

EO 05-1-3/11

ROYAL CANADIAN AIR FORCE



**AIRCRAFT FLEXIBLE HOSE  
STANDARD MANUFACTURE  
REPLACEMENT AND INSPECTION**

**REVISION**  
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## PART 1

# INTRODUCTION

1 The purpose of this EO is to outline DND policy and provide information with regard to manufacture, replacement, salvage, storage and inspection of the standard types of flexible hose assemblies used on Military aircraft and associated equipment.

### WARNING

Do not use the flexible hose described in this EO in oxygen systems.

## POLICY

2 The overall aim is to obtain a complete internal capability for the assembly of flexible hose lines. This shall be accomplished as follows:

(a) All low and medium pressure rubber hose assemblies shall be fabricated by users. This includes:

- (1) MIL-H-6000 low pressure rubber assemblies with clamps.
- (2) AN6270 low pressure rubber assemblies.
- (3) MIL-H-8795 medium pressure rubber assemblies, up to size 20.

(b) All high pressure rubber assemblies, teflon hose assemblies and lightweight engine hose assemblies shall be manufactured by 6RD Trenton, as directed by MATCOM HQ. This includes:

- (1) MIL-H-8790 high pressure rubber assemblies.
- (2) MIL-H-25579B medium pressure teflon assemblies.
- (3) MIL-H-38360 high pressure teflon assemblies.
- (4) 601 lightweight engine hose assemblies.
- (5) MIL-H-8795 medium pressure rubber assemblies size 24 and up.

3 6RD is responsible for the salvage of end fittings from unserviceable teflon and 601 lightweight engine hose assemblies and retaining serviceable parts for further use. Users shall ensure that unserviceable assemblies, on removal, are shipped direct to the Repair Depot, specifying where possible, reasons for rejection.

4 EO 00-35-1 is the authority for shelf life limitation on hose and hose assemblies.

5 Local purchase of all low and medium pressure rubber hose, end fittings and assemblies are to be from qualified sources only.

6 The DND standards for flexible hose assemblies are outlined in Figure 1-1.

## DESCRIPTION

7 Description of the hose and hose assemblies are as follows:

(a) MIL-H-6000 Hose - This is a rubber hose used for low pressure fuel, oil, coolant, water and alcohol in engine installations. The hose consists of an inner tube of seamless synthetic rubber compound, reinforced by one or more plies of suitable friction material and covered by a layer of predominantly polychloroprene rubber. The hose is so constructed as to permit ready assembly with standard hose fitting connecting ends MS33658 and MS33660, see Figure 1-2, tubing ends pipe threads, adaptors and AN737TW hose clamps. For further identification of AN737TW clamps refer to paragraph 7 (h).

(b) AN6270 Hose Assembly - This is a rubber hose assembly used for low pressure lines on aircraft air and vacuum instrument system. It consists of MIL-H-5593 hose and MS27404 end fittings, see Figure 1-3. The MIL-H-5593 hose consists of an inner tube of seamless synthetic rubber compound, reinforced by a single cotton braid, and covered by a layer of synthetic rubber.

Type of Assembly	Hose Specification	End Fitting	Assembly
LOW Pressure Rubber	MIL-H-5593 (See Note 1)	MS27404	AN6270
MEDIUM Pressure Rubber	MIL-H-8794	MS24587	MIL-H-8795
HIGH Pressure Rubber	MIL-H-8788	MIL-F-8789	MIL-H-8790
MEDIUM Pressure Teflon	MIL-H-27267	MIL-F-27272 (See Note 2)	MIL-H-25579
HIGH Pressure Teflon	See Note 3	See Note 3	MIL-H-38360
LIGHTWEIGHT Engine Hose	See Note 4		

NOTES

1 - Low Pressure rubber hose for use with tube end fittings and clamps is to MIL-H-6000.

2 - MS27069 and round sockets, RCAF Drawing C64C52026 may be used.

3 - The DND standard for the end fittings and hose shall be Aeroquip (Canada) design hose number 677.

4 - The DND standard for lightweight engine hose shall be Aeroquip (Canada) design hose number 601. This shall be assembled as per BuWeps - FWAE 2321/934: DR (21 Sep 62).

Figure 1-1 (Issue 2) DND Standards for Flexible Hose Assemblies

(c) MIL-H-8795 Hose Assembly - This is an oil resistant rubber hose assembly used on medium pressure oil, fuel, pneumatic coolant and hydraulic system. It consists of MIL-H-8794 hose and applicable medium pressure end fittings. MIL-H-8794 hose consists of a seamless synthetic rubber compound inner tube, reinforce with synthetic - impregnated single wire braid over single cotton braid, and an outer cover of synthetic impregnated oil-resistant cotton braid. The applicable end fittings sizes 3, 4, 5 and 6 have plated steel nipples and nuts and anodized aluminum alloy sockets. Size 8 and above may have an aluminum alloy nut and body.

(d) MIL-H-8790 - Hose Assembly - This is a rubber hose assembly for use in high pressure pneumatic and hydraulic systems up to an operating pressure of 3000 psi. It consists of MIL-H-8788 hose and applicable

high pressure end fittings. The MIL-H-8788 hose consists of an inner tube of seamless synthetic rubber compound, reinforced in sizes - 4 through - 12 by a double steel wire braid and in sizes 16 and up by a triple wire braid and the outer covering consist of a smooth layer of synthetic rubber over fabric braid. The end fittings nut and nipple are cadmium plated steel, and socket is anodized aluminum. This hose assembly is not to be manufactured by users.

(e) MIL-H-25579B Hose Assembly - This Teflon hose is for use in medium pressure fuel, lubrication oil, water alcohol, or chemical fluid and for 1500 psi hydraulic and pneumatic systems. It consists of hose to MIL-H-27267 and end fittings to MIL-F-27272. The MIL-H-27262 hose consists of an inner tube of seamless extrusion tetrafluorethylene resin,

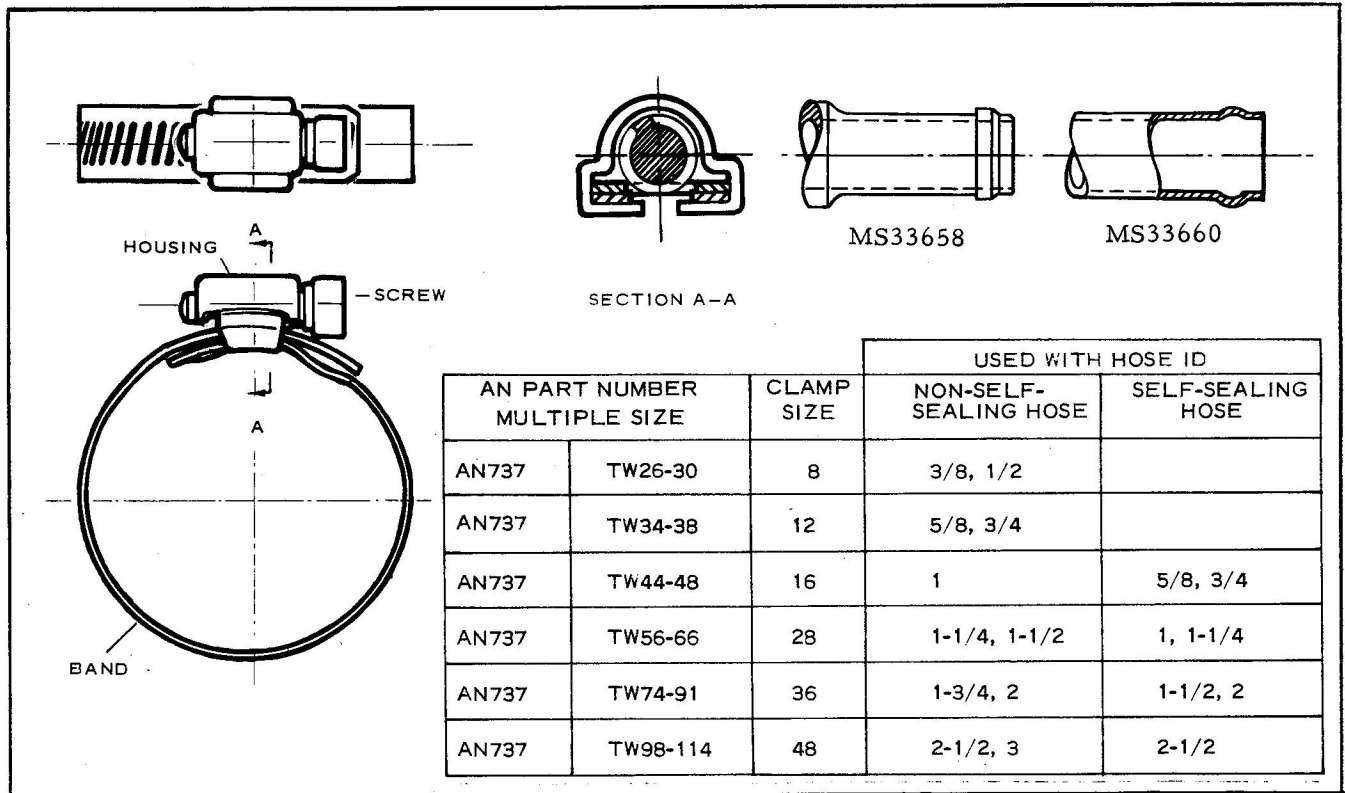


Figure 1-2 Table of AN737 Hose Clamps

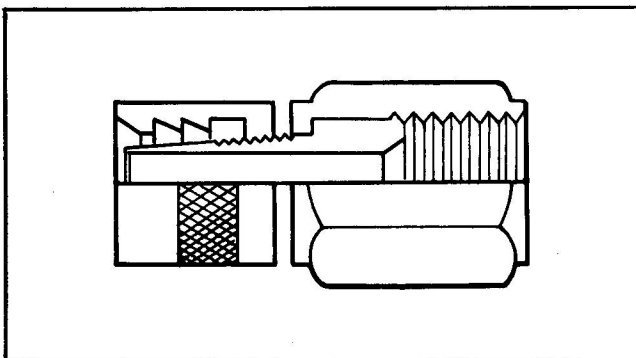


Figure 1-3 MS27404 Hose Fitting

commonly known as \*Teflon and an outer layer of stainless steel braid. Sizes 16 and 20 hose have a doubler layer of wire braid. MIL-F-27272 end fittings are of the re-usable type. There are three types of end fitting sockets presently in use: hexagon, flat and the round. This hose assembly is not to be manufactured by users.

\* Dupont Trade Name.

(f) MIL-H-38360 Hose Assembly - This Teflon hose is for use in high pressure (3000 psi) aircraft hydraulic and pneumatic systems operating in a temperature range of -54 to 204°C (-65° to 400°F). The hose consists of an inner tube of seamless extrusion tetrafluorethylene resin. Sizes 4 to 8 inclusive have two spiral wraps plus one braid, and sizes 10 to 16 have four spiral wraps plus 1 braid. The end fittings are of corrosion-resistant steel. This hose assembly is not to be manufactured by users.

(g) 601 Lightweight Engine Hose - 601 lightweight engine hose is an exclusive Aeroquip Corporation product and is used on aircraft power plants for air, fuel and lubricating oil systems where lightweight, flexibility, ability to withstand high operating temperatures and increase fire-resisting qualities are prime considerations. The hose consists of an inner tube of seamless, specially formulated synthetic rubber compound, reinforced by a partial inner braid of stainless steel wire, and covered by a full outer braid of stainless steel wire. It has a continuous operating temperature range of -40 to 149°C (-40 to

Assembly To Spec.	Hose			End Fittings		
	Spec.	CQPL	QPL	Spec.	CQPL	QPL
MIL-H-8790	MIL-H-8788	MIL-H-8788	8788	MIL-F-8789	MIL-F-8789	8789
MIL-H-8795	MIL-H-8794	MIL-H-8794	8794	MIL-A-5070	MIL-A-5070	5070
N/A	MIL-H-6000	MIL-H-6000	6000	Used with AN737 Clamps	MIL-C-6985	
AN6270	MIL-H-5593	MIL-H-5593	5593	MS27404 MIL-A-38726		
MIL-H-25579	MIL-H-27267	MIL-H-27267	27267	MIL-H-27272 and hose coup- ling socket RCAF Drawing C64C52026 or MS27069	CQPL MIL- F-27272	27272
MIL-H-38360	Aeroquip	-	-	Aeroquip	-	-
601	Aeroquip	-	-	Aeroquip	-	-

Figure 1-4 (Issue 2) Hose Assemblies and Components

300°F). This hose assembly is not to be manufactured by user units.

(h) AN737TW clamps with tangential worm screw recess slotted head are the standard clamps used with MIL-H-6000 Hose. AN737 clamps are the only clamps authorized for use with MIL-H-6000 hose. These clamps are available in single and multiple sizes in two series.

(1) All Stainless Steel (SS) - Stainless steel band and housing with stainless steel worm screw: Example - Part AN737TW44SS.

(2) Stainless Steel - Stainless steel band and housing with carbon steel (cadmium plated) worm screw: Example Part AN737TW44.

NOTE

An AN737TW clamp with thumb type worm screw may be found in service but is no longer procurable.

The AN737 RM clamp is a radial type clamp with machine thread screw at right angles to longitudinal axis of clamp. This clamp has very limited use as its configuration prevents it being used in confined areas.

