AEROSPACE RECOMMENDED PRACTICE

ARP1658	REV. B

Issued 1982-03
Revised 1997-08
Reaffirmed 2014-10

Superseding ARP1658A

Hose Assemblies, Installed, Visual Inspection Guide For

RATIONALE

ARP1658B has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) covers visible surface defects on aerospace hose assemblies which have been installed and are functioning within a working environment at the time of visual inspection.

1.1 Purpose:

This document is intended to help those who are conducting periodic visual inspections of hose assemblies used in aerospace systems and ground servicing equipment to determine time for replacement by condition of hose assemblies at time of inspection. This practice is intended to augment existing procedures for replacement of hose assemblies based on service time.

1.1.1 A constant surveillance of all hose assemblies for visible wear, defects, and/or damage shall be routine at all times of maintenance. When wear, defects, or damage to installed hose assemblies is detected, the hose assemblies shall be tagged or replaced in accordance with Section 4 of this document.

2. REFERENCES:

2.1 Related Publications:

The following publications are provided for information purposes only and are not a required part of this document.

2.1.1 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

FED-STD-162a Hose, Rubber, Visual Inspection Guide

MIL-STD-177 Rubber Products, Terms for Visible Defects of
MIL-STD-407 Visual Inspection Guide for Rubber Molded Products

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/ARP1658B

2.1.2 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AIR4092 Investigation of PTFE "Melt" Phenomenon for High Pressure Hoses

2.2 Definitions:

The following terms defining types of visible defects on installed hose assemblies shall apply specifically to this document.

ABRASION: The wearing away by friction, especially hose cover or reinforcement which evidence damage, fraying, etc., due to rubbing or vibrating against another hose or permanent fixture in an installation.

BROKEN CLAMPS: Loose, broken, or damaged firesleeve clamps which evidence a failure to properly secure firesleeving to a hose assembly.

BROKEN WIRES: On hose with wire-braided jacket or cover, a strand of wire, or multiple strands of wire forming a plait, which is severed or broken in two due to abrasion, flexing or stress fatigue.

CHALKING: The formation of a powdery surface condition due to disintegration of firesleeving or hose cover material by weathering or other destructive environments.

CHECKING: Short, shallow cracks on the surface of an elastomeric hose cover material resulting from damaging action of environmental conditions.

CORROSION: A physical discoloration of hose cover or reinforcement indicative of material degradation due to extreme heat, chemical attack, weathering, oxidation, etc.

COVER BLISTERS: Raised areas or spots on an elastomeric hose cover surface usually forming a void or air-filled space in the material.

CRACKED SLEEVE: A firesleeve which evidences surface cracks or fissures caused by strain and environmental conditions.

CRAZING: A surface effect on elastomeric hose cover material characterized by multitudinous minute cracks.

HEAT DAMAGE: Charring, chalking, or hardening and cracking of hose cover caused by excessive or prolonged exposure to heat. Other evidence may include fluid leakage from socket where fitting or coupling is attached to hose.

KINKING: A temporary or permanent distortion of a hose, induced by winding or doubling upon itself and consequently exceeding the recommended minimum bend radius established for that hose.

2.2 (Continued):

LEAKER: (1) A crack or hole in the tube which allows fluids to escape. (2) A hose assembly which allows fluids to escape at the fittings or couplings.

LOOSE COVER: A separation of the cover from the carcass or reinforcements.

SOAKED SLEEVE: A firesleeve, so saturated with fluid conveyed by the hose assembly the sleeve is mounted to that sweating or permeation of the fluid through the firesleeve results. (A soaked sleeve is usually indicative of a damaged or faulty hose assembly or spillage of fluid from a nearby port.)

TEARS: A sharp break or fissure in the surface of a hose cover, generally caused by strain and service conditions.

TORN SLEEVE: A firesleeve which evidences surface tear, or which has been stretched in two or fissured to the degree that it will no longer provide adequate fire protection to the hose assembly.

TWIST: A hose or hose assembly subjected to internal pressures or improperly installed so that each end of the hose is turned awkwardly about the hose axis in opposing directions.

WEATHERING: The surface deterioration of a hose cover during outdoor exposure, such as checking, cracking, crazing, or chalking.

WIRE THROW-OUT: In braided hose, a broken end or ends in the wire reinforcements protruding from the surface of the braid.

3. REQUIREMENTS:

The following inspection procedure shall be in effect commencing with the receipt of equipment, containing hose assemblies, by the user.

3.1 Inspection Records:

Appropriate work orders, job sheets, Technical Orders (T.O.'s) and maintenance service records shall contain requirements for visual hose inspection and sign-off indicating that the inspections were made.

3.2 Frequency of Inspections:

3.2.1 Routine Visual Inspection: Shall be made on all exposed hose assemblies each time the equipment is serviced.

3.2.2 Complete Visual Inspection: Shall be made at user's approved schedule (recommend inspection twice annually).

3.3 Inspection Procedures:

3.3.1 Routine Visual Inspection: Shall consist of a constant surveillance of those hose assemblies exposed during routine servicing of the equipment. The operator or mechanic is to look for visible evidence of leakage, wear, damage, or abuse and replace in accordance with classification of defects (see Section 4).

3.3.2 Complete Visual Inspection: Shall consist of a thorough examination of all hose assemblies on the equipment. The operator or mechanic shall trace through the entire system examining the hose assemblies for evidence of leakage, wear, damage, or abuse and replace in accordance with classification of defects (see Section 4).

3.3.3 Disposition of Defective Assemblies: When leaky, worn, damaged, or abused hose assemblies are found, they shall be tagged or replaced if necessary and the cause shall be corrected or eliminated. A full report shall be made so that similar equipment may likewise be corrected.

4. CLASSIFICATION OF DEFECTS:

Defects observed shall fall into two classifications, minor and major.

4.1 Minor Defects:

Minor defects, when observed, should be tagged for future observations and/or replacement.

4.2 Major Defects:

Major defects should be replaced immediately.

5. IDENTIFICATION OF DEFECTS:

5.1 Kinked:

Minor: In body of low pressure hose.

Major: If near fitting, indicating possible heavy stress, or in medium or high pressure hose assemblies.

5.2 Broken Wires:

Minor: If isolated random occurrence.

Major: If two or more wires in one plait broken (see 2.2), or if breakage of several wires is concentrated in one section.

5.3 Abrasion:

Minor: If confined to no more than two wires.

Major: If extended throughout one plait or from one plait to another.

Minor: For rubber covered hose if confined to rubber cover of hose.

Major: For rubber covered hose if wire is exposed.

Minor: Para-aramid reinforced hose if straw colored reinforcement is not exposed.

Major: Para-aramid reinforced hose if straw colored reinforcement is exposed.

5.4 Corrosion:

Minor: A discoloration of the hose cover or reinforcement but no physical corrosion is detectable.

Major: If any corrosion of wire is detectable.

