TECHNICAL MANUAL
CHECKLIST

AIRCRAFT FUEL SERVICING WITH THE R-12 HYDRANT SERVICING VEHICLE (HSV)

This manual supersedes TO 00-25-172CL-5 dated 6 June 2015, Change 1 dated 4 May 2016.

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* Zero in this column indicates an original page.

TABLE OF CONTENTS

TABLE OF CONTENTS - CONTINUED

TABLE OF CONTENTS - CONTINUED

INTRODUCTION

1 PURPOSE.

This checklist is a step-by-step guide in abbreviated form for use as a reference to ensure accomplishment of selected tasks by a predetermined sequence procedure. The intent of this checklist is to eliminate the probability of omission of a step in the sequenced procedures for fueling/defueling aircraft using an A/S32R12 Hydrant Servicing Vehicle (HSV). The procedures contained herein are presented in the shortest practical form for use by qualified personnel and are not intended to provide full technical instructions. This checklist provides, in a abbreviated form, procedures for AIRCRAFT SERVICING PROCEDURES WITH THE R-12 HYDRANT SERVICING VEHICLE. These procedures are derived from, but do not replace, the detailed procedures contained in Technical Order (TO) 36A12-13-31-1, TO 36A12-13-34-1, TO 36A12-13-17-101, TO 36A12-13-36-1, TO 36A12-13-37-1, and TO 00-25-172.

2 SCOPE.

This checklist provides sequenced procedures for servicing aircraft using the USAF R-12 hydrant servicing vehicle. These instructions will be used by refueling unit operators as an aid to safe and efficient aircraft servicing.

3 ABBREVIATIONS.

All abbreviations used in this manual are shown in the list of abbreviations below. Standard abbreviations are in accordance with ASME Y14.38, Abbreviations and Acronyms for Use on Drawings and Related Documents.

°F	degrees Fahrenheit
2F0X1	Hydrant Servicing Vehicle Operator
AC	Aircraft
ACC	Accessory
AF	Air Force

AFTO	Air Force Technical Order
AFSC	Air Force Specialty Code
CSO	Chief/Concurrent Servicing Operations
CSS	Chief Servicing Supervisor
DLA	Defense Logistics Agency
DoD	Department of Defense
ESDS	Electrostatic Discharge Sensitive
ETIMS	Enhanced Technical Information Management System
FSC	Fuel Service Center
FSSZ	Fuel Servicing Safety Zone
HAS	Hardened Aircraft Shelters
HCI	Hardness Critical Items
HF	High Frequency
HSV	Hydrant Servicing Vehicle
ICT	Integrated Combat Turnaround
NAOC	National Airborne Operation Center
NFPA	National Fire Protection Association
PAS	Protective Aircraft Shelters
PN	Part Number
PSI	Pound-force per Square Inch
PTO	Power Takeoff
SPR	Single Point Receptacle
TCTO	Time Compliance Technical Order
TO	Technical Order
USAF	United States Air Force

4 RELATED PUBLICATIONS.

The following publications contain information in support of this technical manual.

List of Related Publications

Number	Title
ASME Y14.38	Abbreviations and Acronyms for Use on Drawings and Related Documents
DODI 5330.03_AFI 33-395	Defense Logistics Agency (DLA) Document Services
TO 00-5-1	AF Technical Order System
TO 00-25-172	Ground Servicing of Aircraft and Static Grounding/Bonding
TO 00-25-195	AF Technical Order System Source, Maintenance, and Recoverability Coding of Air Force Weapons, Systems, and Equipments
TO 00-25-234	General Shop Practice Requirements for the Repair, Maintenance, and Test of Electrical Equipment
TO 31Z-10-4	Electromagnetic Radiation Hazards
TO 36A12-13-17-101	Operation and Maintenance Instructions - Truck, Aircraft Refueling Hydrant Hose, A/S 32R-12, PN 182HT-Z001, NSN 2320-00-477-5521
TO 36A12-13-31-1	Operation and Operator Maintenance Instructions - Truck, Aircraft Refueling Hydrant Hose, Model HSV-12-AF, PN 50-0003
TO 36A12-13-34-1	Operation and Maintenance Instructions - Aircraft Hydrant Servicing Vehicle, Model PAHT-750-8

List of Related Publications - Continued

Number	Title
TO 36A12-13-36-1	Operation and Maintenance Instructions with Illustrated Parts Breakdown - Truck, Aircraft Refueling, Hydrant, A/S 32R-12, PN K-600, NSN-2320-01-478-5095
TO 36A12-13-37-1	Operation and Maintenance Instructions - Truck, Aircraft Refueling, Hydrant Hose A/S32R-12, PN 403HT-Z001, NSN 2320-00-477-5521
TO 36A12-13-52-1	Isometrics, Inc Operation and Maintenance Instructions - Truck, Aircraft Refueling, Hydrant Hose A/S32R-12, NSN 2320-01-642-7129, PN 1104HT-00-00, GS-30F-1032D/RPN-N-IR310 (Isometrics R-12 Refueler)
TO 37A-1-101	USAF Fuel, Water, and Lubricant Dispensing Equipment

5 RECORD OF APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS (TCTOs).

List of Time Compliance Technical Orders

TCTO Number	TCTO Title	TCTO Date

None

6 HCI HARDNESS CRITICAL ITEMS (HCI).

CAUTION

The HCI symbol (HCI) establishes special requirements limiting changes and substitutions and that the specific parts listed must be used to ensure hardness is not degraded.

If included, items with nuclear survivability requirements are marked with the HCI symbol (HCI). All changes to, or proposed substitutions of, HCIs must be approved by the acquiring activity.

7 ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) ITEMS.

CAUTION

All ESDS parts shall be handled in accordance with the ESDS device handling procedures in TO 00-25-234.

