the test wafer or disk and indicate the amount of water that is present in the fuel.

(3) **Aquaglo Kit** is a very sensitive and precise test method. It is capable of detecting free water concentrations as low as 1 ppm. The test consists of passing a measured amount of fuel through a chemically coated paper disc. The membrane is then compared to a known color standard. The chemical will glow in ultraviolet light proportional to the amount of water in the fuel.

(4) **Shell Water Detector Kit** indicates the presence of suspended free water in jet fuel at the time and temperature of testing by color changes of water-sensitive paper through which fuel has been drawn. A distinct color change is obtained as free water content approaches 30 ppm, giving positive indication of water contamination.

***NOTE:*** All Free Water Test kits mentioned herein are known to be commercially available with detailed instructions from the manufacturers. Other similar kits also may be available.

3-6. API Gravity Test

1. Introduction and Purpose

This procedure describes the means for measuring the gravity of fuel with a hydrometer. A significant change in gravity may indicate contamination by another product. Hydrometers may be calibrated in one of the following units of gravity measurement: API Gravity, Relative Density (Specific Gravity) or Density. The term "Gravity" will be used throughout this procedure as a general term to avoid repeating these measurement terms.
2. References


3. Description

The scale reading at the intersection of the fuel surface on a freely floating hydrometer and the temperature of the fuel at the time of the test are observed and recorded. The observed readings are then used to correct the gravity to the standard temperature for the test.

4. Equipment

1. ASTM approved thermohydrometers graduated in degrees API Gravity and degrees F as specified in [ASTM E100]. Thermohydrometers recommended for Jet A/A-1 are designated ASTM 54HL and 55HL. Thermohydrometers recommended for Jet B are designated 55HL and 56HL. The thermohydrometers recommended for aviation gasoline are designated ASTM 57HL and 58HL.

2. ASTM plain form hydrometers graduated in units of density, relative density (specific gravity) or API gravity. These must conform to requirements outlined in [ASTM E100]. Plain form hydrometers do not contain a built-in thermometer.

3. ASTM approved thermometers graduated in either degrees F or degrees C and specified in [ASTM E1]. Specific thermometers recommended are the ASTM 12F (graduated in degrees F) or the ASTM 12C (graduated in degrees C). Thermometers are not required where thermohydrometers are used.

4. A clear glass, plastic or metal hydrometer cylinder as shown in [Figure 3-6.1]. Clear glass or clear plastic cylinders are preferred since accurate hydrometer readings can only be obtained with translucent plastic or metal cylinders when the sample level is at the top of the cylinder.
5. Procedure

1. Collect the sample in a clean hydrometer cylinder and place it in a vertical position in a location free from air currents. Allow a minute or two for air bubbles to disappear. Remove any air bubbles that remain on the surface of the sample by touching them with the corner of a clean paper towel.

2. When using a thermohydrometer, gently lower it into the sample and, when it has settled, depress it about two scale divisions into the liquid and then release it. Gently spin the hydrometer when releasing it. This will assist
3. When the thermohydrometer has come to rest and the thermometer is showing a steady reading, read and record the temperature of the sample to the nearest 0.5 °C or 1 °F. Then read the hydrometer to the nearest scale division and record the value. The correct hydrometer reading is that point on the hydrometer scale at which the principal surface of the liquid cuts the scale (Ref. [Figure 3-6.1]).

4. When using a plain form hydrometer, first measure temperature with an approved thermometer. Continuously stir the sample with the thermometer taking care that the mercury is kept fully immersed. As soon as a steady reading is obtained, read and record the temperature of the sample to the nearest 0.5 °C or 1 °F and then remove the thermometer. To obtain the hydrometer reading, follow the procedure described in paragraphs 2 and 3 above.

5. Correct the observed hydrometer reading to the standard temperature of 60 °F for API gravity and relative density, or to 15 °C for density using the appropriate correction table. (Ref. [Figure 3-6.2]).

6. Report the corrected gravity measurement.
6. Cautions

The hydrometer must float freely to obtain a correct reading. It must not come to rest against the side or bottom of the cylinder during the test.

The thermometer should not be completely removed from the liquid to read temperature. Evaporation of liquid from the
thermometer stem and bulb will lower the temperature and cause an incorrect reading.

Hydrometers and thermometers must be inspected periodically to be sure that they are not cracked or that there are no separations of the mercury column.

7. Interpretation of Results

Once a batch of fuel is produced, its corrected gravity remains relatively constant. A significant change in gravity from that previously determined could indicate contamination with another product and should be investigated immediately. Very slight differences in test results may occur due to differences in test operators or sample location, but these are usually minimal, such as less than 0.3 API.

The procedure presented here is used to detect possible contamination of fuel by comparing gravity measurements. It is necessary to correct hydrometer readings to a standard temperature.

Another use of hydrometers at an airport is to determine fuel weight at the fueling temperature. In this case, temperature correction must not be made. This measurement must be reported as “observed” or “uncorrected.”

3-7. White Bucket Test

1. Purpose

The purpose of this test is to visually determine the possible presence of surfactants, water and/or solids in turbine fuel.

2. Description of Test

A fuel sample is obtained in a white bucket from sump drains of filter vessels and tanks, and observed for indications of surfactants, or presence of water and/or solids.

3. Equipment

Preferred equipment consists of a nine quart white porcelain bucket and a bright copper coin.

4. Procedure

1. Fill the white bucket to an approximate depth of eight inches (200 mm).
2. Let the sample settle for one minute to remove air bubbles.
3. Place the white bucket on a level surface and inspect the bottom for water droplets, solid contaminants, hazy/cloudy condition and/or brown slime.

NOTE: A shiny copper coin, dropped into the bucket, can be used as an aid in determining the clarity of the sample. If the coin characteristics can be easily distinguished, the fuel is considered neither hazy nor cloudy.
5. Cautions

The presence of contamination is much more evident when the sample is taken from a pressurized system. Samples removed from a static system may indicate little contamination when significant contamination actually can be found under flow or pressurized conditions.

Be sure that the fuel sampling tap is free of loose contaminant by flushing the sampling tap at maximum flow prior to drawing the sample.

To determine the difference between a haze caused by entrained water or air bubbles, perform a water detection test (Ref. Section C).

6. Interpretation of Test Results

6.1. Rating of White Bucket Sample

<table>
<thead>
<tr>
<th>Solids Contaminant Indicators</th>
<th>Moisture Content Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clean</td>
<td>A. Bright</td>
</tr>
<tr>
<td>2. Slight Particulate Matter</td>
<td>B. Hazy</td>
</tr>
<tr>
<td>3. Particulate Matter</td>
<td>C. Cloudy</td>
</tr>
<tr>
<td>4. Dirty</td>
<td>D. Wet (Free Water)</td>
</tr>
<tr>
<td></td>
<td>E. Surfactants</td>
</tr>
</tbody>
</table>

6.2. Rating Definitions

6.2.1. Solids Contaminant Indicators

- **Clean**: Refers to lack of particles, silt or sediment, flakes or dye, rust or solids.
- **Slight Particulate Matter**: Contains several fine to moderate sized particles.
- **Particulate Matter**: A sample in which many small particles may be seen floating or settled on the bottom.
- **Dirty**: Discoloration or many particles dispersed in the fuel or settled on the bottom.

6.2.2. Moisture Content Indicators

- **Bright**: Brightness is a quality independent of the color of the sample and refers to the lack of suspended or free water in the sample. Bright fuel tends to sparkle.
- **Hazy**: A condition resulting from fine droplets of moisture dispersed throughout the sample producing a dull hazy appearance. This can be a temporary condition brought about by a drop in temperature. During the first minute, the fuel can appear hazy due to air bubbles.
Cloudy  The result of extremely fine droplets of water dispersed throughout the sample giving it a milky appearance.

Wet  Any form of free water in the form of droplets or bulk water on the bottom of the bucket or clinging to the sides.

Surfactants  Slime in the bottom of the bucket or at the fuel/water interface appearing as a dark brown/black layer; or scum or lacy material floating in or on the sample.

6.3 Use of Rating System

Example:  "2C" means there is slight particulate matter with cloudy condition in the sample.

3-8. Sample Containers

The types and preparation of containers most suitable for the handling of aviation fuel samples can be found in [ASTM D4396-84], entitled "Standard Practice for Sampling Aviation Fuel for Tests Affected by Trace Contamination."

For the purpose of retaining one gallon samples of suspect product as specified in this manual, a one gallon epoxy-coated sample can is recommended. Such cans are commercially available from a number of aviation fueling equipment distributors.

3-9. Filter Vessel Differential Pressure (Filter/Separators & Monitors)

The purpose of observing differential pressure across a filter vessel is to monitor the changing condition of the elements. Whenever fuel passes through a filter, a drop in pressure should occur. The difference in pressure between the inlet and outlet of the filter is known as differential pressure, and is one of the more apparent indications of filter element conditions.

The differential pressure reading should be taken and recorded daily. For accuracy, these checks should be undertaken when the flow rate is steady, and as close as possible to maximum operating flow rate. Tests on individual pieces of equipment should be carried out at the same flow rate, if possible.

The filter vessel elements should be replaced when the coalescers element differential pressure exceeds the manufacturer's recommendation or 15 psi in filter/separators or 25 psi in monitors and/or when a sudden drop in differential pressure occurs under identical operating conditions.

The differential pressure gauge lines and valves should be checked periodically to insure they are not plugged or restricted.

Some direct reading gauges have small filters in their inlets. They must be cleaned or replaced periodically to assure proper operation.

3-10. Bonding Cable Continuity Check

1. General

This Appendix describes the equipment and procedures to check and test bonding cable. Safety of personnel, equipment,
and facilities is of primary concern.

2. Bonding Equipment, Checks, and Maintenance ****

Maintain bonding cables, clips, straps, and adapter plugs in good condition. Check this equipment for frayed wires, broken or damaged clips, and worn or damaged adapter plugs. Make electrical continuity checks of bonding cables monthly.

CONTINUITY TESTER N22T (Ray-O-Vac) (or equivalent)

(a) Complete all test in the open, never in a confined area, or anywhere there are confined fumes.

(b) Make sure the leads remain plugged into the back of the tester.

(c) Do not switch on until the leads from the tester are connected to each end of the ground/bond wire.

(d) If the wire being tested has continuity, the light comes on when the switch is turned on.

(e) Turn off the switch before disconnecting the test leads from the bond wire.

SIMPSON MODEL 260, VOLT OHM METER (or equivalent)

(a) This device may also be used to check continuity. The same precautions as given for tester N22T apply.

WARNING: MAKE CONNECTIONS BEFORE SWITCHING TO RESISTANCE POSITION AND SWITCH OFF RESISTANCE POSITIONS BEFORE BREAKING CONTACT.

****NOTE: All bonding cable continuity test equipment mentioned herein are known to be commercially available with detailed instructions from the manufacturer. Other similar test equipment also may be available.

3-11. Fuel Storage Tank Inspection and Cleaning

CAUTION: ENTRY OF A FUEL STORAGE TANK REQUIRES SPECIALIZED EQUIPMENT AND PERSONNEL TRAINING, AND MUST BE ACCOMPLISHED IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL OCCUPATIONAL SAFETY REGULATIONS. THE VENDOR SHOULD NOT ATTEMPT ENTRY OF A STORAGE TANK UNLESS THE REQUIRED EQUIPMENT IS ON HAND AND THE REQUIRED TRAINING OF PERSONNEL HAS BEEN ADMINISTERED.

Storage tanks should be inspected at least every 12 months. Check for build-up of sediment or evidence of microbial growth. If inspection reveals microbial growth or build up of sediment exceeding 1/10 of the area of the tank bottom surface, cleaning should be accomplished.

Jet fuel storage tanks should be cleaned with high pressure water only. Under no circumstances should solvents, chemicals, or detergents be used.

After cleaning with water, use squeegeies and lint free mops to dry the tank surfaces. Assure removal of all free water, and allow tank to dry through natural ventilation as long as practicable.

If the tank has internal epoxy coating, inspect coating for evidence of chipping, flaking, or other deterioration.

Maintain a record of tank inspection and cleaning on ATA Form No. 103. 07 (Ref. 2-15). For convenience, it is also
suggested that the inspection and cleaning dates be stenciled on the tank manhole cover.

3-12. Water Defense System

1. Automatic Water Slug and Drain Systems

1.1 Introduction and Purpose

This section describes the equipment, operation and testing procedures for automatic water slug and drain systems.

1.2 Reference

There is no known published standard on this test.

1.3 Description of Equipment

A flow control valve (or slug valve) is installed in a system to stop fuel flow when water reaches a predetermined level in the filter/separator. This system may also include an automatic water drain valve.

1.3.1 Float-operated System.

This system is actuated by a signal from a float with a sealed air and fluid chamber, which, when properly balanced, will sink in fuel and float in water. The float remains in the downward position, permitting fuel flow, until enough water accumulates in the sump to raise the float. As the float raises, it re-positions a pilot valve or operates an electrical switch either of which will stop fuel flow. In order to restart fuel flow, the operator must manually drain the accumulated water from the sump, allowing the float to return to the downward position.

In some float-operated systems, an additional function is provided whereby, at an intermediate float position, the pilot valve (or an additional electrical switch) is actuated which opens a water drain valve to automatically drain the accumulated water. At the higher level, the flow is stopped as noted previously.

1.3.2 Direct Acting, Float Operated System:

In this system, a float, similar to that described above, acts directly as the disc of the water drain valve. As such, when sufficient water accumulates, the float rises, directly releasing any accumulated water. When the water has been discharged, the float returns to the seated position, stopping the discharge of water. This system is utilized only in stationary systems.

1.3.3 Electric Exposed or Sealed-probe-operated System:

This type of system is usually found on mobile equipment. It consists of an electric probe installed in the filter/separator sump which actuates a relay system to stop fuel flow when sufficient water accumulates. Water must be drained off manually before fuel flow can resume.

In some stationary probe-operated systems, an additional function is provided whereby, at an intermediate water level in the sump, a different set of contacts within the probe are actuated. This opens a water drain valve to automatically drain any accumulated water. At the higher level, the flow is stopped as noted previously.
1.4. Summary

The different applications and uses of these Automatic Water Slug and Drain Systems are summarized in [Table 3-12.1], below:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POWER SIGNAL</th>
<th>USUAL APPLICATION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Float</td>
<td>Compressed Air</td>
<td>Mobile</td>
<td>Closes Fuel Flow Control Valve</td>
</tr>
<tr>
<td>B. Float</td>
<td>Electrical</td>
<td>Mobile</td>
<td>Closes Fuel Flow Control Valve</td>
</tr>
<tr>
<td>C. Float</td>
<td>Hydraulic</td>
<td>Stationary</td>
<td>Closes Fuel Flow Control (Slug) and/or opens automatic water drain valve.</td>
</tr>
<tr>
<td>D. Float</td>
<td>Mechanical</td>
<td>Stationary</td>
<td>Directly opens Drain Valve</td>
</tr>
<tr>
<td>E. Probe</td>
<td>Electrical</td>
<td>Mobile</td>
<td>Closes Fuel Flow Control Valve</td>
</tr>
<tr>
<td>F. Probe</td>
<td>Electric</td>
<td>Mobile</td>
<td>Closes Fuel Flow Control Valve</td>
</tr>
<tr>
<td>G. Probe</td>
<td>Electrical</td>
<td>Stationary</td>
<td>Closes Fuel Flow Control Valve and/or opens water drain valve and/or stops pump and/or provides alarm signals.</td>
</tr>
</tbody>
</table>

2. Cautions

1. Use the manual water drain valve for daily or more frequent drainings, even when an automatic water drain valve is installed. It should be emphasized that these automatic drain valves DO NOT operate until there is a substantial quantity of water in the sump of the unit and therefore do not replace the requirement for manually draining all water from these sumps. (An automatic water drain valve does not discharge all the water from the sump.) Good housekeeping procedures prescribe complete removal of sump water to prevent microbiological growth.

2. Never use City, or other pressurized water supply systems for float system tests. The fuel pressure can be greater than the pressurized water supply pressure, and fuel could be forced into the potable water system, contaminating the system. Additionally, there is no positive means to verify how much water actually has been put into the sump.

3. When testing mobile float systems, always inject a measured amount of water, and never more than one (1) U.S. gallon. The same amount of water should be recovered after completion of the test.

4. Be sure the vent port from the pilot valve (float control valve) is unobstructed. Sometimes this vent is plugged during shipment to prevent dirt or debris from getting into the pilot valve assembly. If the plug is not removed prior to system operation, improper operation of the fuel flow control valve and/or automatic drain valve will occur.

5. Ensure that the pilot valve (float control valve) is installed correct side up. If mounted upside down, the fuel flow control valve (slug/discharge valve) will operate improperly.

6. A leaking automatic water drain valve should be repaired immediately. Do not install caps or plugs, even as a temporary procedure.
7. After testing the float and pilot assembly, ensure that all ports are free of water before reinstallation.

8. Be sure to provide adequate means for collecting the discharged fuel when using the manual tester on a float or probe-operated pilot valve which activates an automatic water drain valve.

9. It is cautioned that the manual tester on the float pilot valve only checks the operation of the pilot valve assembly. It does not check whether or not the float will float in water.

3. Testing

CAUTION: All mobile systems should be tested while fuel is flowing through the system, but never while fueling an aircraft. Hydrant carts should be checked at a test stand and refuelers should be tested while fuel is being recirculated using the following procedure.

3.1. Mobile Units (Float Operated and Electric Exposed Probe Systems)

(a) Flush fuel through the manual drain line and valve from the filter/seperator to ensure all dirt and foreign material have been removed.

(b) Connect specialized injection equipment to manual drain for injecting a measured amount of clean fresh water into filter sump.

(c) While fuel system is pressurized, but not flowing, slowly inject water through the manual drain valve or until the flow of fuel is stopped by the action of the automatic shut-off system. Do not exceed one gallon. If system does not shutoff with one gallon of water injection, consider the system inoperative, and replace or repair as required.

(d) Drain all water injected. Drain an additional gallon of product to ensure that all water is removed.

3.2. Mobile Units (Sealed Electrical Probe Systems)

Sealed electrical probe systems are normally fitted with a 1/4" Pet-Cocks through which water may be injected inside the probe. This may be utilized as an alternative to the above procedure and is accomplished as detailed below:

(a) Fill the Test Bulb with clean water for the equipment or a similar unit for injecting clean water through the Pet-Cock water.

(b) Attach the discharge end of the Test Bulb to the Inlet Pet-Cock.

(c) While recirculating fuel at the desired test rate, open the inlet and outlet Pet-Cocks and slowly squeeze water into the probe. When the water reaches the internal surface of the probe, the fuel flow will be stopped.

(d) Stop fuel flow. Remove the Test Bulb, drain the probe, and close the two Pet-Cocks.

3.3. Stationary Units (Float Operated Systems)

Due to the volume of water required as well as flow rates and pressure encountered, stationary units should NOT be tested by injecting water into the systems. Most float operated systems of Types C & D are equipped with an external Testing Mechanism consisting either of a Thumb Screw or a Plunger. This test will physically raise the float inside the unit to enable the verification of the correct operation of the automatic system. The following procedure should be followed in testing this type system.

(a) Start the pump to pressurize the system and establish a flow rate.
(b) If installed, partially close the shut-off valve in the automatic drain line. Place a bucket or other similar container at the end of this discharge line.

(c) Turn the Test Screw (clockwise) or gently push in the Plunger (depending upon the style of Test Mechanism installed) until product flows through the drain. Allow two to three gallons to flow through the system to flush any residual sediment from the system.

NOTE: If no product flows through the automatic drain system return the Test Mechanism (Test Screw or Plunger) to its original positions and open slightly the manual drain valve to ensure pressure and product are available. If product is obtained from this drain, turn off the pump, close the shut-off valve in the automatic dump line completely and check the strainer (if installed) in the system for cleanliness. If the strainer is clean, the drain system is malfunctioning and further checking must be made. If strainer is dirty and plugged, clean the strainer and repeat the procedure from the beginning.

(d) If unit is equipped with a flow control (slug) valve as well as the automatic drain system, proceed with step e., otherwise skip to Step g.

(e) After obtaining the successful flush noted in c., above, close the manual shut-off valve in the automatic drain line completely to stop all flow through the automatic drain line.

(f) Continue turning the Test Screw (or gently pushing in the Plunger) observing the valve position indicator on the flow control (slug) valve in the main fuel system. The flow control (slug) valve should close as the Testing Mechanism raises the float to its top position, stopping all flow.

(g) Turn off the pump to stop all flow through the system. If flow is not stopped when the Testing Mechanism is all the way in, the system is malfunctioning and further checking will be required.

(h) Return Testing Mechanism to its original position and open the shut-off valve in the automatic drain line.

(i) Next time the unit is open for maintenance, the float should be removed and its correct buoyancy checked by verifying that it will float in water and sink in jet fuel.

3.4. Stationary Units (Sealed Electrical Probe Systems)

If the stationary system is equipped with a sealed probe, such as Type G, the procedure utilized under sealed electrical probes on Mobile Equipment may be utilized. This type of electrical probe may be connected to perform various operations, such as activating an alarm or a warning light, stopping the pump and/or closing a flow valve as well as the functions performed by the float operated systems. The testing of this type unit is performed in the same manner as that specified under mobile equipment with the operation of the two-stages verified as the water is injected into the probe interior.

3-13. Filter Change Procedures

A. Stop pumping product to the filter vessel, close the shut-off valves in the inlet and outlet lines, and open vent.

**WARNING:** IF FILTER VESSEL IS EQUIPPED WITH AN ELECTRICAL HEATER, BE SURE TO TURN OFF HEATER BEFORE OPENING DRAIN.

B. Open drain valves, allow sufficient time for unit to vent, and drain completely before opening cover.

C. Open cover and remove old elements.

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D. Wash the interior of the filter vessel with clean jet fuel.

E. Inspect epoxy-coat for deterioration. Repair as necessary.

**WARNING:** COALESCER/SEPARATOR WILL NOT PERFORM CORRECTLY IF POSITIONS OF COALESCER AND SEPARATOR ELEMENTS ARE REVERSED. LOCATION OF COALESCER ELEMENTS IS ALWAYS NEAREST THE INLET PIPE.

F. Install new filter vessel elements in accordance with the manufacturer's recommendations. Throw away polyethylene or cotton gloves should be used when handling the elements. With gloves on, the elements may be handled without disarming them.

G. Install new seal, close cover, and tighten all bolts.

H. Open blocking valve and allow the filter vessel to fill slowly. Allow all entrapped air to escape.

I. Inspect for leaks. Repair as necessary.

J. Open inlet and outlet valves to full open position.

K. Record filter change date on filter change record and filter vessel.

L. Circulate product at normal rate. Check and record the differential pressure.

**NOTE:** If the differential pressure remains the same after changing the filter elements, further investigation is required. If there is no differential, or if the differential is low (1/2 to 3 PSI) at normal flow, immediate investigation is required as this would indicate that some of the elements may not be properly sealed, allowing product to by-pass some of the elements.

3-14. Miscellaneous Information

1. Fuel Odor

Acceptable jet fuel produces a distinctive odor which can range from relatively mild or sweet to moderately objectionable. Specification [ASTM D1655] states that the fuel shall not produce an odor which is "nauseating or irritating." Such strong odors can be indicative of problems and requires further investigation.

During all phases of fuel handling, sampling and testing, the operator should be cognizant of the significance of fuel which produces an unfamiliar odor. If fuel producing an unfamiliar, nauseating or irritating odor is detected, further investigation is required. Draw a one gallon sample of the fuel into a container (See [Section 3-8]), and notify the airline.

2. Water Separation Test (Microsep)

This test provides a field method for determining water separation characteristics of jet fuel. Fuel containing little or no surfactant has excellent water separation characteristics. Fuel containing significant amounts of surfactant has very poor water separation characteristics. The better the water separation rating, the more effective system filtration equipment will be in removing free water.

Detailed instructions for performing the test are contained in ASTM Method D-3948.

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3. **Visual Detection of Microorganisms**

3.1 **Introduction and Purpose**

This method is a visual means for detecting symptoms which indicate the presence of microorganisms in a turbine fuel handling system.

3.2 **Description**

The test is performed concurrently with routine drainage of storage tank and filtration equipment sumps and low point drains in system piping. A sample from these locations is drawn into a white bucket and examined visually. Microorganisms produce visual evidence which can be identified by the operator.

3.3 **Equipment**

Equipment consists of a plain white porcelain lined bucket, clear glass petroleum product sample bottles, and a small permanent magnet.

3.4 **Equipment Preparation**

Thoroughly rinse the white bucket and sample bottles in system fuel. Wipe the inside of the bucket dry and free of contaminants with a clean rag or paper towel.

3.5 **Cautions**

Some contaminants commonly found in turbine fuel handling systems produce visual evidence which may be erroneously interpreted as microorganisms. For this reason, it is essential that the operator does not draw immediate conclusions.

Because visual evaluation is used, the elements of human perception and judgment are involved.