5.5 Twisted:

Minor: On all spirally reinforced hose.

Major: If wires are broken or liner cannot be rounded out.

5.6 Cracked Firesleeve (Integral):

Minor: If only surface crazing and no excessive hardening.

Major: If hose exposed or if significant hardening (correct cause of apparent over temperature exposure).

5.7 Wetted Firesleeve:

Minor: Light intermittent external surface only.

Major: If fiberglass wetted or if sleeve (integral or slip-on) is submerged.

5.8 Torn Firesleeve (Slip-On):

Minor: Shallow superficial tear with no material missing.

Major: If fiberglass is exposed.

5.9 Broken Clamps:

Minor

5.10 Leakers:

Minor: A leak which can be stopped by tightening a loose swivel nut. Any leak that can be stopped by tightening swivel nut to maximum recommended torque.

Major: A tear or defect in the hose assembly or fitting causing a leak. Any leak that cannot be overcome by tightening swivel nut or retaining bolts (flange) to maximum recommended torque.

5.11 PTFE "Melt" Phenomenon:

Minor: None

Major: Visible signs of PTFE material, typically "whisker" like appearance, leaching past reinforcement wire braid.

6. NOTES:

6.1 Key Words:

Aerospace, hose assemblies, defect, visual inspection

6.2 The change bar (**l**) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document.

PREPARED BY SAE SUBCOMMITTEE G-3D, AEROSPACE HOSE OF
COMMITTEE G-3, AEROSPACE COUPLINGS, FITTINGS,
HOSE, AND TUBING ASSEMBLIES

NOTE: Figure in Minor or Major Column indicates plate number. No number means no photo available.	LOW PRESSURE RUBBER HOSE (a)			MEDIUM PRESSURE RUBBER HOSE (FABRIC COVERED) (b)			MEDIUM PRESSURE RUBBER HOSE (SS RE-INFORCED) (c)			HIGH PRESSURE RUBBER HOSE (RUBBER COVERED) (d)			LOW & MEDIUM PRESSURE PTFE HOSE (e)			HIGH PRESSURE PTFE HOSE (f)			FIRE-SLEEVED HOSE		
	Applicable	Minor	Major	Applicable	Minor	Major	Applicable	Minor	Major	Applicable	Minor	Major	Applicable	Minor	Major	Applicable	Minor	Major	Applicable	Minor	Major
Kinked Assemblies	X	1	2	X	3	4	X	5	6				X	7	8						
Abrasion	X	9	10	X	11	12	X	13	14	X	15	16	X	17	18	X	19	20/88			
Weathering	X	21	22							X	23	24									
Heat Cracking	X	25	26																		
Leaker	X	27	28	X	29	30	X	31	32	X	33	34	X	35	36	X	37	38	X	39	40
Tears	X	41	42							X	43	44									
Twist				X	45	46				X	47	48	X	49	50	X	51	52			
Corrosion				X	53	54	X	55	56	X	57	58	X	59	60	X	61	62			
Heat Damage				X	63	64	X	65	66	X	67	68									
Broken Wires (plys)				X	69	70	X	71	72				X	73	74	X	75	76			
Cover Blisters										X	77	78									
Cover Cracks										X	79	80									
Cracked Sleeve																			X	81	82
Torn Sleeve																			X	83	84
Broken Clamps																			X	85	
Soaked Sleeve																			X	86	
PTFE "Melt" Phenomenon (g)																X		87			

(a) MIL-H-5593
(b) MIL-H-8794
(c) MIL-H-83797
(d) MIL-H-8788
(e) MIL-H-25579, MIL-H-27267, AS620, AS1227, AS1946 or AS4897
(f) MIL-H-38360, AS604, AS614, AS1339, AS1975, AS4098, AS4604 or AS4623
(g) Applicable to AS1339 only (see AIR4092)

FIGURE 1 - Pictorial Reference by Hose Type and Defects

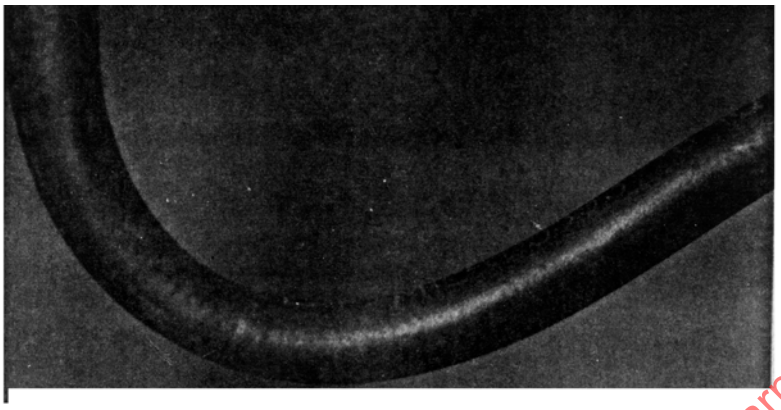


PLATE 1

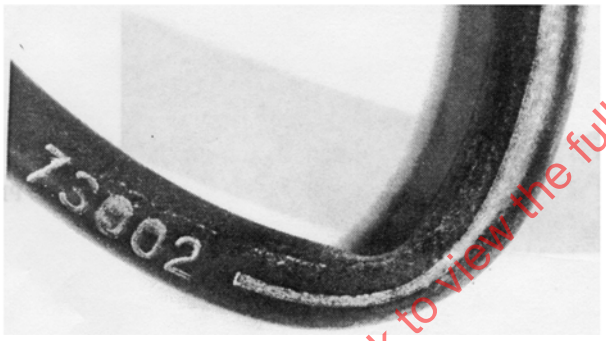


PLATE 2

FIGURE 2 - Kinked Assemblies - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