If included, items containing ESDS parts are marked with the ESDS symbol ( ).

8 IMPROVEMENT REPORTS.

Recommended changes to this manual shall be submitted in accordance with TO 00-5-1.

SAFETY SUMMARY

1 GENERAL SAFETY INSTRUCTIONS.

This manual describes physical and/or chemical processes which may cause injury or death to personnel, or damage to equipment, if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any specific task, the WARNINGs, CAUTIONs, and NOTEs included in that task shall be reviewed and understood.

2 WARNINGS, CAUTIONS, AND NOTES.

WARNINGs and CAUTIONs are used in this manual to highlight operating or maintenance procedures, practices, conditions, or statements which are considered essential to protection of personnel (WARNING) or equipment (CAUTION). WARNINGs and CAUTIONs immediately precede the step or procedure to which they apply. WARNINGs and CAUTIONs consist of four parts: heading (WARNING, CAUTION, or icon), a statement of the hazard, minimum precautions, and possible results if disregarded. NOTEs are used in this manual to highlight operating or maintenance procedures, practices, conditions, or statements which are not essential to protection of personnel or equipment. NOTEs may precede or follow the step or procedure, depending upon the information to be highlighted. The headings used and their definitions are as follows:

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

CHAPTER 1
EMERGENCY SHUTDOWN PROCEDURES

1.1 INTRODUCTION.

This checklist is a step by step guide in abbreviated form for use as a reference to ensure accomplishment of selected tasks by a predetermined sequence procedure. The intent of this checklist is to eliminate the probability of omission of a step in accomplishment of the intended task. The procedures contained herein are presented for use by qualified personnel and are not intended to provide full technical instructions. This checklist provides sequenced procedures for servicing aircraft using United States Air Force (USAF) R-12 fuel servicing vehicles. These instructions will be used by refueling unit operators as an aid to safe and efficient aircraft servicing.

1.2 HAND SIGNALS.

- **OK or Transfer Fuel**: Hand raised thumb up.
- **Negative or Malfunction or Not Clear**: Hand raised thumb down.
- **Stop or Cut Engine/Power**: Movement of either hand across throat.

1.3 EMERGENCY SHUTDOWN PROCEDURES.

WARNING

Do not actuate engine emergency shutdown switch if truck must be moved. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

a. Release deadman control and pull lanyard/control cable on the Type II hydrant system. If fuel flow continues, actuate the closest emergency fuel shutoff switch.

NOTE

Actuating any of the fuel emergency shutoff switches will close both the hydrant valve and the truck control valve if connected to a Type III hydrant. If the truck is connected to Type II hydrant system, only the truck control valve will close.

b. Actuate any of the emergency engine shutdown switches to stop the vehicle engine.

NOTE

If the hydrant-servicing vehicle must be moved without stowing the servicing hoses, hydrant hoses or lowering lift platform, close and disconnect the servicing nozzles and hydrant coupler. Break the seal and activate the interlock system override lever.

c. Close hydrant coupler valve; close single point nozzle valve(s).

d. Depart area if instructed by maintenance or fire department personnel.

CHAPTER 2
SAFETY PRECAUTIONS

2.1 SAFETY PRECAUTIONS.

The following safety precautions must be strictly complied with to prevent possible injury to personnel and damage to aircraft or equipment.

NOTE

The servicing vehicle will be pressurized and components, i.e., hoses, nozzles, and dry break coupler(s), will be checked for leaks during checkpoint or prior to the first servicing of the day. Ensure sump tank is drained prior to use.

a. All refueling and defueling operations will be accomplished under the supervision of the refueling supervisor.

b. Shoes with exposed nails, metal toe or heel plates will not be worn. However, shoes constructed with nonferrous metal nails or plates are acceptable.

c. Spark producing devices are not authorized in the Fuels Servicing Safety Zone (FSSZ).

d. Clothing containing more than 65 percent of any combination or mixture of nylon, rayon, wool, or polyester will not be worn as outer garments in the FSSZ when fuel servicing aircraft with low flashpoint fuels (flashpoint 100 degrees Fahrenheit (°F) or below). Do not put on or remove outer garments while in the FSSZ.

e. Electronic devices may be used in accordance with Technical Order (TO) 00-25-172.

f. Fire protection equipment requirements will be placed according to TO 00-25-172.

g. Should a leak develop during refueling or defueling, stop all operations. Necessary safety precautions will be taken and repairs accomplished prior to resuming operations.

h. All unattended vehicles on the flight line will be parked so they will not interfere with the aircraft being towed or taxied. Ignition will be turned off, keys will be left in the ignition, brakes set and wheel chocks placed both in front of and behind one of the rear wheels. One chock will be placed between the tandem wheels of dual (tandem) axle vehicles.

i. Use wheel chocks and spotter when backing toward aircraft. Spotter and driver must be able to see each other.

j. Refueling/defueling operations will not be performed:

(1) Within 300 feet of aircraft radar and High Frequency (HF) radios operating in the transmit mode unless otherwise specified in applicable aircraft and equipment TOs, or when TO 31Z-10-4 procedures are used.

(2) Within a 50 foot radius of operating aircraft, or with aircraft turned in such a way that engine exhaust is directed upon fueling/defueling operation.

(3) Within 50 feet of active ignition source (open flames, sparks from internal combustion engines, electrical arcing).

(4) Whenever an electrical storm is within five miles.

(5) Whenever high winds are considered hazardous.

(6) When there are fuel leaks in the aircraft, fuel servicing equipment, or other equipment in the area.

(7) While oxygen servicing operations are in progress.

(8) If glowing or crackling fuel is noted when servicing the aircraft.

k. Fire department will be notified in advance of fueling time when special fueling operations are to be accomplished in accordance with TO 00-25-172.

