SECTION 10. SERVICE LOOP HARNESSES (Plastic Tie Strips)

11-135. GENERAL. The primary function of a service loop harness is to provide ease of maintenance. The components, mounted in the instrument panel and on the lower console and other equipment that must be moved to access electrical connectors, are connected to aircraft wiring through service loops. Chafing in service loop harnesses is controlled using the following techniques.

11-136. SUPPORT. Only string ties or plastic cable straps in accordance with paragraph 11-158 should be used on service loop harnesses. A 90° or "Y" type spot tie should be installed at the harness breakout point on the harness bundle. Ties should be installed on service loop harnesses at 4 to 6-inch intervals.

11-137. ANTI-CHAFING MATERIAL. When service loops are likely to be in contact with each other, expandable sleeving or equivalent chafe protection jacket material must be installed over service loop harnesses to prevent harness-to-harness chafing. The sleeve should be held in place with string ties at 6 to 8-inch intervals. Harness identification labels should be installed, with string tie, within 3 inches of the service loop harness installation.

11-138. STRAIN RELIEF. The strain relief components may be installed to control routing where close clearance exists between termination and other components or bulkheads. Strain relief components provide support of the service loop harness at the termination point. Connector strain relief adapters, heat-shrinkable boot, or a length of heat-shrinkable tubing should be installed. The heat-shrinkable boots will provide preselected angles of wire harness termination when heat is applied. Heat-shrinkable tubing should be held at the desired angle until cool.

11-139. "SERVICE LOOP." Primary support for service loop harness(es) should be a cushion clamp and a connector at the harness termination. Service loop harnesses should be inspected for the following:

a. Adequate Length. Components should extend out from their mounting position a distance that permits rotating and unlocking (or locking) the electrical connector. Usually a distance of 3 to 6 inches, with all other components installed, should be sufficient.

b. Bundle BreakOut Point.

(1) Bundle breakout point should be adequately supported with string tie.

(2) Service loop must maintain a minimum bend radius of 3 times the harness diameter.

(3) The breakout point should be located directly behind, beside, below, or above the component so that the service loop harness does not bind other components.

(4) Plastic ties should not be used between the service loop breakout and the electrical connector when they are likely to chafe against adjacent wire.

c. Service Loop Routing. The service loop harness should be routed directly from the breakout point to the component. The harness should not contact moving mechanical components or linkage, and should not be wrapped or tangled with other service loop harnesses.

d. Service Loop Harness Termination. Strain relief should be provided at the service loop harness termination, and is normally provided by the connector manufacturer's backshell, heat-shrinkable boot, or tubing.

11-140.—11-145. [RESERVED.]

SECTION 11. CLAMPING

11-146. GENERAL. Wires and wire bundles must be supported by using clamps meeting Specification MS-21919, or plastic cable straps in accessible areas if correctly applied within the restrictions of paragraph 11-158. Clamps and other primary support devices must be constructed of materials that are compatible with their installation and environment, in terms of temperature, fluid resistance, exposure to ultraviolet (UV) light, and wire bundle mechanical loads. They should be spaced at intervals not exceeding 24 inches. Clamps on wire bundles should be selected so that they have a snug fit without pinching wires, as shown in figure 11-11 through figure 11-13.

CAUTION: The use of metal clamps on coaxial RF cables may cause problems if clamp fit is such that RF cable's original cross-section is distorted.

a. Clamps on wire bundles should not allow the bundle to move through the clamp when a slight axial pull is applied. Clamps on RF cables must fit without crushing and must be snug enough to prevent the cable from moving freely through the clamp, but may allow the cable to slide through the clamp when a light axial pull is applied. The cable or wire bundle may be wrapped with one or more turns of electrical tape when required to achieve this fit. Plastic clamps or cable ties must not be used where their failure could result in interference with movable controls, wire bundle contact with movable equipment, or chafing damage to essential or unprotected wiring. They must not be used on vertical runs where inadvertent slack migration could result in chafing or other damage. Clamps must be installed with their attachment hardware positioned above them, wherever practicable, so that they are unlikely to rotate as the result of wire bundle weight or wire bundle chafing. (See figure 11-11.).