The determinations made using this test indicate only the probability that microbial contamination exists. Confirmation must be made by laboratory analysis.

3.6 **Test Procedure**

(a) Collect sample from storage tank sump, filtration equipment sump, or low point drain in system piping in the white bucket.
(b) Allow the bucket sample to settle for at least two minutes.

(c) Tip the bucket from side to side while visually observing for any evidence of dark colored solids, dark colored water, substances which cling to the side of the bucket, or scummy mucus-like material.

(d) If any suspect materials are found, carefully pour off the fuel contained in the bucket, and collect a sample of the suspect material in a clear glass sample bottle.

(e) Cap the sample bottle tightly and identify as to date, location, and sampling point.

3.7. Evaluation of Sample

(a) Visually examine the contents of the sample bottle in an area providing strong background lighting.

(b) If the sample is chiefly solids, check for the possibility of the material being rust. This can be done by holding a small magnet against the side of the sample bottle and moving it around. Rust particles will collect and follow the magnet.

(c) If the sample is a dark colored sludge-like substance but does not respond to a magnet, fungi is a possibility. Further indicators are matty, lumpy, or stringy consistency and a rank moldy odor.

(d) If the sample is chiefly discolored water, check for the possibility of fine suspended rust. This can be done by filtering some of the water through a clean white paper towel and allowing it to dry. After drying, visual and magnetic inspection can usually detect the rust.

(e) If the sample is chiefly water, especially dark brown or black in color, and has a scummy mucus-like interface or topping, viable microorganisms may be present. A further indicator is a noticeably foul odor.

(f) If visual examination as described above indicates the possibility of fungi or microorganisms, forward the sample to a qualified laboratory for analysis. The operator should make no positive statements concerning microbial contamination unless confirmed by laboratory analysis.

3-15. Reserved for Future Use

Reserved for future use

3-16. Filter Element Replacement Criteria and Time Extension

1. Element Replacement Criteria and Frequency

1.1. Coalescer Elements

Coalescer elements must be replaced when:

1. Filter Membrane (Millipore) Test indicated elements are not performing (Refer to [Section 3-4]).

2. Differential pressure exceeds 15 psi or there is a sudden drop in differential pressure.

3. Continuous sump samples indicate surfactants, microbial or solid contaminants.
4. 12-month service life has expired and approved extension procedure is not accomplished (Refer to 3.A., following).

5. Free water detection test indicated elements are not performing (Refer to [Section 3-5]).

1.2. Teflon-coated and Synthetic Separator Elements

Teflon-coated and synthetic separator elements life can be extended as long as the elements are cleaned and inspected according to manufacturer's instructions.

1.3. Paper Separator Elements

Paper separator elements must be replaced whenever the coalescer elements are replaced. Maximum service life of a paper separator element is two years.

1.4. Full Flow Monitor Elements

(a) Full flow monitor elements must be replaced when:

1. Filter Membrane (Millipore) Test indicated elements are not performing (Refer to [Section 3-4]).

2. Differential pressure exceeds 25 psi or there is a sudden drop in differential pressure.

3. Chemical water detection test indicates a positive reading of more than 30 ppm (Refer to [Section 3-5]).

4. Continuous sump samples indicate surfactants, microbial or solid contaminants.

5. 24-month service life has expired.

2. Coalescer Element Time Extension

2.1. Single Element Test

(a) A verifiable single element test of a coalescer element will be conducted at the 12th and 18th month after initial element installation by a testing facility acceptable to and approved by the airlines; or

(b) From the time of filter element installation, monthly upstream and downstream Membrane Filtration Tests have been conducted, and monthly Free Water Tests have been performed upstream and downstream of the filter/sePARATOR which indicate the filter/sePARATOR elements are functioning properly, and the filter vessel has been opened up and a visual inspection conducted of the filter elements and the vessel interior at the annual inspection for any sign of contamination. If any evidence of contamination is found during any of these tests or inspections which indicate the filter/sePARATOR elements are not functioning properly, the elements must be changed (see [Section 3-4] and [Section 3-5]).

NOTE: The airline must approve filter element life extension program in writing. Station, fueling agent, FBO, etc., will submit proposed time extension program in writing. Include name and location of agency which will perform single element test. The airline will provide written approval which will be kept in local files.
3-17. Flushing Standards and Specifications

1. Flushing Standards

Before a new, modified or repaired hydrant fuel system, or portion thereof, is placed into service, all piping affected by change must be flushed to ensure system cleanliness before aircraft fueling is permitted.

The installing contractor shall be responsible for all flushing requirements.

Flush procedures shall be pre-approved by airline fuel quality assurance representative prior to publication and releasing of construction documents.

Product used for flushing shall meet [ASTM D1655], latest revision, specs for kerosene Jet A/A-1 type aviation grade turbine fuels.

Desired flow rate of flush is 10 feet per second minimum unless a lesser rate is agreed upon by airline QA representative. Additional temporary pumps and filters, if required to provide minimum flow velocity, shall be provided by contractor.

No flushing will be allowed through hydrant pit valves.

Test samples are to be drawn immediately ahead of filtration on closed loop recirculation systems; immediately ahead of storage tanks in receiving manifold on recirculation systems returning flushed fuel to tankage; or immediately ahead of transport trucks on single line systems.

Where possible, temporary piping connections to form a closed loop piping system shall be installed and the system flushed by means of recirculation. All temporary cross connections or special fabrication of adapters required shall be provided by contractors.

If flushing into tank trucks, contractor shall supply any temporary manifolds plus; sufficient number of single compartment tank trucks and hoses to allow the desired flow rates to be achieved in a safe manner. Hoses and couplings shall be aircraft type with a minimum 150 lb. rating and must be hydrostatically tested. Recommended 4" hose size to achieve flow capacities during flush.

All general service valves and adapters shall be in place throughout the flushing procedure. Contractor shall remove control valves and metering assemblies prior to initiating flush.

A two test minimum is required to ensure piping cleanliness. The system being flushed must be displaced with clean fuel prior to taking second test.

Contractor shall provide all filtration media required for the system flush. Upon completion of flush, contractor shall install new coalescer elements in filter/separators. Separator elements are to be inspected and replaced; if damaged. Replaced elements are to be retained; until inspected by airline.

2. Flushing Into Tank Trucks

CAUTION: All electrical and motorized equipment in area should be shut down in case of a mishap or fuel spill.

For safety, all persons not involved in the flushing operation must be kept a minimum of 100 feet away.
1. Tank truck internal valves should be safety wired in an open position.

2. All quick release type couplings are to be safety wired when coupled to the bottom load receptacle and hydrant adapter.

3. Hoses are to be secured in a manner to prevent whipping during flush.

4. Bond truck to hydrant system piping.

5. Start product flow slowly before reaching flushing velocity to check for leaks and system tightness.

6. Fire extinguishers are to be in place in case of emergency.

7. Location of test personnel:
   - One person per each tank truck to monitor fuel level in tank.
   - One person at each hydrant pit to control fuel flow into tank truck.
   - One person at main pump control station to shut down pumps in emergency.
   - One person at nearest terminal EFS station to shut down pumps in emergency.
   - One person manning fire extinguisher(s).
   - One person removed from manual tasks in command of flushing operation.

3. Acceptance Specifications

   Visual - All fuel samples must be clear and bright. Other visual clues must be observed and acted upon accordingly, i.e., feel, color, odor, etc.

   Solids - Particle Assessment - "B" Scale @ One Gallon Sample Membrane Color - #3 Rated Wet @ One Gallon Sample

   NOTE: If color rating exceeds the above limits or is in dispute, a matched weight gravimetric rating not to exceed 0.5 mg/liter shall govern.

   Undissolved Water - 15 PPM Maximum

   Water separation (Microsep) Rating - 85 Minimum

4. Final Acceptance

   It shall be the responsibility of the airline fuel quality assurance representative, or his designee, to have final decision on system cleanliness and acceptance before aircraft fuel servicing is permitted.
### Chapter 4. Forms

#### 4-1. Forms

*NOTE: Click on [1] for printing instructions*

<table>
<thead>
<tr>
<th>ATA FORM NO.</th>
<th>FORM</th>
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<tr>
<td>103.01A</td>
<td>Fuel Facility Checks</td>
</tr>
<tr>
<td>103.01B</td>
<td>Sump Results &amp; Filter Differential Pressure</td>
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<tr>
<td>103.01C</td>
<td>Quarterly &amp; Annual Fuel Facility Checks</td>
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<tr>
<td>103.01D</td>
<td>Annual Checks - Continued</td>
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<td>103.02</td>
<td>Record of Receipt by Transport Truck</td>
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<tr>
<td>103.04A</td>
<td>Aircraft Fueling Equipment Checks</td>
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## FUEL FACILITY CHECKS

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<tr>
<th>DAILY - USE APPLICABLE RATINGS</th>
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<td>5. BONDING RINGS, CABLES AND CLAMPS</td>
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<td>6. FIRE EXTINGUISHERS</td>
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NOTE #1 - BUMP SAMPLE RATINGS: SOLIDS - (1) CLEAR (2) SLIGHT (3) PARTICULATE (4) DIRTY ; WATER - (A) BRIGHT (B) HAZY (C) CLOUDY (D) WET (E) SURFACTANTS

NOTE #2 - MULTIPLE TANKS, FILTERS AND OTHER EQUIPMENT MUST HAVE SUPPORTING DOCUMENTATION SHOWING RESULTS OF REQUIRED CHECKS.

SIGNATURE OF PERSON PERFORMING ACTUAL CHECKS MUST BE ON SUPPORTING DOCUMENTS.

NOTE #3 - RECORD BUMP RESULTS & FILTER DIFFERENTIAL PRESSURE ON BACK OF FORM.

REMARKS:

RETURN FILE FOR 12 MONTHS

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**NOTE:** RATING OF SUMP SAMPLES: 0 (CLEAN), 1 (SLIGHT), 2 (PARTICULATE), 3 (DIRTY), 4 (WATER), 5 (BRIGHT), 6 (HOLY), 7 (CLOUDY), 8 (WET), 9 (SURFACTANTS)

RETAIN ON FILE FOR 12 MONTHS

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Copyright 2001, Air Transport Association
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ANNUAL CHECKS – (continued on back of form)

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REMARKS:

RATINGS: S = SATISFACTORY; C = COMMENT (COMMENT REQUIRED IN REMARKS SECTION); N/A = NOT USED; N/A = NOT APPLICABLE

RETAI ON FILE FOR 12 MONTHS
### ANNUAL CHECKS - continued

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| 5. TANK VENTS               |      |      |      |      |      |      |      |      |      |      |      |      |      |
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| CHECKED BY:                 |      |      |      |      |      |      |      |      |      |      |      |      |      |

| 6. CATHODIC PROTECTION      |      |      |      |      |      |      |      |      |      |      |      |      |      |
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| CHECKED BY:                 |      |      |      |      |      |      |      |      |      |      |      |      |      |

| 7. FACILITY CONDITION       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| DATE & RATING               |      |      |      |      |      |      |      |      |      |      |      |      |      |
| CHECKED BY:                 |      |      |      |      |      |      |      |      |      |      |      |      |      |

| 8. LINE STRainers           |      |      |      |      |      |      |      |      |      |      |      |      |      |
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| CHECKED BY:                 |      |      |      |      |      |      |      |      |      |      |      |      |      |

**REMARKS:**

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**RATINGS:** S = SATISFACTORY; C = COMMENT (COMMENT REQUIRED IN REMARKS SECTION); N/A = NOT USED; N/A = NOT APPLICABLE

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**SIGNATURE OF PERSON PERFORMING CHECKS**

✓ SATISFACTORY  X UNSATISFACTORY - ENTER REMARK

[RETAINTHISFORMONFILEFOR24MONTHS]

ATA FORM NO. 103.02  01/15/89
## Aircraft Fueling Equipment Checks

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**Identification of Person Performing Tasks or Person Accepting Responsibility That Tasks Were Performed**

**Ratings:**
- S = Satisfactory
- C = Comment (Comment Required in Remarks Section)
- N/A = Not Used
- N/A = Not Applicable

**Sump Sample Ratings:**
- Solids - 1 = Clean, 2 = Slight, 3 = Particulate, 4 = Dirty
- Water - A = Bright, B = Hazy, C = Cloudy, D = Wet

**Remarks:**

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### MONTHLY

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**REMARKS:**

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**ATA FOR:** RETAIN ON FILE FOR 12 MONTHS

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### QUARTERLY & ANNUAL AIRCRAFT FUELING EQUIPMENT CHECKS

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RETAI ON FILE FOR 12 MONTHS
## Hydrant System Checks

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<td>4. EFS Stations</td>
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<td>5. Pressure/Flow Charts</td>
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</table>

### Identification of Person Performing Tasks or Person Accepting Responsibility That Tasks Were Performed

### Monthly - Use Applicable Ratings

<table>
<thead>
<tr>
<th>Month</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hydrant Valve Assembly</td>
<td></td>
</tr>
<tr>
<td>2. Isolation Valve Pits</td>
<td></td>
</tr>
<tr>
<td>3. Low Point Drains</td>
<td></td>
</tr>
<tr>
<td>4. Emergency Shutdown</td>
<td></td>
</tr>
</tbody>
</table>

### Semi-Annual - Use Applicable Ratings

<table>
<thead>
<tr>
<th>Month</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High Point Vents</td>
<td></td>
</tr>
<tr>
<td>2. Surge Arresters</td>
<td></td>
</tr>
<tr>
<td>3. Pipeline Casings</td>
<td></td>
</tr>
</tbody>
</table>

### Annual - Use Applicable Ratings

<table>
<thead>
<tr>
<th>Month</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cathodic Protection</td>
<td></td>
</tr>
<tr>
<td>2. Instrumentation/Electrical Controls</td>
<td></td>
</tr>
</tbody>
</table>

---

**Note #1**: Multiple tanks, filters and other equipment must have supporting documentation showing results of required checks. Signature of person performing actual checks must be on supporting documents.

**Ratings:**
- B = Satisfactory
- C = Comment (Comment required in remarks section)
- NU = Not Used
- N/A = Not Applicable

**Remarks:**

---

Retain on file for 12 months

---

Copyright 2001, Air Transport Association
Figure 4-1.10. Form 103.06 - Jet Fuel Filter Vessel Record
<table>
<thead>
<tr>
<th>DIFFERENTIAL PRESSURE RECORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>18</td>
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<tr>
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</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAY</th>
<th>TUES</th>
<th>WED</th>
<th>THU</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SIGNATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

MONTH ______ 19

[RETAIN THIS FORM ON FILE FOR 24 MONTHS]

ATA FORM NO. 103.06 01/15/89
Figure 4-1.11. Form 103.07 - Storage Tank Inspection & Cleaning Record
SPECIFICATION 103

STORAGE TANK
INSPECTION AND CLEANING RECORD

AIRPORT ____________________ FACILITY ____________________

TANK NO. ______________

<table>
<thead>
<tr>
<th>DATE INSPECTED</th>
<th>CONDITION</th>
<th>ACTION</th>
<th>SIGNATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td>R M</td>
<td>CL HC</td>
</tr>
</tbody>
</table>

CONDITION CODES: 1 = CLEAN 2 = TRACE 3 = MODERATE 4 = HEAVY
S = SEDIMENT R = RUST M = MICROBIAL GROWTH
ACTION CODES: CL = CLEANED HC = NOT CLEANED

REMARKS ___________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

[RETAINT THIS FORM ON FILE INDEFINITELY]

ATA FORM NO. 103.07 01/15/89
## Fuel Quality Test Record

### Sampling Point

#### Before Filtration
- PARTICULATE
- CLAY
- FILTER/SEPARATOR

\[ \Delta P = \text{psi} \]
- UNIT NO.

#### After Filtration
- PARTICULATE
- CLAY
- FILTER/SEPARATOR

\[ \Delta P = \text{psi} \]
- UNIT NO.

### Membrane Filtration Test

- ASTM D-3830

### Water Separation

- ASTM D-3948

### Water Test

- ppm

**Dry Rating**
- SAMPLE SIZE
- GAL

**Notes:**

- [Retain this form on file for 24 months]

ATA Form No. 103.08  01/15/89
### Used Filter Element Analysis

#### Request and Report

**DATE:**

**STATION:**

**TEST REQUESTED BY:**

**REASON FOR TEST:**

- [] SERVICE LIFE EXTENSION
- [] PERFORMANCE CHECK

**MOBILE UNIT NO.:**

**FILTER VESSEL MODEL NO.:**

**RATED FLOW (GPM):**

**COALESCER ELEMENT P/N:**

**QUANTITY INSTALLED:**

**DATE INSTALLED NEW:**

**PRESENT △P (PSI):**

**TEFLOM SCREEN SEPARATOR ELEMENT DATA:**

- [] TEST GOOD
- [] CLEANED/TEST GOOD
- [] REPLACED

**VISUAL INSPECTION OF COALESCER ELEMENT TO BE TESTED:**

- OUTER Sock: [ ] CLEAN, [ ] UNIFORM STAIN, [ ] RANDOM STAINS
- INSIDE TUBE: [ ] CLEAN, [ ] VISIBLE CONTAMINATION
- STRUCTURE: [ ] ACCEPTABLE, [ ] UNACCEPTABLE

### Flow Test at

<table>
<thead>
<tr>
<th>TIME (MIN)</th>
<th>△P (PSI)</th>
<th>Appearance of Fuel Effluent</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPM 2</td>
<td></td>
<td>[] CLEAR, [] HAZED</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>[] CLEAR, [] HAZED</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>[] CLEAR, [] HAZED</td>
</tr>
</tbody>
</table>

### Coalescing Test at

<table>
<thead>
<tr>
<th>TIME (MIN)</th>
<th>△P (PSI)</th>
<th>Water Droplet Size</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPM 2</td>
<td></td>
<td>1 1/2 1/2 1/2 1 1/2</td>
<td>[] HAZE</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1 1/2 1/2 1/2 1 1/2</td>
<td>[] HAZE</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>1 1/2 1/2 1/2 1 1/2</td>
<td>[] HAZE</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>1 1/2 1/2 1/2 1 1/2</td>
<td>[] HAZE</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>1 1/2 1/2 1/2 1 1/2</td>
<td>[] HAZE</td>
</tr>
</tbody>
</table>

### Post Test Tear Down:

- Inner Pleats
- Outer Wrap

**TEST PERFORMED BY:**

**TESTING AGENCY:**

**DATE TESTED:**

**TESTING AGENCY RECOMMENDATION:**

- [ ] EXTEND SERVICE LIFE
- [ ] REPLACE ELEMENTS
- [ ] FURTHER INVESTIGATION

**VENDOR/OPERATOR ACTION:**

- [ ] EXTEND SERVICE LIFE TO
- [ ] REPLACED ELEMENTS
- [ ] FURTHER INVESTIGATION

**TESTING AGENCY REPRESENTATIVE**

**DATE**

**VENDOR/OPERATOR REPRESENTATIVE**

**DATE**

[RETAIN THIS FORM ON FILE FOR 24 MONTHS]

**ATA FORM NO. 103.09 01/15/89**
Annex 1.

References

See [Heading 3-6.2] for a list of references.
This edition of NFPA 407, *Standard for Aircraft Fuel Servicing*, was prepared by the Technical Committee on Aircraft Fuel Servicing, and acted on by NFPA at its May Association Technical Meeting held May 13–17, 2001, in Anaheim, CA. It was issued by the Standards Council on July 13, 2001, with an effective date of August 2, 2001, and supersedes all previous editions.

This edition of NFPA 407 was approved as an American National Standard on August 2, 2001.

**Origin and Development of NFPA 407**

Active work by NFPA leading toward the development of this standard began in 1951. Since then, the technical committee responsible has made every effort to keep the text up-to-date, and subsequent editions have been published almost every year from 1955 to 1975. The twenty-first edition was issued in 1980, and the technical committee completed a partial revision in 1984.

The 1990 edition was a complete rewrite that reorganized the design and operational requirements into separate chapters. The requirements for grounding were deleted, and the requirements for bonding were clarified.

The 1996 edition was a partial revision. Requirements for self-service fueling and rapid refueling of helicopters were added.

This 2001 edition includes new requirements for non–driven hydrant carts.

**Technical Committee on Aircraft Fuel Servicing**

**Michael Klutz, Chair**

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Robert & Company, GA [SE]

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Terry Bosserman, Bosserman Aviation Equipment, Inc., OH [M]

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Al Mazur, Transport Canada, Canada [E]

Francis P. O’Neill, United Airlines Inc. (SFOFU), CA [U]

John J. O’Sullivan, British Airways, PLC, England [C]


Ronald F. Pattie, Aircraft Service International Group, FL [M]

Claude Taucher, American Airlines, OK [C]

J. Donald Thomas, Delta Airlines Inc., GA [U]

John C. Thurston, Air BP/Division of BP Oil, Inc., IL [U]
Rep. American Petroleum Institute

Robert A. Woodward, CIGNA Loss Control, PA [SE]

Alternates

Rodney Hoke, URS Greiner Woodward Clyde, FL [SE]
(Alt. to C. A. Davis)

Frank M. E. Hughes, British Airways, PLC, England [C]
(Alt. to J. J. O’Sullivan)

Richard A. Mays, Robert & Co., GA [SE]
(Alt. to M. Kluttz)

Thomas G. Powers, American Airlines, OK [C]
(Alt. to C. Taucher)

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Chapter 1 Administration

1.1 Scope.

This standard applies to the fuel servicing of all types of aircraft using liquid petroleum fuel. It does not apply to any of the following:

(1) In-flight fueling

(2) Fuel servicing of flying boats or amphibious aircraft on water

(3) Draining or filling of aircraft fuel tanks incidental to aircraft fuel system maintenance operations or manufacturing

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1.2* Purpose.

1.2.1 The purpose of this standard is to establish reasonable minimum fire safety requirements for procedures, equipment, and installations for the protection of persons, aircraft, and other property during ground fuel servicing of aircraft using liquid petroleum fuels. These requirements are based upon sound engineering principles, test data, and field experience.

1.2.2 The fire hazard properties of aviation fuels vary; however, for the purpose of this standard, the same fire safety precautions are specified for all types.

1.3 Units.

Where the value for a measurement as specified in this standard is followed by an equivalent value in other units, the first value shall be regarded as the requirement. The equivalent value could be approximate.

---

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.


2.1.2 Other Publications.

2.1.2.1 ANSI Publication.

American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY

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Chapter 3 Definitions

3.1 General.
The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.
3.2.3 **Labeled.** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* **Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 **Shall.** Indicates a mandatory requirement.

3.2.6 **Should.** Indicates a recommendation or that which is advised but not required.

3.3 **General Definitions.**

3.3.1 **Aircraft.** A vehicle designed for flight that is powered by liquid petroleum fuel.

3.3.2 **Aircraft Fuel Servicing.** See 3.3.27.1.

3.3.3 **Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle).** See 3.3.35.1.

3.3.4 **Aircraft Fuel Servicing Ramp or Apron.** An area or position at an airport used for the fuel servicing of aircraft.

3.3.5 **Aircraft Fuel Servicing Tank Vehicle (Fueiler).** See 3.3.35.2.

3.3.6 **Aircraft Fueling Vehicle.** See 3.3.35.3.

3.3.7 **Airport Fueling System.** An arrangement of aviation fuel storage tanks, pumps, piping, and associated equipment, such as filters, water separators, hydrants and station, or aircraft fuel servicing vehicles, installed at an airport and designed to service aircraft at fixed positions.

3.3.8* **Aviation Fuel.** Any petroleum fuel for use in aircraft engines.

3.3.9 **Bulkhead.** A liquidtight transverse closure between compartments of a cargo tank.

3.3.10 **Burst Pressure.** See 3.3.24.1.

3.3.11* **Cargo Tank.** A container used for carrying fuels and mounted permanently or otherwise secured on a tank vehicle.

3.3.12 **Cathodic Protection.** A method of controlling or impressing an electrical current to prevent corrosion of metal components of airport fueling systems that are in contact with the ground.

3.3.13 **Deadman Control.** A device that requires a positive continuing action of a person to
allow the flow of fuel.

**3.3.14 Electric Hand Lamp.** A portable lamp other than a flashlight.

**3.3.15 Emergency Fuel Shutoff.** A function performed to stop the flow of fuel in an emergency.

**3.3.16* Fuel Servicing Station.** A unit that includes all necessary equipment to enable the transfer of fuel into or from an aircraft or fueler.

**3.3.17 Fueler.** See 3.3.35.2, Aircraft Fuel Servicing Tank Vehicle (Fueler).

**3.3.18 Head.** A liquidtight transverse closure at the end of a cargo tank.

**3.3.19 Hydrant Cart.** A non-driven vehicle used to deliver fuel from a hydrant to an aircraft.

**3.3.20 Hydrant Valve.** An outlet of an airport fueling system that includes a deadman-controlled valve and adapter assembly to which a coupler on a hose or other flexible conduit on an aircraft fuel servicing vehicle can be connected.