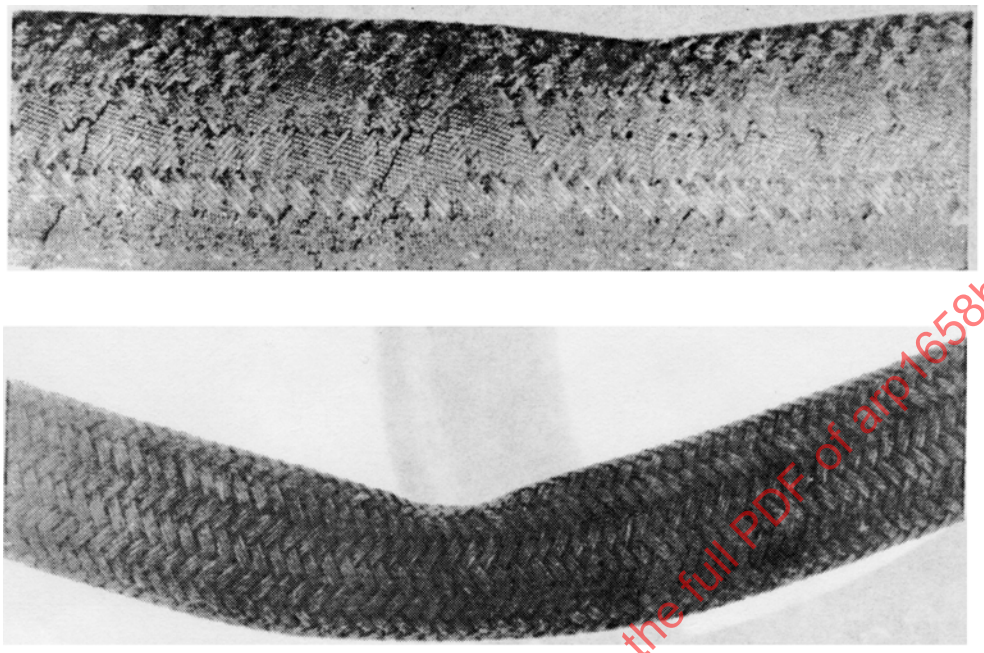


FIGURE 3 - Kinked Assemblies - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)

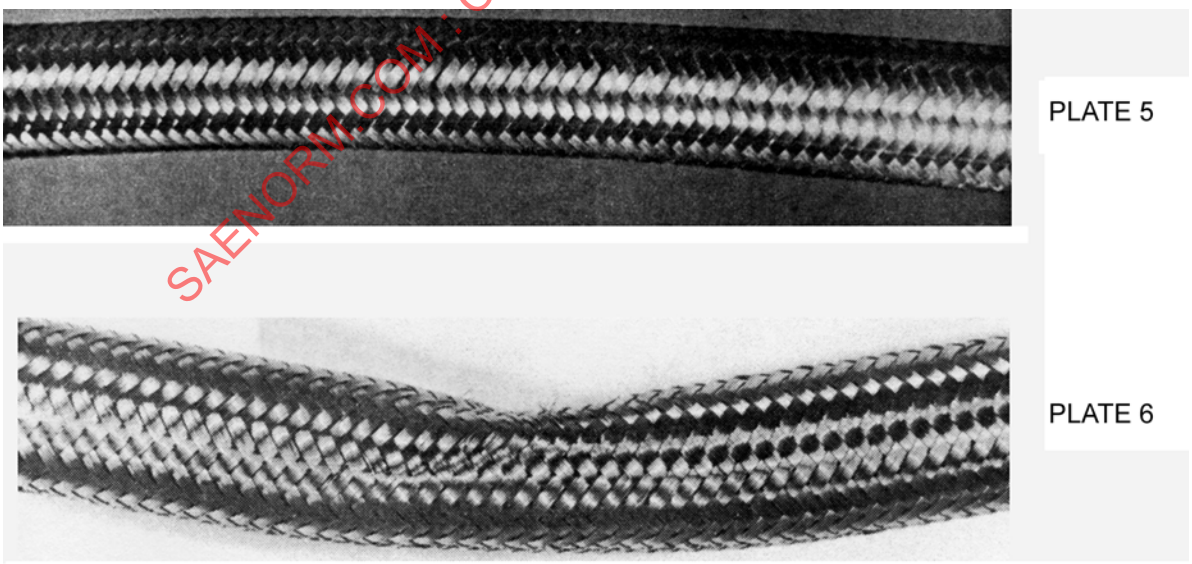


FIGURE 4 - Kinked Assemblies - Minor and Major
Medium Pressure Rubber Hose With Stainless Steel Reinforcement (MIL-H-83797)

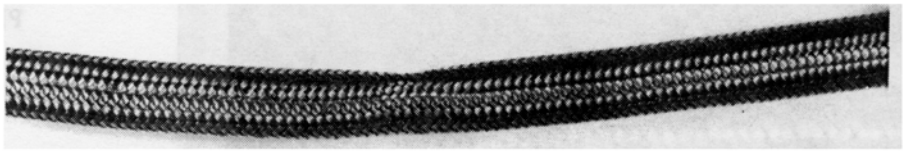


PLATE 7

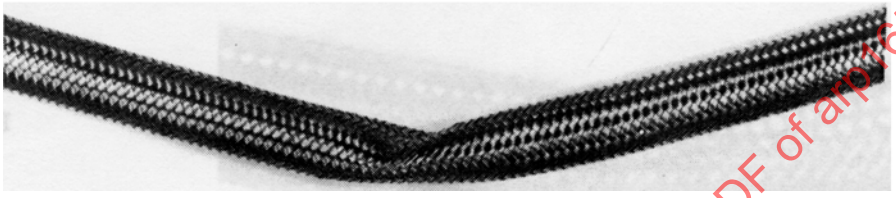


PLATE 8

FIGURE 5 - Kinked Assemblies - Minor and Major
Low and Medium Pressure PTFE Hose (MIL-H-25579/MIL-H-27267, AS620, AS1227, or AS1946)