CHAPTER 3
REFUELING/DEFUELING TEAM

3.1 REFUELING/DEFUELING TEAM.

The refueling/defueling team will consist of 3 team members.

- Aircraft Servicing Supervisor (2A5X1 or other authorized Air Force Specialty Code (AFSC)) is in charge of the refueling operation and maintains visual contact with all other team members.

- Aircraft Servicing Crew (2A5X1 or other authorized AFSC) handles the fuel nozzles and observes the aircraft for leaks or spills.

- Hydrant Servicing Vehicle Operator (2F0X1) operates pump control switches and observes servicing vehicle instruments. Also observes the servicing vehicle for leaks or other defects.

3.1.1 Type III Hydrant Systems. Type III hydrant systems equipped with an operable “Pump On” indicator light and emergency “Shutoff” switch located in the Resource Control Center are not required to be manned during operation. MAJCOM policy may vary.

CHAPTER 4
REFUELING/DEFUELING PREPARATIONS

4.1 PREPARATIONS.

CAUTION

Aircraft flaps must be in full up position on aircraft requiring under wing fuel servicing prior to positioning servicing vehicle. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Use wheel chocks and spotter when backing toward aircraft.

a. Stop at least 25 feet from the aircraft. Upon signal from the Aircraft Servicing Supervisor, position hydrant servicing vehicle. (Set parking brake on servicing vehicle.)

NOTE

Engine must remain running (idle) while refueling using the R-12 model Hydrant Servicing Vehicle (HSV). Engines may be shutoff while using the PAHT-750-8 HSV; however, the ignition must be in the Accessory (ACC) position while refueling.

b. Shut off radio (if appropriate), exit cab, and leave door ajar. Chock vehicle.

c. Ground servicing vehicle to static ground in accordance with Technical Order (TO) 00-25-172 and Aircraft -2 checklist.

d. Attend briefing by Aircraft Servicing Supervisor concerning amount of fuel to be refueled/defueled and procedure to be followed in case of emergency. Ensure the location of emergency switches and emergency shutoff procedures are briefed to all personnel involved in the operation.

e. Brief/warn servicing crew not to lower lift on 1997/98 Beta model when single point nozzles are connected.

f. Prior to refueling/defueling, verify jointly with the Aircraft Servicing Supervisor/Crew the correct grade of fuel required.

g. Prepare vehicle for appropriate servicing operation.

h. Remove hydrant and aircraft servicing nozzles. Inspect hydrant coupler and servicing nozzles for security, damage, missing, and broken parts, and inspect hoses as outlined in TO 37A-1-101.

Refueling Operator shall ensure nozzles equipped ball strainer valves are in the correct refuel/defuel position. The ball valve strainer must be inspected and cleaned as required every time the ball valve position is switched from the refuel to defuel or defuel to refuel position. This strainer is the last line of protection for preventing solid contaminates from entering Aircraft (AC) or the refueling vehicle components. If the strainer is not inspected and cleaned if required, damage to AC fuel systems/ refueling vehicle components and fuel spill may occur. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

i. Nozzle strainers shall be removed or reversed on all designated defuel units. Strainers shall be inspected and, if necessary, cleaned on units used for one-time defuels prior to the next refuel operation in accordance with TO 37A-1-101.

CAUTION

On Type III hydrant fueling systems, the hydrant coupler must be in the open position prior to connecting sensing hoses to hydrant control valve and during refueling operations, the sensing hoses must be connected to the pit. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

j. Attach hydrant coupler to hydrant outlet adapter. Ensure coupler is securely attached to the outlet. Open hydrant coupler. For refuel only, connect sensing hoses to pit control valve on Type III hydrant fueling system.

WARNING

Aircraft/equipment must be grounded and/or bonded prior to connecting the single point nozzle to the aircraft; however, the hydrant coupler will be connected to the hydrant outlet prior to bonding the hydrant-servicing vehicle to the aircraft. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

k. Bond the hydrant-servicing vehicle to the hydrant system and to the aircraft.

l. On Type II hydrant fueling systems, the sensing hoses are not used.

WARNING

If peak hold differential pressure gauge is not reset, a filter separator element rupture could go undetected, placing safety of flight in jeopardy. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

m. Verify with procedures on the control panel of each specific R-12 that all valves and controls are properly configured for refueling/

defueling operation. If applicable, reset the peak hold differential pressure gauge and zero the meter. (On Type II systems, attach control cable if applicable).

CAUTION

- The high-lift operator must ensure lift does not strike aircraft. The 2F0X1 acts as a safety observer during movement of the high-lift. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Do not lower the high-lift on the 1997 and 1998 Beta model R-12 while the hoses are attached to the aircraft unless the vehicle has been modified with an articulating pantograph assembly. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Use of the D-2 straight throat nozzle or D-3 universal inlet nozzle for under wing fuel servicing of military/commercial aircraft is preferred. If 45 degree D-1 nozzles are used, ensure nozzles and hoses are supported to prevent damage to aircraft receptacles. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

n. Prior to pressurizing the hose, ensure the Aircraft Servicing Crew connects the nozzle to the aircraft and properly verifies dry break coupler quick disconnect locking device is positively engaged and the single point nozzle cannot be removed with the poppet valve in the open position.

WARNING

If either the dry break quick disconnect locking device or the single point nozzle check fail, remove the vehicle from service until repaired. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

o. Check sump tank gauge prior to, during, and after each operation to prevent overfill.

p. For normal refueling operations proceed to Chapter 5, REFUELING.

q. For normal defueling operations, proceed to Chapter 6, DEFUELING.

CHAPTER 5
REFUELING

5.1 REFUELING EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

5.2 REFUELING PROCEDURES.

a. Follow preparation procedures outlined in Chapter 4.

b. Prepare the vehicle control panel for refuel operation.