**3.3.21 Hydrant Vehicle.** See 3.3.35.4.

**3.3.22 Misfueling.** The accidental fueling of an aircraft or refueling vehicle tank with an incorrect grade of product.

**3.3.23 Overshoot.** The quantity of fuel passing through the valve after the deadman control is released.

**3.3.24 Pressure.**

**3.3.24.1 Burst Pressure.** The pressure at which a component ruptures.

**3.3.24.2 Test Pressure.** The pressure to which a system or a component of a system is subjected to verify the integrity of the system or component.

**3.3.24.3 Working Pressure.** The maximum allowable pressure, including momentary surge pressure, to which a system, hose, or other component can be safely subjected while in service.

**3.3.25 Pressure Fuel Servicing.** See 3.3.27.2.

**3.3.26 Self-Service Fueling.** The dispensing of aviation fuels into aircraft fuel tanks by persons other than the facility owner/operator.

**3.3.27 Servicing.**

**3.3.27.1 Aircraft Fuel Servicing.** The transfer of fuel into or from an aircraft.

**3.3.27.2 Pressure Fuel Servicing.** A system used to fuel an aircraft by close coupling under pressure.

**3.3.28 Tank Baffle.** A nonliquidtight transverse partition in a cargo tank.

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3.3.29 **Tank Compartment.** A liquidtight division in a cargo tank.

3.3.30 **Tank Full Trailer.** A vehicle that is not self-propelled and that has a cargo tank for the transportation of aviation fuel mounted thereon or built as an integral part thereof. It is so constructed that its weight and load rest on its own wheels.

3.3.31 **Tank Semitrailer.** A vehicle that is not self-propelled and that has a cargo tank for the transportation of aviation fuel mounted thereon or built as an integral part thereof. It is so constructed that when drawn by a tractor by means of a fifth wheel connection, some of its load and weight rests upon the towing vehicle.

3.3.32 **Tank Truck.** Any single self-propelled motor vehicle equipped with a cargo tank mounted theron and used for the transportation of flammable and combustible liquids or asphalt. [385:1.2.15]

3.3.33 **Tank Vehicle.** See 3.3.35.5.

3.3.34 **Test Pressure.** See 3.3.24.2.

3.3.35 **Vehicle.**

3.3.35.1 **Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle).** A vehicle equipped with facilities to transfer fuel between a fuel hydrant and an aircraft.

3.3.35.2 **Aircraft Fuel Servicing Tank Vehicle (Fueiler).** A vehicle having a cargo tank (tank truck, tank full trailer, tank semitrailer) designed for or used in the transportation and transfer of fuel into or from an aircraft.

3.3.35.3 **Aircraft Fueling Vehicle.** A fuel servicing hydrant vehicle, hydrant cart, or an aircraft fuel servicing tank vehicle.

3.3.35.4 **Hydrant Vehicle.** See 3.3.35.1, Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle).

3.3.35.5 **Tank Vehicle.** Any tank truck, tank full trailer, or tractor and tank semitrailer combination.

3.3.36 **Working Pressure.** See 3.3.24.3.

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**Chapter 4 Design**

4.1 **General.**

4.1.1 **Fueling Hose Apparatus.** Nozzle receptacles and hose storage apparatus shall be arranged to avoid kinks and short loops in hose.

4.1.2 **Electrostatic Hazards and Bonding.**
4.1.2.1 A provision for bonding shall be incorporated in the design of fuel servicing vehicles or carts and systems to prevent differences in electrostatic potential in accordance with Section 5.4.

4.1.2.2 Bonding cables shall be constructed of conductive, durable, and flexible material.

4.1.2.3 Bonding connections shall be electrically and mechanically firm. Jacks, plugs, clamps, and connecting points shall be clean, unpainted metal to provide a positive electrical connection.

4.1.2.4 API BULL 1529, *Aviation Fueling Hose*, Type C hose (semiconductive) shall be used to prevent electrostatic discharges but shall not be used to accomplish required bonding. API BULL 1529, Type A hose that does not have a semiconductive cover shall not be used. Type F hose (hard wall) and Type CT hose (cold temperature) shall be permitted because they have semiconductive covers.

4.1.2.5* The design shall incorporate the provision of a 30-second relaxation period between the filter separator and the discharge outlet.

*Exception: This requirement shall not apply to systems designed for fuels with static dissipater additives.*

4.1.3 No Smoking Signs. Entrances to fueling areas shall be posted with “no smoking” signs.

4.1.4 Radar Equipment.

4.1.4.1 Aircraft Radar Equipment.

4.1.4.1.1 Surveillance radar equipment in aircraft shall not be operated within 90 m (300 ft) of any fueling, servicing, or other operation in which flammable liquids, vapors, or mist could be present.

4.1.4.1.2 Weather-mapping radar equipment in aircraft shall not be operated while the aircraft in which it is mounted is undergoing fuel servicing.

4.1.4.2* Ground Radar Equipment.

4.1.4.2.1 Antennas of airport flight traffic surveillance radar equipment shall be located so that the beam will not be directed toward any fuel storage or loading racks within 90 m (300 ft). Aircraft fuel servicing shall not be conducted within this 90-m (300-ft) distance.

4.1.4.2.2 Antennas of airport ground traffic surveillance radar equipment shall be located so that the beam will not be directed toward any fuel storage or loading racks within 30 m (100 ft). Aircraft fuel servicing or any other operations involving flammable liquids or vapors shall not be conducted within 30 m (100 ft) of such antennas.

4.1.5 Emergency Fire Equipment Accessibility. Accessibility to aircraft by emergency fire equipment shall be considered in establishing aircraft fuel servicing positions.

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4.1.6 Portable Fire Extinguishers.

4.1.6.1* Portable extinguishers shall be provided in accordance with 4.3.9 and Section 5.13.

4.1.6.2 Extinguishers shall conform to the requirements of NFPA 10, *Standard for Portable Fire Extinguishers*.

4.1.7* Deadman Controls.

4.1.7.1 The valve that controls the flow of fuel to an aircraft shall have a deadman control. The deadman control device shall be arranged to accommodate the operational requirements of Section 5.15. The fuel flow control valve shall be one of the following:

(1) The hydrant pit valve
(2) At the tank outlet on a tank vehicle
(3) A separate valve on the tank vehicle
(4) On the hose nozzle for overwing servicing

4.1.7.2 Deadman controls shall be designed to preclude defeating their intended purpose.

4.1.8 Pressure Fuel Servicing System Controls. The system shall be designed to minimize surge pressure. The overshoot shall not exceed 5 percent of actual flow rate from the time the deadman is released until the flow stops completely. The control valve shall be located and designed so that it will not be rendered inoperative by a surface accident, power failure, or spill. It shall be fail-safe by closing completely in the event of control power loss.

4.2* Aircraft Fueling Hose Requirements.

4.2.1 Performance Requirements. Hose shall comply with the requirements of API BULL 1529, *Aviation Fueling Hose*. Couplings shall comply with the requirements of API BULL 1529.

4.2.2 Additional Requirements.

4.2.2.1 Each coupled length of hose shall be tested at the same minimum proof pressure rating for that grade of hose as defined in API BULL 1529, *Aviation Fueling Hose*.

4.2.2.2 A test certificate shall be provided for each coupled length of hose and shall state the following:

(1) Manufacturer's name (hose)
(2) Manufacturer's name (couplings)
(3) Hose type
(4) Hose grade

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(5) Size and length of hose
(6) Serial number or reference number of hose
(7) Quarter and year of manufacture of hose
(8) Model number of couplings
(9) Sizes of coupling ferrules
(10) Hydrostatic test pressures
(11) Coupled length serial number
(12) Identification of individual responsible for coupling the hose
(13) Name and address of company responsible for coupling the hose
(14) Date of certification

4.2.2.3 The coupling tests as specified in API BULL 1529, *Aviation Fueling Hose*, shall be performed for each hose grade, type, and manufacturer.

4.2.2.4 Each coupling of a coupled length of hose shall be permanently marked with a serial number corresponding to its hydrostatic test certificate.

4.2.2.5 The hose at the end of each coupling ferrule shall be permanently marked prior to hydrostatic testing to serve as a reference to determine whether a coupling has slipped during testing or while in service.

4.2.3 Hydrostatic Testing. Hydrostatic testing shall be in accordance with ASTM D 380, *Standard Test Methods for Rubber Hose*.

4.2.3.1 Following a hydrostatic test, all of the water shall be drained and the hose shall be dried internally. The open ends, including the threads of the couplings, shall be suitably covered to protect the threads and to prevent contamination.

4.2.3.2 A hose that is recoupled for any reason shall be hydrostatically tested and recertified to the same criteria as a newly coupled hose.

4.3 Aircraft Fuel Servicing Vehicles and Carts.

Aircraft fuel servicing tank vehicles that are used on public highways also shall comply with NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*.

4.3.1 Materials.

4.3.1.1 In addition to any specific requirements in this chapter, only materials safe for use in the service intended and compatible with fuel applications shall be used in the construction of aircraft fuel servicing vehicles and hydrant fuel service carts.

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4.3.1.2 Magnesium shall not be used in the construction of any portion of an aircraft fuel servicing vehicle or cart.

4.3.2 Vehicle Cargo Tanks. Every cargo tank shall be supported by and attached to, or shall be a part of, the tank vehicle upon which it is carried in accordance with NFPA 385, Standard for Tank Vehicles for Flammable and Combustible Liquids.

4.3.3 Static Protection.

4.3.3.1 All metallic components and vehicle or cart chassis shall be electrically bonded to prevent a difference in their electrostatic potential.

4.3.3.2 A provision shall be made for the bonding of the tank to the fill pipe or the loading rack as specified in 5.20.2.1. Electrical continuity between the loading rack and fill pipe shall be accomplished as specified in Section 5.4.

4.3.3.3 Cables shall be provided on the vehicle or cart to allow the bonding operations specified in Section 5.4.

4.3.3.4 A cable with a clip or plug shall be attached to each overwing nozzle to facilitate compliance with 5.4.2.

4.3.4 Propulsion or Power Engine Compartments. Propulsion or power engine equipment shall be in a compartment housing that shall minimize the hazard of fire in the event of leakage or spillage of fuel during the servicing of an aircraft.

4.3.4.1 The engine air intake shall retain the manufacturer's configuration to prevent the emission of flame in case of backfiring.

4.3.4.2 Where provided, the sediment bowl in the fuel supply line shall be of steel or material of equivalent fire resistance.

4.3.5 Containers and Systems for Flammable Liquids Other than Cargo Tanks.

4.3.5.1 Vehicle or cart fuel tanks and containers for other flammable liquids shall be made of metal and shall be designed, constructed, and located in a manner that precludes hazardous arrangements. Tanks shall be substantially protected by their location, and fill pipes shall not project beyond the vehicle profile. Tanks and containers shall vent away from sources of ignition during filling. Any arrangement not protected by location shall be listed for such use. The fuel tank arrangement shall allow for drainage without the tanks removal from its mountings.

4.3.5.2 Gravity feed systems shall not be used.

4.3.5.3 All portions of the flammable liquid feed system shall be constructed and located to minimize the fire hazard. The lines shall be made of materials not adversely affected by the fluid or by other materials likely to be encountered, shall be of adequate strength for the purpose, and shall be secured to avoid chafing or undue vibration.

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4.3.6 Engine Exhaust System.

4.3.6.1* The engine exhaust system shall be designed, located, and installed to minimize the hazard of fire in the event of any of the following:

(1) Leakage of fuel from the vehicle or cart (where applicable) fuel tank or fuel system

(2) Leakage from the fuel dispensing system of the vehicle or cart

(3) Spillage or overflow of fuel from the vehicle or cart (if applicable) fuel tank or the cargo tank

(4) Spillage of fuel during the servicing of an aircraft

4.3.6.2 Exhaust system components shall be secured and located clear of components carrying flammable liquids and separated from any combustible materials used in the construction of the vehicle.

4.3.6.3 Suitable shielding shall be provided to drain possible fuel spillage or leakage away from exhaust system components safely.

4.3.6.4 Exhaust gases shall not be discharged where they could ignite fuel vapors that could be released during normal operations or by accidental spillage or by leakage of fuel.

4.3.6.5 A muffler (or silencer) cutout shall not be provided.

4.3.6.6 Gasoline-powered engines on fuel servicing vehicles shall be provided with flame and spark arresting exhaust systems.

4.3.7 Vehicle or Cart Lighting and Electrical Equipment.

4.3.7.1 Battery Compartments. Batteries that are not in engine compartments shall be securely mounted in compartments to prevent accidental arcing. The compartment shall be separate from fueling equipment. Suitable shielding shall be provided to drain possible fuel spillage or leakage away from the compartment. The compartment shall be provided with a vent at the top of the compartment.

4.3.7.2 Wiring shall be of adequate size to provide the required current-carrying capacity and mechanical strength. It shall be installed to provide protection from physical damage and from contact with spilled fuel either by its location or by enclosing it in metal conduit or other oil-resistant protective covering. All circuits shall have overcurrent protection. Junction boxes shall be weatherproofed.

4.3.7.3 Spark plugs and other exposed terminal connections shall be insulated to prevent sparking in the event of contact with conductive materials.

4.3.7.4* Motors, alternators, generators, and associated control equipment located outside of the engine compartment or vehicle cab shall be of a type listed for use in accordance with NFPA 70, National Electrical Code®, Class I, Division 1, Group D locations.
4.3.7.5 Electrical equipment and wiring located within a closed compartment shall be of a type listed for use in accordance with NFPA 70, National Electrical Code, Class I, Division 1, Group D locations.

4.3.7.6 Lamps and switching devices, other than those covered in 4.3.7.4 and 4.3.7.5, shall be of the enclosed, gasketed, weatherproof type. Other electrical components shall be of a type listed for use in accordance with NFPA 70, National Electrical Code, Class I, Division 2, Group D locations.

4.3.7.7 Electrical service wiring between a tractor and trailer shall be designed for heavy-duty service. The connector shall be of the positive-engaging type. The trailer receptacle shall be mounted securely.

4.3.8 Cabinets. All cabinets housing vehicle auxiliary equipment shall have expanded metal flooring, perforated metal grating-type flooring, or open floor to facilitate air circulation within the enclosed space and to prevent the accumulation of fuel.

4.3.9 Fire Extinguishers for Aircraft Fuel Servicing Vehicles or Carts.

4.3.9.1 Each aircraft fuel servicing tank vehicle shall have two listed fire extinguishers, each having a rating of at least 20-B:C with one extinguisher mounted on each side of the vehicle.

4.3.9.2 There shall be one listed extinguisher having a rating of at least 20-B:C installed on each hydrant fuel servicing vehicle or cart.

4.3.9.3 Extinguishers shall be readily accessible from the ground. The area of the paneling or tank adjacent to or immediately behind the extinguisher(s) on fueling vehicles or carts shall be painted with a contrasting color.

4.3.9.4 Extinguishers shall be kept clear of elements such as ice and snow. Extinguishers located in enclosed compartments shall be readily accessible, and their location shall be marked clearly in letters at least 50 mm (2 in.) high.

4.3.10 Full Trailers and Semitrailers.

4.3.10.1 Trailer connections shall be designed to secure the trailer firmly and to prevent the towed vehicle from swerving from side to side at the speeds anticipated so that the trailer essentially remains in the path of the towing vehicle.

4.3.10.2 Full trailers and semitrailers shall be equipped with brakes on all wheels.

4.3.11 Smoking Restrictions.

4.3.11.1 A “no smoking” sign shall be posted prominently in the cab of every aircraft fuel servicing vehicle.

4.3.11.2 Smoking equipment such as cigarette lighters and ash trays shall not be provided. If a vehicle includes such equipment when initially procured, it shall be removed or rendered
inoperable.

4.3.12 Cargo Tanks.

4.3.12.1 Cargo tanks shall be constructed in accordance with 49 CFR 178.34,5 DOT MC406, or other equivalent standard for international application.

4.3.12.2 Aluminum alloys for high strength welded construction shall be joined by an inert gas arc welding process using filler metals R-GR40A, E-GR40A (5154 alloy), R-GM50A, and E-GM50A (5356 alloy) in accordance with AWS A5.10, *Specification for Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods*.

4.3.12.3 Tank outlets shall be of substantial construction and shall be attached securely to the tank.

4.3.12.4 Every cargo tank or compartment over 2.3 m (7½ ft) long shall be provided with baffles, the total number of which shall be such that the distance between any two adjacent baffles, or between any tank head or bulkhead and the baffle closest to it, shall in no case exceed 1.5 m (5 ft). The cross-sectional area of each baffle shall be not less than 80 percent of the cross-sectional area of the tank, and the thickness of a baffle shall be not less than that required for the heads and bulkheads of the cargo tank in which it is installed.

4.3.12.5 Venting shall be in accordance with 49 CFR, DOT MC406.

4.3.12.6 Cargo drawoff valves or faucets projecting beyond the frame of a tank vehicle shall be protected against damage.

4.3.13 Fill Openings and Top Flashings.

4.3.13.1 Dome covers shall be provided with a forward-mounted hinge and self-latching catches and shall be fitted with watertight fuel-resistant seals or gaskets (designed to prevent spillage or leakage from overturn and to prevent water entry). Dome covers shall automatically close and latch with the forward motion of the vehicle.

4.3.13.2 Drains from top flashing shall divert spilled fuel from possible sources of ignition, including the engine, the engine exhaust system, the electrical equipment, or an auxiliary equipment enclosure.

4.3.13.3 The tank fill openings shall be protected against overturn damage by a rigid member(s) fixed to the tank and extending a minimum of 25 mm (1 in.) above any dome cover, handle, vent opening, or projection of the unit. Overturn protection shall be braced adequately to prevent collapse. The overturn protection shall be designed to channel rain water, snow, or fuel to the exterior of the cargo tank.

4.3.14 Piping, Joints, Flanged Connections, and Couplings.

4.3.14.1 Product piping shall be metal and rated for the system working pressure or at least 860 kPa (125 psi), whichever is greater.

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4.3.14.2 Except as provided in 4.3.14.3, all joints shall be welded. Elbows and fittings shall be kept to a minimum and, where used, shall be of the preformed welding type.

4.3.14.3 Flanged connections or approved couplings shall be provided to avoid the need for cutting and welding where components are serviced or replaced. Gaskets in flanged connections shall be of a material and design that resist fire exposure for a time comparable to the flange and bolts.

4.3.14.4 Piping shall be supported adequately.

4.3.15 Outlet Valves and Emergency Shutoff Controls.

4.3.15.1 The outlets of each cargo tank or compartment, including water drawoffs, shall be equipped with shutoff valves located inside the shell, or in the sump where it is an integral part of the shell. The cargo tank outlet shall be designed so that the valve needs to be kept closed except during loading and unloading operations. The water drawoff connection shall be of a type that cannot be blocked open.

4.3.15.2 The operating mechanism for each tank outlet valve shall be adjacent to the fuel delivery system operating controls and shall be arranged so that the outlet valve(s) can be closed simultaneously and instantly in the event of a fire or other emergency. A means shall be provided to assure proper operation. There shall be at least two emergency shutoff controls, one mounted on each side of the vehicle. These controls shall be quick-acting to close the tank outlet valve in case of emergency. They also shall be remote from the fill openings and discharge outlets and shall be operable from a ground-level standing position. In addition, all vehicles or carts equipped with a top deck platform shall have an emergency shutoff control operable from the deck.

4.3.15.3 Emergency fuel shutoff controls shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 50 mm (2 in.) high and shall be of a color that contrasts with the placard background for visibility. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. The words EMERGENCY FUEL SHUTOFF shall not be used to identify any control or device on the vehicle other than the emergency fuel shutoff controls.

4.3.15.4 Each outlet valve shall be provided with a fusible device that causes the valve to close automatically in case of fire.

4.3.15.5 A shear section shall be provided between shutoff valve seats and discharge outlets that breaks under strain unless the discharge piping is arranged to afford the same protection and leave the shutoff valve seat intact.

4.3.15.6 Openings in cargo tank compartments that are connected to pipe or tubing shall be fitted with a spring-loaded check valve, a self-closing valve, or similar device to prevent the accidental discharge of fuel in case of equipment malfunction or line breakage. Unless such valves are located inside the tank, they shall be equipped with a shear section as described in...
4.3.16 Fuel Dispensing System.

4.3.16.1 The valve that controls the flow of fuel from an aircraft fuel servicing vehicle or cart to an aircraft shall have a deadman control(s) in accordance with the requirements of 4.1.7.

4.3.16.2 The deadman flow control in the nozzle shall be permitted for overwing fueling. Notches or latches in the nozzle handle that could allow the valve to be locked open shall be prohibited. Each overwing servicing nozzle shall have a cable with a plug or clip for bonding to the aircraft. (See 5.4.2.)

4.3.16.3 Nozzles for underwing fueling shall be designed to be attached 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.

4.3.16.4 Fuel servicing pump mechanisms shall be designed and arranged so that failure or seizure does not cause rupture of the pump housing, a tank, or of any component containing fuel. Fuel pressure shall be controlled within the stress limits of the hose and plumbing by means of either an in-line pressure controller, a system pressure relief valve, or other suitable means. The working pressure of any system component shall equal or exceed any pressure to which it could be subjected.

4.3.16.5 On tank full trailer or tank semitrailer vehicles, the use of a pump in the tractor unit with flexible connections to the trailer shall be prohibited unless one of the following conditions exists:

(1) Flexible connections are arranged above the liquid level of the tank in order to prevent gravity or siphon discharge in case of a break in the connection or piping

(2) The cargo tank discharge valves required by 4.3.16.1 are arranged to be normally closed and to open only when the brakes are set and the pump is engaged

4.3.16.6 Hose shall be connected to rigid piping or coupled to the hose reel in a manner that prevents kinks or undue bending action or mechanical stress on the hose or hose couplings.

4.3.16.7 Aircraft fuel servicing vehicles and carts shall have an integral system or device that prevents the vehicle or cart from being moved unless all fueling nozzles and hydrant couplers are properly stowed and mechanical lifts are lowered to their stowed position.

4.3.17 Tests.

4.3.17.1 Cargo tanks, at the time of manufacture, shall be tested by a minimum air or hydrostatic pressure of 24.4 kg/m² (5 psi) applied to the whole tank (or each compartment thereof if the tanks are compartmented). Such pressure shall be maintained for a period of at least 5 minutes during which, if the test is by air pressure, the entire exterior surface of all joints shall be coated with a solution of soap and water, heavy oil, or other substance that causes foaming or bubbling that indicates the presence of leaks. Hydrostatic pressure, if used, shall be
gauged at the top of the tank. The tank shall be inspected at the joints for the issuance of liquid to indicate leaks. Any leakage discovered by either of the methods described, or by any other method, shall be considered evidence of failure to meet these requirements.

4.3.17.2 At the time of manufacture, the section of the fuel dispensing system that is under pressure during service shall be subjected to a hydrostatic test pressure equal to 150 percent of the working pressure of the system for at least 30 minutes and shall be proven tight before it is placed in service. Hose connections shall be permitted to be plugged during this test.

4.3.18 **Product Identification Signs.** Each aircraft fuel servicing vehicle or cart shall have a sign on each side and the rear to identify the product. The sign shall have letters at least 75 mm (3 in.) high and shall be of a color contrasting sharply with the sign background for visibility. The word FLAMMABLE and the name of the product carried, such as JET A, JET B, GASOLINE, or AVGAS shall appear on the sign.

4.3.19 **Loading.**

4.3.19.1 No cargo tank or compartment shall be loaded to the point where it is liquid full. The ullage expansion space shall not be less than 1 percent of the volume of the tank compartment. Where local climatic conditions warrant, the ullage expansion space shall be increased to prevent leakage or overflow from expansion of the contents due to a rise in atmospheric temperature or direct exposure to the sun.

4.3.19.2 A heat-actuated shutoff valve shall be provided in the piping immediately upstream of the loading hose or swing arm connection.

4.3.20 **Top Loading.**

4.3.20.1 Drop tubes used in top loading or overhead loading of tank vehicles shall be designed to minimize turbulence. Drop tubes shall be metallic.

4.3.20.2 Fixed drop tubes permanently mounted in the vehicle tank shall extend to the bottom of the tank or to the inside of the sump to maintain submerged loading and avoid splashing of the fuel.

4.3.20.3 Drop tubes attached to loading assemblies extending into the vehicle tank shall extend to the bottom of the tank and shall be maintained in that position until the tank is loaded to provide submerged loading and to avoid splashing or free fall of fuel through the tank atmosphere.

4.3.20.4 Loading arms shall be counterbalanced properly.

4.3.20.5 A deadman control shall be provided and located so that the operator can observe the liquid level in the tank as it fills.

4.3.21 **Bottom Loading.**

4.3.21.1 Loading hose shall conform to the requirements of Section 4.2. Swivel connections
shall be provided at each end of the hose to allow free movement to compensate for changes in
the position of the vehicle connection during loading.