8 Figure 1-4 lists hose assemblies together with their component parts specifications Canadian Qualified Products List (CQPL) and American Qualified Product List (QPL).

## PART 2

# IDENTIFICATION

1 The prime function of hose marking is identification to prevent issue and/or installation of over age or improper hose on aircraft or aircraft accessories. Aircraft hose can be readily and completely identified by code markings. Rubber hose: all specification types will be marked with a broken and/or solid line. Braided tetrafluorethylene and lightweight 601, and high pressure rubber hose: permanent metal tag, see Figure 2-1.

2 Rubber hose assemblies low pressure and medium pressure shall have a removable temporary tag attached for identification purposes, such as, the Identity and Condition Tag E33 or a light metal tag may be used. This tag shall be removed upon installation. The information on the removable tag shall include, the stock number, part number, MS number (where applicable); manufacturer, date of assembly, and date of proof pressure test.

3 High pressure rubber tetrafluorethylene and 601 lightweight engine hose assemblies shall have a spot welded permanent band attached. The band shall be in accordance with RCAF Drawing 28012, see Figure 2-5.

**CAUTION**

This band shall not be removed upon installation.

### STANDARD HOSE CODE

4 Examples of complete hose assembly code number are as follows:

(a) Straight fittings or elbow at one end only:

MS18036 - 8 - 0726

Assembly length 72-3/4"  
 Assembly size 1/2"  
 Type of hose assembly

(b) Elbow fittings at both ends:

MS28922 - J - 0214 - 035

Position angle between angle, see Figure  
 Assembly length 21-1/2"  
 Assembly size 5/8"  
 (See Figure)  
 Type of Hose Assembly

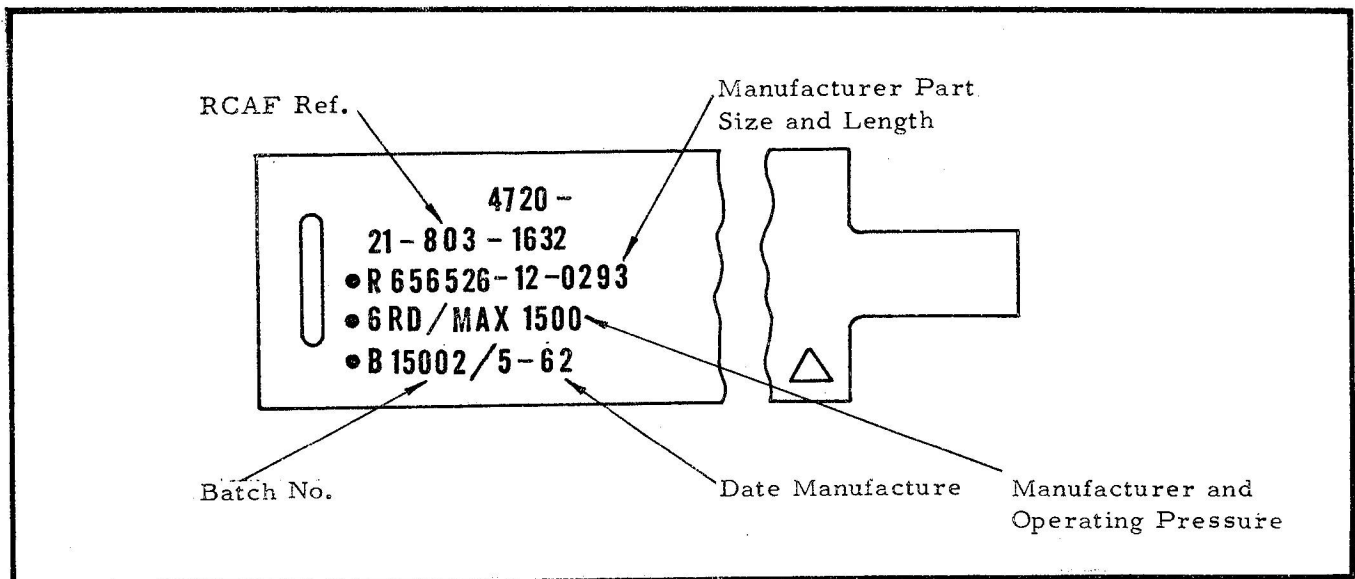


Figure 2-1 Permanent Identification Band

HOSE SPEC.	SIZE IN FRACTION												
	1/8"	5/32"	3/16"	7/32"	1/4"	9/32"	5/16"	11/32"	3/8"	13/32"	7/16"	1/2"	9/16"
MIL-H-6000			3		4		5		6			8	
MIL-H-5593	2		3		4				6			8	
MIL-H-8794	3		4		5		6			8		10	
MIL-H-8788				4		5		6			8		10
Aeroq. 601		3		4		5		6			8		10
MIL-H-27267			4		5		6			8		10	
HP Teflon				4			6			8		10	

HOSE SPEC.	5/8"	11/16"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-13/16"	2"	2-1/2"	3"
	MIL-H-6000	10		12	14	16		20		24		32	40
MIL-H-5593	10												
MIL-H-8794	12			16		20		24		32			48
MIL-H-8788		12		16									
AerOq. 601		12		16		20		24		32			
MIL-H-27267	12			16		20							
HP Teflon	12												

Figure 2-2 (Issue 2) Hose Size

Dash Size	2	3	4	5	6	8	10	12	16	20	24	32	40	48
MS Letter Code	A	B	E	F	G	H	J	K	M	N	P	R	T	U
Vendor Letter Code	A	E	F	G	H	J	K	L	M	N	P	R	T	U

Figure 2-3 Hose Size Relationship

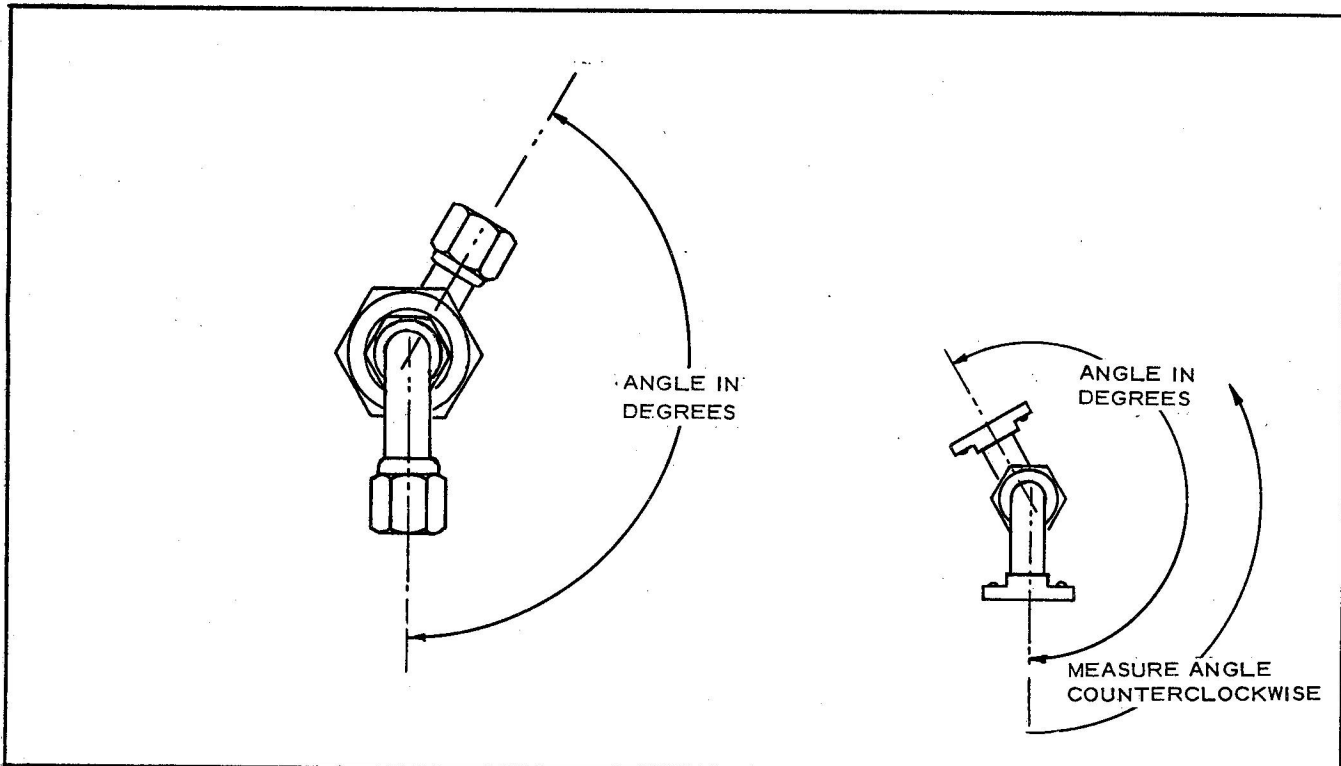
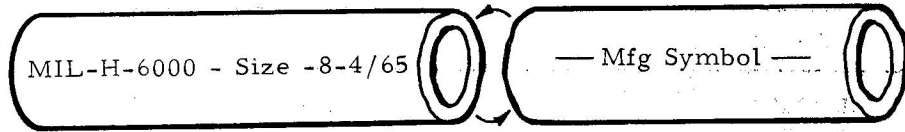
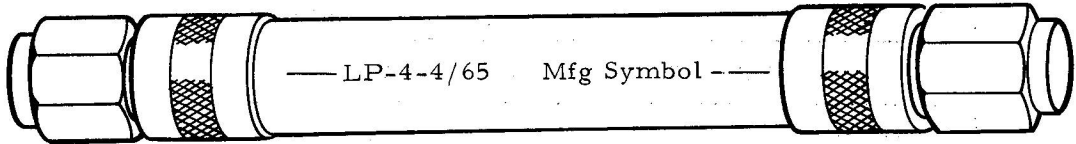


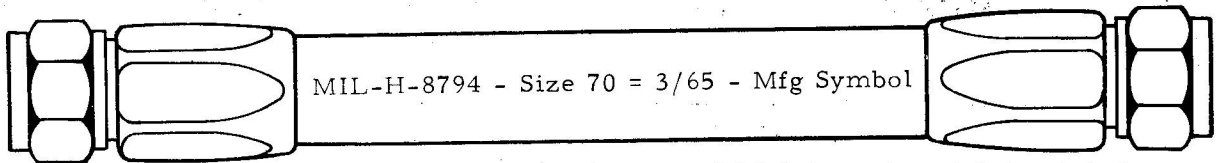
Figure 2-4 Angle Measurement Between Elbows



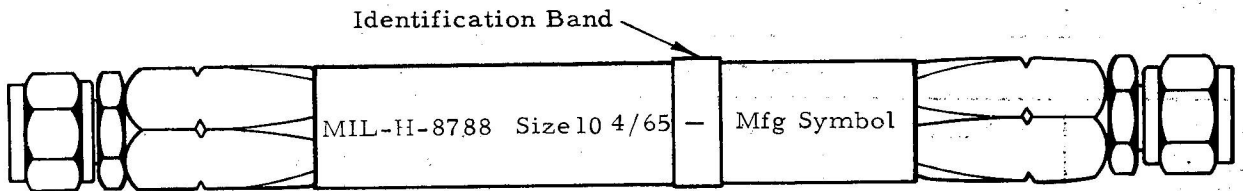
MIL-H-6000 Hose Rubber - White Marking



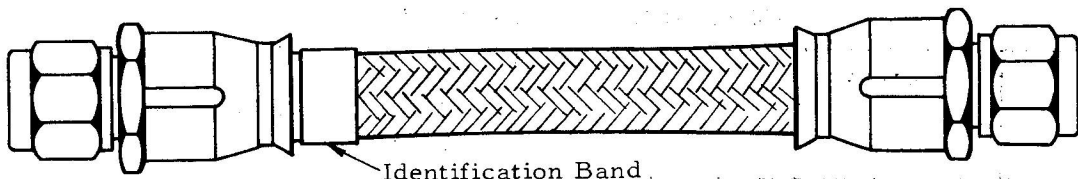
MIL-H-5593 Hose Assembly - Yellow Markings



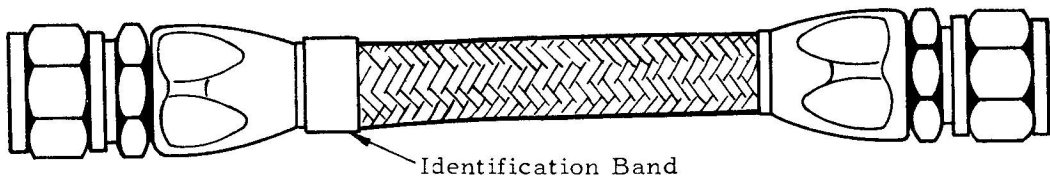
MIL-H-8795 Hose Assembly - Yellow Markings