CAUTION

Refueling Operator shall ensure nozzles equipped ball strainer valves are in the refuel position. The ball valve strainer must be inspected and cleaned as required every time the ball valve position is switched from the refuel to defuel or defuel to refuel position. This strainer is the last line of protection for preventing solid contaminates from entering Aircraft (AC) or the refueling vehicle components. If the strainer is not inspected and cleaned if required, damage to AC fuel systems/refueling vehicle components and fuel spill may occur.

c. Ensure the Aircraft Servicing Crew has opened the single point nozzle(s).

CAUTION

On Type II hydrant systems, the deadman control must be activated immediately after hydrant system is energized, and the hydrant system must be de-energized immediately after releasing the deadman control. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

d. Open hydrant coupler valve and pressurize the system by activating the deadman control. (Energize pumps on Type I and II systems.)

e. Observe nozzle(s), hydrant coupler, and servicing vehicle plumbing for leaks. Check the inlet and outlet hose(s) at coupling for signs of slippage. If a leak is detected, shut down the operation, notify the Fuel Service Center (FSC). Observe the filter differential pressure and record, if required. If adjusted differential pressure reaches 15

Pound-force per Square Inch (PSI), shut down the operation. Observe servicing vehicle pressure. If nozzle pressure exceeds 55 PSI, shut down and notify FSC.

f. Closely monitor control panel. Maintain visual contact with Aircraft Servicing Supervisor during the entire operation.

CAUTION

If the aircraft crew requests shutting down refuel operation to transfer fuel between aircraft tanks, the single point poppet valves will be closed to prevent backflow into the refueling unit sump tank. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

During normal refueling operations, the hydrant servicing vehicle operator retains control by holding deadman control and lanyard/control cable on the Type II systems.

g. When servicing is complete, deactivate deadman (deenergize pumps on Type II system), close single point nozzle(s), relieve pressure if required, and disconnect servicing nozzle(s) from aircraft.

h. Close hydrant coupler valve, disconnect sensing hoses from hydrant control valve, and remove hydrant coupler from hydrant outlet. Check hydrant outlet valve for proper closing/seating. Reinstall dust cover, replace sensing caps and close hydrant pit lid.

NOTE

If a leak is detected, report deficiency to FSC.

i. Stow hydrant coupler and sense hoses.

j. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of refuel or recirculation operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

k. Disconnect and stow ground and bonding cables.

l. Complete necessary accounting records.

m. Perform a walk around inspection, remove wheel chocks, and depart area with assistance of a spotter.

n. If vehicle brakes fail to release, verify nozzle(s), coupler, and high-lift positioning.

CHAPTER 6
DEFUELING

6.1 DEFUELING EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

6.2 DEFUELING PROCEDURES.

WARNING

Do not pressurize servicing vehicle with the single point nozzle(s) open and the aircraft valves in the defueling position. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

a. Follow preparation procedures outlined in Chapter 4.

CAUTION

Refueling Operator shall ensure nozzles equipped ball strainer valves are in the defuel position. The ball valve strainer must be inspected and cleaned as required every time the ball valve position is switched from the refuel to defuel or defuel to refuel position. This strainer is the last line of protection for preventing solid contaminates from entering Aircraft (AC) or the refueling vehicle components. If the strainer is not inspected and cleaned if required, damage to AC fuel systems/refueling vehicle components and fuel spill may occur. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

- Prior to defueling operations, the defueling vehicle operator will obtain the following information from the Fuel Service Center (FSC): reason for the defuel, type of fuel being defueled, and estimated amount of fuel to be defueled from the aircraft.
- If contamination is suspected a one-quart sample will be taken and examined for color, water, and sediment. If visual inspection fails, do not defuel the aircraft until corrective action is taken.
- For KC-10, KC/EC/RC-135 rapid defueling use Chapter 7.
- Nozzle strainers shall be removed or reversed on all designated defuel units. Strainers shall be inspected and, if necessary, cleaned on units used for one-time defuels prior to the next refuel operation in accordance with Technical Order (TO) 37A-1-101.

b. Place Power Takeoff (PTO) in the PUMP position and transmission in the DRIVE position. If equipped, ensure the air cylinder behind the accelerator pedal is extended.

CAUTION

- Do not allow the PTO to operate more than five minutes without fluid flow. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Do not operate the pump at speeds that cause cavitation. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Do not allow the engine to operate at speeds above idle during a "no flow" condition. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

- Decreasing the revolutions per minute during the defuel operation may be necessary to prevent pump cavitation.
- Sensing lines are not required to be hooked to the pit during defuel operations for the Beta Freightliner, Gen II, and Kovatch Ford Hydrant Servicing Vehicle's (HSV's), but will be connected for Beta International, Gen I and Tri-State HSVs.

c. Prepare the vehicle control panel for defuel operation.

d. Ensure Aircraft Servicing Crew performs coupler and poppet checks prior to opening single point nozzle(s).

e. Squeeze deadman control to defuel aircraft. Adjust the engine speed, as required.

f. Observe nozzle(s), hose(s), hydrant coupler valve, and servicing vehicle for leaks. If a leak is detected, shut down the operation and notify FSC.

g. Maintain visual contact with Aircraft Servicing Supervisor during entire operation.

CAUTION

If the aircraft crew requests shutting down defuel operation to transfer fuel between aircraft tanks, the single point poppet valves will be closed to prevent backflow into the refueling unit sump tank. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

During normal defueling operations, the HSV Operator retains control by holding deadman control and lanyard/control cable on Type II hydrant systems.

h. When defueling is complete, reduce revolutions per minute to idle, deactivate deadman, stop the servicing vehicle defuel pump by placing transmission in NEUTRAL (deactivate hydrant system defuel pump on Type II hydrant systems); close single point nozzle(s), and close and disconnect hydrant coupler from the hydrant control valve. Check hydrant outlet for proper closing/seating. Reinstall dust cover and close pit lid.