4.3.21.2 Swinging loading arms shall be counterbalanced properly. Swivel joints shall be used
to allow free movement and to compensate for changes in the attitude of the vehicle during
loading.

4.3.21.3 The connection between the tank truck and the arm or hose shall be a dry-break
coupler that cannot be opened until it is engaged to the vehicle tank adapter. It shall not be
possible to disconnect the hose coupler from the tank vehicle connection until the internal
valves of the vehicle adapter and coupler are fully closed.

4.3.21.4* The bottom loading fitting of the tank vehicle shall be a spring-loaded check valve
that remains in a closed position until opened by connecting the coupler.

4.3.21.5 Aircraft fuel servicing vehicles shall incorporate an integral brake interlock system
that prevents the vehicle from being moved until the bottom loading coupler has been
disconnected from the vehicle.

4.3.21.6 The supply piping terminating at the loading hose or swing arm shall be supported to
carry the loads imposed.

4.3.21.7 The filling of the vehicle cargo tank shall be controlled by a deadman control so that a
fueling operator can monitor the operation while activating the control. In addition, a
float-actuated shutoff or other automatic sensing device shall be provided. This requirement
shall apply to defueling also. (See 5.14.1.) Any liquid bled from a sensing device during loading
shall be piped to the bottom of the cargo tank.

4.3.21.8 The fill pipe and valving on bottom-loaded tank vehicles shall be arranged to prevent
fuel spray and turbulence in the cargo tank.

4.3.22 Emergency Remote Control Stations.

4.3.22.1 Each tank vehicle loading station shall be provided with an emergency fuel shutoff
system. This requirement is in addition to the deadman control required by 4.3.20.5 for top
loading and by 4.3.21.7 for bottom loading. It shall be the purpose of this system to shut down
the flow of fuel in the entire system or in sections of the system if an emergency occurs. This
system shall be of a fail-safe design.

4.3.22.2 Each emergency fuel shutoff station location shall be placarded EMERGENCY FUEL
SHUTOFF in letters at least 2 in. (50 mm) high. The method of operation shall be indicated by
an arrow or by the word PUSH or PULL, as appropriate. Any action necessary to gain access to
the shutoff device (e.g., BREAK GLASS) shall be shown clearly. Lettering shall be of a color
contrasting sharply with the placard background for visibility. Placards shall be weather
resistant, shall be located at least 2.1 m (7 ft) above grade, and shall be positioned so that they
can be seen readily from a distance of at least 7.6 m (25 ft).

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4.4 Airport Fuel Systems.

4.4.1 Design Approval. Work shall not be started on the construction or alteration of an airport fuel system until the design, plans, and specifications have been approved by the authority having jurisdiction.

4.4.2 System Approval. The authority having jurisdiction shall inspect and approve the completed system before it is put into service.

4.4.3 General Requirements.

4.4.3.1 Each installation planned shall be designed and installed in conformity with the requirements of this standard and with any additional fire safety measures deemed necessary by the authority having jurisdiction.

4.4.3.2 The system and each of its components shall be designed for the working pressure of the system.

4.4.3.3 The emergency fuel shutoff system shall be designed and installed as an integral part of the airport fuel system. Operating controls for emergency fuel shutoff of the system shall be located to be accessible readily and safely in the event of an accident or spill.

4.4.3.4 In establishing each aircraft fuel dispensing location, consideration shall be given to the accessibility of the location in an emergency by fire-fighting personnel and equipment.

4.4.4 Fuel Storage Tanks.

4.4.4.1* Fuel storage tanks shall conform to the applicable requirements of NFPA 30, Flammable and Combustible Liquids Code.

4.4.4.2 The authority having jurisdiction shall determine the clearances required from runways, taxiways, and other aircraft movement and servicing areas to any aboveground fuel storage structure or fuel transfer equipment with due recognition given to national and international standards establishing clearances from obstructions. Tanks located in designated aircraft movement areas or aircraft servicing areas shall be underground or mounded over with earth. Vents from such tanks shall be constructed in a manner to preclude collision hazards with operating aircraft. Aircraft operators shall be consulted regarding the height and location of such vents to avoid venting flammable vapors in the vicinity of ignition sources, including operating aircraft and automotive equipment permitted in the area.

4.4.5 Emergency Fuel Shutoff Systems.

4.4.5.1 Each fuel system, as required by 4.4.3.3, shall have means for quickly and completely shutting off the flow of fuel in an emergency. This requirement shall be in addition to the requirement in 4.1.7 for deadman control of fuel flow.

4.4.5.2* The method of fuel transfer (gravity, pumping, or use of hydraulic or inert gas pressure) shall be considered in the design of the emergency fuel shutoff system and the
location of the emergency fuel shutoff valve.

4.4.5.3 The emergency fuel shutoff system shall include shutoff stations located outside of probable spill areas and near the route that normally is used to leave the spill area or to reach the fire extinguishers provided for the protection of the area.

4.4.5.4* At least one emergency shutoff control station shall be conveniently accessible to each fueling position.

4.4.5.5 The emergency fuel shutoff system shall be designed so that operation of a station shuts off fuel flow to all hydrants that have a common exposure.

4.4.5.6 Emergency fuel shutoff systems shall be designed so that they shut off the flow of fuel if the operating power fails.

4.4.5.7 Each emergency fuel shutoff station shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 50 mm (2 in.) high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. Any action necessary to gain access to the shutoff device (e.g., BREAK GLASS) shall be shown clearly. Lettering shall be of a color contrasting sharply with the placard background for visibility. Placards shall be weather resistant, shall be located at least 2.1 m (7 ft) above grade, and shall be positioned so that they can be seen readily from a distance of at least 7.6 m (25 ft). Valves used to shut off a hydrant for maintenance purposes shall not have placards that could create confusion in an emergency.

4.4.6 Transfer Piping.

4.4.6.1 Underground piping shall be used in the vicinity of aircraft movement areas unless the piping is protected by a substantial barrier guard. Piping shall be protected by suitable sleeves or casings to protect the pipe from shock hazards where it crosses sewer manholes, service tunnels, catch basins, or other underground services. Piping shall be laid on firm supports using clean, noncorrosive backfill.

4.4.6.2 Transfer piping located within buildings not specifically designed for the purpose of fuel transfer shall be located within a steel casing of a pressure rating equal to that of the carrier pipe. This casing shall extend beyond the building and shall terminate at a low point(s) with an automatic leak detection system. The casing shall be capable of being drained to a safe location.

4.4.6.3 Fuel piping that runs under a building or a passenger concourse shall be protected by a steel casing that encloses only the piping.

4.4.6.4 Piping, valves, and fittings shall be of metal, suitable for aviation fuel service, and designed for the working pressure and mechanically and thermally produced structural stresses to which they could be subjected and shall comply with ANSI B31.3, Chemical Plant and Petroleum Refinery Piping. Deviations from ANSI B31.3 shall be permitted, provided they are authorized by the authority having jurisdiction where engineering data can be presented to justify such deviations.

4.4.6.5 Cast-iron, copper, and galvanized steel piping, valves, and fittings shall not be

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permitted. Ductile iron valves shall be permitted.

4.4.6.6 Aluminum piping, valves, and fittings shall be used only where specifically approved by the authority having jurisdiction.

4.4.6.7 In the selection of pipe, valves, and fittings, the following shall be considered:

(1) Working pressure
(2) Bending and mechanical strength requirements (including settlement)
(3) Internal and external corrosion
(4) Impact stresses
(5) Method of system fabrication and assembly
(6) Location of piping and accessibility for repair or replacement
(7) Exposure to mechanical, atmospheric, or fire damage
(8) Expected period of service and effect of future operations

4.4.6.8 Gaskets in flanged connections shall resist fire temperatures for a duration comparable to the temperature resistance of the flange and bolts.

4.4.6.9 Allowances shall be made for thermal expansion and contraction by the use of pipe bends, welded elbows, or other flexible design. Pressure relief valves shall be provided in lines that can be isolated.

4.4.6.10 Welded joints shall be made by qualified welders in accordance with the standards of the American Welding Society and ANSI B31.3, Chemical Plant and Petroleum Refinery Piping.

4.4.6.11* Isolation valves or devices shall be provided to facilitate dismantling portions of the fueling system. These valves shall be capable of being locked closed.

4.4.6.12 Buried flanges and valves shall not be permitted.

4.4.7 Fuel Flow Control.

4.4.7.1 Hydrant valves shall be designed so that the flow of fuel shall shut off when the hydrant coupler is closed. Hydrant valves shall be of the self-closing, dry-break type.

4.4.7.2 The flow control valve shall be an integral part of the hydrant valve or coupler. The fuel control valve shall be arranged so that it is not rendered inoperative by a surface accident, spill, or malfunction and shall shut off the flow of fuel if the operating energy fails. The fuel control system shall be designed to minimize overshoot. The system shall be designed to shut off fuel flow quickly and effectively, even if there is a reduction of pressure downstream of the flow control valve such as could result from a major line or hose break. A screen shall be provided ahead of the valve to trap foreign material that could interfere with complete closure.
of the valve. The hydrant valve that allows the flow of fuel to the aircraft shall have a deadman control. The use of any means that allows fuel to flow without the operator activating this control shall not be permitted. The deadman control shall be arranged so that the fueling operator can observe the operation while activating the control.

4.4.7.3* The pressure of the fuel delivered to the aircraft shall be automatically controlled so that it is not higher than that specified by the manufacturer of the aircraft being serviced.

4.4.8 Filter Vessels. All sections of the filtering system shall have electrical continuity with adjoining piping and equipment. In freezing climates, filter separator sumps and associated piping that could contain water shall be protected to prevent freezing and bursting. Heaters shall be constructed of noncorrosive materials.

4.4.9 Electrical Equipment. All electrical equipment and wiring shall comply with the requirements of NFPA 70, National Electrical Code, Article 515, utilizing the Class I liquids requirements for all applications.

4.4.10 Fuel Servicing Hydrants, Pits, and Cabinets.

4.4.10.1 Piping, valves, meters, filters, air eliminators, connections, outlets, fittings, and other components shall be designed to meet the working pressure requirements of the system.

4.4.10.2 Fueling hydrants and fueling pits that are recessed below a ramp or apron surface and are subject to vehicle or aircraft traffic shall be fitted with a cover designed to sustain the load of vehicles or aircraft that taxi over all or part of them.

4.4.10.3 Fueling hydrants, cabinets, and pits shall be located at least 15.2 m (50 ft) from any terminal building, hangar, service building, or enclosed passenger concourse (other than loading bridges).

4.4.11 Drainage.

4.4.11.1 Aircraft servicing ramps or aprons shall be sloped and drained in accordance with NFPA 415, Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways. The ramp or apron shall slope away from the rim or edge of fueling hydrants or fueling pits to prevent flooding.

4.4.11.2 Fueling hydrant boxes or fueling pits that are connected to a ramp drainage system shall be fitted with vapor-sealing traps.

4.4.12* Cathodic Protection. All fueling systems with underground piping shall have cathodic protection to mitigate corrosion. Systems provided with cathodic protection shall have appropriate signs, located at points of entry, warning against separation of units without prior deenergization or without proper jumpers across the sections to be disconnected.

4.4.13 Hydrostatic Test. After completion of the installation (including fill and paving), the airport fuel systems shall be subjected to a temperature-compensated hydrostatic test pressure equal to 150 percent of the system working pressure for at least 4 hours and shall be proven.
tight before the system is placed into service.

4.5 Fueling at Rooftop Heliports.

Fueling on rooftop heliports shall be permitted only where approved by the authority having jurisdiction.

4.5.1 General Limitations.

4.5.1.1 In addition to the special requirements in this chapter, the heliport shall comply with the requirements of NFPA 418, Standard for Heliports.

4.5.1.2 Facilities for dispensing fuel with a flash point below 37.8°C (100°F) shall not be permitted at any rooftop heliport.

4.5.2 Fueling Facilities.

4.5.2.1 In addition to the special requirements of this chapter, the fuel storage, piping, and dispensing system shall comply with the requirements of NFPA 30, Flammable and Combustible Liquids Code, and with applicable portions of this standard.

4.5.2.2 The entire system shall be designed so that no part of the system is subjected to pressure above its working pressure.

4.5.2.3 The fuel storage system shall be located at or below ground level.

4.5.3 Pumps.

4.5.3.1 Pumps shall be located at or below ground level. Relay pumping shall not be permitted.

4.5.3.2 Pumps installed outside of buildings shall be located not less than 1.5 m (5 ft) from any building opening. They shall be substantially anchored and protected against physical damage from collision.

4.5.3.3 Pumps installed within a building shall be in a separate room with no opening into other portions of the building. The pump room shall be adequately ventilated. Electrical wiring and equipment shall conform to the requirements of NFPA 70, National Electrical Code, Article 515.

4.5.4 Piping. Piping above grade shall be steel and, unless otherwise approved by the authority having jurisdiction, shall be suitably cased or shall be installed in a duct or chase. Such piping duct or chase shall be constructed so that a piping failure does not result in the entry of fuel liquid or vapor entering the building. All pipe casings, ducts, and chases shall be drained. Piping shall be anchored and shall be protected against physical damage for a height of at least 2.4 m (8 ft) above the ground. An isolation valve shall be installed on the suction and discharge piping of each pump. In addition, a check valve shall be installed at the base of each fuel piping riser to automatically prevent the reverse flow of the fuel into the pump room in the event of pump seal failure, pipe failure, or other malfunction. (See 4.4.6.)

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4.5.4.1 Piping within buildings shall comply with 4.4.6.2.

4.5.4.2 Piping above grade exterior to buildings shall be of steel. Piping shall be located within a steel casing. The pressure rating of the pipe casing shall be equal to that of the carrier pipe. The casing shall be capable of being drained to a safe location. An automatic leak detection system shall be provided at the casing low point(s).

4.5.4.3 Piping shall be anchored and shall be protected against physical damage for a height of at least 2.4 m (8 ft) above the ground.

4.5.4.4 An isolation valve shall be installed on the suction and discharge piping of each pump. In addition, a check valve shall be installed at the base of each fuel piping riser to automatically prevent the reverse flow of fuel into the pump room in the event of a pump seal failure, pipe failure, or other malfunction.

4.5.5 Nozzles.

4.5.5.1 Overwing nozzles shall conform to 4.3.16.2.

4.5.5.2 Underwing nozzles shall conform to 4.3.16.3.

4.5.6 Hose. Hose shall comply with the requirements of Section 4.2.

4.5.7 Static Electricity. The provisions of 4.1.2 shall apply, as appropriate, to guard against electrostatic hazards during helicopter fuel servicing operations.

4.5.8 Deadman Control. Each fuel dispensing hose shall have a deadman-controlled fuel shutoff conforming to the requirements of 4.1.7 and 4.1.8.

4.5.9 Emergency Fuel Shutoff Stations.

4.5.9.1 A system shall be provided to completely shut off the flow of fuel in an emergency. The system shall shut off the fuel at the ground level. The emergency fuel shutoff controls shall be in addition to the normal operating controls for the pumps and deadman control.

4.5.9.2 At least two emergency fuel shutoff stations located on opposite sides of the heliport at exitways or at similar locations shall be provided. An additional emergency fuel shutoff station shall be located at ground level and shall be near, but at least 3 m (10 ft) from, the pumps.

4.5.9.3 Each emergency fuel shutoff station location shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 50 mm (2 in.) high. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. Any action necessary to gain access to the shutoff device (e.g., BREAK GLASS) shall be shown clearly. Lettering shall be of a color contrasting sharply with the placard background for visibility. Placards shall be weather resistant, shall be conspicuously located, and shall be positioned so that they can be seen readily from a distance of at least 7.6 m (25 ft).

4.5.10 Fire Protection. Fire protection shall conform to the requirements of NFPA 418,
4.5.11 Personnel Training. All heliport personnel shall be trained in the operation of emergency fuel shutoff controls and in the use of the available fire extinguishers.

4.6 Self-Service Aircraft Fueling.

4.6.1 Self-service fueling shall be permitted, subject to the approval of the authority having jurisdiction.

4.6.2 Fueling Facilities. In addition to the special requirements of this chapter, the fuel storage, piping, and dispensing system shall comply with the requirements of NFPA 30, Flammable and Combustible Liquids Code, and with applicable portions of this standard.

4.6.3 Dispensing Devices.

4.6.3.1 Listed or approved dispensing devices shall be used.

4.6.3.2 Access to dispensing equipment shall be controlled by means of mechanical or electronic devices designed to resist tampering and to prevent access or use by unauthorized persons.

4.6.3.3 Dispensing devices shall have a listed or approved emergency shutoff valve, incorporating a fusible link or other thermally actuated device designed to close automatically in case of fire. This valve also shall incorporate a shear section that automatically shuts off the flow of fuel due to severe impact. This valve shall be rigidly mounted at the base of the dispenser in accordance with the manufacturer's instructions.

4.6.3.4 Dispensing devices shall be located on an island to protect against collision damage or shall be suitably protected with pipe bollards or other suitable protection.

4.6.3.5* Dispensing devices or cabinets shall be designed so that a proper bond between the aircraft and the fueling equipment can be established in accordance with Section 5.4.

4.6.4 Hose shall comply with the requirements of Section 4.2. Two or more lengths of hose shall not be coupled together.

4.6.5 Nozzles.

4.6.5.1 Overwing nozzles shall conform to 4.3.16.2.

4.6.5.2 Underwing nozzles shall conform to 4.3.16.3.

4.6.6 Emergency Fuel Shutoff System.

4.6.6.1 A system conforming with 4.4.5 shall be provided to shut off the flow of fuel completely in an emergency. The emergency fuel shutoff controls shall be in addition to the normal operating controls for the dispenser and deadman control.

4.6.6.2 The controls shall be designed to allow only authorized personnel to reset the system.
after an emergency fuel shutoff.

4.6.6.3 The emergency fuel shutoff controls shall be installed in a location acceptable to the authority having jurisdiction and shall be more than 7 m (20 ft) but less than 30 m (100 ft) from the dispensers.

4.6.7 A clearly identified means to notify the fire department shall be provided and shall be located in the immediate vicinity of each emergency fuel shutoff control.

4.6.8 Each facility shall have a minimum of one fire extinguisher with a rating of at least 20-B:C located at the dispenser and one fire extinguisher with a rating of at least 20-B:C at each emergency fuel shutoff control.

4.6.9 In addition to the warning signs specified in 4.4.5.7 and 5.8.1, emergency instructions shall be conspicuously posted in the dispensing area and at the emergency fuel shutoff control and shall provide the address of the site and shall incorporate the following or equivalent wording:

EMERGENCY INSTRUCTIONS:

In case of fire or spill:

(1) Use emergency fuel shutoff.

(2) Report accident by calling (specify local fire emergency reporting number) on phone.

(3) Report address of site (list address of site here).

4.6.10 Operating Instructions. Operating instructions shall be posted. The instructions shall include the proper operation and use of all equipment, correct bonding procedures, the procedures that are to be employed to dispense fuel safely, the location and use of the emergency fuel shutoff controls, the use of the available fire extinguishers, and the procedures to be used in the event of an emergency.

Chapter 5 Operations

5.1 General.

5.1.1 Only authorized personnel trained in the safe operation of the equipment they use, in the operation of emergency controls, and in the procedures to be followed in an emergency shall fuel or defuel aircraft.

5.1.2 Where a valve or electrical device is used for isolation during maintenance or modification of the fuel system, it shall be tagged/locked. The tag/lock shall not be removed until the operation is completed.
5.2* Prevention and Control of Spills.

5.2.1 Fuel servicing equipment shall comply with the requirements of this standard and shall be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service.

5.2.2 Following fueling of an aircraft all hose shall be removed including those from hydrant systems. All hose shall also be properly stowed.

5.2.3 Fuel nozzles shall not be dragged along the ground.

5.2.4 Pumps, either hand operated or power operated, shall be used where aircraft are fueled from drums. Pouring or gravity flow shall not be permitted from a container with a capacity of more than 18.9 L (5 gal).

5.2.5 Where a spill is observed, the fuel servicing shall be stopped immediately by release of the deadman controls. In the event that a spill continues, the equipment emergency fuel shutoff shall be actuated. In the event that a spill continues from a hydrant system, the system emergency fuel shutoff shall be actuated. The supervisor shall be notified at once, and the operation shall not be resumed until the spill has been cleared and conditions are determined to be safe.

5.2.6 The airport fire crew shall be notified if a spill covers over 3 m (10 ft) in any direction or is over 5 m² (50 ft²) in area, continues to flow, or is otherwise a hazard to persons or property. The spill shall be investigated to determine the cause, to determine whether emergency procedures were properly carried out, and to determine the necessary corrective measures.

5.2.7 Transferring fuel by pumping from one tank vehicle to another tank vehicle within 61 m (200 ft) of an aircraft shall not be permitted.

5.2.8 Not more than one tank vehicle shall be permitted to be connected to the same aircraft fueling manifold.

Exception: Where means are provided to prevent fuel from flowing back into a tank vehicle because of a difference in pumping pressure.

5.3 Emergency Fuel Shutoff.

5.3.1 Access to emergency fuel shutoff control stations shall be kept clear at all times.

5.3.2 A procedure shall be established to notify the fire department serving the airport in the event of a control station activation.

5.3.3 If the fuel flow stops for any reason, it first shall be presumed that an emergency fuel shutoff system has been actuated. The cause of the shutoff shall be corrected before fuel flow is resumed.

5.3.4 Emergency fuel shutoff systems shall be operationally checked at intervals not exceeding
6 months. Each individual device shall be checked at least once during every 12 month period.

5.3.5 Suitable records shall be kept of tests required by this section.

5.4* Bonding.

5.4.1 Prior to making any fueling connection to the aircraft, the fueling equipment shall be bonded to the aircraft by use of a cable, thus providing a conductive path to equalize the potential between the fueling equipment and the aircraft. The bond shall be maintained until fueling connections have been removed, thus allowing separated charges that could be generated during the fueling operation to reunite. Grounding during aircraft fueling shall not be permitted.

5.4.2 In addition to the above, where fueling overwing, the nozzle shall be bonded with a nozzle bond cable having a clip or plug to a metallic component of the aircraft that is metallically connected to the tank filler port. The bond connection shall be made before the filler cap is removed. If there is no plug receptacle or means for attaching a clip, the operator shall touch the filler cap with the nozzle spout before removing the cap in order to equalize the potential between the nozzle and the filler port. The spout shall be kept in contact with the filler neck until the fueling is completed.

5.4.3* Where a funnel is used in aircraft fueling, it shall be kept in contact with the filler neck as well as the fueling nozzle spout or the supply container to avoid the possibility of a spark at the fill opening. Only metal funnels shall be used.

5.4.4 Where a hydrant servicer or cart is used for fueling, the hydrant coupler shall be connected to the hydrant system prior to bonding the fuel equipment to the aircraft.

5.4.5 Bonding and fueling connections shall be disconnected in the reverse order of connection.

5.4.6 Conductive hose shall be used to prevent electrostatic discharge but shall not be used to accomplish required bonding.

5.5 Operation of Aircraft Engines and Heaters.

5.5.1 Fuel servicing shall not be performed on a fixed wing aircraft while an onboard engine is operating. (See Section 5.21.)

Exception: In an emergency resulting from the failure of an onboard auxiliary power unit on a jet aircraft and in the absence of suitable ground support equipment, a jet engine mounted at the rear of the aircraft or on the wing on the side opposite the fueling point shall be permitted to be operated during fueling to provide power, provided that the operation follows written procedures approved by the authority having jurisdiction.

5.5.2 Combustion heaters on aircraft (e.g., wing and tail surface heaters, integral cabin heaters) shall not be operated during fueling operations.
5.6 Internal Combustion Engine Equipment Around Aircraft (Other than Aircraft Fuel Servicing Vehicles).

5.6.1 Equipment, other than that performing aircraft servicing functions, shall not be permitted within 15 m (50 ft) of aircraft during fuel servicing operations.

5.6.2 Equipment performing aircraft servicing functions shall not be positioned within a 3-m (10-ft) radius of aircraft fuel system vent openings.

5.6.3 During overwing aircraft fuel servicing where aircraft fuel system vents are located on the upper wing surface, equipment shall not be positioned under the trailing edge of the wing.

5.7* Electrical Equipment Used on Aircraft Servicing Ramps.

5.7.1 Battery chargers shall not be connected, operated, or disconnected while fuel servicing is performed on the aircraft.

5.7.2* Aircraft ground-power generators or other electrical ground-power supplies shall not be connected or disconnected while fuel servicing is performed on the aircraft.

5.7.3 Electric tools or similar tools likely to produce sparks or arcs shall not be used while fuel servicing is performed on the aircraft.

5.7.4 Photographic equipment shall not be used within 3 m (10 ft) of the fueling equipment or the fill or vent points of aircraft fuel systems.

5.7.5 Other than aircraft fuel servicing vehicles, battery-powered vehicles that do not comply with the provisions of this standard shall not be operated within 3 m (10 ft) of fueling equipment or spills. (See Section 5.6.)