MIL-8790 Hose Assembly - Yellow Markings and Permanent Identification Tag



MIL-H-38360 - MIL-H-25579 Teflon Hose Assembly - Permanent Identification Band



601 Lightweight Engine Hose Assembly (Aeroquip Design) - Permanent Identification Band

Figure 2-5 (Issue 1) Hose Assembly Identification and Markings

HOSE ASSEMBLY NO.	FITTING	FITTING	TYPE	SPECIFICATION
ASSEMBLIES STRAIGHT TO STRAIGHT FITTINGS				
AN6270	MS27404		Flared	MIL-H-5593 LP Rubber
MS28759	MS28760		Flared	MIL-H-8790 HP Rubber
MS28762	MS28761		Flareless	MIL-H-8790 HP Rubber
MS28741	MS24587		Flared	MIL-H-8795 MP Rubber
MS27363			Flared	MIL-H-38360 HP Teflon
MS27369			Flareless	MIL-H-38360 HP Teflon
ASSEMBLIES STRAIGHT TO 45° FITTINGS				
MS28920	MS28760	MS28780	Flared	MIL-H-8790 HP Rubber
MS27367			Flared	MIL-H-38360 HP Teflon
MS27370			Flareless	MIL-H-38360 HP Teflon
ASSEMBLIES STRAIGHT TO 90° FITTINGS				
MS28921	MS28760	MS28781	Flared	MIL-H-8790 HP Rubber
MS27365			Flared	MIL-H-38360 HP Teflon
MS27371			Flareless	MIL-H-38360 HP Teflon
ASSEMBLIES 45° to 45° FITTINGS				
MS28922	MS28780		Flared	MIL-H-8790 HP Rubber
MS27366			Flared	MIL-H-38360 HP Teflon
MS27372			Flareless	MIL-H-38360 HP Teflon
ASSEMBLIES 45° to 90° FITTINGS				
MS28923	MS28780	MS28781	Flared	MIL-H-8790 HP Rubber
MS27367			Flared	MIL-H-38360 HP Teflon
MS27373			Flareless	MIL-H-38360 HP Teflon
ASSEMBLIES 90° to 90° FITTINGS				
MS28924	MS28781		Flared	MIL-H-8790 HP Rubber
MS27368			Flared	MIL-H-38360 HP Teflon
MS27374			Flareless	MIL-H-38360 HP Teflon

Figure 2-6 Aircraft Flexible Hose Assemblies Identification



Hose/Assembly	Marking	Example
AN6270 MIL-H-8795	Removable light metal tag or RCAF "Identity and Condition Tag E33" detailing RCAF stock number or part number, manufacturer's name, date of assembly and date of proof pressure test.	4720-00-289-6164
MIL-H-8790 MIL-H-25579 601 MIL-H-38360	Permanent Metal Band (RCAF Drawing 28012) detailing RCAF stock number, manufacturer's part number, manufacturer's name, maximum operating pressure, batch number and date of manufacture.	4720-21-803-1632 R656526-12-0293 6RD/MAX1500 B15002/5-62
MIL-H-27267	An adhesive tape affixed to the hose at 3 foot intervals detailing RCAF stock number, manufacturer's name, liner code number, batch number, date of manufacture, operating pressure in psi.	4720-00-618-8084/ Aeroquip/92582/ B15002/8-64/1500
MIL-H-5593	Yellow marking along the longitudinal axis, repeated at 6" intervals showing: the symbol "LP", size number and date of manufacture by quarter of year and year.	LP  Size 8 3Q64
MIL-H-6000	Red marking along the longitudinal axis showing manufacturer's code number as outlined in the specification. White marking along the longitudinal axis, repeated at 6" intervals, showing size, specification number and cure date in quarter and year.	Red Marking - BFG White Marking - 5/8 6000 1Q64
MIL-H-8788 MIL-H-8794	Yellow marking, repeated at 9" intervals, showing specification number, size number, date of manufacture in quarter and year and manufacturer's code number.	8788-10-3Q62-90179 8794-6-2Q59-97992

Figure 2-7 Identification Requirements

**SIZE**

5 The size of a hose assembly with straight fittings or with an elbow at one end only is normally denoted by a numerical digit which gives the inside diameter of the hose. The inside diameters corresponding to these "dash" sizes are shown in Figure 2-2. Material symbol may follow the size numerical digit. For example in MS Numbers, D identifies aluminum, C identifies corrosion resistant steel and no material symbol identified steel.

6 For hose assembly with elbow fittings at both ends the size is denoted by an alphabetical letter.

NOTE

A problem exists in that hose assemblies with elbows at both ends introduced prior to the adoption of the new Military Standard (MS) letter codes were coded to what is known as a Vendor Letter Code which differs from the newly introduced MS Letter Code. Table at Figure 2-3 cross refers the MS Letter Code and

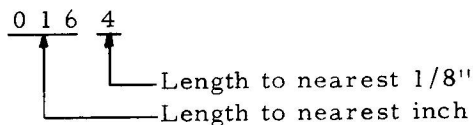
Vendor Letter codes to the "dash" sizes of hoses or fittings.

**ANGLE**

7 The measurement of the angle between elbow fittings on an assembly is measured in degrees counterclockwise, see Figure 2-4. The angle is normally denoted by a three digit code following the length of the hose assembly in some cases it is preceding the assembly part number.

**LENGTH**

8 The standard method of measuring the length of hose assemblies is denoted by a four digit code and is illustrated by the example below:



Total length 16-1/2".

**PART 3****INSTALLATION AND INSPECTION OF FLEXIBLE HOSE****INSTALLATION**

1 The following steps are general instructions to be followed when replacing an unserviceable flexible hose, see Figure 3-1.

(a) Never, under any conditions, use oil on self-sealing hose as an aid to installation. Oil or water may be used on all other types of fuel, oil, and coolant hose when installation is made; however, only oil should be used on hydraulic and pneumatic hose.

(b) Install hose so that it will not be subject to twisting under any condition of operation, and there will be no tendency for the connecting fittings to loosen. When replacing hose in hydraulic, fuel, oil, alcohol, water injection, and pneumatic systems, the hose installed should be a duplicate of the hose removed as to length, outside diameter, inside diameter, material, type and contour unless otherwise directed.

(c) When bends are required in installing hose in fluid systems, the radius shown in Figure 3-2 should be the minimum radius maintained at all times for fuel, oil, and coolant systems. Figure 3-3 shows the minimum bend radius for hydraulic and pneumatic systems, a radius larger than the minimum allowed is preferred.

(d) When hose is installed through holes in brackets or when supporting clips are used, there must be no reduction in the diameter of the hose. If this condition is present, the flow will be reduced and damage to the hose may occur.

(e) Support hose at least every 24 inches. Closer supports are preferred. Support flexible lines so that they will not cause deflection of the rigid connecting lines. Flexible hose between two rigid connections may have excessive motion restrained where necessary but should never be rigidly supported.

(f) Eliminate chafing by using suitable bulkhead type grommets or cushioned clips and ensuring adequate clearance.

(g) Protect hose installations from excessive temperatures, such as exhaust blasts, supercharger ducts, and the like, either by shrouding or relocation.

(h) Where hose connections are made to an engine or to engine-mounted accessories, install the hose so 1-1/2" of slack or an adequate bend is provided between the last point of support and the attachment to the engine or accessory. This prevents the possibility of the hose being pulled off the nipple due to engine movement.

(j) Whenever a length of hose is connected to the engine with a hose clamp, firmly support the hose in a manner that will prevent vibrational and torsional strain on the hose connection. Whenever possible, place the support approximately three inches from the engine connection.

(k) Whenever possible, install hose so all markings on the hose are visible.

2 When replacing an unserviceable hose the following precautions shall be observed.

(a) All temporary identification tags are to be removed prior to installation. Hose assemblies made to MIL-H-8790 high pressure rubber MIL-H-25579 and MIL-H-38360 teflon and 601 lightweight engine hose assemblies will have a spot welded permanent identification tag and is not to be removed under any circumstances.

(b) Ensure both caps or plugs are removed prior to installation.

(c) Inspect the new assembly to ensure that it has no defects internally or externally.

(d) Immediately prior to installing the hose assembly, lubricate the male threads of the attachment fitting with anti-seize compound 8030-21-802-4304 only. Female threads shall not be lubricated as the compound will be forced into the hose interior when connection is made.

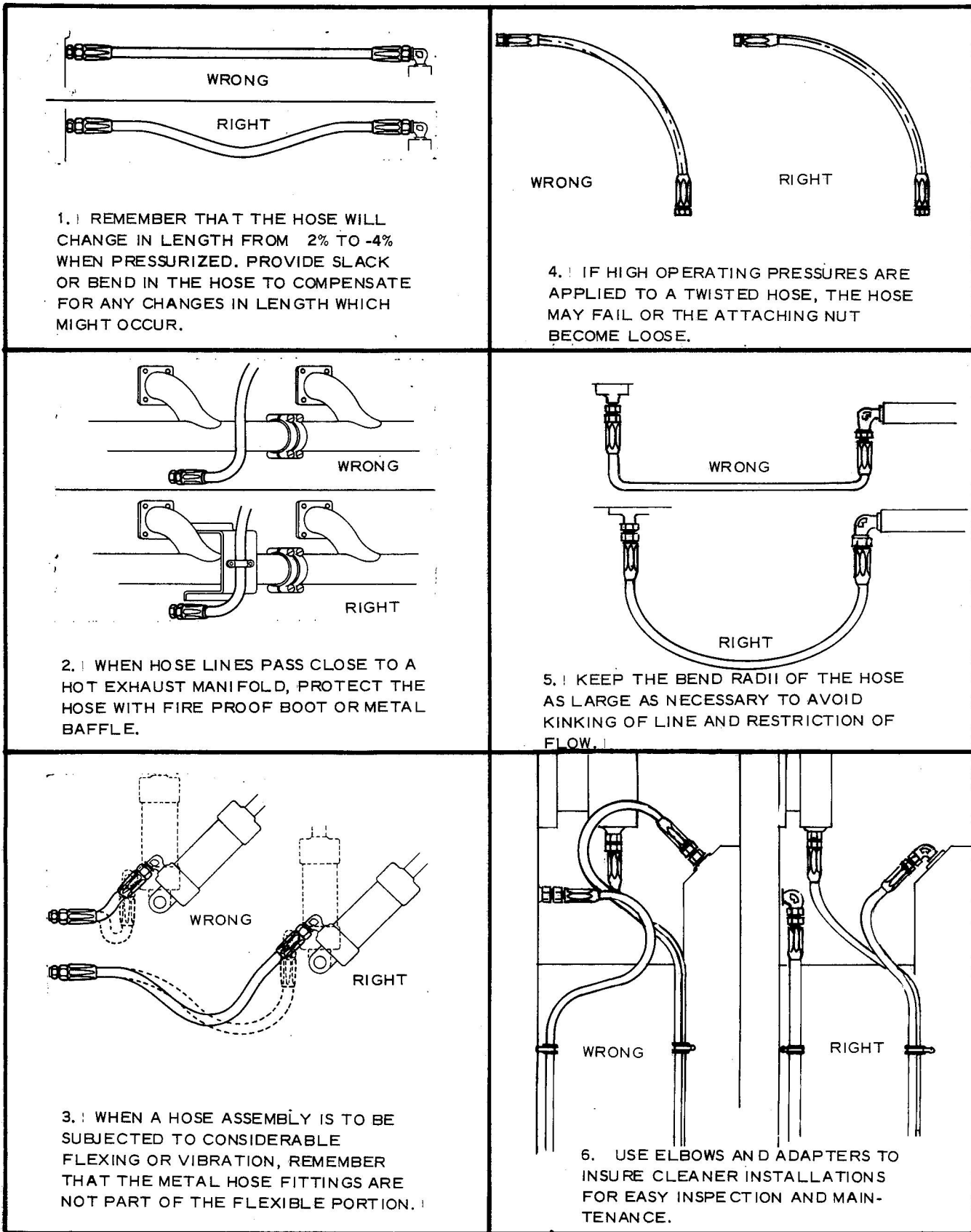


Figure 3-1 Hose Line Installation Aids for All Types of Hose

Hose (Military Specification No.)	Size	Correct Radii
MIL-H-8794 (MIL-H-5511)	All	See AND10090
MIL-H-7061	Up to and including 1-1/4" inside diameter	R = 6 x inside diameter
MIL-H-7061	Larger than 1-1/4" inside diameter	R = 12 x inside diameter
MIL-H-5593	All	R = 12 x inside diameter
MIL-H-6000	All	R = 12 x inside diameter
MIL-H-7938	All	R = 12 x inside diameter

Figure 3-2 Minimum Bend Radii of Hose for Fuel, Oil, and Coolant Systems

(e) Using fingers only, start hose nuts on attachment fittings until nuts are finger tight. Complete tightening with wrench until nuts are secure.

NOTE

Avoid overtightening of nuts.

(f) It is mandatory after installation of the new hose assembly to carry out a functional and visual check of the system for leakage or malfunction.

(g) Where hose assemblies are exposed to atmosphere or water (e.g. hydraulic lines - amphibious aircraft) they shall be coated with three coats of 8040-21-805-9846 rubber cement at the end fitting connections. This coating is to extend one inch both ways from where the hose enters the fitting, allow sufficient drying time between applications.

## INSPECTION - INSTALLED HOSE

3 Hose installed on aircraft is to be inspected in accordance with the relevant Maintenance Schedule (-7 of the relevant EO).

4 Examine and replace flexible hose when any deterioration is evident. Signs of deterioration are:

(a) Leakage.

(b) Separation of the rubber cover or braid from the inner tube.

(c) Hardening and lack of flexibility is determined by squeezing the hose.