b. Clamps lined with nonmetallic material should be used to support the wire bundle along the run. Tying may be used between clamps, but should not be considered as a substitute for adequate clamping. Adhesive tapes are subject to age deterioration and, therefore, are not acceptable as a clamping means.

c. The back of the clamp, whenever practical, should be rested against a structural member. Stand-offs should be used to maintain clearance between the wires and the structure. Clamps must be installed in such a manner that the electrical wires do not come in contact with other parts of the aircraft when subjected to vibration. Sufficient slack should be left between the last clamp and the electrical equipment to prevent strain at the terminal and to minimize adverse effects on shock-mounted equipment. Where wires or wire bundles pass through bulkheads or other structural members, a grommet or suitable clamp should be provided to prevent abrasion.

d. When wire bundle is clamped into position, if there is less than 3/8-inch clearance between the bulkhead cutout and the wire bundle, a suitable grommet should be installed as indicated in figure 11-14. The grommet may be cut at a 45 degree angle to facilitate installation, provided it is cemented in place and the slot is located at the top of the cutout.

11-147. WIRE AND CABLE CLAMPS INSPECTION. Inspect wire and cable clamps for proper tightness. Where cables pass through structure or bulkheads, inspect for proper clamping and grommets. Inspect for sufficient slack between the last clamp and the electronic equipment to prevent strain at the cable terminals and to minimize adverse effects on shock-mounted equipment.

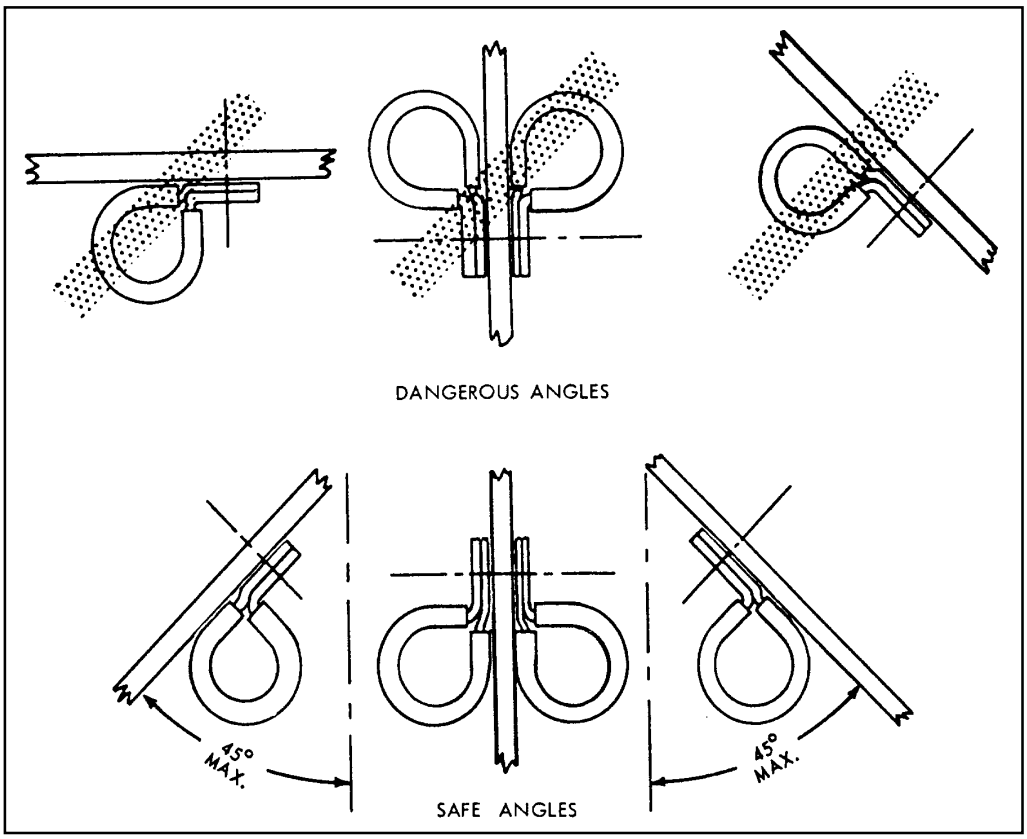

FIGURE 11-11. Safe angle for cable clamps.