5.7.6 Communication equipment used during aircraft fuel servicing operations within 3 m (10 ft) of the fueling equipment or the fill or vent points of aircraft fuel systems shall be intrinsically safe in accordance with UL 913, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations.

5.8 Open Flames on Aircraft Fuel Servicing Ramps.

5.8.1 Entrances to fueling areas shall be posted with “no smoking” signs.

5.8.2 Open flames on aircraft fuel servicing ramps or aprons within 15 m (50 ft) of any aircraft fuel servicing operation or fueling equipment shall be prohibited.

5.8.3 The category of open flames and lighted open-flame devices shall include, but shall not be limited to, the following:

1. Lighted cigarettes, cigars, pipes

2. Exposed flame heaters, liquid, solid, or gaseous devices, including portable and wheeled
gasoline or kerosene heaters

(3) Heat-producing, welding, or cutting devices and blowtorches

(4) Flare pots or other open-flame lights

5.8.4 The authority having jurisdiction might establish other locations where open flames and open-flame devices shall not be permitted.

5.8.5 Personnel shall not carry lighters or matches on their person while engaged in fuel servicing operations.

5.8.6 Lighters or matches shall not be permitted on or in fueling equipment.

5.9* Lightning Precautions.

5.9.1 Fuel servicing operations shall be suspended where there are lightning flashes in the immediate vicinity of the airport.

5.9.2 A written procedure shall be established to set the criteria for where fueling operations are to be suspended at each airport as approved by the fueling agent and the airport authority.

5.10 Aircraft Fuel Servicing Locations.

5.10.1 Aircraft fuel servicing shall be performed outdoors. Aircraft fuel servicing incidental to aircraft fuel system maintenance operations shall comply with the requirements of NFPA 410, Standard on Aircraft Maintenance.

5.10.2* Aircraft being fueled shall be positioned so that aircraft fuel system vents or fuel tank openings are not closer than 8 m (25 ft) to any terminal building, hangar, service building, or enclosed passenger concourse other than a loading walkway. Aircraft being fueled shall not be positioned so that the vent or tank openings are within 15 m (50 ft) of any combustion and ventilation air-intake to any boiler, heater, or incinerator room.

5.10.3 Accessibility to aircraft by emergency fire equipment shall be established for aircraft fuel servicing positions.

5.11 Aircraft Occupancy During Fuel Servicing Operations.

5.11.1 If passengers remain onboard an aircraft during fuel servicing, at least one qualified person trained in emergency evacuation procedures shall be in the aircraft at or near a door at which there is a passenger loading walkway, integral stairs that lead downward, or a passenger loading stair or stand. A clear area for emergency evacuation of the aircraft shall be maintained at not less than one additional exit. Where fueling operations take place with passengers onboard away from the terminal building, and stairways are not provided, such as during inclement weather (diversions), all slides shall be armed and the ARFF services shall be notified to respond in stand-by position in the vicinity of the fueling activity with at least one vehicle. Aircraft operators shall establish specific procedures covering emergency evacuation under...
such conditions for each type of aircraft they operate. All “no smoking” signs shall be displayed in the cabin(s), and the no smoking rule shall be enforced.

5.11.2 For each aircraft type, operators shall determine the areas through which it could be hazardous for boarding or deplaning passengers to pass while the aircraft is being fueled. Controls shall be established so that passengers avoid such areas.

5.12 Positioning of Aircraft Fuel Servicing Vehicles and Carts.

5.12.1 Aircraft fuel servicing vehicles and carts shall be positioned so that a clear path of egress from the aircraft for fuel servicing vehicles shall be maintained.

5.12.2 The propulsion or pumping engine of aircraft fuel servicing vehicles or carts shall not be positioned under the wing of the aircraft during overwing fueling or where aircraft fuel system vents are located on the upper wing surface. Aircraft fuel servicing vehicles or carts shall not be positioned within a 3-m (10-ft) radius of aircraft fuel system vent openings.

5.12.3 Parking brakes shall be set on all fuel servicing vehicles or carts before operators begin the fueling operation.

5.13* Portable Fire Extinguishers.

5.13.1 During fueling operations, fire extinguishers shall be available on aircraft servicing ramps or aprons.

5.13.2 Each aircraft fuel servicing tank vehicle shall have two listed fire extinguishers, each having a rating of at least 20-B:C, with one extinguisher mounted on each side of the vehicle.

5.13.3 There shall be one listed fire extinguisher having a rating of at least 20-B:C installed on each hydrant fuel servicing vehicle or cart.

5.13.4 Where the open hose discharge capacity of the aircraft fueling system or equipment is more than 750 L/min (200 gpm), at least one listed wheeled extinguisher having a rating of not less than 80-B:C and a minimum capacity of 55 kg (125 lb) of agent shall be provided.

5.13.5* Extinguishers shall be kept clear of elements such as ice and snow. Extinguishers located in enclosed compartments shall be readily accessible, and their location shall be marked clearly in letters at least 50 mm (2 in.) high.

5.13.6* Fuel servicing personnel shall be trained in the use of the available fire extinguishing equipment they could be expected to use.

5.14 Defueling.

5.14.1 The transfer of fuel from an aircraft to a tank vehicle through a hose generally is similar to fueling, and the same requirements shall apply. In addition, each operator shall establish procedures to prevent the overfilling of the tank vehicle, which is a special hazard when defueling (see 4.3.21.7).
5.14.2 Where draining residual fuel from aircraft tanks incidental to aircraft fuel system maintenance, testing, manufacturing, salvage, or recovery operations, the procedures of NFPA 410, Standard on Aircraft Maintenance, shall apply.

5.15 Deadman Control Monitoring.

5.15.1 The fueling operator shall monitor the panel of the fueling equipment and the aircraft control panel during pressure fueling or shall monitor the fill port during overwing fueling.

5.15.2 Fuel flow shall be controlled by use of a deadman control device. The use of any means that defeats the deadman control shall be prohibited.

5.16* Aircraft Fueling Hose.

5.16.1 Aircraft fueling hose shall be inspected before use each day. The hose shall be extended as it normally would be for fueling and checked for evidence of blistering, carcass saturation or separation, cuts, nicks, or abrasions that expose reinforcement material, and for slippage, misalignment, or leaks at couplings. If coupling slippage or leaks are found, the cause of the problem shall be determined. Defective hose shall be removed from service.

5.16.2 At least once each month the hose shall be completely extended and inspected as required in 5.16.1. The hose couplings and the hose shall be examined for a length approximately 305 mm (12 in.) adjacent to the couplings. Structural weakness shall be checked by pressing the hose in this area around its entire circumference for soft spots. Hoses that show evidence of soft spots shall be removed from service. The nozzle screens shall be examined for rubber particles. The presence of such particles indicates possible deterioration of the interior, and the hose shall be removed from service. With the hose still completely extended, it shall be checked at the working pressure of the fueling equipment to which it is attached. Any abnormal twisting or ballooning during this test indicates a weakening of the hose carcass, and the hose shall be removed from service.

5.16.3 A hose assembly that has been subjected to abuse, such as severe end-pull, flattening or crushing by a vehicle, or sharp bending or kinking, shall be removed from service. It shall be hydrostatically tested prior to use. (See 4.2.2.1.)

5.16.4* If inspection shows that a portion of a hose has been damaged, the damaged portion shall be cut off and the undamaged portion recoupled. Two lengths of hose shall not be coupled together. Only couplings that are an exact match for the interior and exterior dimensions of the hose shall be used. Recoupled hose assemblies shall be hydrostatically tested. (See 4.2.2.1.)

5.16.5 Before any hose assembly, new or recoupled, is placed in service, it shall be visually inspected for evidence of damage or deterioration.

5.16.6 Kinks or short loops in fueling hose shall be avoided.

5.16.7 Suitable records shall be kept of required inspections and hydrostatic tests.
5.17 Maintenance of Aircraft Fuel Servicing Vehicles and Carts.

5.17.1 Aircraft fuel servicing vehicles or carts shall not be operated unless they are in proper repair and free of accumulations of grease, oil, or other combustibles.

5.17.2 Leaking vehicles or carts shall be removed from service, defueled, and parked in a safe area until repaired.

5.17.3 Maintenance and servicing of aircraft fuel servicing vehicles and carts shall be performed outdoors or in a building approved for the purpose.

5.18 Parking Aircraft Fuel Servicing Tank Vehicles.

Parking areas for unattended aircraft fuel servicing tank vehicles shall be arranged to provide the following:

(1) Dispersal of the vehicles in the event of an emergency

(2) A minimum of 3 m (10 ft) of clear space between parked vehicles for accessibility for fire control purposes

(3) Prevention of any leakage from draining to an adjacent building or storm drain that is not suitably designed to handle fuel

(4) A minimum of 15 m (50 ft) from any parked aircraft and buildings other than maintenance facilities and garages for fuel servicing tank vehicles

5.19 Parking Aircraft Fuel Servicing Hydrant Vehicles and Carts.

Parking areas for unattended aircraft fuel servicing hydrant vehicles or carts shall be arranged to provide the following:

(1) Dispersal of the vehicles in the event of an emergency

(2) Prevention of any leakage from draining to an adjacent building or storm drain that is not suitably designed to handle fuel

5.20 Loading of Aircraft Fuel Servicing Tank Vehicles.

5.20.1 General Requirements.

5.20.1.1 Filling of the vehicle cargo tank shall be under the observation and control of a qualified and authorized operator at all times.

5.20.1.2 The required deadman and automatic overfill controls shall be in normal operating condition during the filling operation. They shall not be blocked open or otherwise bypassed.

5.20.1.3 The engine of the tank vehicle shall be shut off before starting to fill the tank.

5.20.1.4 To prevent leakage or overflow from expansion of the contents due to a rise in temperature.
atmospheric temperature or direct exposure to the sun, no cargo tank or compartment shall be loaded to the point where it is liquid full.

5.20.2 Top Loading.

5.20.2.1 Where loading tank trucks through open domes, a bond shall be established between the loading piping and the cargo tank to equalize potentials. The bond connection shall be made before the dome is opened and shall be removed only after the dome is closed.

5.20.2.2 Drop tubes attached to loading assemblies extending into the vehicle tank shall extend to the bottom of the tank and shall be maintained in that position until the tank is loaded to provide submerged loading and avoid splashing or free fall of fuel through the tank atmosphere. The flow rate into the tanks shall not exceed 25 percent of the maximum flow until the outlet is fully covered.

5.20.2.3 The level in the tank shall be visually monitored at all times during top loading.

5.20.3 Bottom Loading.

5.20.3.1 A bonding connection shall be made between the cargo tank and the loading rack before any fuel connections are made and shall remain in place throughout the loading operation.

5.20.3.2 The operator shall initiate fuel flow by means of a deadman control device.

5.20.3.3 The operator shall perform the precheck on each compartment shortly after flow has started to ensure that the automatic high-level shutoff system is functioning properly.

5.20.3.4 At least monthly the operator shall perform a check to ensure complete closure of the bottom-loading valve on the tank vehicle.

5.21 Rapid Refueling of Helicopters.

5.21.1 Only turbine engine helicopters fueled with JET A or JET A-1 fuels shall be permitted to be fueled while an onboard engine is operating. Helicopters permitted to be fueled while an onboard engine is operating shall have all sources of ignition of potential fuel spills located above the fuel inlet port(s) and above the vents or tank openings. Ignition sources shall include, but shall not be limited to, engines, exhausts, auxiliary power units (APUs), and combustion-type cabin heater exhausts.

5.21.2 Helicopter fueling while onboard engines are operating shall be permitted only under the following conditions:

(1) An FAA-licensed helicopter pilot shall be at the aircraft controls during the entire fuel servicing process.

(2)* Passengers shall be deboarded to a safe location prior to rapid refueling operations. Where the pilot in command deems it necessary for passengers to remain onboard for safety

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reasons, the provisions of 5.11.1 shall apply.

(3) Passengers shall not board or deboard during rapid refueling operations.

(4) Only designated personnel, properly trained in rapid refueling operations, shall operate the equipment. Written procedures shall include the safe handling of the fuel and equipment.

(5) All doors, windows, and access points allowing entry to the interior of the helicopter that are adjacent to, or in the immediate vicinity of, the fuel inlet ports shall be closed and shall remain closed during refueling operations.

(6) Fuel shall be dispensed into an open port from approved deadman-type nozzles, with a flow rate not to exceed 227 L/min (60 gpm), or it shall be dispensed through close-coupled pressure fueling ports. Where fuel is dispensed from fixed piping systems, the hose cabinet shall not extend into the rotor space. A curb or other approved barrier shall be provided to restrict the fuel servicing vehicle from coming closer than within 3 m (10 ft) of any helicopter rotating components. If a curb or approved barrier cannot be provided, fuel servicing vehicles shall be kept 6 m (20 ft) away from any helicopter rotating components, and a trained person shall direct fuel servicing vehicle approach and departure.

5.22 Self-Service Fueling.

Occupancy of the aircraft during self-service fueling shall be prohibited.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.2 Fire Hazards in Aircraft Fuel Servicing. Aircraft fuel servicing involves the transfer of a flammable or combustible liquid fuel between a bulk storage system and the fuel tanks of an aircraft. It includes both fueling and defueling. The transfer is usually accomplished by using a tank vehicle, a hydrant vehicle, a hydrant cart, a fuel servicing cabinet, or a fueling pit. Drums and pumps sometimes are used. The movement of the fuel through the pumps, piping, and filters of the transfer system causes the fuel to be charged electrostatically. If the charge on the fuel is sufficiently high when it arrives at the fuel tank, a static spark could occur that can ignite the fuel vapor.

During overwing fueling, the fuel is discharged into an opening in the aircraft fuel tank using a hose with a hand-held nozzle. The flow and splashing of fuel causes the generation of static electricity and the production of flammable mists and vapors. Top loading of tank vehicles creates similar hazards.

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Underwing servicing, hydrant servicing, and bottom loading of tank vehicles use hoses or flexible connections of metal tubing or piping, as well as devices to allow temporary connection of fuel transfer lines. These methods minimize the charge generation and misting hazards associated with overwing fueling and top loading.

Other potential sources of ignition that could present a hazard during aircraft fuel servicing include the following:

1. Operating aircraft engines, auxiliary power units, and heaters
2. Operating automotive or other internal combustion engine servicing equipment in the vicinity
3. Arcing of electrical circuits
4. Open flames
5. Energy from energized radar equipment
6. Lightning

The autoignition temperatures of turbine fuels (see Annex B, Aviation Fuel) are such that the residual heat of aircraft turbine engines after shutdown or the residual heat of turbine aircraft brakes following hard use can ignite such fuels if they are spilled or sprayed on these surfaces before they have cooled below the autoignition temperatures of the fuels.

Aircraft fuel tank vents usually are located some distance above ground level. Under normal conditions, fuel vapors from the vents are quickly dissipated and diluted safely. Fuel spilling from the vents of an overfilled tank is a much more serious hazard. Spills resulting from leaks or equipment failure also are a hazard.

Fire prevention measures in aircraft fuel servicing are directed principally toward the following:

1. Prevention of fuel spillage
2. Elimination or control of potential ignition sources

**A.3.2.1 Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

**A.3.2.2 Authority Having Jurisdiction.** The phrase “authority having jurisdiction” is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their Copyright NFPA
responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.8 Aviation Fuel. See Annex B.

A.3.3.11 Cargo Tank. The term “cargo tank” does not apply to any container used solely for the purpose of supplying fuel for the propulsion of the vehicle on which it is mounted.

A.3.3.16 Fuel Servicing Station. This unit can be installed in a cabinet above or below ground.

A.4.1.2.5 The charge on the fuel can be reduced by the use of a static dissipater additive that increases the electrical conductivity of the fuel and thereby allows the charge to relax or dissipate more quickly, or by the use of a relaxation chamber that increases the residence time of the fuel downstream of the filter to at least 30 seconds, thereby allowing most of the charge to dissipate before the fuel arrives at the receiving tank.

API RP 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents, recommends a 30-second relaxation time for loading tank trucks and refuelers. However, it has not been a common practice to require a similar relaxation time for aircraft refueling, primarily because of the relatively few electrostatic incidents that have occurred during aircraft fueling.

In filling tank trucks or storage tanks, API RP 2003 recommends that at least 30 seconds of residence time be provided downstream of a filter in order to allow static charges generated in flowing fuel to relax before fuel enters the tank.

The reason it is possible to fuel aircraft safely with low conductivity fuel without providing 30 seconds of relaxation time is due primarily to the difference in the geometry of aircraft tanks as compared with tank truck compartments. Flow into the aircraft normally is subdivided into several tanks simultaneously and also distributed into adjoining compartments of each tank by a multihole inlet. Bachman and Dukek (1972) conducted full-scale research using a simulated large aircraft tank and concluded that none of the tanks or compartments hold sufficient fuel to allow enough charges to accumulate and create large surface voltages. Slower fill rates per

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compartment also allow more charge to relax.

Additionally, the inlet system of most aircraft tanks directs fuel towards the bottom of the tank to avoid splashing that generates more charge. Finally, while the hoses that connect the fueler to the aircraft provide only a few seconds of residence time for charge relaxation at high rates of flow, the actual relaxation volume in the system is significantly greater where a coated screen is used as a second stage water barrier. In this case, the vessels volume after the first stage filter coalescer could represent an additional 15 seconds of residence time for charge relaxation. (The coated screen, unlike other water barriers, does not generate charge.)

A flammable vapor space in the tank due to the presence of JET B or JP-4 fuels still constitutes a potential hazard. Therefore, to minimize the chance for static ignition, FAA regulations require that fueling be conducted at half of the rated flow where civil aircraft have used such fuels.

A.4.1.4.2 Radar Ignition Hazards. The beam of radar equipment has been known to cause ignition of flammable vapor–air mixtures from inductive electric heating of solid materials or from electrical arcs or sparks from chance resonant conditions. The ability of an arc to ignite flammable vapor–air mixtures depends on the total energy of the arc and the time lapse involved in the arc's duration, which is related to the dissipation characteristics of the energy involved. The intensity or peak power output of the radar unit, therefore, is a key factor in establishing safe distances between the radar antenna and fueling operations, fuel storage or fuel loading rack areas, fuel tank truck operations, or any operations where flammable liquids and vapors could be present or created.

Most commercially available weather-mapping airborne radar equipment operates at peak power outputs, varying from 25 kW to 90 kW. Normally this equipment should not be operated on the ground. Tests have shown that the beam of this equipment can induce energy capable of firing flash bulbs at considerable distances. If the equipment is operated on the ground for service checking or for any other reason, the beam should not be directed toward any of the hazards described in the previous paragraph that are located within 30 m (100 ft). (WARNING: Higher power radar equipment can require greater distances.)

Airport surface detection radar operates under a peak power output of 50 kW. It is fixed rather than airborne equipment.

Airborne surveillance radar of the type currently carried on military aircraft has a high peak power output. Aircraft carrying this type of radar can be readily distinguished by radomes atop or below the fuselage, or both.

Aircraft warning radar installations are the most powerful. Most of these installations are, however, remotely located from the hazards specified in the first paragraph and therefore are not covered herein. Ground radar for approach control or traffic pattern surveillance is considered the most fire hazardous type of radar normally operating at an airport. The latter type of equipment has a peak power output of 5 MW. Where possible, new installations of this type of equipment should be located at least 150 m (500 ft) from any of the hazards described.
in the first paragraph.

**A.4.1.6.1** Multipurpose dry chemical (ammonium phosphate) should not be selected due to corrosion concerns relative to the agent. Carbon dioxide extinguishers should not be selected due to their limited range and effectiveness in windy conditions.

**A.4.1.7** Deadman controls should be designed so that the operator can use them comfortably while wearing gloves and hold them for the time needed to complete the operation. A pistol grip deadman device that is squeezed to operate is preferable to a small button that needs to be held by a thumb or finger.

**A.4.2** The section on aircraft refueling hose has been altered extensively by referencing API BULL 1529, *Aviation Fueling Hose*. NFPA 407 formerly contained many requirements for hose, but it was intended only to address features that could be related to a fire or the results of a fire. It was not until 1982 that a comprehensive aircraft refueling hose specification was published by API. Prior to that time, NFPA 407 was the only document in existence that addressed this subject.

API BULL 1529 deals with all aspects of hose safety, including the couplings that are acceptable.

NFPA 407 recognizes the need for an extensive document such as API BULL 1529 and requires hoses that meet that standard. However, it is important to recognize that API does no testing and it does not regulate those manufacturers who claim to sell hose that meets API BULL 1529. The hose user and the cognizant authority in charge could find it prudent to require hose manufacturers to produce copies of test reports or documents that certify that hoses using the identical construction and compounds have been tested and have passed all requirements of API BULL 1529 satisfactorily.

**A.4.3.6.1** Wherever possible, flexible engine exhaust pipe should be avoided due to the potential of breaking. Where used, stainless steel is preferable, and the length should be limited to approximately 457 mm (18 in.).

**A.4.3.7.4** *Electrical Equipment in Aircraft Fuel Servicing Vehicle or Cart Engine Compartments.* Equipment contained in the engine compartment or vehicle cab and located 457 mm (18 in.) or more above ground can be permitted to be of the general purpose type.

**A.4.3.21.4** *Optional Precautions Against Misfueling of Aircraft Fuel Servicing Tank Vehicles.* The coupler and truck fitting should be equipped with coded lugs or a mechanical device to ensure product selection and to prevent mixing of products. This might not be feasible on over-the-road-type tank vehicles.

**A.4.4.4.1** *Optional Guidance on Fuel Storage Tanks.* Where pressure tanks are used, details on construction, spacing, and location should be in accordance with industry good practice and approved by the authority having jurisdiction. When AVGAS, MOGAS, or JET B turbine fuels are stored in bulk quantities in aboveground tanks, they should be stored in floating roof-type tanks. Covered floating roof tanks minimize the hazardous flammable vapor–air space above Copyright NFPA
the liquid level. The vapor spaces of underground tanks storing fuels should not be interconnected.

**A.4.4.5.2 Discussion of Fuel Transfer Methods.** Fuel transfer by pumping is the more common procedure and normally is preferred from a fire protection standpoint, since it allows rapid shutdown of fuel flow through pump shutdown. Gravity transfer is the simplest method but normally is limited to relatively low flow rates. Because the static head does exert some pressure in the system, a safety shutdown should include a valve or valves located as close to the tank as practicable.

**A.4.4.5.4 Alarms for Emergency Shutoff System.** The operation of the emergency shutoff control should sound an alarm at the airport fire crew station and at the fuel storage facility.

**A.4.4.6.11 System Component Isolation Guidance.** Flanged connections should be provided for ease of dismantling and to avoid cutting and welding after the system has been placed in service. The location of these isolation devices depends upon the size and character of each system, but the following locations generally apply (see Figure A.4.4.6.11):

(1) At each storage tank
(2) At each pump
(3) At each filter separator
(4) At each hydrant or on each hydrant lateral
(5) At each flow regulator or pressure control valve
A.4.4.7.3 Location of Surge Suppressors. Where surge suppressors are necessary, they should be located so that exposure to vehicular traffic, weather conditions, and the result of accidental rupture is minimized.

A.4.4.12 Cathodic protection is recommended for metal components of airport fueling systems and fuel storage facilities that are in contact with the ground. There are two types of cathodic protection as follows:

(1) The galvanic anode method, which generates its own current

(2) The impressed current method, which has an external current source

A.4.6.3.5 Although it is not technologically possible to have a bonding system that is 100 percent fail-safe, there are devices available that can help ensure that a proper bond has been established before fueling.
**A.5.2 Handling Fuel Spills.** The following actions are appropriate in the event of a fuel spill, although each spill should be treated as an individual case due to such variables as the size of the spill, type of flammable or combustible liquid involved, wind and weather conditions, equipment arrangement, aircraft occupancy, emergency equipment, and personnel available:

1. The flow of fuel should be stopped, if possible. If the fuel is discovered leaking or spilling from fuel servicing equipment or hoses, the emergency fuel shutoff should be operated at once. If the fuel is discovered leaking or spilling from the aircraft at the filler opening, vent line, or tank seams during fueling operations, fueling should be stopped immediately. Evacuation of the aircraft should be ordered when necessary. The aircraft then should be thoroughly checked for damage or entrance of flammable liquid or vapors into any concealed wing or fuselage area, and corrective action should be taken as necessary before it is returned to normal operational service.

2. The airport fire crew should be notified if the spill presents a fire hazard. The only routine exceptions are for small spills. Supervisory personnel should be notified to ensure that operations in progress can be continued safely or halted until the emergency is past and that corrective measures can be taken to prevent recurrence of a similar accident.

3. It could be necessary to evacuate the aircraft if the spill poses a serious fire exposure to the aircraft or its occupants. Walking through the liquid area of the fuel spill should not be permitted. Persons who have been sprayed with fuel or had their clothing soaked with fuel should go to a place of refuge, remove their clothing, and wash. Individuals whose clothing has been ignited should be wrapped in blankets, coats, or other items or should be told to or forced to roll on the ground.