NOTE

If a leak is detected, report deficiency to FSC.

i. Stow hydrant coupler.

NOTE

Reinstall/inspect nozzle strainer, if applicable.

j. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of defuel operation, ensure the hose isolation valves are open to prevent thermal expansion and damage to equipment. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

k. Ensure grounding and bonding cables, when used, are disconnected and stowed properly on the reels.

l. Complete necessary accounting records.

m. Perform walk around inspection and remove wheel chocks.

n. Move the PTO to the DRIVE position and ensure that the air cylinder behind the accelerator pedal is retracted, if equipped.

o. Depart area with spotter assistance.

p. If vehicle brakes fail to release, verify nozzle(s), coupler, and high-lift positioning.

CHAPTER 7
KC-10; KC/EC/RC-135 RAPID DEFUELING

7.1 RAPID DEFUELING EMERGENCY SHUTDOWN PROCEDURES.

WARNING

- When performing rapid defueling, all members of the fueling team except fire guard will be in contact with each other via the intercom system. This includes the Hydrant Servicing Vehicle (HSV) Operator (2F0X1). Aircraft Maintenance personnel will perform all other items. It cannot be over emphasized that these procedures must be followed in the proper sequence to ensure a safe operation. These procedures are applicable only to the Type II (Pritchard-Modified) and the Type III (Phillips) hydrant systems. Ensure sufficient space is available to hold fuel being defueled from the aircraft. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

- Due to the fire hazards associated with rapid defueling operations, the preferred distance between aircraft wing tips is 50 feet. At installations where aircraft parking space is limited and hydrant fuel pit spacing will not permit 50 foot aircraft wing tip clearance, the wing tip separation can be reduced to a minimum of 35 feet. However, whenever a distance of less than 50 feet (wing tip to wing tip) is maintained, an aircraft rescue and firefighting vehicle must be at the aircraft during rapid defueling operations. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

a. Notify Aircraft Servicing Crew to stop on-board transfer pumps.

b. Release deadman control. If fuel flow continues, actuate the closest emergency fuel shutoff switch.

NOTE

- Do not actuate engine emergency shutdown switch if truck must be moved.
- Actuating any of the fuel emergency shutoff switches will close both the hydrant valve and the truck control valve if connected to a Type III hydrant. If the truck is connected to a Type II hydrant system, only the truck control valve will close.

c. Actuate any of the emergency engine shutdown switches to stop the vehicle engine.

NOTE

If the hydrant-servicing vehicle must be moved without stowing the servicing hoses, hydrant hoses or lowering lift platform, close and disconnect the servicing nozzles and hydrant coupler. Break the seal and activate the interlock system override lever.

d. Close hydrant coupler valve; close single point nozzle valve(s).

e. Depart area if instructed by maintenance or fire department personnel.

7.2 RAPID DEFUELING PROCEDURES.

a. Follow preparation procedures outlined in Chapter 4.

NOTE

If contamination is suspected, a one-quart sample will be taken and examined for color, water, and sediment. If visual inspection fails, do not defuel the aircraft until corrective action is taken.

b. Obtain headsets from the Aircraft Servicing Supervisor.

CAUTION

Refueling Operator shall ensure nozzles equipped ball strainer valves are in the defuel position. The ball valve strainer must be inspected and cleaned as required every time the ball valve position is switched from the refuel to defuel or defuel to refuel position. This strainer is the last line of protection for preventing solid contaminates from entering Aircraft (AC) or the refueling vehicle components. If the strainer is not inspected and cleaned if required, damage to AC fuel systems/refueling vehicle components and fuels spills may occur.

c. Ensure nozzle strainer has been removed for defueling operation.

d. Perform intercom check with supervisor and all members of the rapid defueling team.

WARNING

Do not pressurize servicing vehicle with the single point nozzle(s) open and the aircraft valve in the defueling position. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

e. Place Power Takeoff (PTO) in the PUMP position and transmission in DRIVE position. Ensure the air cylinder behind the accelerator pedal is extended, if equipped.

f. Pressurize servicing vehicle and check for leaks.

CAUTION

- Hearing protection devices will be worn during engine run. Failure to comply could result in injury to personnel or long term health hazard.
- Use of the D-2 straight throat nozzle or D-3 universal inlet nozzle for under wing fuel servicing of military/commercial aircraft is preferred. If 45 degree D-1 nozzles are used, ensure nozzles and hoses are supported to prevent damage to aircraft receptacles.
- Do not allow the PTO to operate more than five minutes without fuel flow. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Do not operate the pump at speeds that cause cavitation. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.
- Do not allow the engine to operate at speeds above idle during a “no flow” condition. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

g. Prepare the vehicle control panel for defuel operation.

h. Ensure aircraft engine that is the farthest distance from the hydrant outlet is started: Number 1 or Number 4 engine.

i. Ensure crew chief opens single point nozzle(s).

j. Squeeze deadman control to defuel aircraft. Adjust the engine speed as required.

WARNING

When the Aircraft On-Board transfer pumps are started an increase in fuel flow will be observed. Continuous monitoring and coordination with servicing crew is required to ensure flow rates never exceed 300 gallons per minute. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

k. Observe nozzle(s), hose(s), hydrant coupler valve, and servicing vehicle for leaks. If a leak is detected, shut down the operation and notify Fuel Service Center (FSC).

l. Maintain visual contact with Aircraft Servicing Supervisor/Crew during the entire operation.

