

## SECTION 2. FUEL SYSTEMS

**8-30. GENERAL.** Maintain, service, and adjust aircraft fuel systems and fuel system components in accordance with the applicable manufacturer's maintenance instructions. Certain general fuel system maintenance principles are outlined in the following paragraphs..

**8-31. FUEL LINES AND FITTINGS.** When fuel system lines are to be replaced or repaired, consider the following fundamentals in addition to the applicable airworthiness requirements. Additional inspection and repair practices for aircraft tubing systems may be found in the Chapter 9, Aircraft Systems and Components.

**a. Compatibility of Fittings.** All fittings are to be compatible with their mating parts. Although various types of fittings appear to be interchangeable in many cases they have different thread pitch or minor design differences which prevent proper mating and may cause the joint to leak or fail.

**b. Routing.** Make sure that the line does not chafe against control cables, airframe structure, etc., or come in contact with electrical wiring or conduit. Where physical separation of the fuel lines from electrical wiring or conduit is impracticable, locate the fuel line below the wiring and clamp it securely to the airframe structure. In no case should wiring be supported by the fuel line.

**c. Alignment.** Locate bends accurately so that the tubing is aligned with all support clamps and end fittings and is not drawn, pulled, or otherwise forced into place by them. Never install a straight length of tubing between two rigidly-mounted fittings. Always incorporate at least one bend between such fittings to absorb strain caused by vibration and temperature changes.

**d. Bonding.** Bond metallic fuel lines at each point where they are clamped to the structure. Integrally bonded and cushioned line support clamps are preferred to other clamping and bonding methods.

**e. Support of Line Units.** To prevent possible failure, all fittings heavy enough to cause the line to sag should be supported by means other than the tubing.

**f. Support clamps.**

(1) Place support clamps or brackets for metallic lines as follows.

Tube O.D.	Approximate distance between supports
1/8"-3/16"-----	9"
1/4"-5/16"-----	12"
3/8"-1/2"-----	16"
5/8"-3/4"-----	22"
1"-1 1/4"-----	30"
1 1/2"-2"-----	40"

(2) Locate clamps or brackets as close to bends as possible to reduce overhang. (See figure 8-12.)

**8-32. FUEL TANKS AND CELLS.** Welded or riveted fuel tanks that are made of commercially pure aluminum, 3003, 5052, or similar alloys, may be repaired by welding. Tanks made from heat-treatable aluminum alloys are generally assembled by riveting. In case it is necessary to rivet a new piece in a tank, use the same material as used in the tank undergoing repair, and seal the seams with a compound that is insoluble in gasoline. Special sealing compounds are available and should be used in the repair of tanks. Inspect fuel tanks and cells for general condition, security of attachment, and evidence of leakage. Examine fuel tank or cell vent line, fuel line, and sump drain attachment fittings closely.

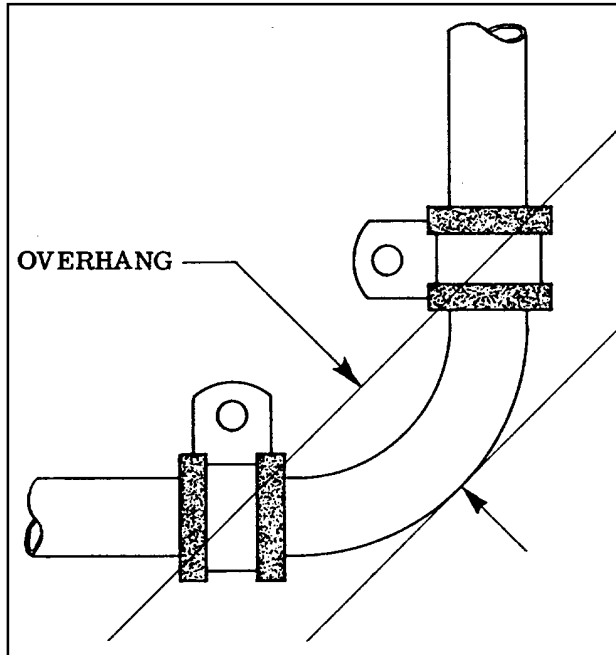


FIGURE 8-12. Location of clamps at tube bends.

**CAUTION:** Purge de-fueled tanks of explosive fuel/air mixtures in accordance with the manufacturer's service instructions. In the absence of such instructions, utilize an inert gas such as CO<sub>2</sub> as a purgative to assure the total deletion of fuel/air mixtures.

**a. Integral Tanks.** Examine the interior surfaces and seams for sealant deterioration and corrosion (especially in the sump area). Follow the manufacturer's instructions for repair and cleaning procedures.

**b. Internal Metal Tanks.** Check the exterior for corrosion and chafing. Dents or other distortion, such as a partially-collapsed tank caused by an obstructed fuel tank vent, can adversely affect fuel quantity gauge accuracy and tank capacity. Check the interior surfaces for corrosion. Pay particular attention to the sump area, especially for those of which sumps are made of cast material. Repairs to the tank may be accomplished in accordance with the practices outlined in the chapter 4, Metal Structure, Welding and Brazing of this AC.