4. Mobile fueling equipment and all other mobile equipment should be withdrawn from the area or left as is until the spilled fuel is removed or made safe. No fixed rule can be made as fire safety varies with circumstances. Shutting down equipment or moving vehicles can provide a source of ignition if no fire immediately results from the spillage.

5. Aircraft, automotive, or spark-producing equipment in the area should not be started before the spilled fuel is removed or made safe. If a vehicle or cart engine is running at the time of the spill, it normally is good practice to drive the vehicle away from the hazard area unless the hazard to personnel is judged too severe. Fuel servicing vehicles or carts in operation at the time of the spill should not be moved until a check is made to verify that any fuel hose that could have been in use or connected between the vehicle and the aircraft is safely stowed.

6. If any aircraft engine is operating at the time of the spill, it normally is good practice to move the aircraft away from the hazard area unless air currents set up by operating power plants would aggravate the extent or the nature of the existing vapor hazard.

7. If circumstances dictate that operating internal combustion engine equipment within a spill area that has not ignited should be shut down, engine speeds should be reduced to idle.
prior to cutting ignition in order to prevent backfire.

(8) The volatility of the fuel can be a major factor in the initial severity of the hazard created by a spill. Gasoline and other low flash point fuels at normal temperatures and pressures produce vapors that are capable of forming ignitable mixtures with the air near the surface of the liquid, whereas this condition does not normally exist with kerosene fuels (JET A or JET A-1) except where ambient temperatures are 38°C (100°F) or above or where the liquid has been heated to a similar temperature.

(9) Spills of gasoline and low flash point turbine fuels (JET B) greater than 3 m (10 ft) in any dimension and covering an area of over 5 m² (50 ft²) or that are of an ongoing nature should be blanketed or covered with foam. The nature of the ground surface and the existing exposure conditions dictate the exact method to be followed. Such fuels should not be washed down sewers or drains. The decision to use a sewer or drain should be made only by the chief of the airport fire brigade or the fire department. If fuels do enter sewers, either intentionally or unintentionally, large volumes of water should be introduced to flush such sewers or drains as quickly as possible to dilute the flammable liquid content of the sewer or drain to the maximum possible extent. Normal operations involving ignition sources (including aircraft and vehicle operations) should be prohibited on surface areas adjacent to open drains or manholes from which flammable vapors could issue due to the introduction of liquids into the sewer system until it can be established that no flammable vapor–air mixture is present in the proximity. (NOTE: NFPA 415, Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways, provides further information on aircraft fueling ramp drainage designs to control the flow of fuel that could be spilled on a ramp and to minimize the resulting possible danger.)

(10) Spills of kerosene grades of aviation fuels (JET A or JET A-1) greater than 3 m (10 ft) in any dimension and covering an area of over 5 m² (50 ft²) or that are of an ongoing nature and that have not ignited should be blanketed or covered with foam if there is danger of ignition. If there is no danger of ignition, an absorbent compound or an emulsion-type cleaner can be used to clean the area. Kerosene does not evaporate readily at normal temperatures and should be cleaned up. Smaller spills can be cleaned up using an approved, mineral-type, oil absorbent.

(11) Aircraft on which fuel has been spilled should be inspected thoroughly to ensure that no fuel or fuel vapors have accumulated in flap well areas or internal wing sections not designed for fuel tankage. Any cargo, baggage, express, mail sacks, or similar items that have been wetted by fuel should be decontaminated before being placed aboard any aircraft.

A.5.4 Bonding. Hydrocarbon fuels, such as aviation gasoline and JET A, generate electrostatic charge when passing through the pumps, filters, and piping of a fuel transfer system. (The primary electrostatic generator is the filter/separator that increases the level of charge on a fuel by a factor of 100 or more as compared with pipe flow.) Splashing, spraying, or free-falling of Copyright NFPA
the fuel further enhances the charge. When charged fuel arrives at the receiving tank (cargo tank or aircraft fuel tank) one of two possible events will occur:

(1) The charge will relax harmlessly to ground.

(2) If the charge or the fuel is sufficiently high, a spark discharge can occur. Whether or not an ignition follows depends on the energy (and duration) of the discharge and the composition of the fuel/air mixture in the vapor space (i.e., whether or not it is in the flammable range).

The amount of charge on a fuel when it arrives at the receiving tank, and hence its tendency to cause a spark discharge, depends on the nature and amount of impurities in the fuel, its electrical conductivity, the nature of the filter media (if present), and the relaxation time of the system [i.e., the residence time of the fuel in the system between the filter (separator) and the receiving tank]. The time needed for this charge to dissipate is dependent upon the conductivity of the fuels; it could be a fraction of a second or several minutes.

No amount of bonding or grounding prevents discharges from occurring inside of a fuel tank. Bonding ensures that the fueling equipment and the receiving tank (aircraft or fueler) are at the same potential and provides a path for the charges separated in the fuel transfer system (primarily the filter/separator) to combine with and neutralize the charges in the fuel. Also, in overwing fueling and in top loading of cargo tanks, bonding ensures that the fuel nozzle or the fill pipe is at the same potential as the receiving tank, so that a spark does not occur when the nozzle or fill pipe is inserted into the tank opening. For this reason, the bonding wire must be connected before the tank is opened.

Grounding during aircraft fueling or refueler loading is no longer required because of the following:

(1) It does not prevent sparking at the fuel surface (see NFPA 77, Recommended Practice on Static Electricity).

(2) It is not required by NFPA 77, Recommended Practice on Static Electricity.

(3) The static wire might not be able to conduct the current in the event of an electrical fault in the ground support equipment connected to the aircraft and could constitute an ignition source if the wire fuses. If ground support equipment is connected to the aircraft or if other operations are being conducted that necessitate electrical earthing, then separate connections should be made for this purpose. Static electrical grounding points can have high resistance and, therefore, are unsuitable for grounding. For a more complete discussion of static electricity in fuels, see NFPA 77, Recommended Practice on Static Electricity.

A.5.4.3 Ordinary plastic funnels or other nonconducting materials can increase static generation. The use of chamois as a filter is extremely hazardous.

A.5.7 Electric Hand Lamps. Electric hand lamps used in the immediate proximity of the Copyright NFPA
fueling operation should be of the type approved for use in NFPA 70, *National Electrical Code®*, Class I, Division 1, Group D hazardous locations. There is no supportable basis for requiring in the petroleum industry the use of approved, listed, or permitted two- or three-cell flashlights to avoid igniting Class I, Group D vapors.

**A.5.7.2 Aircraft Ground-Power Generators.** Aircraft ground-power generators should be located as far as practical from aircraft fueling points and tank vents to reduce the danger of igniting flammable vapors that could be discharged during fueling operations at sparking contacts or on hot surfaces of the generators.

**A.5.9** It is impossible to establish precise rules for fueling when there are electrical storms in the vicinity of the airport. The distance of the storm from the airport, the direction in which it is traveling, and its intensity are all factors to be weighed in making the decision to suspend fueling operations temporarily. Experience and good judgment are the best guides. Sound travels approximately 322 m/sec (\(\frac{1}{2}\) mi/sec). The approximate number of miles to the storm can be determined by counting the seconds between a flash of lightning and the sound of thunder and dividing by 5.

**A.5.10.2 Aircraft Fuel Servicing Locations.** The precautions in 5.10.2 are intended to minimize the danger of the ignition of any flammable vapors discharged during fueling and of fuel spills by sources of ignition likely to be present in airport terminal buildings.

**A.5.13 Portable Fire Extinguishers on Aircraft Servicing Ramps or Aprons.** Fire extinguishers for ramps where fueling operations are conducted are intended to provide an immediate means of fire protection in an area likely to contain a high concentration of personnel and valuable equipment. The prominent and strategic positioning of portable fire extinguishers is essential in order for them to be of a maximum value in the event of an emergency. Extinguishers should not be located in probable spill areas. For normal, single parking configurations, extinguishers specified for protection of fuel servicing operations should be located along the fence, at terminal building egress points, or at emergency remote control stations of airport fixed-fuel systems. To provide accessibility from adjoining gates, particularly where more than one unit is specified, extinguishers can be permitted to be located approximately midway between gate positions. Where this is done, the maximum distance between extinguishers should not be over 90 m (300 ft). Where the specified extinguishers are not located along the fence but are brought into the servicing area prior to the fueling operation, they should be located upwind not over 30 m (100 ft) from the aircraft being serviced. For protection of fuel servicing of aircraft that are double parked or triple parked, extinguishers should be located upwind not over 30 m (100 ft) from the aircraft being serviced.

**A.5.13.5 Protection of Extinguishers Against Inclement Weather.** During inclement weather, extinguishers not in enclosed compartments may be permitted to be protected by canvas or plastic covers. If icing occurs, the extinguisher should be sprayed with deicing fluid.

**A.5.13.6 Training of Personnel in the Utilization of Extinguishers.** Fuel servicing personnel should be given adequate training with extinguishers so that such equipment is used effectively.

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in an emergency. Such training should be given on fires of the type that could be encountered on the job. To ensure prompt action in the event of a spill or other hazardous condition developing during fueling operations, aircraft servicing personnel also should be trained in the operation of emergency fuel shutoff controls. Each new fuel servicing employee should be given indoctrination training covering these and similar safety essentials that are related to the job. Follow-up and advanced training should be given as soon as the employee is sufficiently acquainted with the work to benefit from such training. Supervisors should be given training in the more technical aspects of fire safety so that they understand the reason for these and similar requirements and have an appreciation for the responsibility of a supervisor or the safety of an operation.

A.5.16 Failure of aircraft fueling hose in service is a potential source of fuel spillage and a potential fire hazard. The principal reasons for failure of aircraft fueling hoses include the following:

(1) Using damaged hoses
(2) Using aged hoses
(3) Exceeding pressure limits
(4) Improper installation

A.5.16.4 Splicing of a hose with couplings alters the design bend radius of the hose, creating two kinks when the hose is wound on a drum.

A.5.21.2(2) If passengers remain onboard an aircraft during fuel servicing, at least one person trained in emergency evacuation procedures is required to be aboard (see 5.11.1). It is not intended that the pilot in command perform this function.

Annex B Aviation Fuel

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 General.

The fire hazard properties of aviation fuels are best described by analyzing the factors described in B.2 through B.3.

B.2 Susceptibility to or Ease of Ignition.

B.2.1 Flash Point. The flash point of standard grades of aviation gasoline has been established at approximately -46°C (-50°F) at sea level by the Tag closed-cup method. The flash point of JET B turbine fuel is not regulated by specification, but samples have been tested by the closed-cup method and have been found to be as low as -23°C (-10°F) at sea level. JET A or
kerosene grade turbine fuels have a minimum flash point of 38°C (100°F).

Aviation gasoline and JET B turbine produce large volumes of vapor and are capable of forming ignitible mixtures with air even at very low temperatures. Kerosene grades of turbine fuel (JET A) do not produce ignitible mixtures with air at normal temperatures and pressures, but when a JET A turbine fuel is heated above its flash point (or exists in the form of a mist), the mixture can be ignited. This condition can develop where temperatures are 38°C (100°F) or higher.

**B.2.2 Flammability Conditions.** The lower limit represents the minimum concentration while the upper limit defines the maximum amount of fuel vapors in air that allows combustion. The generally accepted flammability range by volume for most gasolines is 1.4 percent to 7.6 percent. The average range for JET B turbine fuels is 1.16 percent to 7.63 percent. The average range for kerosene grade (JET A) turbine fuels is 0.74 percent to 5.32 percent.

More significant than the strict flammability range is the temperature range in which it is possible for such flammable vapor–air mixtures to form. At sea level in a storage tank, such a temperature range for aviation gasoline is approximately -46°C to -1°C (-50°F to 30°F); for JET B turbine fuels, the range is approximately -23°C to 27°C (-10°F to 80°F); and, for kerosene grade (JET A) turbine fuels, the range is approximately 38°C to 74°C (100°F to 165°F). It is evident that JET B turbine fuels represent the most serious practical hazard under normal temperature conditions.

Air enters as vented tanks are drained, and, during such periods, the flammable vapor conditions can change drastically. The same change occurs when the aircraft descends in altitude. These facts are important in assessing the degree of hazard that could exist in a tank containing any of these volatile products during or after such air mixing.

Under aircraft crash impact conditions where fuel mists are created following tank failures, all of the fuels are readily ignitible at essentially all ambient temperatures. Under these conditions, fuel in mist form presents a hazard equal to fuel in vapor form with respect to flammability limits.

**B.2.3 Vapor Pressure.** The vapor pressure of these fuels is the pressure of the vapor at any given temperature at which the vapor and liquid phases of the substance are in equilibrium in a closed container. Such pressures vary with the temperature, but, most commonly, information on hydrocarbon mixtures is obtained using the Reid method, in which the pressures are measured at 38°C (100°F) [see ASTM D 323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*]. The Reid vapor pressures of average grades of aviation gasoline have a range of 38 kPa to 48 kPa (5.5 psi to 7.0 psi). For JET B turbine fuels, the Reid vapor pressure range is 14 kPa to 21 kPa (2.0 psi to 3.0 psi). JET A (kerosene grade) turbine fuels have a Reid vapor pressure range of approximately 0.7 kPa (0.1 psi).

The practical significance of this characteristic of the three grades of fuel is that the standard grades of aviation gasoline do produce flammable vapors in ignitible amounts at normal temperatures and pressures. However, where these vapors are confined, the vapor–air mixture
over the liquid surface most often is too rich to be ignited by sparks, since it is above the upper flammability limit. With JET B turbine fuel, due to its relatively low vapor pressure, the vapor–air mixture above the liquid surface under normal temperature and pressure conditions frequently is within the flammability range. This means that ignition of JET B turbine fuel vapors either within or exterior to a tank can cause violent combustion within the confined space if flame enters. The JET A (kerosene grade) turbine fuels do not produce flammable vapors in ignitable amounts unless the fuel temperature is above 38°C (100°F).

**B.2.4 Autoignition Temperature.** The autoignition temperature is the minimum temperature of a substance that will initiate or cause self-sustained combustion independently of any sparks or other means of ignition.

Under one set of test conditions, standard grades of aviation gasoline have ignition temperatures approximating 449°C (840°F). Turbine fuels have ignition temperatures among the lowest found for hydrocarbons and are considerably lower than those for aviation gasoline. For example, the autoignition temperature of a JET B turbine fuel was measured using the same test procedure at approximately 249°C (480°F). A JET A (kerosene grade) turbine fuel tested under the same method was found to have an autoignition temperature approximating 246°C (475°F). Temperatures in this range can exist for a considerable period in turbine engines after shutdown or on brake surfaces following hard use.

It should be noted that these temperatures are derived from reproducible laboratory test procedures, whereas, in actual field conditions, these ignition temperatures could be higher.

**B.2.5 Distillation Range.** The initial and the end boiling points of standard grades of aviation gasoline are approximately 43°C and 163°C (110°F and 325°F), respectively. The initial boiling point of JET B turbine fuels is approximately 57°C (135°F) and the end point is approximately 252°C (485°F). The only marked difference in the distillation ranges of the three fuels under consideration occurs in the JET A or kerosene grades of turbine fuels that have initial boiling points of approximately 163°C (325°F) and end points of approximately 300°C (572°F). Note that initial and end boiling points should be determined by ASTM D 86, *Standard Test Method for Distillation of Petroleum Products*.

The boiling range, along with the flash points and vapor pressures of the fuels, indicates the relative volatility of the fuels; the initial and end boiling points indicate the overall volatility of a fuel through its entire distillation range; the flash point and vapor pressures measure the initial tendency of the fuel to vaporize.

**B.3 Fire Severity After Ignition.**

**B.3.1 Heat of Combustion.** The net heat of combustion of gasoline normally is quoted as approximately 44.19 kJ/kg (19,000 Btu/lb). For JET B turbine fuels, the average is approximately 43.50 kJ/kg (18,700 Btu/lb), while for the JET A (kerosene grades) of turbine fuels it is approximately 43.26 kJ/kg (18,600 Btu/lb).

These figures for heat of combustion clearly indicate that there is little difference in the heats of combustion...
B.3.2 Rate of Flame Spread. Where fuel is spilled, there is a marked difference in the rates of flame spread over pools of JET A or kerosene grades of turbine fuel as compared with the other two types. Under these conditions, a direct relationship exists between the rate of flame spread and the vapor pressures of the materials. A report dated October 1973 entitled An Evaluation of the Relative Fire Hazards of JET A and JET B for Commercial Flight (N74-10709) states that the rate (of flame spread) for JP-4 (JET B) is about 30 times greater than for aviation kerosene (JET A) at the temperatures most often encountered. This is an important factor in evaluating the severity of the fire hazard encountered under these conditions and also is a factor that affects the ease of fire control under similar conditions.

This slower rate of flame propagation for JET A or kerosene grades of turbine fuel does not occur, however, where the fuel is released as a fuel mist, as frequently results in aircraft impact accidents or where the fuels are heated to or above their flash point. If a flammable or combustible liquid exists in mist form or is at a temperature above its flash point, the speed of flame spread in the mist or vapor is essentially the same, regardless of the liquid spilled.

B.4 Fire Control Factors.

B.4.1 Relative Density. The relative density of a material is commonly expressed as related to water at 16°C (60°F). All these fuels are lighter than water; the relative density of aviation gasolines is normally quoted at about 0.70, JET B turbine fuels at about 0.78, and the JET A (kerosene grade) fuels at about 0.81.

This means that, with respect to fire control, all of the fuels float on water. This can be a handicap during fire-fighting operations under certain conditions where sizable quantities of spilled fuel are involved.

B.4.2 Solubility in Water. All three of the fuels are essentially nonsoluble in water. Fires involving all three fuels can be handled with regular foam concentrates (as opposed to alcohol types).

The amount of water that is entrained in the fuel due to water contamination is not particularly significant from a fire hazard viewpoint, except for the fact that the amount of water increases the static generation hazard of the fuel.

B.4.3 Standard Grades of Aviation Fuels. Standard grades of aviation fuels include the following:

(1) Aviation gasoline (AVGAS) includes all gasoline grades of fuel for reciprocating engine-powered aircraft of any octane rating. It has the general fire hazard characteristics of ordinary automotive gasoline (MOGAS).

(2) JET A and JET A-1 are kerosene grades of fuel for turbine engine-powered aircraft, whatever the trade name or designation. JET A has a -40°C (-40°F) freezing point (maximum); JET A-1 incorporates special low temperature characteristics for certain
operations having a -47°C (-53°F) freezing point (maximum). JP-8 (identical to JET A except for the additive package) and JP-5 (slightly less volatile than either JET A or JET A-1) are used by certain U.S. military forces. JET A and JP-8 are known in the United Kingdom and in many former U.K. areas of influence as AVTUR, whereas JP-5 is similar to the U.K. designated AVCAT.

(3) JET B is a blend of gasoline and kerosene grades of fuel for turbine engine-powered aircraft, whatever the trade name or designation. JET B is a relatively wide boiling range volatile distillate having a 51°C (60°F) freezing point (maximum). JP-4 is one grade of JET B fuel used by the U.S. military forces; JP-4 has identical specifications to JET B as they relate to fire hazards. This fuel is known in the United Kingdom as AVTAG.

Annex C Informational References

C.1 Referenced Publications.

The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

C.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 77, Recommended Practice on Static Electricity, 2000 edition.

C.1.2 Other Publications.

C.1.2.1 API Publications. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005.


C.1.2.2 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.


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C.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

C.2.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.


C.2.2 Other Publications.

C.2.2.1 API Publication. American Petroleum Institute, 1220 L Street NW, Washington, DC 20005.


C.2.2.2 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.


C.3 References for Extracts.

The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.


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**Formal Interpretations**

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Formal Interpretation

NFPA 407
Standard for Aircraft Fuel Servicing
2001 Edition

Reference: 2-1.2.5
F.I. No.: 407-96-1

Question 1: Does Paragraph 2-1.2.5 apply to the actual refueling of an aircraft?
Answer: No.

Question 2: Does Paragraph 2-1.2.5 apply to bulk fuel handling on the airport as explained in A-2-1.2.5?
Answer: Yes.

Issue Edition: 1996
Reference: 2-1.2.5
Issue Date: March 28, 2001
Effective Date: April 17, 2001
Tentative Interim Amendment

NFPA 407

Standard for Aircraft Fuel Servicing

2001 Edition

Reference: 5.7.6, Annex A
TIA 01-1 (NFPA 407)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 407, Standard for Aircraft Fuel Servicing, 2001 edition. The TIA was processed by the Aircraft Fuel Servicing Committee, and was issued by the Standards Council on July 17, 2003, with an effective date of August 6, 2003.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Revise the text of 5.7.6 as follows:

5.7.6* Communication equipment used during aircraft fuel servicing operations within 3 m (10 ft) of the fueling equipment or the fill or vent points of aircraft fuel systems shall be listed as intrinsically safe for Class I Division 1, Group D hazardous (classified) locations, in accordance with UL 913, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations.

2. Add a new paragraph to Annex A as follows:

A.5.7.6 For further information on intrinsically safe apparatus see UL 913:2002, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations: FM Class 3610:1999 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, & III Division 1, and Class I, Zone 0 & 1 Hazardous (Classified) Locations: ANSI/ISA 12.02.01:2002 - Electrical Apparatus for Use in Class I, Zones 0, 1, & 2 Hazardous (Classified) Locations - Intrinsic Safety "i", or ANSI/UL 60079-11:2002 Electrical Apparatus for Use in Class I, Zones 0, 1, & 2 Hazardous (Classified) Locations - Intrinsic Safety "i".