CAUTION

- If the aircraft crew requests defuel operation be shutdown to transfer fuel between aircraft tanks, the single point poppet valves will be closed to prevent backflow into the refueling unit sump tank. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

- If vehicle operator needs to terminate operation, they must make an effort to inform servicing crew prior to releasing deadman. Crew will cease operation of aircraft pumps prior to stopping flow at the truck to prevent excessive pressure surges. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

The HSV Operator retains control by holding deadman control and lanyard/control cable on the Type II hydrant systems.

m. When defuel is complete, deactivate deadman, place transmission in NEUTRAL; close single point nozzle(s), and disconnect sensing hose(s) from pit control valve, and remove hydrant coupler. Check hydrant outlet for proper closing/seating. Reinstall dust cover, and close outlet lid.

NOTE

If a leak is detected, report deficiency to FSC.

n. Stow hydrant coupler and sensing hoses.

NOTE

Reinstall/inspect nozzle strainer, if required.

o. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of defuel operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

p. Disconnect and stow grounding and bonding cables.

q. Complete necessary accounting records.

r. Perform a walk around inspection and remove wheel chocks.

s. Move the transmission selector to the DRIVE position and if equipped, ensure that the air cylinder behind the accelerator pedal is retracted.

t. Depart area with spotter assistance.

CHAPTER 8
FILLING REFUELING TANK TRUCKS

8.1 EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

8.2 TRUCK FILLING PROCEDURES.

NOTE

When performing this operation, the Hydrant Servicing Vehicle Operator will be in charge of the entire operation.

a. Position hydrant servicing vehicle at the appropriate hydrant outlet, set parking brake, and chock vehicle.

NOTE

Engine must remain running (idle) while refueling using the R-12 model Hydrant Servicing Vehicle (HSV). Engines may be shutoff while using the PAHT-750-8 HSV; however, the ignition must be in the Accessory (ACC) position while refueling.

b. Ground hydrant servicing vehicle. Position 150 pound Halon 1211 fire extinguisher or equivalent in area.

c. Position and chock tank truck.

d. Conduct briefing concerning amount of fuel to be refueled and procedure to be followed in case of emergency. Ensure location of emergency switches and emergency shutoff procedures are briefed to all concerned.

e. Verify proper grade of fuel with truck.

f. Remove hydrant coupler and inlet hose from hydrant servicing vehicle. Inspect hoses, nozzles, couplers in accordance with Technical Order (TO) 37A-1-101.

g. Attach hydrant coupler to hydrant outlet. Ensure the hydrant coupler is securely attached. Open the hydrant coupler.

CAUTION

On Type III hydrant fueling systems, the hydrant coupler must be in the open position prior to connecting sensing hoses to hydrant control valve. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

h. Attach the sensing hoses to the hydrant control valve on the Type III hydrant system.

WARNING

Equipment must be grounded and/or bonded prior to connecting the single point nozzle to the receiving tank truck; however, the hydrant coupler will be connected to the hydrant outlet prior to bonding the hydrant-servicing vehicle to the receiving tank truck. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

i. Bond the hydrant-servicing vehicle to the receiving tank truck and to the hydrant system.

NOTE

On Type II hydrant fueling systems, the sensing hoses are not used.

j. Remove ground dispensing hose from servicing vehicle. Inspect nozzle for security, damage, and broken parts. Inspect hose for cuts and abrasions.

k. Prior to pressurizing the hose, ensure the refueling unit operator connects the nozzle to the bottom loader and properly verifies the

dry break coupler quick disconnect locking device is positively engaged and the single point nozzle cannot be removed with the poppet valve in the open position.

NOTE

If either the dry break quick disconnect locking device or the single point nozzle check fail, remove the vehicle from service until repaired.

l. Verify with procedures on the control panel of each specific R-12 that all valves and controls are properly configured for filling operation. If applicable, reset the peak hold differential pressure gauge and zero meter. (On Type II hydrant systems, attach control cable, if applicable.)

m. Ensure the refueling unit operator has opened the single point nozzle and bottom loader valve.

n. Notify tank truck operator when ready to begin filling operation.

NOTE

The deadman control will be operated by the HSV Operator.

o. Pressurize the system by activating the deadman control. (Energize pumps on the Type I and II hydrant systems.)

p. Ensure the refueling unit operator tests the high-level shutoff system, if equipped, or verifies overfill protection system is operational.

NOTE

If the test fails, remove the vehicle from service immediately and notify Fuel Service Center (FSC). Units with a non-operational high level shutoff system will only be used when mission essential at which time a person must be placed on top of the unit upwind to prevent overfilling.

q. Observe nozzle, hydrant coupler, and servicing vehicle for leaks. Check the inlet and outlet hose at coupling for signs of slippage. If a leak is detected, shut down the operation and notify FSC. Observe the filter differential pressure and record, if required. If the corrected differential pressure reading reaches 15 Pound-force per Square Inch (PSI), shut down the operation. Observe servicing vehicle pressure. If nozzle pressure exceeds 55 PSI, shut down and notify FSC.

r. Closely monitor control panel. Maintain visual contact with refueling unit operator during the entire operation.

s. When servicing is complete, deactivate deadman (deenergize pumps on Type II hydrant systems), close single point nozzle, relieve pressure if required, and disconnect servicing nozzle from tank truck.

t. Close hydrant coupler valve, disconnect sensing hoses from hydrant control valve, and remove hydrant coupler from hydrant outlet. Check hydrant outlet valve for proper closing/seating. Reinstall dust cover, replace sensing caps, and close hydrant pit lid.

NOTE

If a leak is detected, report deficiency to FSC.

u. Stow hydrant coupler and sensing hoses.

v. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of tank truck filling operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

w. Disconnect and store grounding and bonding cables.

x. Complete necessary accounting records.

y. Perform a walk around inspection, remove wheel chocks, and depart area.

z. If vehicle brakes fail to release, verify nozzle(s), coupler, and high-lift positioning.