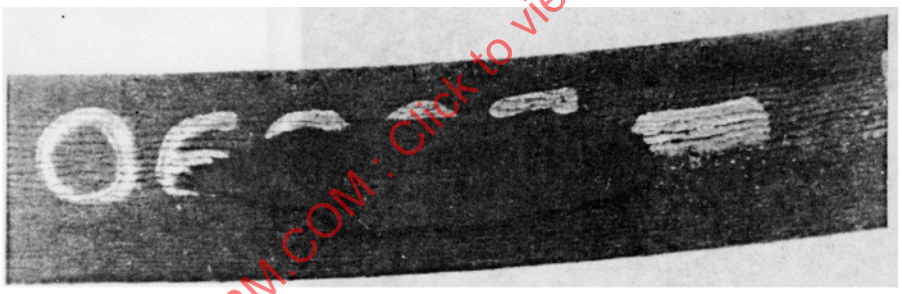


PLATE 9

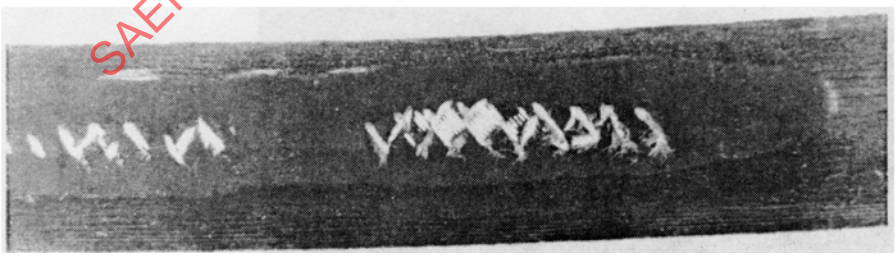


PLATE 10

FIGURE 6 - Abrasion - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

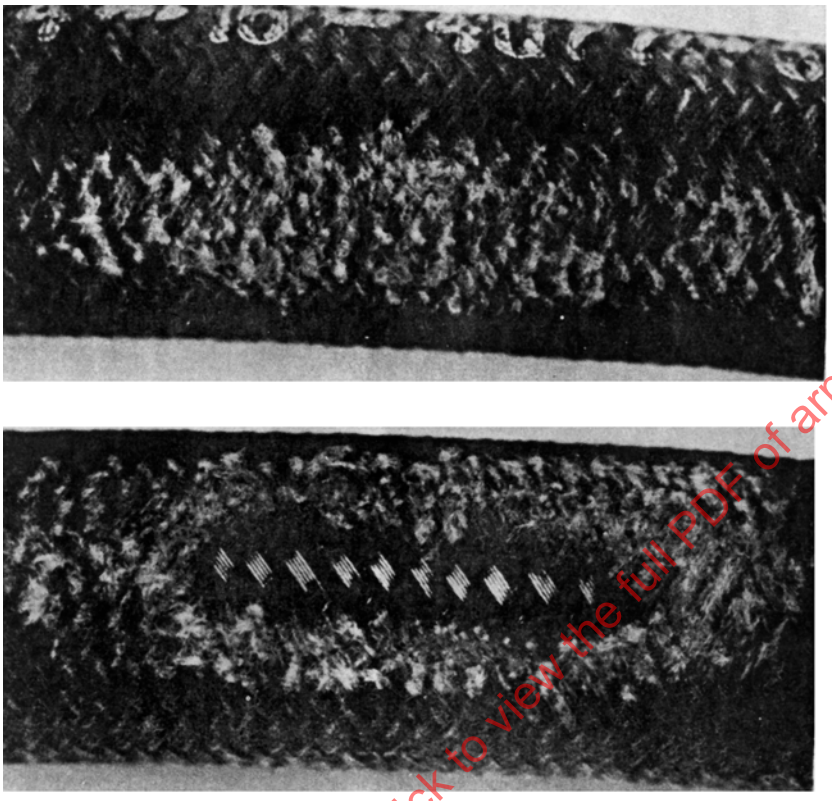
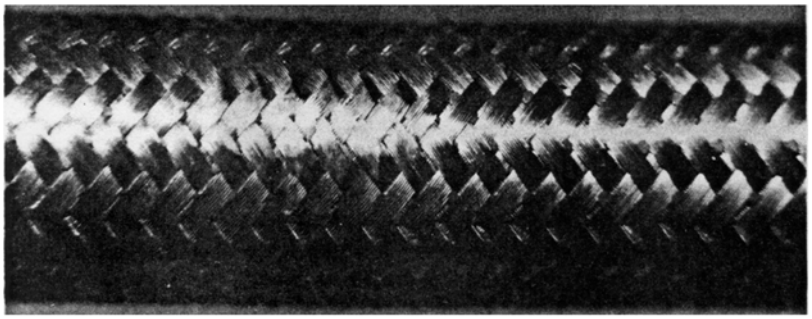


PLATE 11

PLATE 12

FIGURE 7 - Abrasion - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)



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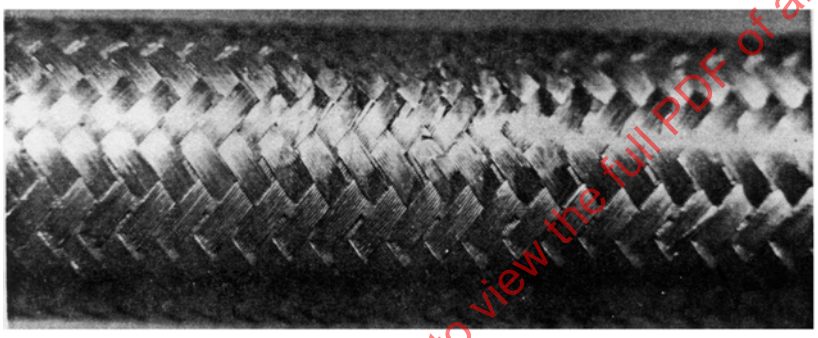
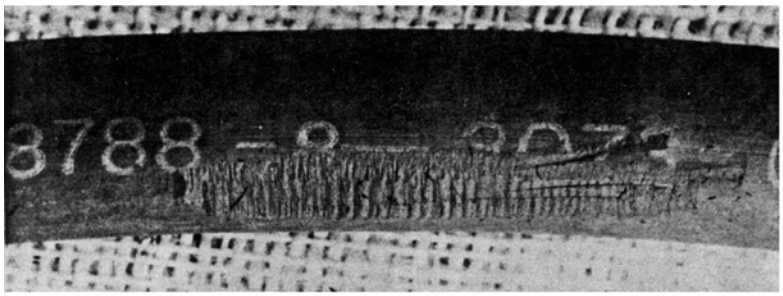


PLATE 14

FIGURE 8 - Abrasion - Minor and Major
Medium Pressure Rubber Hose With Stainless Steel Reinforcement (MIL-H-83797)



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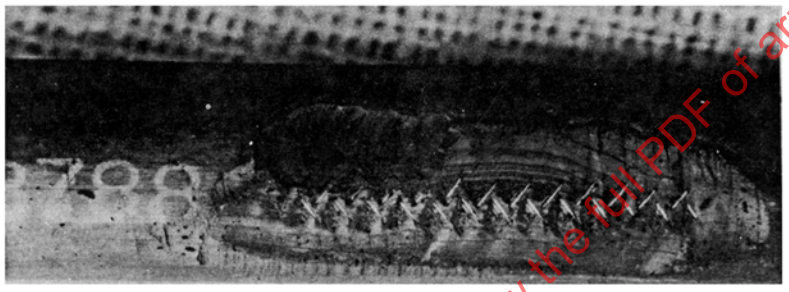
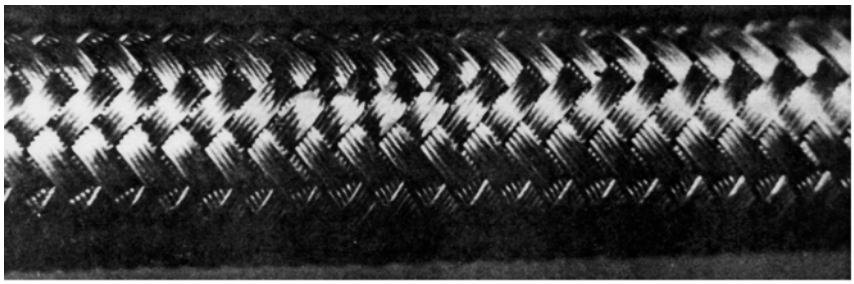


PLATE 16

FIGURE 9 - Abrasion - Minor and Major
High Pressure Rubber Hose With Rubber Cover (MIL-H-8788)