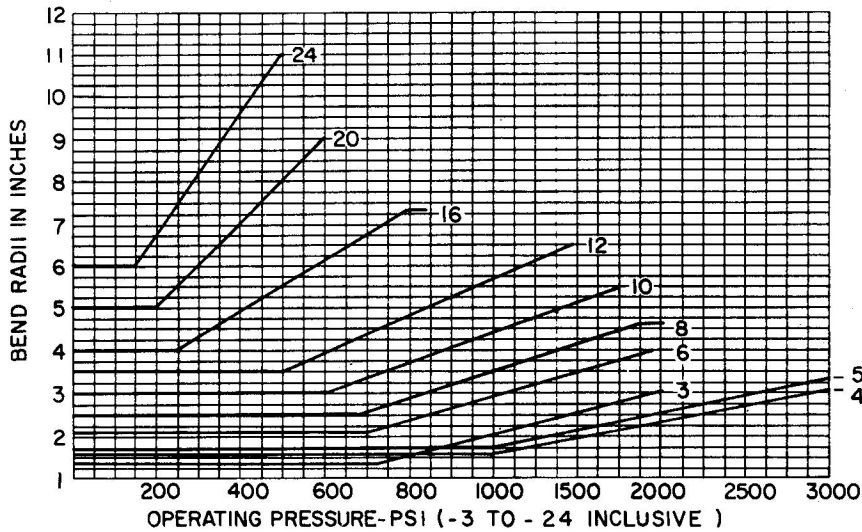
(d) Excessive cold flow. Hose constructed of synthetic compound is subject to "cold flow" and has a tendency to creep; therefore, new hose is to be inspected daily until creep ceases and thereafter on minor inspections. Cold flow is indicated by deep, permanent impressions and cracks in the hose cover produced by the pressure of the hose clamp and chafing of the bead of the nipple. Some hoses tend to flare at the ends beyond the clamp; this is not an unsatisfactory condition, nor is it an indication of leakage.

(e) Collapse which is due to bending or misalignment of lines and fittings.

(f) Hose conforming to Specification MIL-H-8794 has a carbon steel wire braid reinforcement with a fabric braid outer cover. Corrosion of this carbon wire braid may be detected by brownish rust colouring penetrating the outer braid. When this colouring is detected, hose should be replaced.

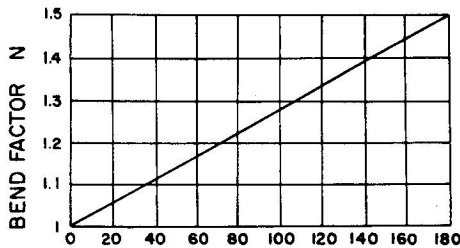
(g) Excessive damage to wire braid outer cover. Excessive wire damage consists of two or more broken wires in a single plait, six or more broken wires per assembly or per linear foot whenever assemblies exceed 12"

INSIDE BEND RADII VS OPERATING PRESSURE MIL-H-8794 (MIL-H-5511) HOSE WITH NO FLEXING



NOTE: MINIMUM BEND RADII FOR -32, -40, AND -48 AT ALL PRESSURES ARE AS FOLLOWS:

- 32 = 13.5 INCHES
- 40 = 24 INCHES
- 48 = 33 INCHES



MIL-H-8788 (MIL-H-5512) HOSE WITH NO FLEXING	
DASH NO.	BEND RADII
4	3.5
5	4.25
6	5.0
8	5.75
10	6.5
12	7.75
16	9.625

TOTAL FLEXING RANGE OF INSTALLED HOSE (DEGREES)

MINIMUM BEND RADIUS OF HOSE UNDER FLEXING CONDITIONS = N X NO FLEXING BEND RADIUS OF EITHER MIL-H-8794 (MIL-H-5511) OR MIL-H-8788 (MIL-H-5512) HOSE

EXAMPLE: FOR MIL-H-8794 (MIL-H-5511) HOSE -12 SIZE AT 1500 PSI AND HAVING A FLEXING RANGE OF 60° MINIMUM BEND RADIUS = 1.16 X 6.5 = 7-1/2 INCHES (MEASURED AT INSIDE OF BEND).

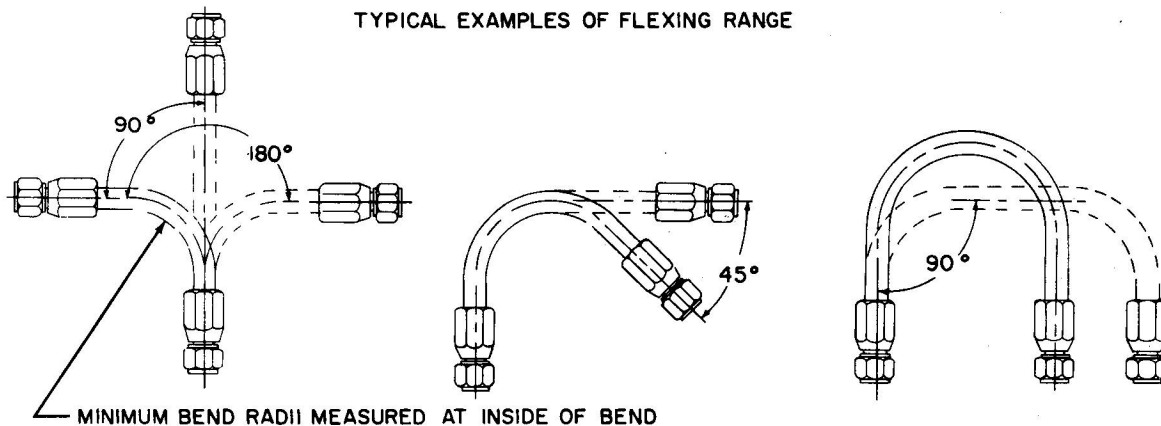


Figure 3-3 Minimum Bend Radii of Hose for Hydraulic and Pneumatic Systems

in length. Broken wires where kinking is suspected are evidenced by sharp dents or twisted wire braid.

NOTE

Crossed reinforcing or random broken wires are not causes for rejection.

(h) Cracks. Hose will be replaced when peeling or flaking of the hose cover results in exposure of the fabric reinforcement, or when weather checks are deep or wide enough to expose fabric when the walls are flattened together.

5 All hose forward of the firewall is to be inspected at every engine change and defective hose replaced.

6 When fuel hose is placed in service, the gasoline has a tendency to extract the plasticizer from the inner lining rubber of the hose. This extraction of the plasticizer is not detrimental as long as gasoline remains in the hose.

If it is found that the fuel hose on any aircraft removed from storage has been without fuel or oil, the hose will be removed and inspected for inward cracking. Inspection can be made by pressing the hose between the fingers, thus widening any cracks which may be present. The absence of cracks in both ends as far in as can be seen will be an indication that the entire length is satisfactory internally.

NOTE

All hose assemblies taken from storage shall be proof tested prior to installation in aircraft, using applicable proof pressure tables of this EO.

7 Rubber strike through on Aeroquip 601 hose has no detrimental effect on the hose and in no way affects the operation or quality. It actually provides an extra good bond between the inner tube and the braided cover even though the excess rubber on the hose exterior may harden or otherwise change appearance under application.





## PART 4

## REPLACEMENT AND ASSEMBLY OF MIL-H-6000 HOSE WITH CLAMP

1 The installation procedures and precautions for MIL-H-6000 low pressure rubber hose are as follows, see Figure 4-1.

(a) Obtain proper size hose and clamp. Clamp shall conform with those described in Figure 1-2. Clamps may be re-used if the band shows no imperfections and the tightening screw functions properly. When the strength of the hose clamp is doubtful, install the clamp on a sample length of hose. Use a hose fitting of the same dimensions as the one on which the hose will be installed and tighten to 50 in.-lb. torque using hose clamp torque wrench 5180-21-807-6071. If the clamp does not fail or sustain damage it is serviceable.

(b) Inspect tube end hose connection for imperfection. It must be cylindrical, free from dents, cracks and sharp edges. Ensure that the offset is within limits shown in Figure 4-1.

(c) Calculate the proper hose length. The hose should be long enough to fit a least 1-1/16" aft of the bead in the case of MS33660, see Figure 1-2, hose fittings or 1-5/16" from the end in the case of MS33658, see Figure 1-2, hose fittings as shown in Figure 4-2. Also allow sufficient slack for pressure and temperature changes.

(d) When short lengths of MIL-H-6000 hose are used to connect rigid lines, the minimum gap G, shown in Figure 4-2 must be 1/4" or  $\frac{\text{tube OD}}{2}$  whichever is greater. The maximum

gap G is not to exceed one tube diameter or 1" whichever is greater. The maximum gap should be allowed for in all offset connections.

(e) Cut hose using a sharp wet knife making sure both ends are square.

(f) Wet hose and adapter sleeve with water. Slide hose over adapter so that it protrudes the correct distance over the fitting.

NOTE

In certain cases a lubricant may be used. This will be detailed in the applicable aircraft -2 EOs.

(g) Place clamps as shown in Figure 4-2 and tighten sufficiently to provide a permanent seal. Over tightening however should be avoided. If torque wrench 5180-21-807-6071 is available, torque clamp to 25 in.-lb.

(h) Following installation, the hose shall be given a functional check to ensure there is no leakage or malfunctioning.