CHAPTER 9
INTEGRATED COMBAT TURNAROUND (ICT) OPERATIONS

9.1 INTRODUCTION.

This checklist is to be utilized by qualified fuels specialists who are thoroughly knowledgeable in ICT procedures.

9.2 ICT EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

9.3 EQUIPMENT/SYSTEM PREPARATION.

a. Ensure the servicing vehicle has been pressurized and components, i.e., hoses, nozzles, and dry break coupler(s), checked for leaks.

b. Equipment/facilities having safety defects will not be used for ICT.

9.4 ICT AIRCRAFT SERVICING PROCEDURES.

a. Follow preparation procedures outlined in Chapter 4.

WARNING

Aircraft/equipment must be grounded and/or bonded prior to connecting the single point nozzle to the aircraft; however, the hydrant coupler will be connected to the hydrant outlet prior to bonding the hydrant-servicing vehicle to the aircraft. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

b. Ensure the crew member has opened the single point nozzle(s).

CAUTION

On Type II hydrant systems, the deadman control must be activated immediately after hydrant system is energized, and the hydrant system must be deenergized immediately after releasing the deadman control. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

During ICT operations the Aircraft Servicing Supervisor/Crew retains control by holding deadman control and lanyard/control cable on the Type II hydrant systems.

c. The Servicing Supervisor will pressurize the system by activating the deadman control. (Energize pumps on Type II hydrant systems.)

d. Observe nozzle(s), hydrant coupler, and servicing vehicle plumbing for leaks. Check the inlet and outlet hose(s) at coupling for signs of slippage. If a leak is detected, shut down the operation and notify the Fuel Service Center (FSC). Observe the filter differential pressure and record, if required. If the corrected differential pressure reading reaches 15 Pound-force per Square Inch (PSI), shut down the operation. Observe servicing vehicle pressure. If nozzle pressure exceeds 55 PSI, shut down and notify FSC.

e. Closely monitor control panel. Maintain visual contact with Servicing Supervisor during the entire operation.

f. When servicing is complete, the Aircraft Servicing Supervisor/Crew will deactivate deadman (de-energize pumps on Type II hydrant systems), close single point nozzle(s), relieve pressure if required, and disconnect servicing nozzle(s) from aircraft.

g. Close hydrant coupler valve, disconnect sensing hoses from hydrant control valve, and remove hydrant coupler from hydrant outlet. Check hydrant outlet valve for proper closing/seating. Reinstall dust cover, replace sensing caps, and close hydrant pit lid.

NOTE

If a leak is detected, report deficiency to FSC.

h. Stow hydrant coupler and sensing hoses.

i. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of ICT operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

j. Disconnect and stow ground and bonding cables.

k. Complete necessary accounting records.

l. Perform a walk around inspection, remove wheel chocks, and depart area with spotter assistance.

m. If vehicle brakes fail to release, verify nozzle(s), coupler, and high-lift positioning.

CHAPTER 10

HOT REFUELING THE E-4B NATIONAL AIRBORNE OPERATIONS CENTER AIRCRAFT

10.1 INTRODUCTION.

This chapter is a step-by-step guide in abbreviated form for use as a reference to ensure accomplishment of selected tasks. The intent of this chapter is to eliminate the possibility of omission of a step in the sequenced procedures for National Airborne Operations Center (NAOC) (E-4B) hot refueling. The procedures contained herein are presented for use by qualified personnel and are not intended to provide full technical instructions. Qualified E-4B hot refueling fuel specialists will have a thorough working knowledge of these precautions.

10.2 E-4B HOT REFUELING EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

10.3 SAFETY PRECAUTIONS.

General safety precautions apply regarding electrical storms, equipment discrepancies, spark producing items, grounding/bonding, clothing, distance criteria, etc. In addition, observe the following:

a. No external maintenance will be accomplished during refueling.

b. Refueling team will consist of a minimum of seven (7) personnel.

c. Telephone and radio landlines may be connected to the aircraft but not connected/disconnected during refueling.

d. Passengers and NAOC personnel may stay on board, but are prohibited from exit/entry during fuel servicing.

e. Personnel must remain at least 10 feet from all lower ultrahigh frequency antennas.

WARNING

Severe electrical shock and burns may result when touching equipment or aircraft during High Frequency (HF) transmissions. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

f. When notified by aircraft servicing supervisor of HF transmissions, stop fuel flow, and lay the deadman control down on ground. Do not touch skin of aircraft or other metal objects; do not touch any portion of servicing vehicle.

g. Hearing protection will be worn when aircraft engine is operating.

h. Headgear will not be worn in immediate area of operating engine.

i. The refueling operator will maintain contact with the servicing supervisor via headset interphones during the entire operation.

10.4 LIMITATIONS.

a. Maintenance during refueling is limited to physical replacement of avionics components inside the aircraft.

b. Refueling will be accomplished using D-2 or D-3 straight throat nozzle(s) connected to Single Point Receptacle (SPR) on the wing opposite the operating engine.

c. Fire protection will be according to Technical Order (TO) 00-25-172.

10.5 AIRCRAFT SERVICING PROCEDURES.

a. Follow preparation procedures outlined in Chapter 4.

b. Obtain headsets from the Aircraft Servicing Supervisor.

WARNING

Aircraft/equipment must be grounded and/or bonded prior to connecting the single point nozzle to the aircraft; however, the hydrant coupler will be connected to the hydrant outlet prior to bonding the hydrant-servicing vehicle to the aircraft. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

c. Prepare servicing vehicle for refueling by verifying that all valves and controls are properly configured and zero the meter. (On Type II hydrant systems, attach control cable, if applicable.)

d. Ensure the crew member has opened the single point nozzle(s).