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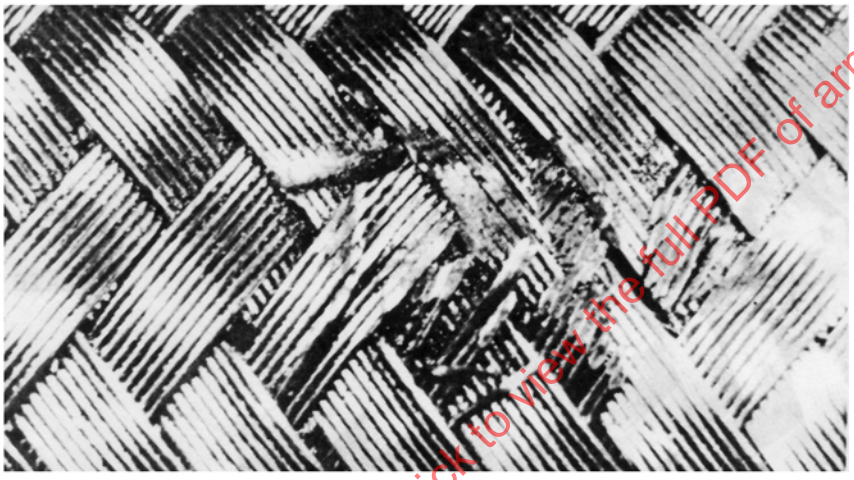


PLATE 18

FIGURE 10 - Abrasion - Minor and Major
Low and Medium Pressure PTFE Hose (MIL-H-25579/MIL-H-27267, AS620, AS1227, or AS1946)

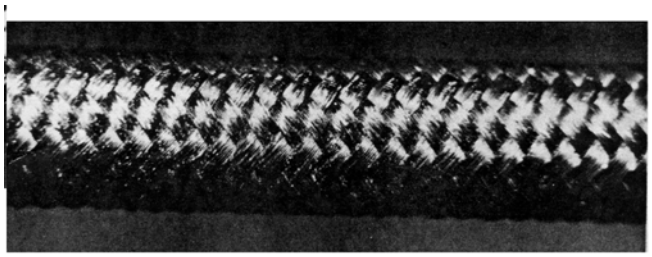


PLATE 19

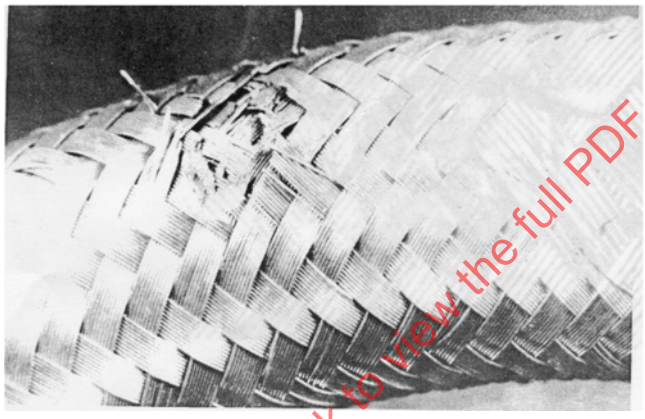
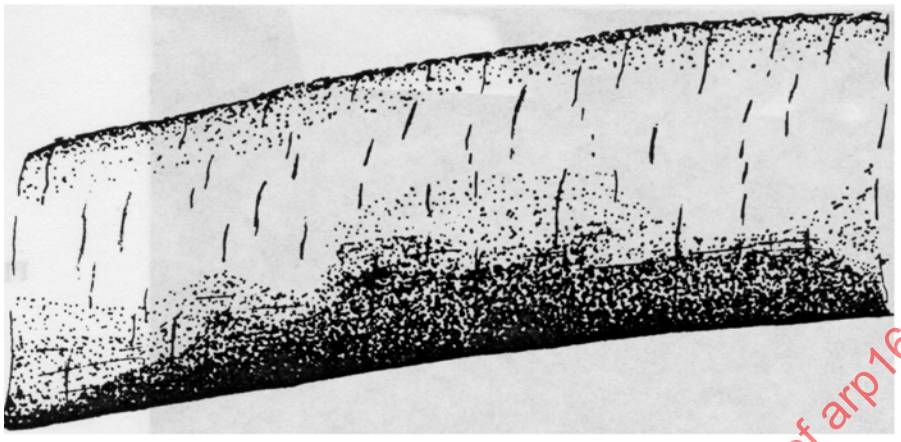


PLATE 20

FIGURE 11 - Abrasion - Minor and Major
High Pressure PTFE Hose, Metallic Reinforced
(MIL-H-38360, AS604, AS614, AS1339, AS4098, or AS4604)



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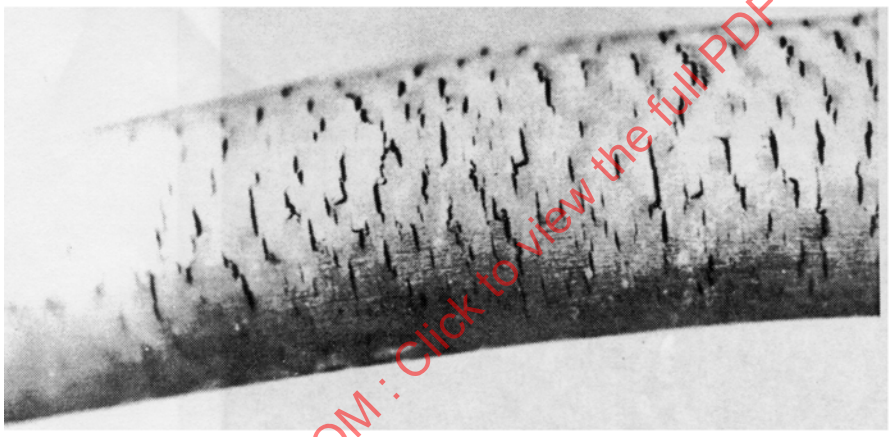

PLATE 22

FIGURE 12 - Weathering - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

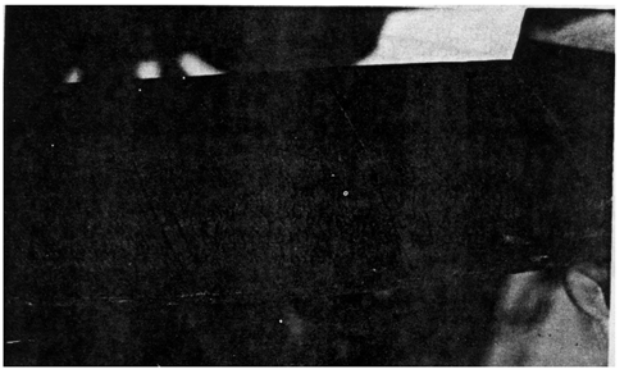

PLATE 23

PLATE 24

FIGURE 13 - Weathering - Minor and Major
High Pressure Rubber Hose With Rubber Covering (MIL-H-8788)