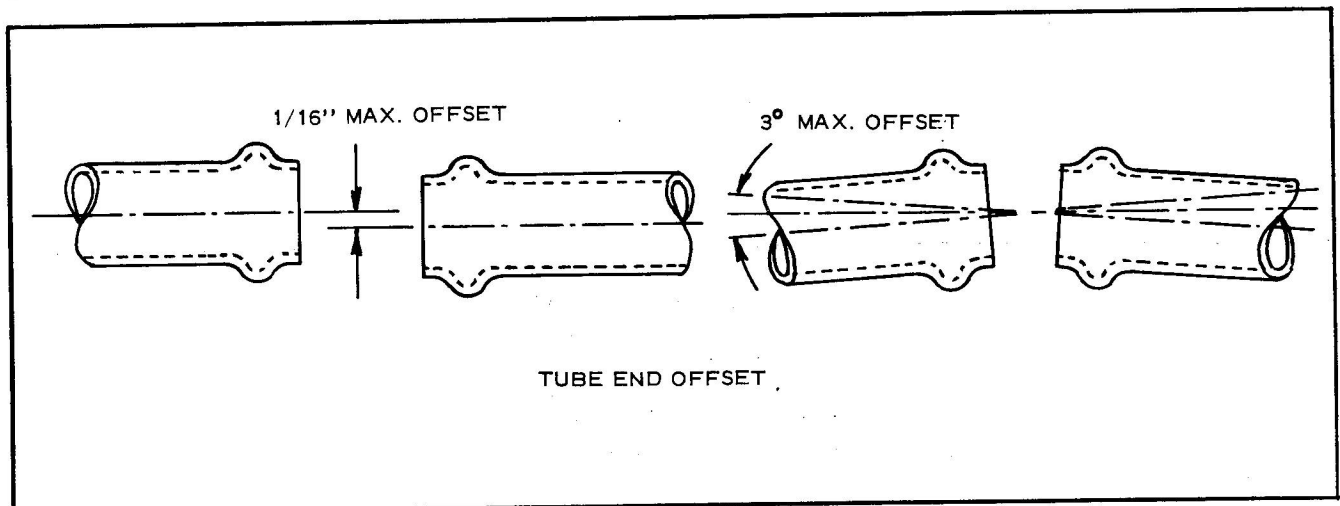


Figure 4-1 Tube end Offset

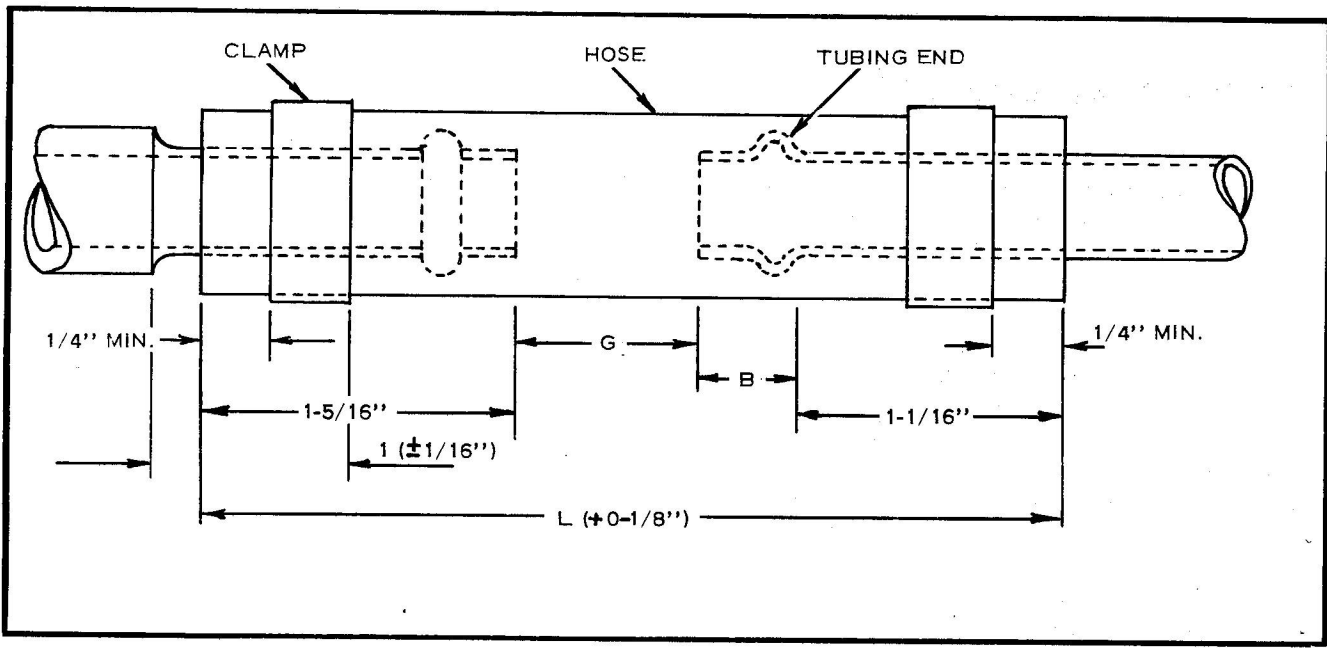


Figure 4-2 MIL-H-6000 Hose Joint With Clamps

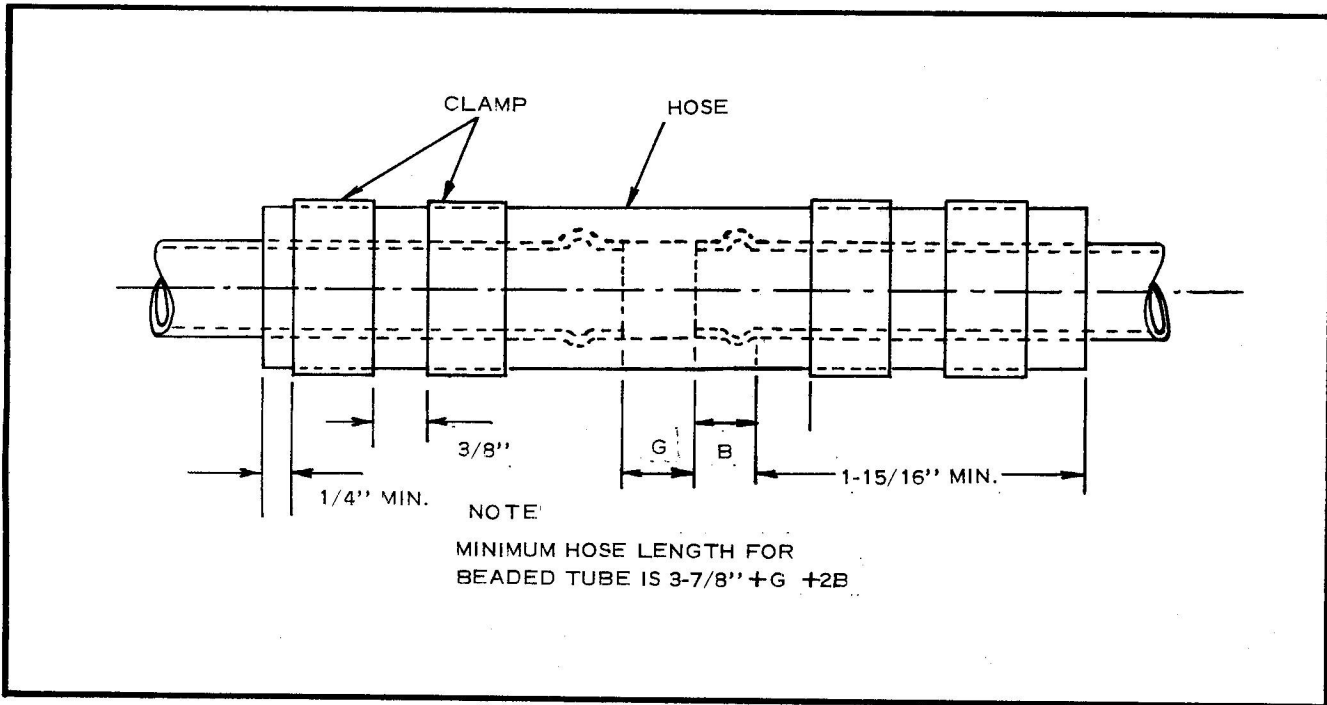


Figure 4-3 MIL-H-6000 Hose Joint With Double Clamps

NOTE

MIL-H-6000 hose also has a tendency to "cold flow" when a new hose of this type is installed retighten the clamps after a period of time in order to maintain original torque value.

(j) Double hose clamps are used in some installations when specified. Clamps in these cases shall be positioned as shown in Figure 4-3.

## PART 5

# REPLACEMENT AND ASSEMBLY OF AN6270 HOSE ASSEMBLY

1 Replacement of low pressure hose assemblies equipped with detachable end fittings, see Figure 5-1.

(a) Remove end fittings from defective hose, and if serviceable, re-use; if unserviceable, select proper new fittings.

(b) Determine length of low pressure hose to be used by measuring defective hose.

(c) Measure and cut length of new hose required.

(d) Assemble as described in following applicable paragraph, 2 or 3.

(e) Clean inside of hose assembly by flushing with water thoroughly dry assembly using compressed air.

(f) Test the assembly by plugging or capping one end of the hose assembly and applying air pressure as noted in Figure 5-2. Immerse in water and hold pressure for not less than 60 seconds during which time hose

end fittings will be checked for evidence of leakage.

### NOTE

Do not confuse entrapped air with leakage. Agitation of the hose assembly under water will remove surface bubbles.

2 Assembling procedures for low pressure flexible hose and low pressure detachable end fittings with threaded type nipples are as follows:

(a) Lock the nipple and nut together with any standard tube fitting of the proper dash number and type thread.

(b) Lubricate end of the selected length of low pressure flexible hose with light oil and insert in the socket. Care must be taken to bottom hose in socket, see Figure 5-3.

(c) Screw nipple into hose and socket with a regular right-hand turn. This operation is accomplished using a wrench and pliers, see

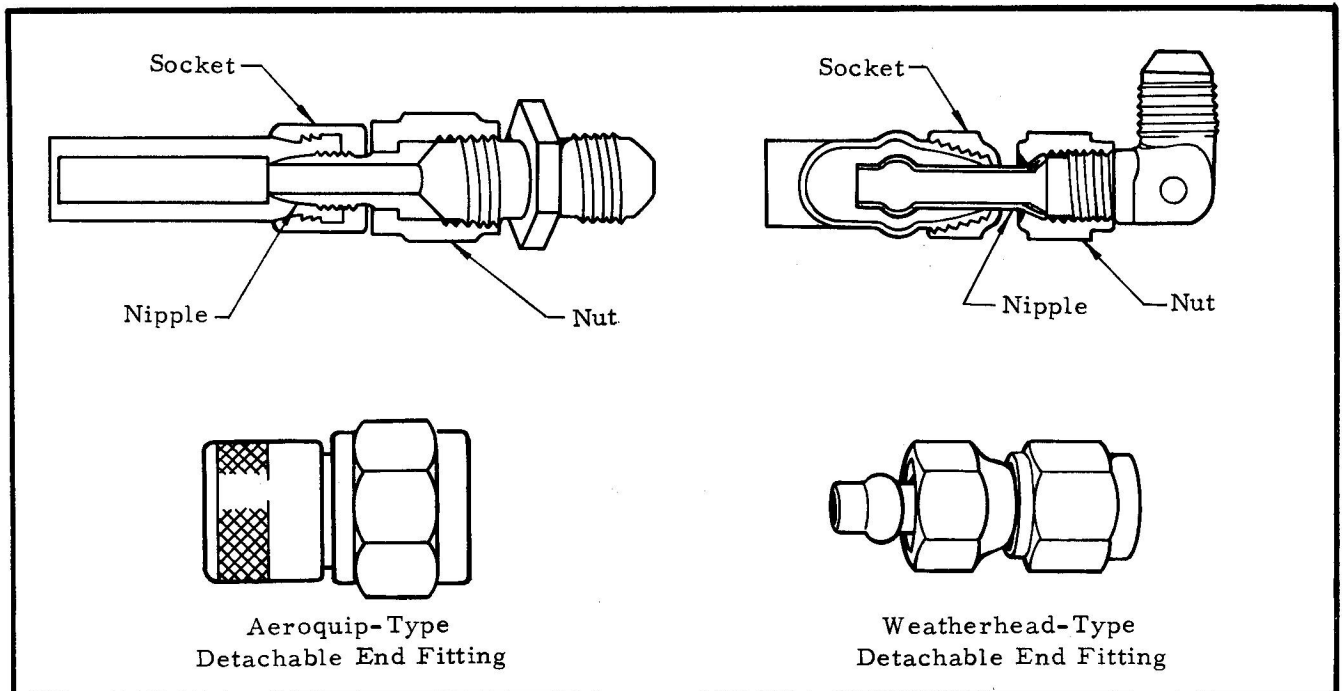


Figure 5-1 MS27404 Fittings

Size Number	Hose Inside Diameter	Deleted	Instrument Air Operating Pressure (psi)	Proof Pressure (psi)	Burst Pressure (psi)
2	1/8		300	600	2000
3	3/16		250	500	1700
4	1/4		200	400	1250
6	3/8		150	300	1000
8	1/2		125	250	750
10	5/8		125	250	700

Figure 5-2 Proof Test and Operating Pressure (psi) for AN6270 Hose Assemblies

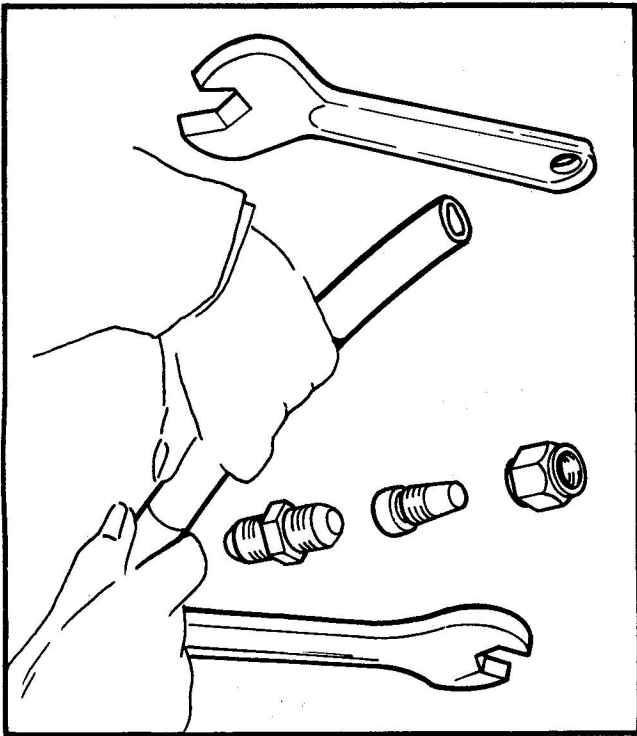


Figure 5-3 Assembling Socket to Hose

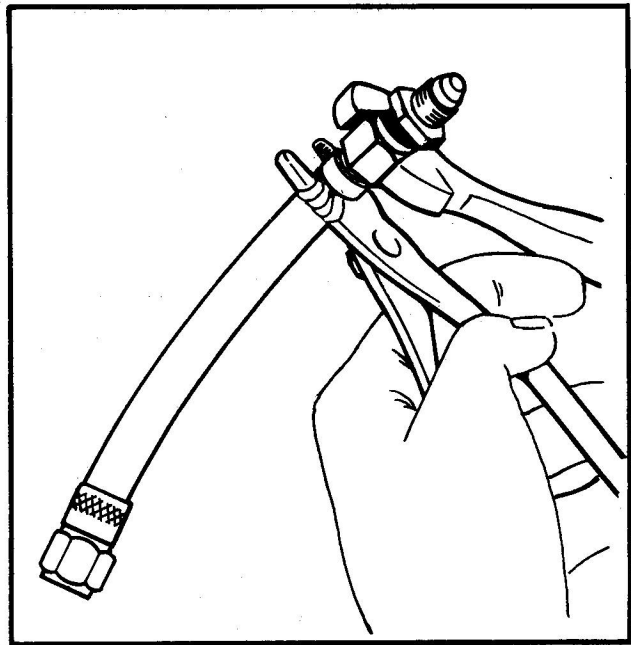


Figure 5-4 Assembling Nipple to Socket

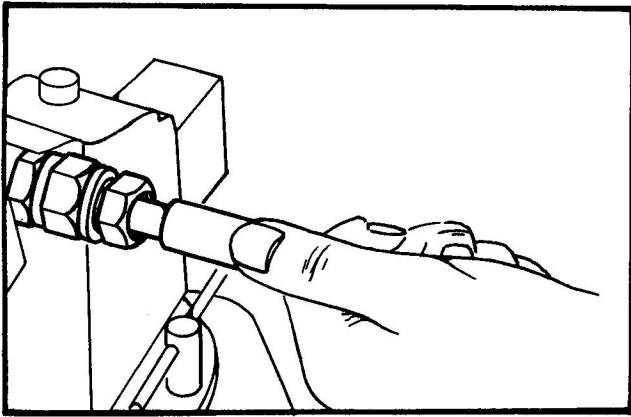


Figure 5-5 Assembling Beaded Type Nipple to Hose

Figure 5-4. If pliers are used, tape jaws to avoid damage to socket. Allow  $1/32$ " clearance between the nut and socket so that the nut will swivel on nipple after assembly.