**c. Removal of Flux After Welding.** It is especially important, after repair by welding, to completely remove all flux in order to avoid possible corrosion. Promptly upon completion of welding, wash the inside and outside of the tank with liberal quantities of hot water and then drain. Next, immerse the tank in either a 5 percent nitric or 5 percent sulfuric acid solution. If the tank cannot be immersed, fill the tank with either solution, and wash the outside with the same solution. Permit the acid to remain in contact with the weld about one hour and then rinse thoroughly with clean water. Test the efficiency of the cleaning operation by applying some acidified 5 percent silver nitrate solution to small quantity of the rinse water used last to wash the tank. If a heavy white precipitate is formed, the cleaning is insufficient and the washing should be repeated.

**d. Flexible Fuel Cells.** Inspect the interior for checking, cracking, porosity, or other signs of deterioration. Make sure the cell retaining fasteners are properly positioned. If repair or further inspection is required, follow the manufacturer's instructions for cell removal, repair, and installation. Do not allow flexible fuel cells to dry out. Preserve them in accordance with the manufacturer's instructions.

**8-33. FUEL TANK CAPS, VENTS, AND OVERFLOW LINES.** Inspect the fuel tank caps to determine they are the correct type and size for the installation, and that "O" rings are in good condition.

**a. Unvented caps,** substituted for vented caps, will cause fuel starvation and possible collapse of the fuel tank or cell. Malfunctioning of this type occurs when the pressure within the tank decreases as the fuel is withdrawn. Eventually, a point is reached where the fuel will no longer flow, and/or the outside atmospheric pressure collapses the tank. Thus,

the effects will occur sooner with a full fuel tank than with one partially filled.

**b. Check tank vents and overflow lines** thoroughly for condition, obstructions, correct installation, and proper operation of any check valves and ice protection units. Pay particular attention to the location of the tank vents when such information is provided in the manufacturer's service instructions. Inspect for cracked or deteriorated filler opening recess drains, which may allow spilled fuel to accumulate within the wing or fuselage. One method of inspection is to plug the fuel line at the outlet and observe fuel placed in the filler opening recess. If drainage takes place, investigate condition of the line and purge any excess fuel from the wing.

**c. Assure that filler opening markings** are affixed to, or near, the filler opening; marked according to the applicable airworthiness requirements; and are complete and legible.

**8-34. FUEL CROSS-FEED, FIREWALL SHUTOFF, AND TANK SELECTOR VALVES.** Inspect these valves for leakage and proper operation as follows.

**a. Internal leakage** can be checked by placing the appropriate valve in the "off" position, draining the fuel strainer bowl, and observing if fuel continues to flow into it. Check all valves located downstream of boost pumps with the pump(s) operating. Do not operate the pump(s) longer than necessary.

**b. External leakage** from these units can result in a severe fire hazard, especially if the unit is located under the cabin floor or within a similarly-confined area. Correct the cause of any fuel stains associated with fuel leakage.

**c. Selector Handles.** Check the operation of each handle or control to see that it indicates the actual position of the selector valve to the placard location. Movement of the selector handle should be smooth and free of binding. Assure that stops and detents have positive action and smooth operational feel. Worn or missing detents and stops can cause unreliable positioning of the fuel selector valve.

**d. Worn Linkage.** Inaccurate positioning of fuel selector valves can also be caused by worn mechanical linkage between the selector handle and the valve unit. An improper fuel valve position setting can seriously reduce engine power by restricting the available fuel flow. Check universal joints, pins, gears, splines, cams, levers, etc., for wear and excessive clearance which prevent the valve from positioning accurately or from obtaining fully "off" and "on" positions.

**e. Assure that required placards** are complete and legible. Replace those that are missing or cannot be read easily.

**8-35. FUEL PUMPS.** Inspect, repair, and overhaul boost pumps, emergency pumps, auxiliary pumps, and engine-driven pumps in accordance with the appropriate manufacturer's instructions.

**8-36. FUEL FILTERS, STRAINERS, AND DRAINS.** Check each strainer and filter element for contamination. Determine and correct the source of any contaminants found. Replace throw-away filter elements with the recommended type. Examine fuel strainer bowls to see that they are properly installed according to the direction of the fuel flow. Check the operation of all drain devices to see that they operate properly and have positive shutoff action.

**8-37. INDICATOR SYSTEMS.** Inspect, service, and adjust the fuel indicator systems according to the manufacturer's instructions. Determine that the required placards and instrument markings are complete and legible.

**8-38. FUEL SYSTEM PRECAUTIONS.** In servicing fuel systems, remember that fuel is flammable and that the danger of fire or explosion always exists. The following precautions should be taken:

**a. Aircraft being serviced** or having the fuel system repaired must be properly grounded.

**b. Spilled fuel** must be neutralized or removed as quickly as possible.

**c. Open fuel lines** must be capped.

**d. Fire-extinguishing equipment** must always be available.

**e. Metal fuel tanks** must not be welded or soldered unless they have been adequately purged of fuel fumes. Keeping a tank or cell filled with carbon dioxide will prevent explosion of fuel fumes.

**f. Do not use Teflon tape** on any fuel lines to avoid getting the tape between the flare and fitting, which can cause fluid leaks.

**8-39.—8-44. [RESERVED.]**