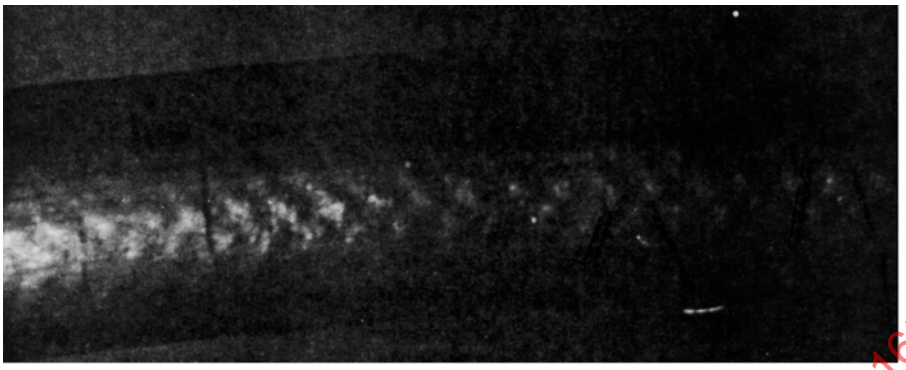

PLATE 25

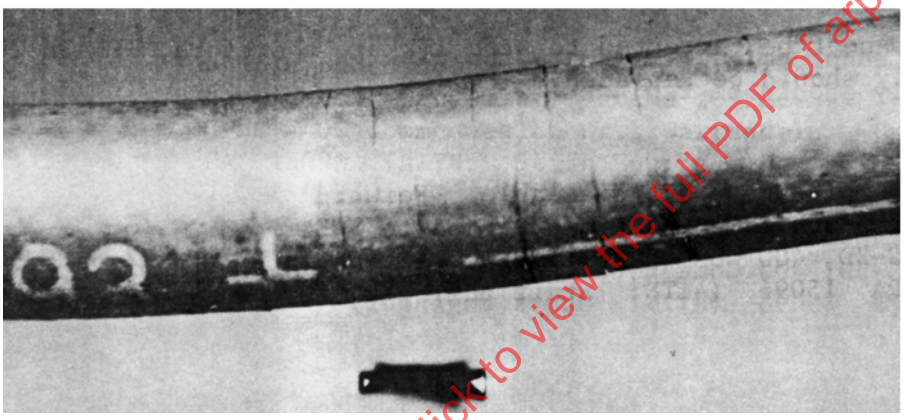

PLATE 26

FIGURE 14 - Heat Cracking - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings)

PLATE 27

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

Major Leaker
Cannot be corrected to stop leakage, therefore, the hose assembly should be replaced.

PLATE 28

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 15 - Leaker - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings)

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 29

Major Leaker
Cannot be corrected to stop leakage, therefore, the hose assembly should be replaced.

PLATE 30

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 16 - Leaker - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings).

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 31

Major Leaker
Cannot be corrected to stop leakage therefore, the hose assembly should be replaced.

PLATE 32

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 17 - Leaker - Minor and Major
Medium Pressure Rubber Hose With Stainless Steel Reinforcement (MIL-H-83797)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings).

PLATE 33

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

Major Leaker
Cannot be corrected to stop leakage therefore, the hose assembly should be replaced.

PLATE 34

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 18 - Leaker - Minor and Major
High Pressure Rubber Hose With Rubber Cover (MIL-H-8788)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings).

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 35

Major Leaker
Cannot be corrected to stop leakage therefore, the hose assembly should be replaced.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 36

FIGURE 19 - Leaker - Minor and Major
Low and Medium Pressure PTFE Hose (MIL-H-25579/MIL-H-27267, AS620, AS1227, or AS1946)

Minor Leaker
Must be correctable to prevent further leakage, i.e., (tightening end fittings).

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 37

Major Leaker
Cannot be corrected to stop leakage therefore, the hose assembly should be replaced.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 38

FIGURE 20 - Leaker - Minor and Major
High Pressure PTFE Hose (MIL-H-38360, AS604, AS614, AS1339, AS1975, AS4098, AS4604, or AS4623)

Minor:
Must be correctable to prevent further leakage without damage to the fire sleeve and the sleeve must not be saturated with fluid.

PLATE 39

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

Major:
Cannot be correctable to stop leakage therefore the hose assembly should be replaced.

PLATE 40

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 21 - Leaker - Minor and Major Fire Sleeved Hose

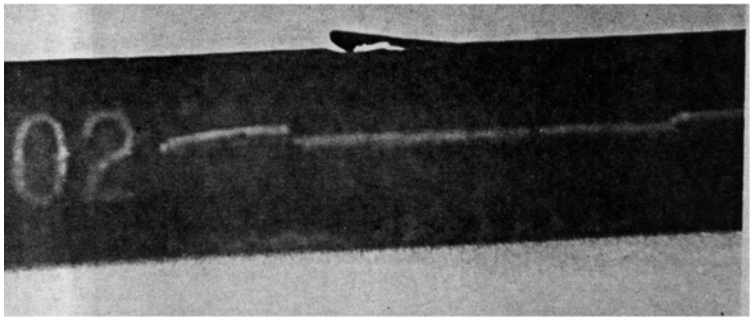

PLATE 41

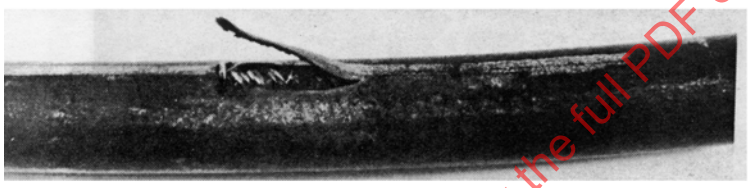

PLATE 42

FIGURE 22 - Tears - Minor and Major
Low Pressure Rubber Hose (MIL-H-5593)

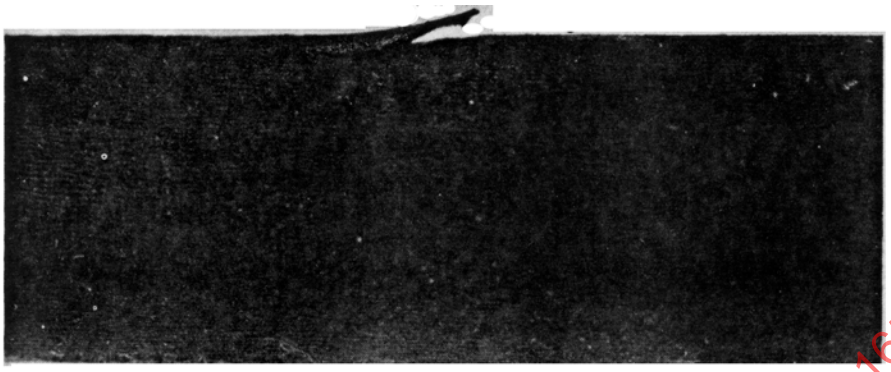

PLATE 43

PLATE 44

FIGURE 23 - Tears - Minor and Major
High Pressure Rubber Hose With Rubber Covering (MIL-H-8788)