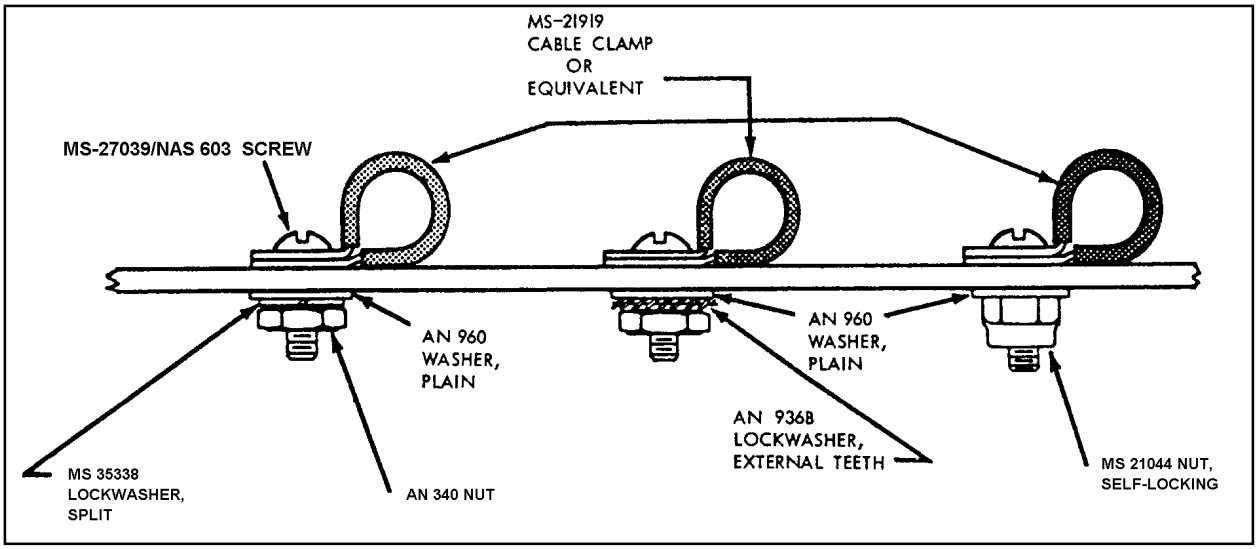

FIGURE 11-12. Typical mounting hardware for MS-21919 cable clamps.

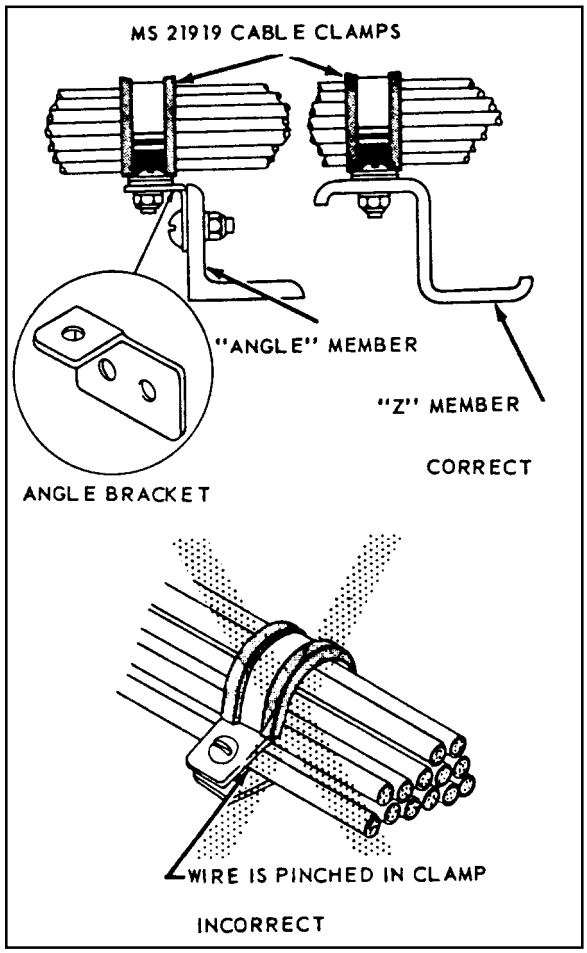

FIGURE 11-13. Installing cable clamp to structure.