CAUTION

On Type II hydrant systems, the deadman control must be activated immediately after hydrant system is energized and the hydrant system must be de-energized immediately after releasing the deadman control. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

e. Upon notification from Aircraft Servicing Supervisor/Crew, pressurize the system by activating the deadman control. (Energize pumps on Type II hydrant systems.)

f. Observe nozzle(s), hydrant coupler, and servicing vehicle plumbing for leaks. Check the inlet and outlet hoses(s) at coupling for signs of slippage. If a leak is detected, shut down the operation and notify Fuel Service Center (FSC). Observe the filter differential pressure and record, if required. If differential pressure reaches 15 Pound-force per Square Inch (PSI) when corrected, shut down the operation. Observe servicing vehicle pressure. If nozzle pressure exceeds 55 PSI, shut down and notify FSC.

g. Closely monitor control panel. Maintain visual contact with Aircraft Servicing Supervisor during refueling operations.

h. When servicing is complete, deactivate deadman (deenergize pumps on Type II hydrant systems), close single point nozzle(s), relieve pressure, if required, and disconnect servicing nozzle(s) from aircraft.

NOTE

If a leak is detected, report deficiency to FSC.

i. Stow hydrant coupler and sense hoses.

j. Stow dispensing hose(s) and nozzle(s).

WARNING

Upon completion of hot refueling operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

k. Disconnect and stow ground and bonding cables.

l. Complete necessary accounting records.

m. Perform a walk around inspection, remove wheel chocks, and depart area with spotter assistance.

n. If vehicle brakes fail to release, verify nozzle(s), coupler, and high-lift positioning.

CHAPTER 11
CONCURRENT SERVICING OPERATIONS

11.1 INTRODUCTION.

This chapter provides, in abbreviated form, procedures for concurrent fuel servicing operations of commercial, contract, and military cargo and passenger aircraft. This chapter is a step-by-step guide to ensure accomplishment of selected tasks. The intent of this chapter is to eliminate the probability of omitting a step in accomplishing an intended task. The procedures contained herein are presented in the shortest, practical form for use by qualified personnel and are not intended to provide full technical instructions.

11.2 EMERGENCY SHUTDOWN PROCEDURES.

Follow Emergency Shutdown Procedures in Chapter 1.

11.3 PREPARATION FOR CONCURRENT OPERATIONS.

a. Only equipment equipped with deadman controls are authorized for use in concurrent servicing operations.

b. Make sure the Concurrent Servicing Supervisor notifies the Fire Department 15 minutes prior to performing concurrent servicing operations.

c. If personnel are remaining on board the aircraft, make sure the Chief Servicing Supervisor (CSS) informs the Fire Department of the number of people involved. With passengers/patients on board and servicing with JP-4 or Jet B fuel, a major aircraft rescue and fire fighting vehicle (P-2/19/23) will be positioned at the aircraft.

d. Bond work stands to the aircraft when stands are used to access the aircraft servicing receptacles or support the fuel hose during servicing operations.

e. The CSS will wear a reflective vest with the letters CSS on the front and back. The CSS is responsible for controlling and monitoring all concurrent-servicing operations.

f. Establish and maintain voice intercom contact if passengers are on board the aircraft.

11.4 CONCURRENT SERVICING OPERATIONS PROCEDURES.

WARNING

Simultaneous fuel and oxygen servicing on an aircraft is not authorized. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

CAUTION

C-130 and C-17 aircraft troop doors and emergency hatches on the right or Single Point Receptacle (SPR) side of the aircraft must be closed during concurrent servicing operations to isolate the cargo department from the fuel servicing safety zone. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

a. Follow preparation procedures outlined in Chapter 4.

WARNING

Aircraft/equipment must be grounded and/or bonded prior to connecting the single point nozzle to the aircraft; however, the hydrant coupler will be connected to the hydrant outlet prior to bonding the hydrant-servicing vehicle to the aircraft. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

b. Ensure the Concurrent Servicing Crew has opened the single point nozzle(s).

CAUTION

On Type II hydrant systems, the deadman control must be activated immediately after hydrant system is energized and the hydrant system must be de-energized immediately after releasing the deadman control. Failure to comply could result in damage to, or destruction of, equipment or loss of mission effectiveness.

c. Upon notification from the Concurrent Servicing Supervisor/Crew, pressurize the system by activating the deadman control. (Energize pumps on Type II hydrant systems.)

d. Observe nozzle(s), hydrant coupler, and servicing vehicle plumbing for leaks. Check the inlet and outlet hose(s) at coupling for signs of slippage. If a leak is detected, shut down the operation and notify Fuel Service Center (FSC). Observe the filter differential pressure and record, if required. If differential pressure reaches 15 Pound-force per Square Inch (PSI) when corrected, shut down the operation. Observe servicing vehicle pressure. If nozzle pressure exceeds 55 PSI, shut down and notify FSC.

e. Closely monitor control panel. Maintain visual contact with CSS during refueling operations.

f. When servicing is complete deactivate deadman (deenergize pumps on Type II hydrant systems), close single point nozzle(s), relieve pressure, if required, and disconnect servicing nozzle(s) from aircraft.

g. Close hydrant coupler valve, disconnect sense hoses from pit control valve, and remove coupler form hydrant outlet. Check hydrant outlet poppet valve for proper closing/seating. Reinstall dust cover, replace sensing caps and close outlet lid.

NOTE

If a leak is detected, report deficiency to FSC.

h. Stow hydrant coupler and sensing hoses.

i. Stow dispensing hoses(s) and nozzle(s).

WARNING

Upon completion of concurrent servicing operation, ensure the hose isolation valves are open to prevent thermal expansion. Failure to comply could result in injury to, or death of, personnel or long term health hazards.

j. Disconnect and stow ground and bonding cables.

k. Complete necessary accounting records.

l. Perform a walk around inspection, remove wheel chocks, and depart area with spotter assistance.