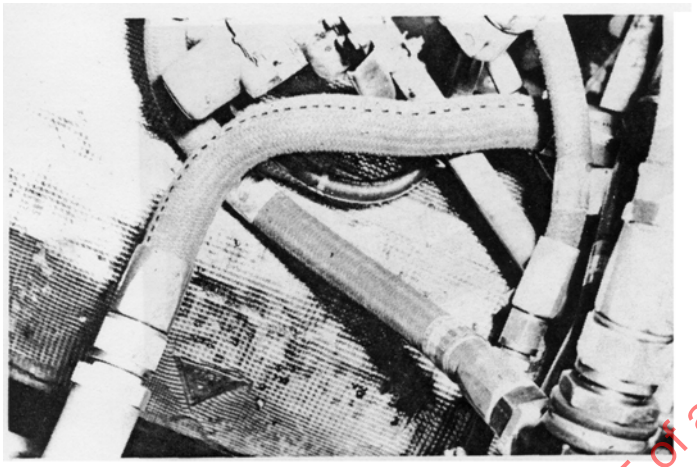

PLATE 45

PLATE 46

FIGURE 24 - Twist - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)

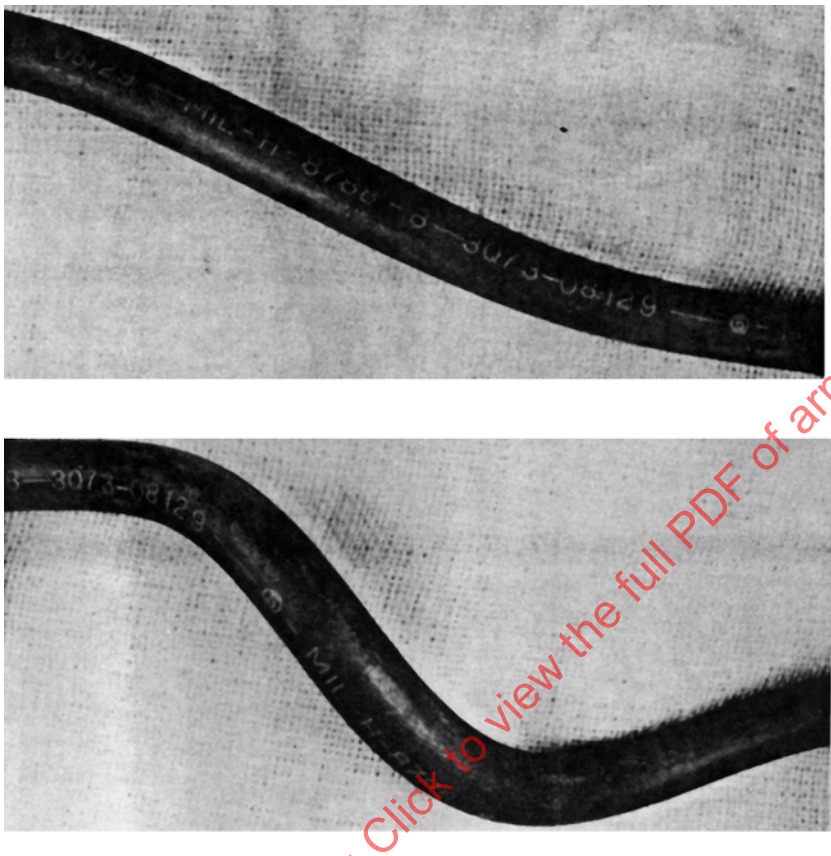

PLATE 47

PLATE 48

FIGURE 25 - Twist - Minor and Major
High Pressure Rubber Hose With Rubber Cover (MIL-H-8788)

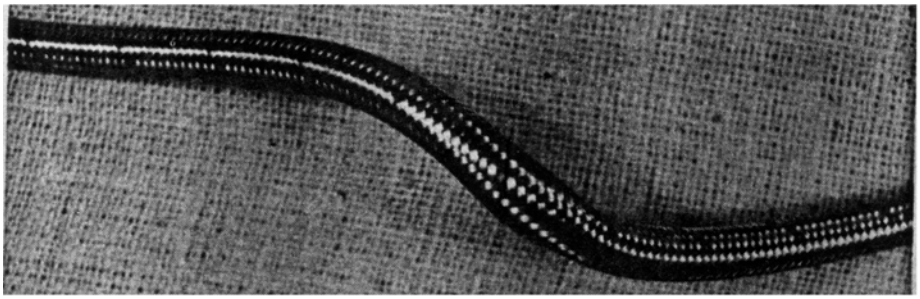

PLATE 49

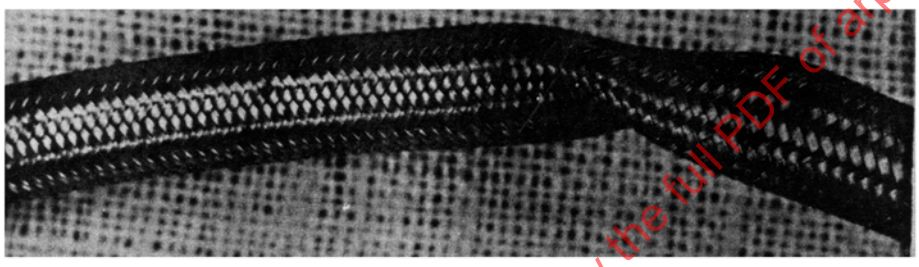

PLATE 50

FIGURE 26 - Twist - Minor and Major
Low and Medium Pressure PTFE Hose (MIL-H-25579/MIL-H-27267, AS620, AS1227, or AS1946)