(d) Clean and test the assembly as described in paragraph 1, (e) and (f).

NOTE

Fittings may be removed from the hose by reversing the order of paragraphs 2(a) to (c).

(e) If hose assembly is not to be used immediately cap or plug each end.

3 Assembling procedures for low pressure flexible hose and low pressure detachable end fittings with beaded-type nipples are as follows:

(a) Thread any standard tube fitting of the proper dash number and type thread into the nut. When seated, this holds the nipple rigid in the nut and serves to support the fitting in a vice during assembly.

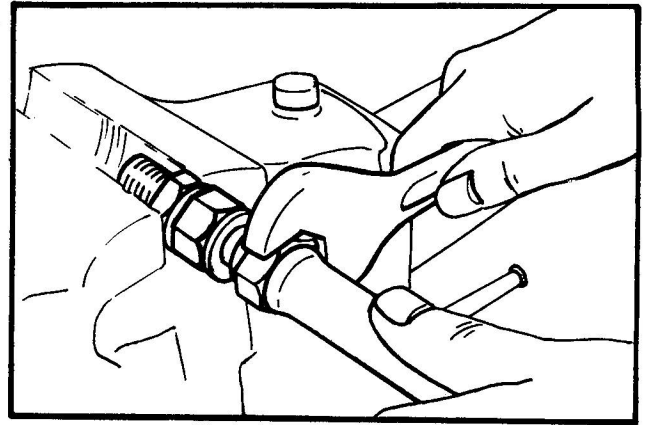


Figure 5-6 Tightening Socket

NOTE

If a vice is not available, assembly can be readily accomplished by holding the fitting in the hand.

(b) Lubricate the bead on the nipple with light oil or light grease and then, with a twisting motion, force the selected length of low pressure flexible hose over the bead of the nipple into the socket as far as it will go, see Figure 5-5.

(c) Holding hose in hand, tighten socket with wrench until hose begins to twist, see Figure 5-6.

(d) Clean and test the assembly as described in paragraph 1, (e) and (f).

NOTE

Fittings may be removed from the hose by reversing the order of paragraphs 3(a) to (c).

(e) If hose is not to be used immediately, cap or plug each end.



## PART 6

# REPLACEMENT AND ASSEMBLY OF MEDIUM-PRESSURE HOSE ASSEMBLY

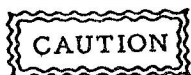
1 The fabricating procedures for sizes 3 through 12 medium pressure hose assemblies using military Specification MIL-H-8794 hose, are as follows:

(a) Select the proper size hose and end fittings; if fittings removed from defective hose are serviceable, re-use.

(b) Determine the correct length of hose. This is done by subtracting variable factor "P", see Figure 6-2 from the length of the assembly, see Figures 6-1 and 6-11. Cut hose to correct length using a fine tooth hacksaw or cutting machine. Clean inside of hose by wiping or washing.

### NOTE

Do not strip hose cover. Fittings requiring the hose cover to be stripped are no longer used.



Check applicable aircraft -4 EO for confirmation of assembly size and length.

(c) Place socket in vice. Screw hose into socket counterclockwise until hose bottoms on shoulder of socket, see Figure 6-3, then back off one-quarter turn.



Do not overtighten socket in vise as this will eggshape the socket.

(d) Select assembly tool mandrel of the same dash number as fitting being assembled. Oil the mandrel, using SAE lubricating oil. Insert mandrel in inside of hose and using a flaring motion, work mandrel in and out to enlarge hole in the hose. Repeat until the mandrel does not bind in the inside of hose, see Figure 6-4.

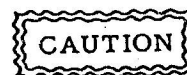
(e) Select proper adapter from tool kit and install on assembly tool. Install the nipple and nut on the assembly, see Figure 6-5, and tighten with a wrench.

### NOTE

When assembly tool is not available, an AN815 union flared tube fitting, of the appropriate size, and a locally manufactured mandrel, see Figure 6-6, may be used to install the nipple into the socket.

Before attaching the nipple on assembly tool, wipe all oil from the nipple and assembly tool cone angles and mandrel.

(f) Lubricate with light oil, the threaded end of the nipple and the end of the hose and socket assembly. Screw the nipple into the socket. To eliminate possible difficulty in assembly, screw the nipple into the socket half the length of the threaded portion. Remove the nipple, dip in oil, and screw into the socket until there is a clearance of 1/32" to 1/16" between the back of the nut to swivel freely when the adapter and assembly tool are removed, see Figure 6-7.



Exercise care to prevent stripping the threads when starting the nipple into the socket.

(g) To remove the assembly tool, apply the wrench on the hex of the nut and unscrew. Remove the assembly from the vice.

2 Disassembling Procedures for sizes 3 through 12 medium pressure hose assembly. Follow the assembly instructions in reverse order. Prior to removing the nipples from the assembly, or when inserting the assembly tool in the nipple, remove all oil from the nipple and assembly tool cone angles, mandrel, and assembly.

3 Fabricating procedures for sizes 16 through 48 medium pressure hose assemblies are as follows.

(a) Select the proper size hose and end fittings.

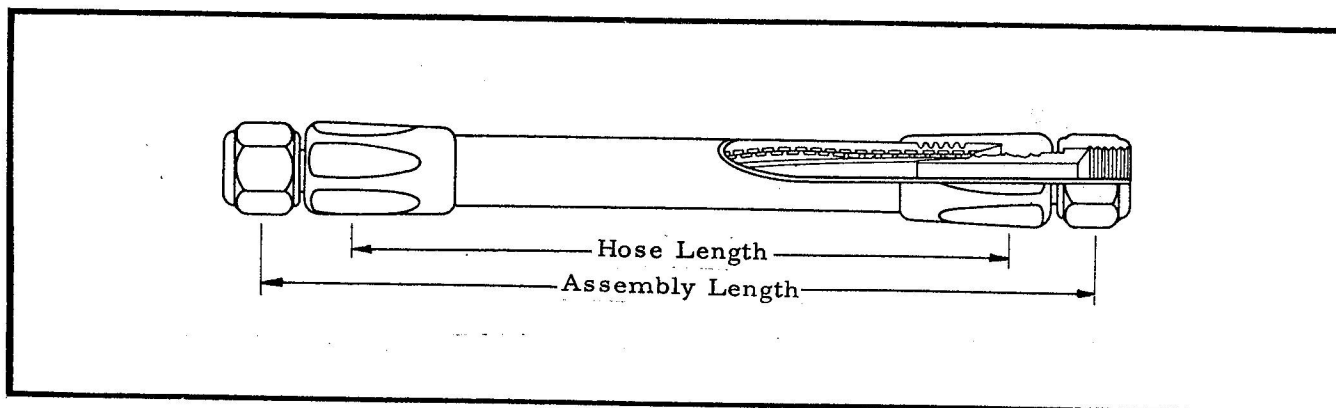


Figure 6-1 Obtaining Correct Length of Hose

Rigid Tube Outside Diameter (Reference)	P	Hose Inside Diameter
3/16	1.42	1/8
1/4	1.34	3/16
5/16	1.55	1/4
3/8	1.60	5/16
1/2	1.82	13/32
5/8	1.96	1/2
3/4	2.22	5/8
1	1.97	7/8

Figure 6-2 Length of Hose

(b) Cut correct length of hose and clean inside of hose by wiping or washing.

(c) Place socket in vice, screw hose into socket counterclockwise until hose bottoms, then back off one-quarter turn.

(d) Tighten nipple and nut to mating adapter AN815, no mandrel is needed.

(e) Lubricate inside of hose and outside of nipple with light lubricating oil.

(f) Screw nipple into socket and hose, using wrench on hex of adapter. Leave 1/32" to 1/16" clearance between the back of the nut and the face of the socket to permit the nut to

swivel freely when the adapter is removed.

4 For fabricating assemblies with elbows or special end fittings, same procedures are used see Figure 6-8.

5 Clean locally manufactured hose assemblies by flushing with water. Thoroughly dry assembly using compressed air.

6 Test Medium pressure hose assemblies as follows:

(a) Test the hose assembly by plugging or capping one end of the hose and applying hydraulic pressure to the inside of the hose, see Figure 6-9 for testing pressure.

(b) Hydraulic oil conforming to 3-GP-26b or MIL-O-6803 shall be used as the liquid medium for testing hose assemblies.

(c) Test hose assemblies in straight, horizontal position, tighten cap only after all trapped air has bled from assembly. Apply pressure and observe for evidence of leakage while maintaining test pressure. Hold pressure for a minimum of 30 seconds.

(d) After pressure testing, the inner tube of the hose assembly shall be cleaned by flushing with dry cleaning solvent 3-GP-8 followed by forced air drying.

(e) Dry completely with forced air.

(f) Inspect the assembly (interior and exterior) for foreign particles and moisture.