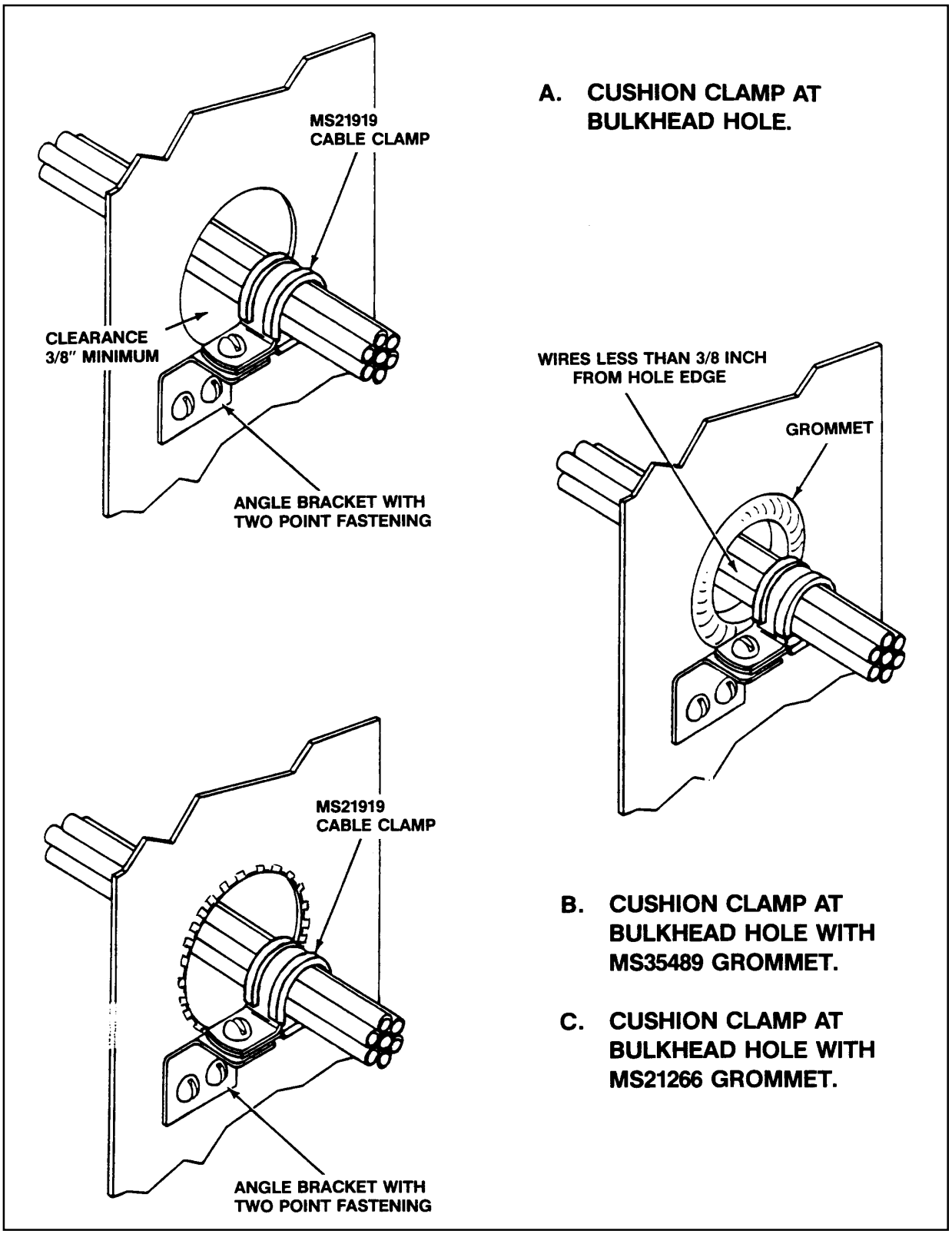

FIGURE 11-14. Clamping at a bulkhead hole.

11-148.—11-154. [RESERVED.]