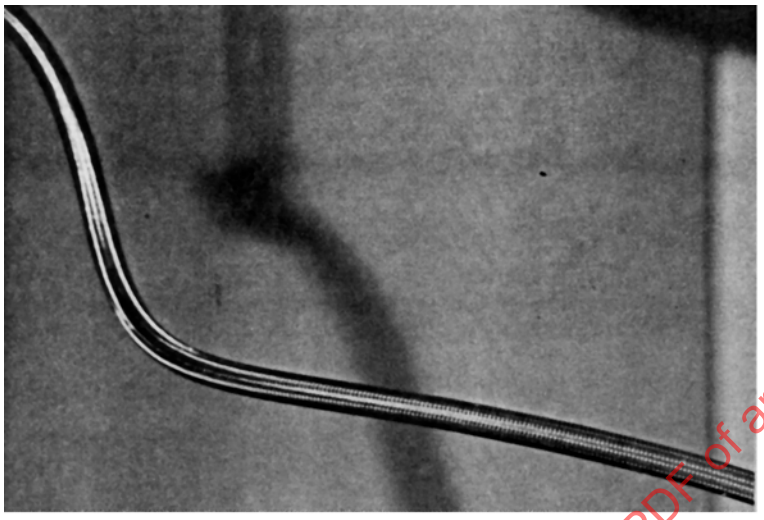

PLATE 51

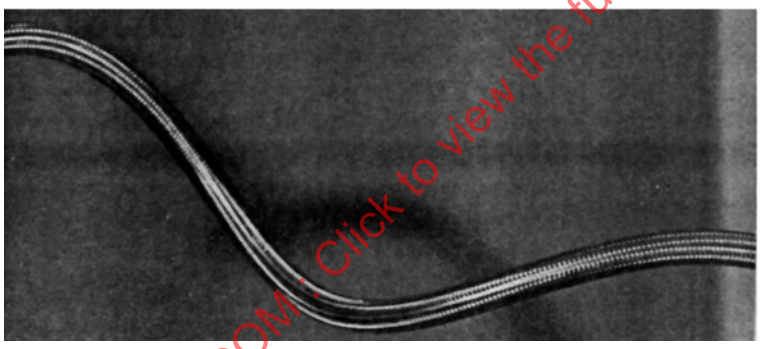

PLATE 52

FIGURE 27 - Twist - Minor and Major
High Pressure PTFE Hose (MIL-H-38360, AS604, AS614, AS1339, AS1975, AS4098, AS4604, or AS4623)

Any evidence of corrosion of the wire reinforcement is minor.

PLATE 53

Sample photo not available. Forward candidate reproducible photos to SAE, G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

Any evidence of corrosion of the wire reinforcement is major.

PLATE 54

Sample photo not available. Forward candidate reproducible photos to SAE, G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

FIGURE 28 - Corrosion - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)

Any evidence of corrosion of the wire reinforcement is minor.

PLATE 55

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

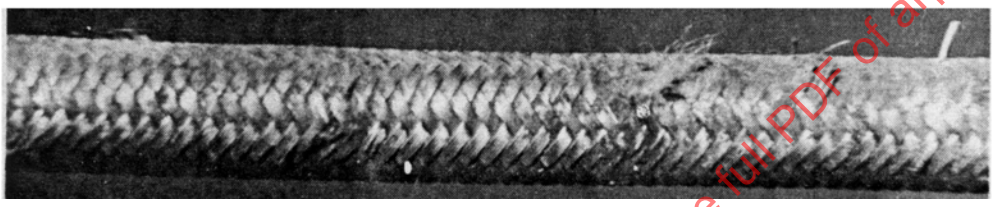

PLATE 56

FIGURE 29 - Corrosion - Minor and Major
Medium Pressure Rubber Hose With Stainless Steel Reinforcement (MIL-H-83797)

Any evidence of corrosion of the wire reinforcement is minor.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 57

Any evidence of corrosion of the wire reinforcement is major.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale, PA 15096 (ATTN: Staff Engineer)

PLATE 58

FIGURE 30 - Corrosion - Minor and Major
High Pressure Rubber Hose With Rubber Cover (MIL-H-8788)

Any evidence of corrosion of the wire reinforcement is minor.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale PA 15096 (ATTN: Staff Engineer)

PLATE 59

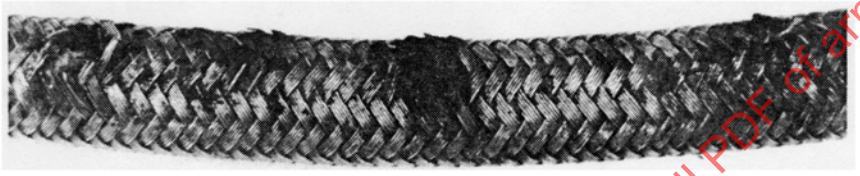

PLATE 60

FIGURE 31 - Corrosion - Minor and Major
Low and Medium Pressure PTFE Hose (MIL-H-25579/MIL-H-27267, AS620, AS1227, or AS1946)

Any evidence of corrosion of the wire reinforcement is minor.

Sample photo not available. Forward candidate reproducible photos to SAE G-3D, 400 Commonwealth Dr., Warrendale PA 15096 (ATTN: Staff Engineer)

PLATE 61

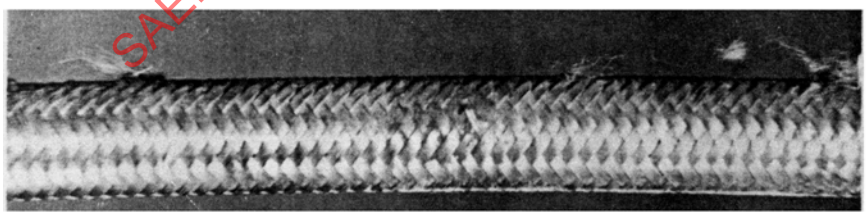

PLATE 62

FIGURE 32 - Corrosion - Minor and Major
High Pressure PTFE Hose (MIL-H-38360, AS604, AS614, AS1339, AS4098, or AS4604)

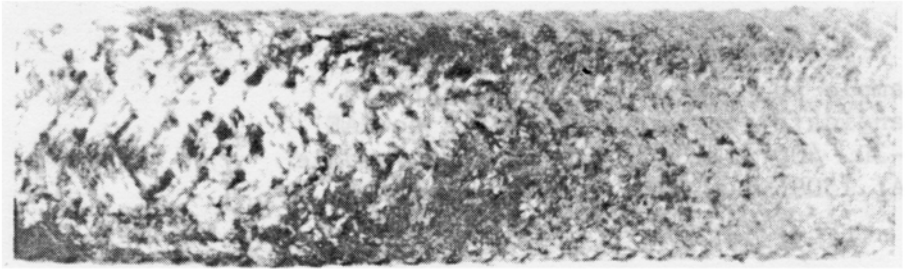

PLATE 63

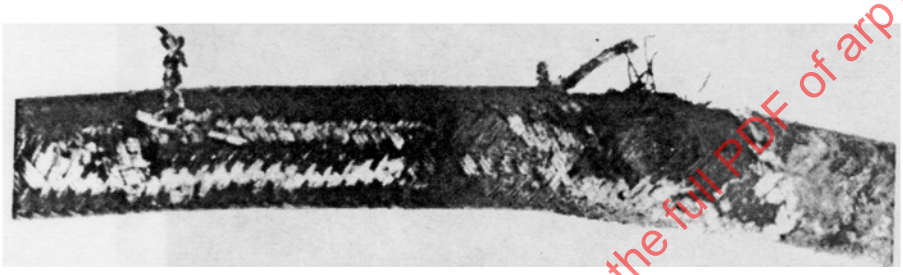

PLATE 64

FIGURE 33 - Heat Damage - Minor and Major
Medium Pressure Rubber Hose With Fabric Cover (MIL-H-8794)