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INDEX


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Aircraft
Access, fire fighting .................................................. 4.1.5
Aircraft fuel servicing .................................................. 3.3.27.1
Aircraft fuel servicing hydrant vehicles see also Aircraft fuel servicing hydrant vehicles; Aircraft fuel servicing tank vehicles; Hydrant cars
Bonding .......................................................... 4.3.8
Cabinets .......................................................... 4.3.5
Containers/systems for flammable liquids ..................... 4.3.1
Definition .......................................................... 3.3.35.1
Emergency shutoff controls see Emergency fuel shutoff
Engine exhaust system ............................................ 4.3.6, A.4.3.6.1
Fill openings and top flashings .................................. 4.3.13
Fire extinguishers for ............................................. 4.3.9
Fuel control valves ............................................. 4.3.16.1 to 4.3.16.2
Lighting and electrical equipment .................................. 4.3.7, A.4.3.7.4
Loading .......................................................... 5.19
Maintenance ...................................................... 5.17
Materials .......................................................... 4.3.1
Outlet valves ...................................................... 4.3.15
Piping, joints, flanged connections, and couplings ........... 4.3.14
Portable fire extinguishers on ................................... 5.13.2
Positioning of ...................................................... 5.12
Product identification signs ........................................ 4.3.18
Smoking restrictions .............................................. 4.3.11
Static protection .................................................. 4.3.3
Aircraft fuel servicing (definition) ............................... 3.3.27.1
Aircraft fuel servicing hydrant vehicles see also Aircraft fuel servicing hydrant vehicles
Definition .......................................................... 3.3.35.1
Emergency remote control stations ............................... 4.3.22
Fire extinguishers on ............................................. 4.3.9.2, 5.13.3
Parking .......................................................... 5.19
Aircraft fuel servicing ramps or aprons
Definition .......................................................... 3.3.4
Drainage .......................................................... 4.4.11.1
Electric equipment .................................................. 5.7, A.5.7
Fueling hydrants and pits below ................................. 4.4.10.2 to 4.4.10.3, 4.4.11.2
Open flames on ..................................................... 5.18
Portable fire extinguishers on .................................... 5.13.1, A.5.13
Aircraft fuel servicing tank vehicles (fuelers) see also Aircraft fuel servicing hydrant vehicles; Cargo tanks; Tank full trailers; Tank semitrailers
Definition .......................................................... 3.3.35.2
Emergency remote control stations ............................... 4.3.22
Fire extinguishers on ............................................. 4.3.9.1
Fuel dispensing system ............................................ 4.3.16
Loading .......................................................... 4.3.19, 5.20
Bottom loading .................................................... 4.3.21, 5.20.3, A.4.3.21.4
Top loading ....................................................... 4.3.20, 5.20.2
Parking .......................................................... 5.18
Public highways, use on .......................................... 4.3.3
Spill control ....................................................... 5.2.7 to 5.2.8
Aircraft ground-power generators .................................. 3.3.27.1
Aircraft radar equipment ........................................... 4.3.14.1
Aircraft fuel servicing systems .................................... 4.4
Acceptance inspection ............................................. 4.4.2
Cathodic protection .................................................. 4.4.12
Design approval .................................................... 4.4.1
Drainage .......................................................... 4.4.11
Electrical requirements ............................................ 4.4.9
Emergency shutoff system see Emergency fuel shutoff
Filter vessels ...................................................... 4.4.8
Fuel flow control .................................................. 4.4.7, A.4.4.7.3
Fuel storage tanks .................................................. 4.4.4, A.4.4.4.1
Requirements ..................................................... 4.4.3
Tests ............................................................... 4.4.13
Transfer piping .................................................... 4.4.6
Approved (definition) ............................................ 3.2.1, A.3.2.1
Aircraft fueling .................................................... 3.3.8, Annex B
Authority having jurisdiction (definition) ........................ 3.2.2, A.3.2.2
Auxiliary power unit, operation during fueling ................. 5.5.1 Ex.
Aviation fuel
Definition .......................................................... 3.3.8, Annex B
Hazardous of ...................................................... 1.2, 1.2.2, A.1.2, Annex B
Bonding .......................................................... 4.1.2, 4.3.3.1 to 4.3.3.2, 4.6.3.5,
For top loading .................................................... 5.20.2.1
For top loading .................................................... 5.20.3.1
Bulkheads ......................................................... 4.3.12.4
Definition .......................................................... 3.3.9
Burst pressure see Pressure
Cabinets
Fuel servicing ...................................................... 4.4.10
Vehicle auxiliary equipment ....................................... 4.3.8
Cargo tanks ......................................................... 4.3.12
Baffles ........................................................... 4.3.12.4
Definition ......................................................... 3.3.11, A.3.3.11
Tests .............................................................. 4.3.17
Cathodic protection .................................................. 4.4.12
A.4.4.12
Definition .......................................................... 3.3.12
Containers, flammable liquid .................................... 4.3.5
Deadman controls see also Emergency fuel shutoff
For bottom loading .................................................. 4.3.21.7, 5.20.3.2, A.4.3.21.4
Definition .......................................................... 3.3.13
Monitoring ......................................................... 5.15
For top loading ..................................................... 4.3.20.5
Definitions ......................................................... Chap. 3, A.3
Defueling .......................................................... 5.14
Design ............................................................. Chap. 4, A.4
Electric hand lamps .................................................. A.5.7
Definition .......................................................... 3.3.14
Electrical equipment
Aircraft fuel servicing ramps ...................................... 5.7, A.5.7
Aircraft fuel servicing vehicles .................................... 4.3.7, A.4.3.7.4
Airport fueling systems ........................................... 4.4.9
Electrostatic hazards see Static electricity

2001 Edition

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AIRCRAFT FUEL SERVICING

Emergency fuel shutoff ........................................ 5.2.5; see also Deadman controls
Airport fuel systems ........................................... 4.4.3.3, 4.4.5, A.4.4.5.2, A.4.4.5.4
Cargo tank or compartment outlets .......................... 4.3.15
Definition ......................................................... 3.3.15
Operations ......................................................... 4.6.10.3
Rooftop heliports ................................................ 4.5.9
Self-service aircraft fueling ................................... 4.6.3.3, 4.6.4 to 4.6.10
Tank vehicle loading stations, remote control of .......... 4.3.22
Employees
Lighters and matches carried by ............................... 5.8.5 to 5.8.6
Training ......................................................... 4.5.11, 5.1.1, 5.13.6, A.5.13.6
Engines
Aircraft, operation during fuel servicing ..................... 5.5.1, 5.21.1 to 5.21.2
Internal combustion, around aircraft .................................. 5.6
Extinguishers, portable fire ...................................... 4.1.6, A.4.1.6.1
Aircraft fuel servicing vehicles ................................ 4.3.9
Aircraft servicing ramps or aprons ............................. 5.13.1, A.5.13.3
Emergency fuel shutoff system .................................. 4.6.8
Inclement weather, protection against ......................... 5.13.5, A.5.13.5
Training in use of ............................................... 5.13.6, A.5.13.6

Fill openings ..................................................... 4.3.13
Fire protection, rooftop heliports .............................. 4.5.10
Fuel, aviation ..................................................... 4.3.16
Fuel dispensing systems/devices ................................. 4.6.3, A.4.6.3.5
Tests .................................................................... 4.3.17
Fuel servicing station (definition) ............................... 4.4.14.4.4.4.1
Fuelers ................................................................. see Aircraft fuel servicing tank vehicles (fuelers)

Fueling hose ......................................................... see Hose, aircraft fueling

Ground radar equipment .......................................... 4.1.4.2, A.4.1.4.2

Hazards
Aircraft fuel hose failure ......................................... A.5.16
Electrostatic ......................................................... see Static electricity
Fire, aviation fuel .................................................. 4.2.2; A.1.2, Annex B
Radar ignition ..................................................... A.4.4.2
Head (definition) ..................................................... 3.3.18
Heaters, operation during fueling ................................. 5.5.2
Helicopters
Rapid refueling of ................................................ 5.21, A.5.21.2(2)
Rooftop heliports, fueling at ..................................... 4.5
Hose, aircraft fueling ............................................. 4.1.1, 5.2.2, 5.4.6, 5.16
Failure of ............................................................. A.5.16
Heliports .............................................................. 4.5.6, 4.5.8
Hydrostatic testing ................................................ 4.2.3
Requirements ....................................................... 4.2, A.4.2

Hydrant carts ....................................................... see also Aircraft fueling vehicles

Fire extinguishers on .............................................. 4.3.9, 5.13.3
Lighting and electrical equipment ................................ 4.3.7, A.4.3.7.4
Maintenance ....................................................... 5.17
Materials ............................................................ 4.3.1
Parking .............................................................. 5.19
Positioning of ....................................................... 5.12
Static protection .................................................. 4.1.2.1, 4.3.3, 5.4.2
Hydrant valves ...................................................... 4.4.7.1 to 4.4.7.2, 4.4.10.1
Definition .......................................................... 3.3.20

Hydrant vehicles .................................................. see Aircraft fuel servicing hydrant vehicles

Hydrants, fuel servicing ........................................... 4.4.10, 5.2.5

Hydrostatic tests
Airport fuel systems ............................................. 4.4.13
Cargo tanks ......................................................... 4.3.17.1
Fuel dispensing system .......................................... 4.3.17.2
Hose ................................................................. 4.2.2.1, 4.2.2.1(10), 4.2.2.4 to 4.2.2.5, 4.2.3

Isolation valves .................................................... 4.4.6.11, A.4.4.6.11, Fig. A.4.4.6.11

Labeled (definition) ............................................... 3.2.3
Lamps, electric hand ............................................... A.5.7

Lighting, vehicle ................................................... 4.3.7, A.4.3.7.4
Lightning precautions ............................................. 5.9, A.5.9
Listed (definition) ................................................ 3.2.4, A.5.2.4
Locations for fuel servicing ..................................... 5.10, A.5.10.2

Measurement, units of ............................................ 1.3
Misfueling (definition) .......................................... 3.3.22

Nozzles, fuel ....................................................... 4.5.5, 4.6.5, 5.2.3, 5.4.2

Open flames, aircraft fuel servicing ramps ................. 5.8
Operations .......................................................... 4.6.10, Chap. 5, A.5
Overshoot (definition) ........................................... 3.3.23

Pumps
Fuel servicing ....................................................... 4.3.14
Rooftop heliport .................................................. 4.5.4
Transfer ............................................................ 4.4.6, A.4.4.6.11

Piping
Aircraft fuel servicing vehicles ................................ 4.3.14
Rooftop heliports ................................................ 4.5.4
Transfer ............................................................ 4.4.6, A.4.4.6.11

Pressure

Burst (definition) .................................................. 3.3.24.1
Of delivered fuel .................................................. 4.4.7.3
Test ................................................................. 4.2.2.1, 4.2.2.2(10), 4.3.17.1 to 4.3.17.2, 4.4.1.3
Working ........................................................... 4.3.17.2, 4.4.10.1, 4.4.13
Definition ........................................................ 3.3.24.3

Pressure fuel servicing
Controls ............................................................ 4.1.8
Definition ........................................................ 3.3.27.2

Purpose of standard ................................................ 1.2, A.1.2

Radar equipment ................................................... 4.1.4, A.4.1.4.2

Ramps ............................................................... see Aircraft fuel servicing ramps or aprons

Referenced publications .......................................... Chap. 2, Annex B

Roof-top fueling, heliport ........................................ 4.5

Scope of standard ................................................ 1.1

Self-service fueling ............................................... 4.6.10, A.4.6.3.5
Definition ........................................................ 3.3.26

Semitrailers, tank ................................................... see Tank semitrailers

Servicing
Aircraft fuel servicing (definition) .............................. 3.27.2
Pressure fuel servicing
Controls ............................................................ 4.1.8
Definition ........................................................ 3.3.27.2

Should (definition) ................................................ 3.2.5

2001 Edition
Tanks
Cargo ................................................................. see Cargo tanks
Fuel storage ....................................................... 4.4.4, A.4.4.4.1
Test pressure ...................................................... see Pressure
Tests
Aircraft fueling hose ........................................... 4.2.2.1, 4.2.2.2(10), 4.2.2.4 to 4.2.2.5, 4.2.3
Airport fuel systems ............................................. 4.4.13
Cargo tanks ......................................................... 4.3.17
Fuel dispensing system ......................................... 4.3.17
Top flashings ........................................................ 4.3.13
Trailers, tank full ................................................... see Tank full trailers
Training, employee .................................................. 4.5.11, 5.11, 5.13.6, A.3.13.6
Transfer piping .................................................... 4.4.6, A.4.4.6.11

Valves
Hydrant .................................................................. see Hydrant valves
Isolation ................................................................. 4.4.6.11, A.4.4.6.11, Fig. A.4.4.6.11

Vehicles ................................................................. see Aircraft fueling vehicles; Aircraft fuel servicing hydrant vehicles; Aircraft fuel servicing tank vehicles (fuelers); Hydrant carts; Tank vehicles

Venting, cargo tanks .............................................. 4.3.12.5

Working pressure .................................................... see Pressure
MATERIAL SAFETY DATA SHEET

Jet A

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Jet A
Product Code: 1014061, 1049849, 1049850, 1049851, 1049853, 1049854, 1049861
Intended Use: Aviation Turbine Fuel
Chemical Family: Petroleum Hydrocarbon

Responsible Party:
66 Aviation Products
A Division of ConocoPhillips
600 N. Dairy Ashford
Houston, Texas 77079-1175

Customer Service: 800-234-6603
Technical Information: 918-661-6991

Emergency Overview

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire or Accident Call CHEMTREC:
North America: (800) 424-9300
Others: (703) 527-3887 (collect)

California Poison Control System: (800) 356-3219

Health Hazards/Precautionary Measures: Causes skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use ventilation adequate to keep exposure below recommended limits, if any. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Clear, light yellow, or light green
Physical Form: Liquid
Odor: Characteristic petroleum

NFPA 704 Hazard Class:
Health: 2 (Moderate)
Flammability: 2 (Moderate)
Instability: 0 (Least)
2. COMPOSITION/ INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>HAZARDOUS COMPONENTS</th>
<th>Component / CAS No:</th>
<th>Percent (%)</th>
<th>ACGIH:</th>
<th>OSHA:</th>
<th>NIOSH:</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerosene ..C9-16</td>
<td>8008-20-6</td>
<td>100</td>
<td>200 mg/m³ TWA - SKIN (as total hydrocarbon vapor)</td>
<td>NE</td>
<td>NE</td>
<td>---</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>0-3</td>
<td>10 ppm TWA 52 mg/m³ TWA 15 ppm STEL 79 mg/m³ STEL</td>
<td>10 ppm TWA 50 mg/m³ TWA</td>
<td>250 ppm IDLH</td>
<td>---</td>
</tr>
</tbody>
</table>

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.
NE=Not Established

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Mild to moderate skin irritant. Contact may cause redness, itching, burning, and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, dermatitis (inflammation), burns, and severe skin damage. No harmful effects from skin absorption are expected.

Inhalation (Breathing): Expected to have a low degree of toxicity by inhalation at concentrations near the proposed exposure limit. At concentrations exceeding the TLV central nervous system and respiratory irritation have been reported.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung irritation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the respiratory tract, irritation of the digestive tract, nausea, vomiting, pneumonia (inflammation of the lungs), transient excitement followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: Inadequate evidence of carcinogenicity (see Sections 11 and 15). However, a component is a possible cancer hazard (see Sections 11).

Target Organs: Inadequate data available for this material.

Developmental: Inadequate evidence available for this material. See Section 11 for developmental toxicity information of individual components, if any.

Other Comments: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage (sometimes referred to as Solvent or Painters' Syndrome). Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders, respiratory (asthma-like) disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.
Skin: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE-FIGHTING MEASURES

Flammable Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>100-150°F / 38-66°C (TCC)</td>
</tr>
<tr>
<td>OSHA Flammability Class</td>
<td>Combustible liquid</td>
</tr>
<tr>
<td>LEL%</td>
<td>0.6</td>
</tr>
<tr>
<td>UEL%</td>
<td>4.7</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>410°F / 210°C</td>
</tr>
</tbody>
</table>

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, water spray, or foam. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).
7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-407 for specific bonding requirements for aircraft fueling.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, and skin damage. Examples of approved materials are nitrile or Viton® (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eye/face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.
9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

- **Appearance:** Clear, light yellow, or light green
- **Physical Form:** Liquid
- **Odor:** Characteristic petroleum
- **Odor Threshold:** No data
- **pH:** Not applicable
- **Vapor Pressure (mm Hg):** 0.40
- **Vapor Density (air=1):** > 4.5
- **Boiling Point:** 300-572°F / 149-300°C
- **Melting/Freezing Point:** < -40°F / -40°C
- **Solubility in Water:** <0.1%
- **Partition Coefficient (n-octanol/water) (Kow):** No data
- **Specific Gravity:** 0.775-0.840
- **Bulk Density:** 6.73 lbs/gal
- **Viscosity:** 1.5-2.5 cSt typical @ 68°F (20°C) / 8 cSt max. @ -4°F (-20°C)
- **Percent Volatile:** 98-100% @ 545°F (285°C)
- **Evaporation Rate (nBuAc=1):** <1
- **Flash Point:** 100-150°F / 38-66°C (TCC)
- **LEL%:** 0.6
- **UEL%:** 4.7
- **Autoignition Temperature:** 410°F / 210°C
- **Decomposition Temperature:** No data

10. STABILITY AND REACTIVITY

**Stability:** Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

**Conditions to Avoid:** Avoid all possible sources of ignition (see Sections 5 and 7).

**Materials to Avoid (Incompatible Materials):** Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

**Hazardous Decomposition Products:** The use of hydrocarbon fuels in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, and other hydrocarbons) and/or dangerously low oxygen levels.

**Hazardous Polymerization:** Will not occur.

11. TOXICOLOGICAL INFORMATION

**Chronic Data:**

- **Carcinogenicity:** Cancer mortality and morbidity were followed in a cohort of 2182 men exposed to jet fuel in the Swedish Armed Forces. No increase in the frequency of total neoplasms or cancers at specific sites was seen, even when the duration of employment, latency, occupation, or type of exposure were considered. IARC has concluded that there is inadequate evidence for the carcinogenicity of jet fuel in both animals and humans.

**Target Organ:** Jet-A and kerosene were negative in skin sensitization studies in animals. JP-8, a similar material, has been shown to be a weak skin sensitizer, and to suppress cellular immunity in laboratory animal studies.

In an epidemiology study comparing 30 exposed and 60 unexposed workers, those exposed to jet fuel (average 300 mg/m³, average employment 17 years) did not perform as well in some psychological and motor skills tests.

**Kerosene ..C9-16 - CAS:** 8008-20-6
**Acute Data:**

Jet Fuel A:
- Dermal LD50 = >5 ml/kg
- LC50 = No data available
- Oral LD50 = >25 ml/kg (Rat)

Kerosene ..C9-16 - CAS: 8008-20-6
- Dermal LD50 = >2,000 mg/kg (Rabbit)
- LC50 = >5000 ppm (rat)
- Oral LD50 = >5 g/kg (Rat), = 28 ml/kg (Rabbit), =20 ml/kg (Guinea Pig)

Naphthalene - CAS: 91-20-3
- Oral LD50 = >5 g/kg (Rat)
- LC50 = >5000 ppm (rat)
- Oral LD50 = 490 mg/kg; 2.6 g/kg (rat)

**12. ECOLOGICAL INFORMATION**

When kerosenes and jet fuels escape into the environment due to leaks or spills, most of their constituent hydrocarbons will evaporate and be photodegraded by reaction with hydroxyl radicals in the atmosphere. The half-lives in air for many of the individual hydrocarbons is less than one day. Less volatile hydrocarbons can persist in the aqueous environment for longer periods. They remain floating on the surface of the water; those that reach soil or sediment biodegrade relatively slowly. Soil contaminated with jet fuel can develop adapted microbial species able to use the fuel as a carbon source; soil aeration and nutrient supplementation can enhance this biodegradation.

Reported LC50/EC50 values for water-soluble fractions of kerosenes and jet fuels are usually in the range of 10 to 100 mg/liter. Adverse effects on the gills, pseudobranch, kidney and nasal mucosa have been reported in fish involved in spills of jet fuel. Juvenile clams may be particularly sensitive to marine sediments contaminated as a result of spilled jet fuel. Direct toxicity and fouling of sea birds from jet fuel can occur if birds dive through floating layers of spilled fuel.

Phytotoxic effects of jet fuel have been reported following exposure of plants to sprays or vapors. Lack of seed germination and inhibition of seedling growth may also occur. There is evidence for moderate bioaccumulation of the water-soluble hydrocarbons present in jet fuels.

Since paraffinic hydrocarbons have low solubility in water and exhibit moderate to rapid rates of biodegradation, they are not expected to persist or accumulate in the environment. Mobility in aquatic and terrestrial environments is estimated to be low due to the low water solubility and high vapor pressure. If spilled, the more volatile components will evaporate rapidly.

It is estimated, based on testing of other materials, that the water-accommodated fraction (WAF) would cause moderate toxicity in fish (96 hr LC 50 about 8 mg/L), aquatic invertebrates (48 hr EC 50 about 32 mg/L in Daphnia), and algae (96 hr EC 50 about 10 mg/L).
13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for ignitability (D001) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Proper Shipping Name: Fuel, aviation, turbine engine
Hazard Class/Division: 3
UN Code: UN1863
Packing group: III*
Bulk Package/Placard Marking: Flammable or Combustible/1863*
Non-Bulk Package Marking: Fuel, aviation, turbine engine, UN1863
Non-Bulk Package Labels: Flammable or Combustible*
Packaging - References (Exceptions, Non-Bulk, Bulk): 49 CFR 173.150, 173.203, 173.241
Hazardous Substance: None
Emergency Response Guide: 128

Note: *This product may be reclassed as a combustible liquid when shipped domestically by rail or highway and is not regulated if shipped in non-bulk packages.

IMDG Shipping Description: Fuel, aviation, turbine engine, 3, UN1863, PG III
ICAO/IATA Shipping Description: Fuel, aviation, turbine engine, UN1863, Division 3, Packing Instruction 309 or 310

15. REGULATORY INFORMATION

U.S. Regulations:

EPA SARA 311/312 (Title III Hazard Categories)
Acute Health: Yes
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:
Naphthalene................91-20-3...............0-3%

EPA (CERCLA) Reportable Quantity (in pounds):
Naphthalene................91-20-3............... 100
Petroleum Exemption applies to this material

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:
-- None Known --

California Proposition 65:
Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):
Benzene -- Cancer, Developmental and Reproductive Toxicant
Naphthalene -- Cancer
Toluene -- Developmental Toxicant

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any.

TSCA:
All components are listed on the TSCA inventory.

Canadian Regulations: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Domestic Substances List: Listed

WHMIS Hazard Class:
B3 - Combustible Liquids
D2B - Materials Causing Other Toxic Effects - Toxic Material

16 OTHER INFORMATION

Issue Date: 22-Jul-2005
Previous Issue Date: 09-Dec-2004
Product Code: 1014061, 1049848, 1049849, 1049850, 1049851, 1049853, 1049854, 1049861
Revised Sections or Basis for Revision:
Product name (Section 1)
Composition (Section 2)
Health Hazard (Section 3)
Toxicological (Section 11)
Shipping information (Section 14)
Regulatory information (Section 15)

Previous Product Code: None
MSDS Code: 001975

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.
SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

COMPANY: EXXON COMPANY, U.S.A.
P.O. BOX 2180
HOUSTON, TX 77252-2180

PRODUCT NAME                          PRODUCT CODE
TURBO FUEL A                          120400

PRODUCT CATEGORY
Turbo Fuel A

MEDICAL EMERGENCY TELEPHONE NUMBER: (713) 656-3424

TRANSPORTATION EMERGENCY TELEPHONE NUMBERS
(BAYTOWN) (281) 834-3296
(CHEMTREC) 1-800-424-9300

Product Information and Technical Assistance: 1-800-443-9966

FAXED MSDSs: 1-800-298-4007 MAILED MSDSs OR OTHER ASSISTANCE: (713) 656-5949

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS                              CAS NO. OF COMPONENTS APPROXIMATE CONCENTRATION
Distillates (petroleum), hydrotreated light 64742-47-8 100%

SEE SECTION 8 FOR EXPOSURE LIMITS

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

OSHA REQUIRED LABEL INFORMATION
In compliance with hazard and right-to-know requirements, where applicable OSHA Hazard Warnings may be found on the label, bill of lading or invoice accompanying this shipment.

DANGER!
COMBUSTIBLE
LONG-TERM, REPEATED EXPOSURE MAY CAUSE SKIN CANCER

Note: Product label may contain non-OSHA related information also.
VARIABILITY AMONG INDIVIDUALS
Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)
Overexposure may cause gasping, nausea and disorientation.

Inhalation of high vapor concentrations (attainable at elevated temperature) may have results ranging from mild depression to respiratory irritation, nausea, disorientation, and possibly death. Prolonged or repeated liquid contact with the skin will dry and defat the skin, leading to possible irritation and dermatitis.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

SECTION 4: FIRST AID MEASURES

EYE CONTACT
If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN
In case of skin contact, remove any contaminated clothing and wash skin with soap and water. Launder or dry-clean clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INHALATION
If overcome by vapor, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION
If ingested, DO NOT induce vomiting; call a physician immediately.

SECTION 5: FIRE-FIGHTING MEASURES
FLASH POINT (MINIMUM)  AUTOIGNITION TEMPERATURE
COMBUSTIBLE - Per DOT 49 CFR 173.120
37.8°C (100°F)  Approximately 210°C (410°F)
ASTM D 56, Tag Closed Cup  ASTM E 659

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 0.9%  Upper Flammable Limit 7%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.


Use water spray, dry chemical, foam or carbon dioxide to extinguish the fire. Use water to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to provide protection for persons attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

SECTION 6: ACCIDENTAL RELEASE MEASURES

CLEAN WATER ACT / OIL POLLUTION ACT
This product may be classified as an oil under Section 311 of the Clean Water Act, and under the Oil Pollution Act. Discharges or spills into or leading to surface waters that cause a sheen must be reported to the National Response Center (1-800-424-8802).

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.

Assure conformity with applicable governmental regulations.

SECTION 7: STORAGE AND HANDLING

HANDLING PRECAUTIONS
This liquid is volatile and gives off invisible vapors. Either the liquid or vapor may settle in low areas or travel some distance along the ground or
surface to ignition sources where they may ignite or explode.

Keep product away from ignition sources, such as heat, sparks, pilot lights, static electricity, and open flames.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

Do not attempt to refill or clean containers since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMIT FOR TOTAL PRODUCT BASIS
100 ppm (735 mg/m3) for an 8-hour Recommended by Exxon workday

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. No smoking, or use of flame or other ignition sources.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
To prevent fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system in accordance with (THE) National Fire Protection Association PUBLICATIONS.

To minimize fire or explosion risk from static charge accumulation and discharge, effectively bond and/or ground product transfer system in accordance with the National Fire Protection Association standard for petroleum products.
Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor, mist or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

The following data are approximate or typical values and should not be used for precise design purposes.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOILING RANGE</td>
<td>Approximately 160-300°C (320-572°F)</td>
</tr>
<tr>
<td>SPECIFIC GRAVITY (15.6°C/15.6°C)</td>
<td>0.7753 to 0.8398</td>
</tr>
<tr>
<td>ASTM D 1298</td>
<td></td>
</tr>
<tr>
<td>MOLECULAR WEIGHT</td>
<td>Approximately 180 average</td>
</tr>
<tr>
<td>ASTM D 1298</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>Essentially neutral</td>
</tr>
<tr>
<td>PERCENT VOLATILE BY VOLUME</td>
<td>100</td>
</tr>
<tr>
<td>EVAPORATION RATE @ 1 ATM. AND 25°C (77°F)</td>
<td>Less than 0.1</td>
</tr>
<tr>
<td>(n-BUTYL ACETATE = 1)</td>
<td></td>
</tr>
<tr>
<td>VAPOR DENSITY (AIR = 1)</td>
<td>Greater than 5</td>
</tr>
<tr>
<td>VAPOR PRESSURE</td>
<td>Less than 5 mm Hg @ 20°C</td>
</tr>
<tr>
<td>POUR, CONGEALING OR MELTING POINT</td>
<td>-40°C (-40°F) Maximum Freeze Point</td>
</tr>
<tr>
<td>by ASTM D 2386</td>
<td></td>
</tr>
<tr>
<td>VISCOSITY</td>
<td>Maximum 8 cSt @ -20°C</td>
</tr>
<tr>
<td>PRODUCT APPEARANCE AND ODOR</td>
<td>Clear water-white liquid</td>
</tr>
<tr>
<td></td>
<td>Faint petroleum hydrocarbon odor</td>
</tr>
<tr>
<td>SOLUBILITY IN WATER @ 1 ATM. AND 25°C (77°F)</td>
<td>Negligible; less than 0.1%</td>
</tr>
</tbody>
</table>

SECTION 10: STABILITY AND REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium
SECTION 11: TOXICOLOGICAL INFORMATION

NATURE OF HAZARD AND TOXICITY INFORMATION
This product contains ethylbenzene. A study conducted by the National Toxicology Program states that lifetime inhalation exposure of rats and mice to high concentrations of ethylbenzene (750 ppm) resulted in increases in certain types of cancer, including kidney tumors in rats and lung and liver tumors in mice. These effects were not observed in animals exposed to lower concentrations of ethylbenzene (75 or 250 ppm). The study does not address the relevance of these results to humans.

Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

Lifetime skin painting studies conducted by the American Petroleum Institute, Exxon and others have shown that similar products boiling between 175-370°C (350-700°F) usually produce skin tumors and/or skin cancer in laboratory mice. The degree of carcinogenic response was weak to moderate with a relatively long latent period. The implications of these results for humans have not been determined.

Limited studies on oils that are very active carcinogens have shown that washing the animals' skin with soap and water between applications greatly reduces tumor formation. These studies demonstrate the effectiveness of cleansing the skin after contact.

Potential risks to humans can be minimized by observing good work practices and personal hygiene procedures generally recommended for petroleum products. See Section I for recommended protection and precautions.

Contains light hydrocarbon components. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined. Certain components, such as normal hexane, may also affect the nervous system at high concentrations (e.g., 1000-1500 ppm).

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

Inhalation of components of exhaust from burning, such as carbon monoxide, may cause death at high concentrations. Exposure to the exhaust of this fuel should be minimized.
SECTION 12: ECOLOGICAL INFORMATION

Do not discharge this product into public waters or waterways unless authorized by a National Pollution Discharge Elimination System (NPDES) permit issued by the Environmental Protection Agency (EPA).

Environmental and Ecological data may be available for this product. Write or call Exxon to obtain further information. Refer to Section 6 and Section 15 for Accidental Release information and Regulatory Reporting information.

SECTION 13: DISPOSAL CONSIDERATION

Options for disposal of this product may depend on the conditions under which it was used. To determine the proper method of disposal, refer to RCRA (40 CFR 261), as well as federal EPA and state and local regulations.

Please refer to Sections 5, 6 and 15 for additional information.

SECTION 14: TRANSPORTATION INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents.

U.S. DOT HAZARDOUS MATERIALS SHIPPING DESCRIPTION
Transported by highway or rail:

- Bulk packagings (capacity greater than 119 gallons)
  Fuel, Aviation, Turbine Engine, Combustible Liquid, UN 1863, III

- Non-bulk packagings (capacity less than or equal to 119 gallons)
  Not regulated

Transported by air or marine vessel:

- Bulk or non-bulk packagings
  Fuel, Aviation, Turbine Engine, 3, UN 1863, III

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355
(SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).
TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
No toxic chemical is present greater than 1% or 0.1% (carcinogen).

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)
EPA Hazard Classification Codes: Acute, Chronic, Fire

TOXIC SUBSTANCES CONTROL ACT (TSCA)
This product, as manufactured by Exxon, does not contain polychlorinated biphenyls (PCB's).

All components of this product are listed on the U.S. TSCA inventory.

SECTION 16: OTHER INFORMATION

The health and safety information presented herein must be used in conjunction with the pertinent standards for training, work practices and facilities design established by OSHA, NIOSH, NFPA, API, NEC, NSC, UNDERWRITERS, BUREAU OF MINES, and similar organizations.

The information and recommendations contained herein are, to the best of Exxon's knowledge and belief, accurate and reliable as of the date issued. Exxon does not warrant or guarantee their accuracy or reliability, and Exxon shall not be liable for any loss or damage arising out of the use thereof.

The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container.

The Environmental Information included under Section 15 hereof as well as the Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings have been included by Exxon Company, U.S.A. in order to provide additional health and hazard classification information. The ratings recommended are based upon the criteria supplied by the developers of these rating systems, together with Exxon's interpretation of the available data.
MATERIAL SAFETY DATA SHEET

SECTION 1
PRODUCT AND COMPANY IDENTIFICATION

PRODUCT
Product Name: KEROSENE TYPE AVIATION TURBINE FUEL
Product Description: Hydrocarbons and Additives
Product Code: 8525
Intended Use: Aviation fuel

COMPANY IDENTIFICATION
Supplier: Canada Imperial Oil Limited, An Affiliate of Exxon Mobil Corporation
P.O. Box 4029, Station A
Calgary, ALBERTA. T2P 3M9 Canada
24 Hour Health Emergency 519-339-2145
Transportation Emergency Phone 519-339-2145
Supplier General Contact 1-800-567-3776

SECTION 2
COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS#</th>
<th>Concentration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEROSENE</td>
<td>8008-20-6</td>
<td>&gt;99%</td>
</tr>
</tbody>
</table>

Hazardous Constituent(s) Contained in Complex Substance(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS#</th>
<th>Concentration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAPHTHALENE</td>
<td>91-20-3</td>
<td>0.1 - 1%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3
HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL PHYSICAL / CHEMICAL EFFECTS
Combustible. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an incendiary electrical discharge.

POTENTIAL HEALTH EFFECTS
Irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. Breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness. High-pressure injection under skin may cause serious damage.

Target Organs: Lung | Skin |

ENVIRONMENTAL HAZARDS
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4  FIRST AID MEASURES

INHALATION
Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT
Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT
Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION
Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN
If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Hydrocarbon Solvents/Petroleum Hydrocarbons- Skin contact may aggravate an existing dermatitis.

SECTION 5  FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING
Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Combustible. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.
**Hazardous Combustion Products:** Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon, Smoke, Fume

**FLAMMABILITY PROPERTIES**

- **Flash Point [Method]:** 38°C (100°F) [ASTM D-93]
- **Flammable Limits (Approximate volume % in air):** LEL: 0.7 UEL: 5.0
- **Autoignition Temperature:** N/D

**SECTION 6  ACCIDENTAL RELEASE MEASURES**

**NOTIFICATION PROCEDURES**

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. U.S. regulations require reporting releases of this material to the environment which exceed the reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

**PROTECTIVE MEASURES**

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See Section 3 for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for Personal Protective Equipment.

**SPILL MANAGEMENT**

**Land Spill:** Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

**Water Spill:** Stop leak if you can do it without risk. Eliminate sources of ignition. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Temperature by 10 degrees C or is less than the Ambient Temperature, use booms as a barrier to protect shorelines and allow the material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

**ENVIRONMENTAL PRECAUTIONS**

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

**SECTION 7  HANDLING AND STORAGE**

**HANDLING**

Avoid contact with skin. Do not siphon by mouth. Use proper bonding and/or grounding procedures. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static
electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source).

Static Accumulator: This material is a static accumulator.

STORAGE
Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

<table>
<thead>
<tr>
<th>Source</th>
<th>Form</th>
<th>Limit / Standard</th>
<th>Note</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEROSENE Stable Aerosol.</td>
<td>TWA 5 mg/m3</td>
<td>N/A</td>
<td>ExxonMobil</td>
<td></td>
</tr>
<tr>
<td>KEROSENE Total vapor and aerosol.</td>
<td>TWA 500 mg/m3</td>
<td>N/A</td>
<td>ExxonMobil</td>
<td></td>
</tr>
<tr>
<td>KEROSENE [total hydrocarbon vapor]</td>
<td>Non-Aerosol TWA 200 mg/m3</td>
<td>Skin</td>
<td>ACGIH</td>
<td></td>
</tr>
<tr>
<td>NAPHTHALENE</td>
<td>TWA 50 mg/m3 10 ppm</td>
<td>N/A</td>
<td>OSHA Z1</td>
<td></td>
</tr>
<tr>
<td>NAPHTHALENE</td>
<td>STEL 15 ppm</td>
<td>Skin</td>
<td>ACGIH</td>
<td></td>
</tr>
<tr>
<td>NAPHTHALENE</td>
<td>TWA 10 ppm</td>
<td>Skin</td>
<td>ACGIH</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
- Chemical resistant gloves are recommended.

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
- Chemical / oil resistant clothing if contact with material is likely.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

**ENVIRONMENTAL CONTROLS**
See Sections 6, 7, 12, 13.

<table>
<thead>
<tr>
<th>SECTION 9</th>
<th>PHYSICAL AND CHEMICAL PROPERTIES</th>
</tr>
</thead>
</table>

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

**GENERAL INFORMATION**
- **Physical State:** Liquid
- **Color:** Pale Yellow
- **Odor:** Petroleum/Solvent
- **Odor Threshold:** N/D

**IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION**
- **Relative Density (at 15 C):** 0.81
- **Flash Point [Method]:** 38C (100F) [ ASTM D-93]
- **Flammable Limits (Approximate volume % in air):** LEL: 0.7 UEL: 5.0
- **Autoignition Temperature:** N/D
- **Boiling Point / Range:** < 205C (401F)
- **Vapor Density (Air = 1):** 4 at 101 kPa
- **Vapor Pressure:** [N/D at 20 °C] | < 1 kPa (7.5 mm Hg) at 38C
- **Evaporation Rate (n-butyl acetate = 1):** N/D
- **pH:** N/A
- **Log Pow (n-Octanol/Water Partition Coefficient):** > 3.5
- **Solubility in Water:** Negligible
- **Viscosity:** [N/D at 40 °C] | 8.8 cSt (8.8 mm2/sec) at -20C
- **Oxidizing Properties:** See Sections 3, 15, 16.
OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: -40°C (-40°F)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Alkalies, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

<table>
<thead>
<tr>
<th>Route of Exposure</th>
<th>Conclusion / Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LC50 &gt; 5000 mg/m3</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Irritation: No end point data.</td>
<td>Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.</td>
</tr>
<tr>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Skin</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rabbit): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Irritation (Rabbit): Data available.</td>
<td>Moderately irritating to skin with prolonged exposure. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Eye</td>
<td></td>
</tr>
<tr>
<td>Irritation (Rabbit): Data available.</td>
<td>May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.</td>
</tr>
</tbody>
</table>

CHRONIC/OTHER EFFECTS
For the product itself:
Vapor/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects including death.
Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.
Jet fuel: Some jet fuels have potential in mice to suppress indicators of immune system functionality. The relevance of these effects to humans is uncertain.
Contains:
Kerosene: Carcinogenic in animal tests. Lifetime skin painting tests produced tumors, but the mechanism is
due to repeated cycles of skin damage and restorative hyperplasia. This mechanism is considered unlikely in humans where such prolonged skin irritation would not be tolerated. Did not cause mutations in vitro. Inhalation of vapors did not result in reproductive or developmental effects in laboratory animals. Inhalation of high concentrations in animals resulted in respiratory tract irritation, lung changes and some reduction in lung function. Non-sensitizing in animal tests.

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

Additional information is available by request.

The following ingredients are cited on the lists below:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>List Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAPHTHALENE</td>
<td>91-20-3</td>
<td>2, 5</td>
</tr>
</tbody>
</table>

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12  ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY
Material -- Expected to be toxic to aquatic organisms.

MOBILITY
More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Majority of components -- Expected to be inherently biodegradable

Atmospheric Oxidation:
More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL
Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13  DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.
DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning PRECAUTIONARY LABEL TEXT: Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)
Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: 1863
Packing Group: III
ERG Number: 128
Label(s): NONE
Transport Document Name: FUEL, AVIATION, TURBINE ENGINE, COMBUSTIBLE LIQUID, UN1863, PG III

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid. This material is not regulated under 49 CFR in a container of 119 gallon capacity or less when transported solely by land, as long as the material is not a hazardous waste, a marine pollutant, or specifically listed as a hazardous substance.

LAND (TDG)
Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
UN Number: 1863
Packing Group: III
Special Provisions: 17

Footnote: In containers of 454 litres or less this material is exempt from TDG regulations.

SEA (IMDG)
Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1863
Packing Group: III
Label(s): 3
Transport Document Name: FUEL, AVIATION, TURBINE ENGINE, 3, UN1863, PG III

AIR (IATA)
Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
UN Number: 1863
Packing Group: III
Label(s): 3
Transport Document Name: FUEL, AVIATION, TURBINE ENGINE, 3, UN1863, PG III

SECTION 15  REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purpose, this material is classified as hazardous in accordance with OSHA 29CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health.

SARA (313) TOXIC RELEASE INVENTORY:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>Typical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAPHTHALENE</td>
<td>91-20-3</td>
<td>0.1 - 1%</td>
</tr>
</tbody>
</table>

The Following Ingredients are Cited on the Lists Below:*

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>List Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEROSENE</td>
<td>8008-20-6</td>
<td>1, 17, 18, 19</td>
</tr>
<tr>
<td>NAPHTHALENE</td>
<td>91-20-3</td>
<td>1, 4, 5, 9, 10</td>
</tr>
</tbody>
</table>

--REGULATORY LISTS SEARCHED--

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = ACGIH ALL</td>
<td>6 = TSCA 5a2</td>
<td>11 = CA P65 REPRO</td>
<td>16 = MN RTK</td>
</tr>
<tr>
<td>2 = ACGIH A1</td>
<td>7 = TSCA 5e</td>
<td>12 = CA RTK</td>
<td>17 = NJ RTK</td>
</tr>
<tr>
<td>3 = ACGIH A2</td>
<td>8 = TSCA 6</td>
<td>13 = IL RTK</td>
<td>18 = PA RTK</td>
</tr>
<tr>
<td>4 = OSHA Z</td>
<td>9 = TSCA 12b</td>
<td>14 = LA RTK</td>
<td>19 = RI RTK</td>
</tr>
<tr>
<td>5 = TSCA 4</td>
<td>10 = CA P65 CARC</td>
<td>15 = MI 293</td>
<td></td>
</tr>
</tbody>
</table>

Code key: CARC=Carcinogen; REPRO=Reproductive

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

SECTION 16  OTHER INFORMATION

N/D = Not determined, N/A = Not applicable
THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
No revision information is available.


PRECAUTIONARY LABEL TEXT:

WARNING!

HEALTH HAZARDS
Irritating to skin. If swallowed, may be aspirated and cause lung damage.
Target Organs: Lung | Skin |

PHYSICAL HAZARDS
Combustible. Material can accumulate static charges which may cause an incendiary electrical discharge.

PRECAUTIONS
Avoid contact with skin. Do not siphon by mouth. Use proper bonding and/or grounding procedures.

FIRST AID
Eye: Flush thoroughly with water. If irritation occurs, get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

FIRE FIGHTING MEDIA
Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SPILL/LEAK
Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Report spills as required to appropriate authorities. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Temperature by 10 degrees C or is less than the Ambient Temperature, use booms as a barrier to protect shorelines and allow the material to evaporate. Seek the advice of a specialist before using dispersants.

Use
Not intended or suitable for use in or around a household or dwelling.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.
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MHC:  1A, 0, 0, 0, 3, 1
PPEC:  C

DGN:  5007486 (1012688)

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# FUEL PROCEDURES NOTICE INDEX

<table>
<thead>
<tr>
<th>Notice Number</th>
<th>Subject Insertion Note</th>
<th>Date issued</th>
<th>Issued By</th>
<th>Valid Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 - 6</td>
<td>Customer Fuel QC Requirements</td>
<td>07/19/2006</td>
<td>Mike Wickware</td>
<td>UNF</td>
</tr>
<tr>
<td>05 - 7</td>
<td>Offshore Manager: Duties and Responsibilities</td>
<td>07/23/2007</td>
<td>Leonard LeBlanc</td>
<td>Upon inclusion into FMM at next revision.</td>
</tr>
<tr>
<td>08 - 7</td>
<td>Fire Extinguisher Requirements</td>
<td>10/02/2007</td>
<td>Leonard LeBlanc</td>
<td>Upon inclusion into FMM at next revision.</td>
</tr>
<tr>
<td>09 - 8</td>
<td>Revised Fuel Handler Training Record form</td>
<td>06/23/2008</td>
<td>Leonard LeBlanc</td>
<td>Upon inclusion into FMM at next revision.</td>
</tr>
</tbody>
</table>
Several of our customers have specific fuel requirements. These are listed below by customer.

Shell
1. Fuel samples will be taken from aircraft tank sump, storage tank sump and delivery filter/sePARATOR sump.
2. Test for water utilizing the Velcon Hydro-Kit.
3. Retain the samples and Hydro-Kits for 24 hours or until the next sample is taken whichever occurs first.
4. All samples are to be free of water and sediment.

BP
1. Fuel samples are to be taken from the storage tank sump and fuel point nozzle.
2. Test for water utilizing the Velcon Hydro-Kit.
3. Retain the samples and Hydro-Kits for 24 hours or until the next sample is taken whichever occurs first.
4. All samples are to be free of water and sediment.

Issued By: Mike Wickware
Valid Period: UNF

A copy of this Fuel Procedures Notice and revised FPN Index shall be inserted in the Memo Section of the Fuel Management Manual. These notices may contain information that is mandatory in nature. Permanent changes will be issued as a revision to the Fuel Management Manual.
Notice Number: 03-6
No. of pages: 1
Date issued: 12/11/2006
Subject: Retirement Life of Aviation Fuel Hoses

Message:
The retirement life of the aviation fuel hoses used on our fueling systems (trucks, trailers, fueling points, etc.) will be 10 years from date of manufacture. The manufacture date is located on the hose and is labeled as follows: quarter and year manufacture (e.g., 4Q-00, which would be 4th qtr. 2000). Prior to year 2000, entire year may be noted on hose.

Issued By: Leonard LeBlanc
Valid Period: Upon inclusion into FMM at next revision.

A copy of this Fuel Procedures Notice and revised FPN Index shall be inserted in the Memo Section of the Fuel Management Manual. These notices may contain information that is mandatory in nature. Permanent changes will be issued as a revision to the Fuel Management Manual.
Notice Number: 05 - 7  
No. of pages: 1  
Date issued: 07/23/2007  
Subject: Offshore Manager: Duties and Responsibilities

Message:
All duties and responsibilities of the Offshore Manager have now been assumed by the Director of Operations, or his designee. These duties and responsibilities are listed in chapter 1, paragraph 1-2.4.1: Offshore Manager Responsibilities.

Insert in FMM after page 8.
Notice Number: 06 - 7
No. of pages: 1
Date issued: 07/23/2007
Subject: Fuel Handler Training Requirements: Customer Training

Message:
Reference Chapter 2 Fuel Handler Training Requirements, Paragraph 2-2 Customer Training:

Several changes have been implemented regarding training of customer personnel in refueling aircraft. After receiving instructions and exhibiting satisfactory knowledge of fuel handling and specific aircraft procedures, a pilot, mechanic or fuel handler may authorize such persons to refuel a helicopter. A “Helicopter Fueling Authorization” card may be issued to document training.

PHI will also no longer maintain a listing of these personnel.

Insert in FMM after page 10.
Notice Number: 08 - 7
No. of pages: 1
Date issued: 10/02/2007
Subject: Fire Extinguisher Requirements

Message:
Reference Chapter 5: Safety and Emergency Procedures, Paragraph 5-1.3(d) Fire Extinguishers:

Several changes have been implemented regarding the size of fire extinguishers at fuel storage areas at PHI. Fire extinguisher size for such areas is a minimum of 20lb. ABC or BC.

Reference PHI's HS&E Manual, Chapter 8: Fire Protection, for specifics as to location, type, rating, pathway distance, and minimum size.

Insert in FMM facing page 16.
Attached is the revised Fuel Handler Training Record form. The form has been reformatted.

Revised Form Reference page also included. Remove and replace as required.

Start utilizing the revised form. Form on Intranet has been updated.
Appendix L - Helicopter Crew Qualifications

Interim Guidance:

Pilot qualifications are contained in the respective aviation provider contracts and are based on the requirements in the Shell Standards and Guidelines for Aircraft Operations (SGAO), Part 1: Standards (access documents via this link).
Appendix M - Aircraft Standards

Interim Guidance:

Aircraft and aircraft equipment specifications are contained in the respective aviation provider contracts and are based on the requirements in the Shell Standards and Guidelines for Aircraft Operations (SGAO), Part 1: Standards (access documents via this link).
Appendix N – Example Impact Weather Tool Output

- Sea Surface Temperatures Map
• 2-Meter Air Temperatures

• Overall Temperature Status (Combined Sea Surface Temp and Air Temp)
• Current Winds/Seas

• 6-hr Winds/Seas Forecast
- **12-hr Winds/Seas Forecast**

Combined Sea State and Winds (Kts)
Valid: Thu Oct 25 01:00 CDT 2012

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Appendix O – Helicopter Type Float Certification Limits

- Table 1 shows the helicopter float certification limits for offshore helicopters currently in the Shell UA Gulf of Mexico contracted inventory.

<table>
<thead>
<tr>
<th>Helicopter Type</th>
<th>Demonstrated and Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW139</td>
<td>Sea State 6</td>
</tr>
<tr>
<td>S-92</td>
<td>Sea State 5 for Shell contracted S-92s from PHI Helicopters (Sea State 6 possible for S-92 if sponson floats installed)</td>
</tr>
<tr>
<td>S-76C++</td>
<td>Sea State 4</td>
</tr>
<tr>
<td>EC135</td>
<td>Sea State 4</td>
</tr>
</tbody>
</table>
### Explanation Beaufort scale for sea states

<table>
<thead>
<tr>
<th>Beaufort number</th>
<th>Description</th>
<th>Wind speed</th>
<th>Wave height</th>
<th>Sea conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Calm</td>
<td>&lt; 1 km/h (&lt; 0.5 m/s)</td>
<td>0 m</td>
<td>Flat.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 1 mph</td>
<td>0 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 1 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 0.3 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Light air</td>
<td>1.1–5.5 km/h (0.3–2 m/s)</td>
<td>0–0.2 m</td>
<td>Ripples without crests.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1–3 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1–3 kn</td>
<td>0–1 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3–1.5 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Light breeze</td>
<td>5.6–11 km/h (2–3 m/s)</td>
<td>0.2–0.5 m</td>
<td>Small waves. Crests of glassy appearance, not breaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4–7 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4–6 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.6–3.4 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12–19 km/h (3–5 m/s)</td>
<td>0.5–1 m</td>
<td>Large waves. Crests begin to break; scattered whitecaps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8–12 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7–10 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.4–5.4 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Moderate breeze</td>
<td>19–26 km/h (6–8 m/s)</td>
<td>1–2 m</td>
<td>Small waves with breaking crests. Fairly frequent whitecaps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13–17 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11–16 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.5–7.9 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fresh breeze</td>
<td>27–38 km/h (13–19 m/s)</td>
<td>2–3 m</td>
<td>Moderate waves of some length. Many whitecaps. Small amounts of spray.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18–24 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>17–21 kn</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>0.0–1.0 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Strong breeze</td>
<td>39–49 km/h (19–30 m/s)</td>
<td>3–4 m</td>
<td>Long waves begin to form. White foam breaks. Small amounts of spray.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25–30 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>22–27 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.8–13.8 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Gale, fresh gale</td>
<td>50–61 km/h (25–31 m/s)</td>
<td>3–5 m</td>
<td>Moderate waves are of considerable height.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31–38 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28–33 kn</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>13.9–17.1 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gale, strong gale</td>
<td>62–74 km/h (32–40 m/s)</td>
<td>5–7 m</td>
<td>Very high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable spray.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39–46 mph</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>33–40 kn</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>17.2–20.7 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Storm, whole gale</td>
<td>75–88 km/h (39–54 m/s)</td>
<td>7–10 m</td>
<td>High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of spray may begin to reduce visibility.</td>
</tr>
<tr>
<td></td>
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<td>47–54 mph</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>41–47 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.8–24.4 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Violent storm</td>
<td>69–102 km/h (32–48 m/s)</td>
<td>9–12.5 m</td>
<td>Very high waves with overhanging crests. Large patches of foam form. Waves give the sea a white appearance. Considerable choking of waves with heavy impact. Large amounts of spray may begin to reduce visibility.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>59–63 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>49–55 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24.3–26.4 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Hurricane</td>
<td>103–117 km/h (54–65 m/s)</td>
<td>11.5–16 m</td>
<td>Exceptionally high waves. Very large patches of foam driven before the wind, cover much of the sea surface. Very large amounts of spray severely reduce visibility.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64–73 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>58–62 kn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28.5–32.6 m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 54 mph</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 24.6 m/s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**November 2012**

**SPM - Appendix O** 2 of 2

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