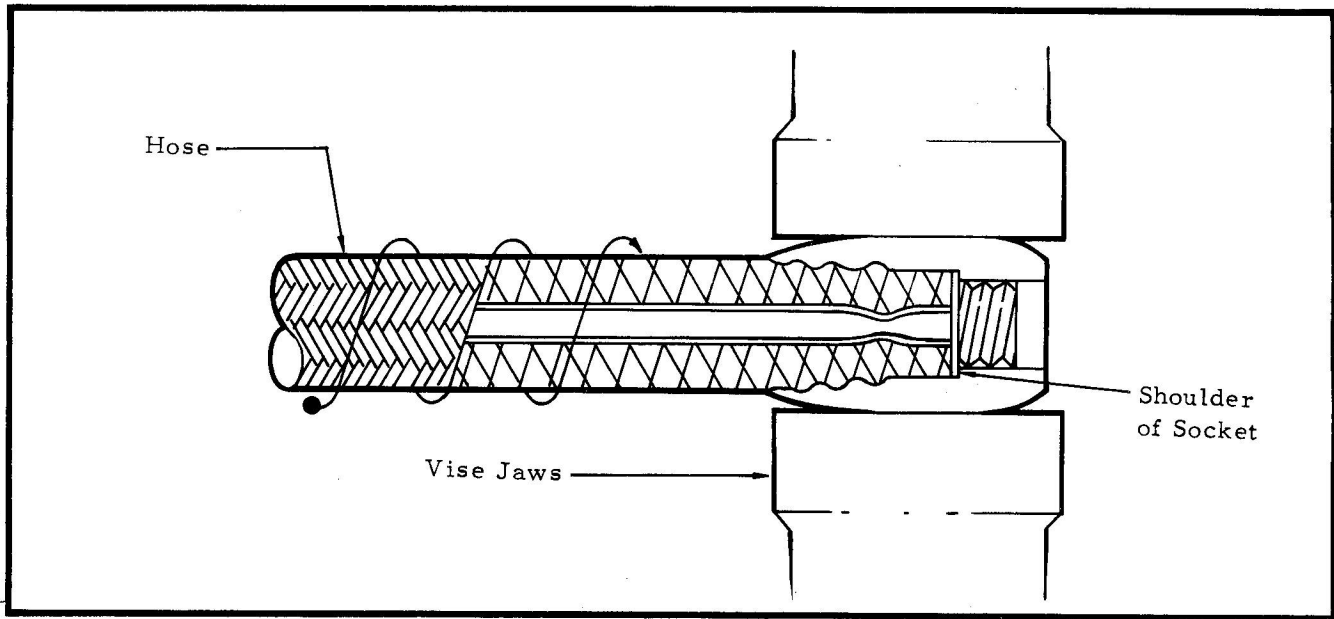


Figure 6-3 Assembling Fitting to Hose

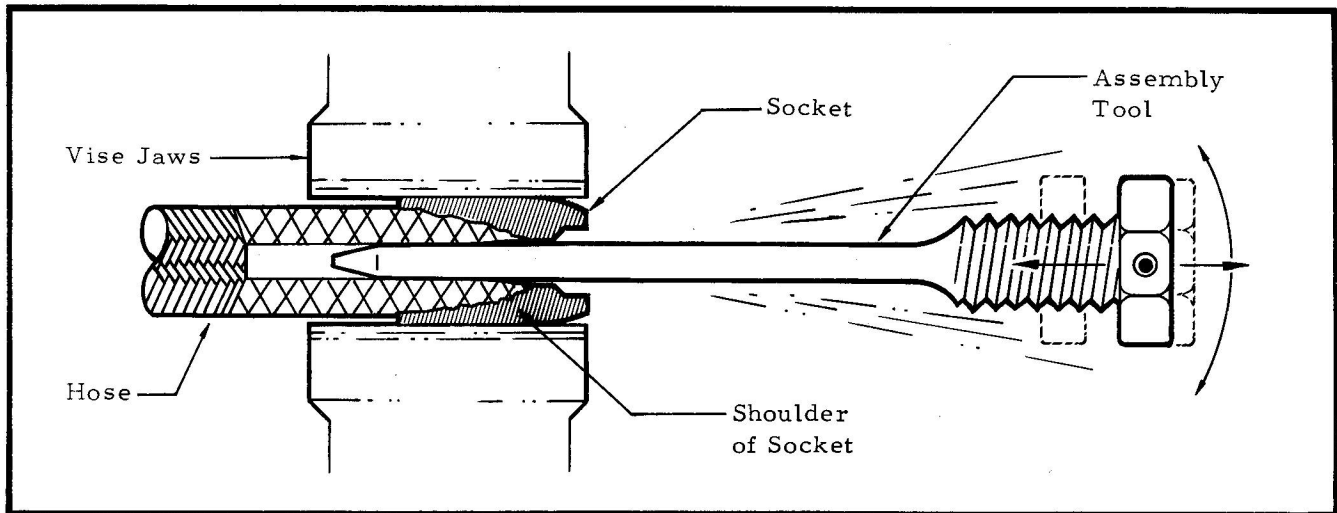


Figure 6-4 Fitting Hose with Assembly Tool

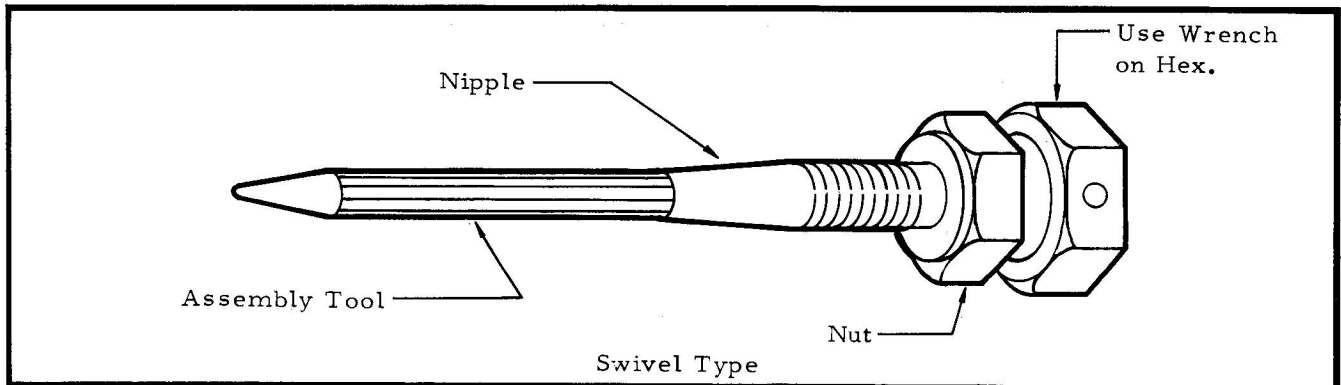


Figure 6-5 Assembly Tool with Nipple and Nut

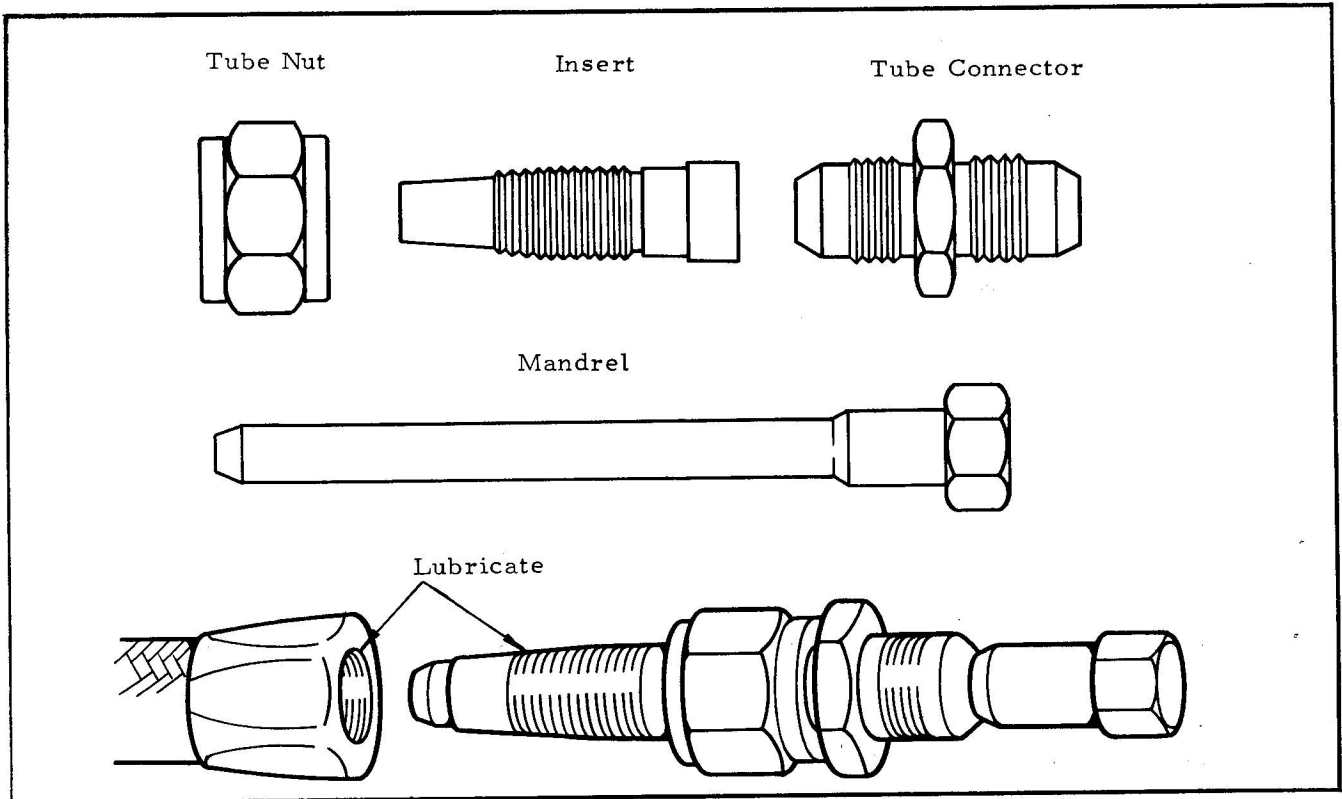


Figure 6-6 AN815 Fitting and Mandrel

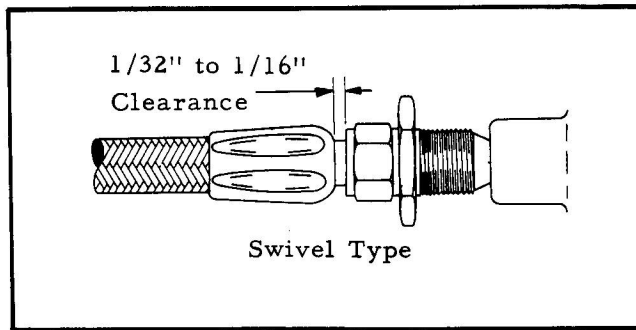


Figure 6-7 Installing Nipples

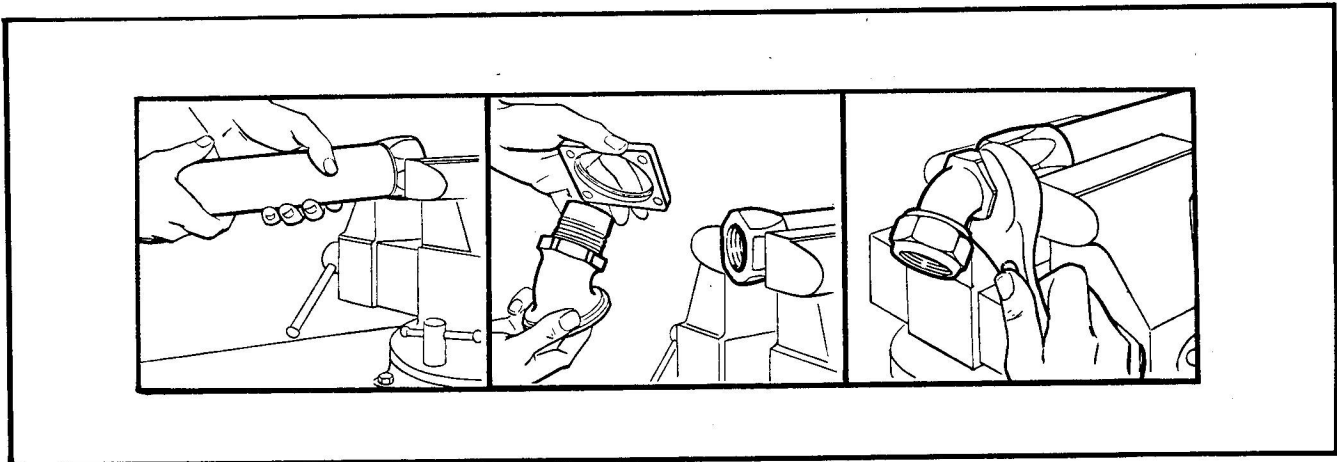


Figure 6-8 Elbow Installation

Size No.	Hose Size ID	Hydraulic		Fuel		Oil			Burst Pressure (psi)
		Operating Pressure (psi)	Proof Pressure (psi)	Operating (psi)	Proof (psi)	Operating (psi)	Surge (psi)	Proof (psi)	
3	1/8"	2000	4000	1000	1500	50	400	600	8000
4	3/16"	3000	6000	1000	1500	50	400	600	12,000
5	1/4"	3000	5000	1000	1500	50	400	600	10,000
6	5/16"	2000	4500	1000	1500	50	400	600	9000
8	13/32"	2000	4000	1000	1500	50	400	600	8000
10	1/2"	1750	3500	1000	1500	50	400	600	7000
12	5/8"	1500	3000	1000	1500	50	400	600	6000
16	7/8"	800	1600	750	1000	50	400	600	3200
20	1-1/8"	600	1250	500	750	50	400	600	2500
24	1-3/8"	500	1000	250	375	50	400	600	2000
32	1-13/16"	350	700	200	300	50	400	600	1400
40	2-3/8"			200	300				1000
48	3"			200	300				800

Figure 6-9 Proof Test and Operating Pressure psi for Medium Pressure Rubber Hose Single Wire Braid MIL-H-8794

	Flange Max. oper. press. (psi)	Fittings Max. Proof press. (psi)
-16	800	1250
-20	500	750
-24	500	750
-32	350	700
-40	250	500
-48	200	300

Figure 6-10 Proof Test and Operating Pressures psi for Medium Pressure Rubber Hose (MIL-H-8794) with Flange Type End Fittings. For Use in Hydraulic Systems.

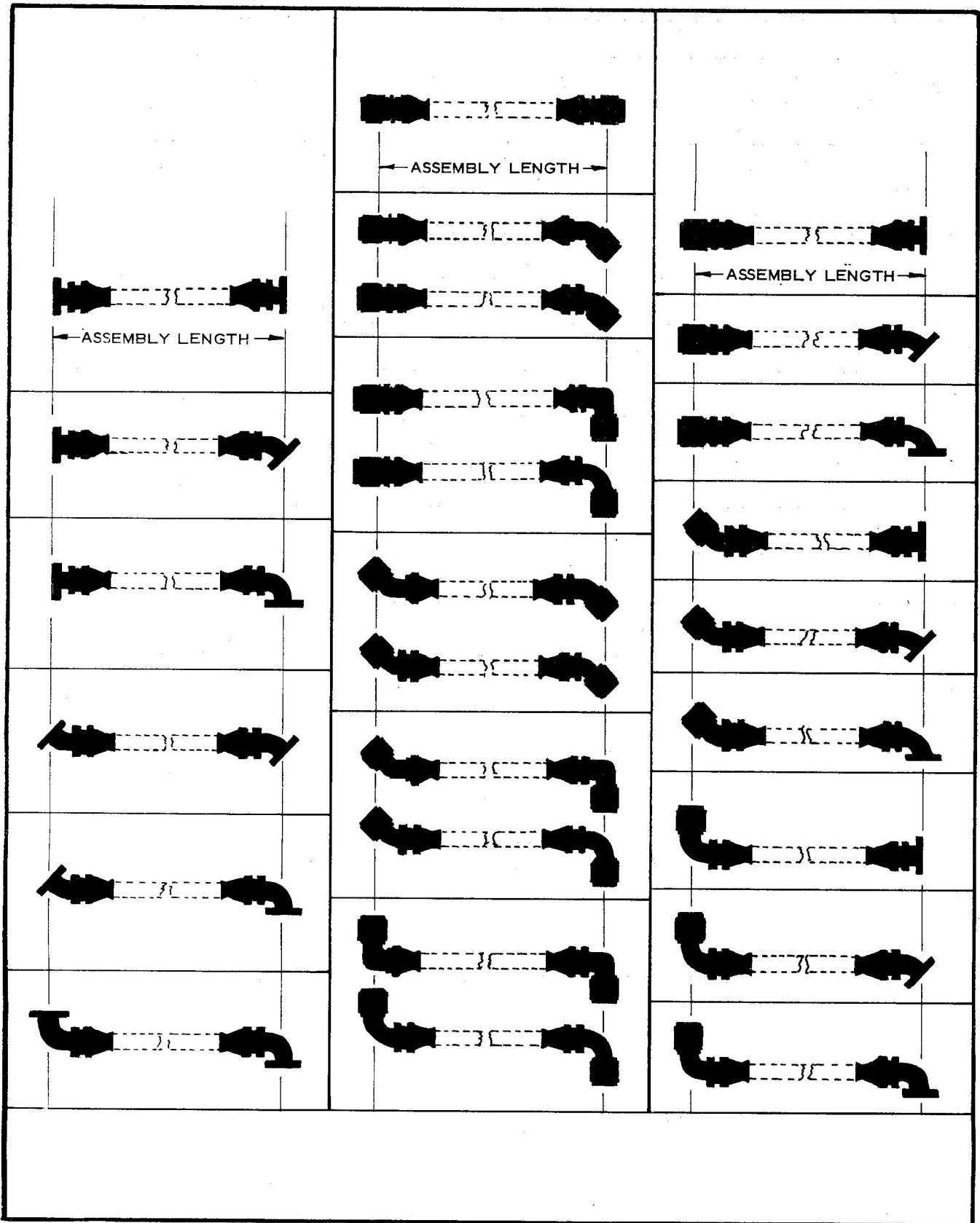


Figure 6-11 Standard Method For Measuring Hose Assembly Lengths

(g) Hose assemblies that are manufactured for immediate use and are to be used in hydraulic systems will not require capping or flushing with solvent.

NOTE

All medium and high pressure rubber hose assemblies used on aircraft or aircraft engines or airborne components shall be replaced at 8 years from cure date. This service life of 8 years includes shelf and installed life. Should the cure date, on inspection, be found

illegible the hose shall be changed as a precautionary measure.

7 Flange type end fittings, size 16 and up should be proof tested at reduced pressures, as indicated in Figure 6-10. When hose assembly with varying size between hose and fitting commonly known as jump size is used, the proof pressure shall be limited to the flange or hose proof pressures, whichever is lowest. When subject to the usual minimum 2 times the operating proof pressure the flange and shoulder has a tendency of warping, with subsequent failure of the gasket.



## PART 7

## HOSE ASSEMBLIES PROCURED AS ASSEMBLIES

1 MIL-H-8790 rubber high pressure, MIL-H-38360 high pressure tetrafluorethylene, MIL-H-25579 tetrafluorethylene medium pressure and 601 lightweight engine hose assemblies will be manufactured by DND approved source only and Units are not to attempt to change any configuration of these assemblies.

2 The permanent spot welded identification tag, see Figure 2-1, attached to the above assemblies shall not be removed upon installation on aircraft or engine. The information contained on the tag is considered essential in the investigation of failure and the tracing of other assemblies in the case of faulty bulk material, and for identification purposes.

3 Tetrafluorethylene medium pressure hose assemblies with elbow fittings at each end (one adjustable one non-adjustable): The relative position angle between fittings may be changed by resetting the adjustable elbow as follows:

NOTE

Adjustable fittings are identified by two grooves on the nipple hexagon, see Figure 7-1.

(a) Hold the grooved round socket with a suitable locally manufactured wrench, see Figure 7-2, and back socket off one turn.

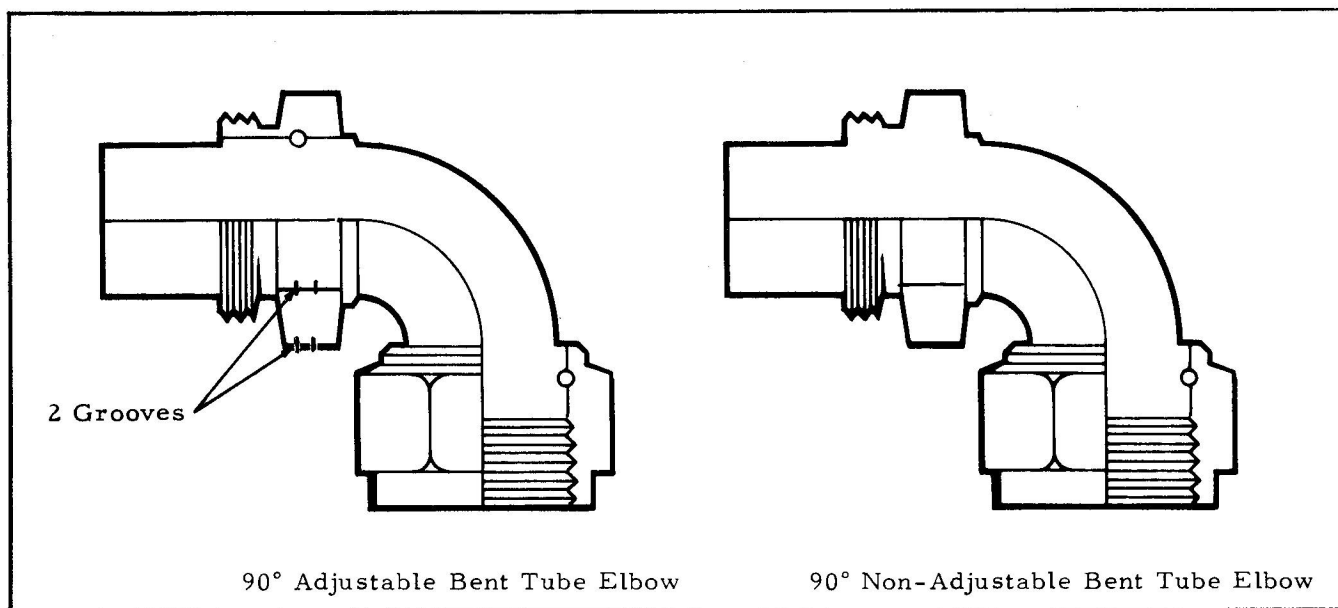


Figure 7-1 (Issue 1) Elbow Fittings

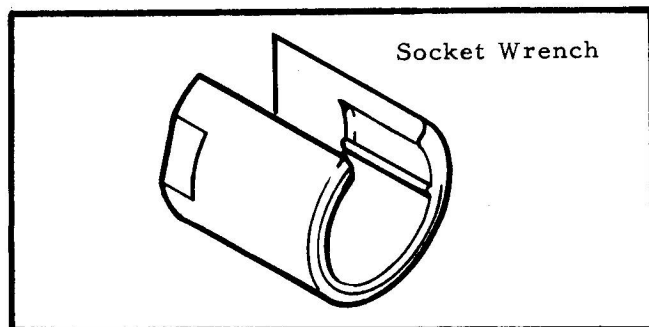


Figure 7-2 Groove Socket Wrench

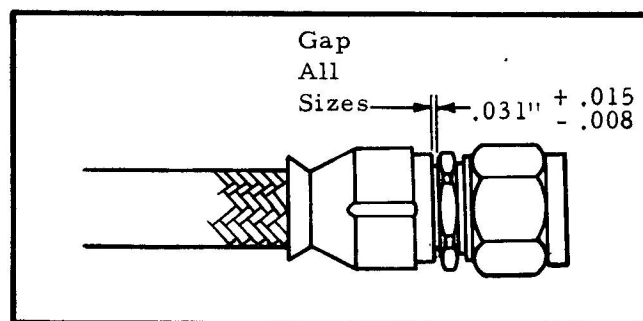


Figure 7-3 Torque Gap

Dash Size	Equivalent Tubing Outside Diameter	Hose Assembly Number	Proof Pressure	Operating Pressure	Bend Radius (Inside) Inches
-4	1/4	MS28759 MS28762	8000	3000	3
-5	5/16	MS28759 MS28762	7000	3000	3-3/8
-6	3/8	MS28759 MS28762	7000	3000	5
-8	1/2	MS28759 MS28762	7000	3000	5-3/4
-10	5/8	MS28759 MS28762	6000	3000	6-1/2
-12	3/4	MS28759 MS28762	6000	3000	7-3/4
-16	1	MS28759 MS28762	5000	3000	9-5/8

Figure 7-4 Proof Test and Operating Pressure (psi) for Hose Assemblies MIL-H-8790 High Pressure Rubber

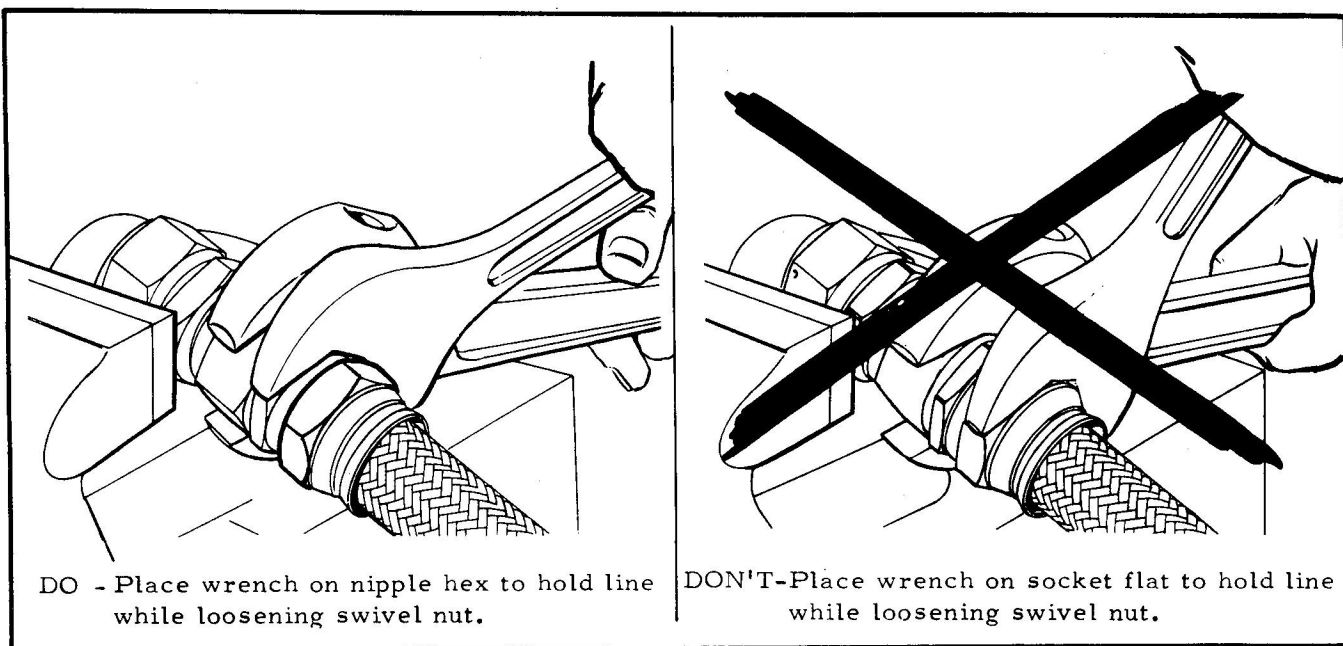


Figure 7-5 Assembly Procedure (Do and Don't)



Hose Size	Swivel End Fittings	Flanged Fittings	Bend Radii	Hose Size ID
-3	3000 psi		2"	1/8"
-4	3000		2"	3/16"
-5	3000		2"	1/4"
-6	3000		4"	5/16"
-8	3000	1500 psi	4-5/8"	13/32"
-10	3000	1500	5-1/2"	1/2"
-12	2000	1500	6-1/2"	5/8"
-16Z	2500	1250	7-3/8"	7/8"
-20Z	2000	750	7-3/8"	1-1/8"

Figure 7-6 Proof Test Pressure for MIL-H-25579 Medium Pressure Teflon

Size	Proof psi	Bend Radii	Hose Size ID
4	6000	3"	7/32"
6	6000	5"	5/16"
8	6000	5-3/4"	13/32"
10	6000	6-1/2"	1/2"
12	6000	7-3/4"	5/8"

Figure 7-7 Proof Test Pressure for MIL-H-38360 High Pressure Teflon

Size	Swivel End Fittings	Flanged Fittings	Bend Radii	Hose Size ID
3	3000 psi		1-3/4"	5/32"
4	3000 psi		2"	7/32"
5	3000 psi		2-1/4"	9/32"
6	3000 psi		2-1/2"	11/32"
8	2500 psi		3-1/2"	7/16"
10	2500 psi		4"	9/16"
12	2000 psi	1500 psi	4-1/2"	11/16"
16	1500 psi	1250 psi	5-1/2"	7/8"
20	1300 psi	750 psi	8"	1-1/8"
24	800 psi	750 psi	9"	1-3/8"
32	600 psi	600 psi	12-1/2"	1-13/16"

Figure 7-8 Proof Test Pressure for 601 Lightweight Engine Hose

- (b) Adjust elbow to the proper angle.
- (c) Retorque to the proper gap, see Figure 7-3.
- (d) Pressure proof test the assembly, see applicable Figure 7-6 or 7-7.

**CAUTION**

Kinking occurs more easily in larger size hose and in very short hose lines. Exercise care in handling and installing all tetrafluorethylene hose.

4 Extra care shall be exercised when handling tetrafluorethylene hose to avoid kinking as result of sharp bending or twisting.

5 Tetrafluorethylene hose assemblies fitted with hexagon or two flat sockets: Do not place wrench on socket of hose fitting when installing hose assembly, see Figure 7-5.

**PART 8****STORAGE OF HOSE AND HOSE ASSEMBLIES**

1 Hose should be stored away from sunlight, heat, ozone, etc. To minimize the deterioration of hose in storage, follow "first-in, first-out" principle.

2 Short hose lengths or assemblies should be stored in closed containers to protect them from dust. Other hose assemblies should have the ends capped.

3 All hoses except MIL-H-8794 when received in coils, for stock or storage, are to be unrolled and stored in straight lengths.

4 Under no circumstances are hoses to be piled to a height which will result in distortion and damage to the lower lengths. This precaution is also applicable to hose in cartons.

5 Do not bend or attempt to straighten preformed hose lines. Care shall be exercised in handling these lines as sharp or excessive bending will tend to kink preformed hose line. These lines should not be removed from carton prior to immediate installation.

