



STANDARD OVERHAUL PRACTICES MANUAL

GENERAL SEALING

**PART NUMBER
NONE**

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STANDARD OVERHAUL PRACTICES MANUAL

Revision No. 14
Jul 01/2009

To: All holders of GENERAL SEALING 20-50-19.

Attached is the current revision to this STANDARD OVERHAUL PRACTICES MANUAL

The STANDARD OVERHAUL PRACTICES MANUAL is furnished either as a printed manual, on microfilm, or digital products, or any combination of the three. This revision replaces all previous microfilm cartridges or digital products. All microfilm and digital products are reissued with all obsolete data deleted and all updated pages added.

For printed manuals, changes are indicated on the List of Effective Pages (LEP). The pages which are revised will be identified on the LEP by an R (Revised), A (Added), O (Overflow, i.e. changes to the document structure and/or page layout), or D (Deleted). Each page in the LEP is identified by Chapter-Section-Subject number, page number and page date.

Pages replaced or made obsolete by this revision should be removed and destroyed.

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TRANSMITTAL LETTER

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Location of Change

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PGBLK 20-50-19-0

Description of Change

Removed "chromate" from the name of BMS 5-142 sealant.

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HIGHLIGHTS

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A = Added, R = Revised, D = Deleted, O = Overflow

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All revisions to this manual will be accompanied by transmittal sheet bearing the revision number. Enter the revision number in numerical order, together with the revision date, the date filed and the initials of the person filing.

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STANDARD OVERHAUL PRACTICES MANUAL

INTRODUCTION

1. General

- A. The instructions in this manual tell how to do standard shop procedures during maintenance functions from simple checks and replacement to complete shop-type repair.
- B. This manual is divided into separate sections:
 - (1) Title Page
 - (2) Transmittal Letter
 - (3) Highlights
 - (4) Effective Pages
 - (5) Contents
 - (6) Revision Record
 - (7) Record of Temporary Revisions
 - (8) Introduction
 - (9) Procedures
- C. Refer to SOPM 20-00-00 for a definition of standard industry practices, vendor names and addresses, and an explanation of the True Position Dimensioning symbols used.
- D. The data is general. It is not about all situations or specific installations. Use it as a guide to help you write minimum standards.
- E. If the component overhaul instructions are different from the data in this subject, use the component overhaul instructions.

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INTRODUCTION

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GENERAL SEALING

1. INTRODUCTION

- A. The data in this subject comes from Boeing Process Specification BAC5000, and Boeing drawings 140W4001, 65-89033 and 69B13372. The airline has a copy of the Boeing Process Specification Manual.
- B. The data is general. It is not about all situations or specific installations. Use this data to help you write minimum requirements.
- C. Refer to SOPM 20-00-00 for a full list of all the vendor names and addresses.

2. MATERIALS

NOTE: Equivalent substitutes can be used.

A. Sealants

- (1) Coating compound, electrical insulating – BMS 5-37
- (2) Dow Corning RTV 730, V71984
- (3) Dow Corning Q3-7063, V71984
- (4) Dow Corning 3-6093, V71984
- (5) Dow Corning 3-6376, V71984
- (6) Dow Corning 93-006, V71984
- (7) Firewall sealant, hydraulic fluid resistant – BMS 5-63
- (8) General Electric RTV 174, V01139
- (9) Low density sealant – BMS 5-142
- (10) Low density integral fuel tank sealant – BMS 5-45 (Supersedes BMS 5-26)
- (11) Low density polyurethane sealant – BMS 5-93
- (12) Modified epoxy adhesive – BMS 5-92, Type 1 (BAC5010, Type 70) (SOPM 20-50-12)
- (13) PR-1826, Class B-1/2 and B-1/4 (dark gray), V83574
- (14) PR-1828, Class B-1/2 and B-1/4 (white), V83574
- (15) PR-1405G, V83574
- (16) Pressure and environmental sealant, chromate type – BMS 5-95
- (17) Two-part hole filling compound – BMS 5-16

B. Sealant Primers

- (1) Dow Corning 1200 Red, V71984
- (2) Firewall sealant primer – BMS 5-63
- (3) Polyurethane primer – BMS 5-93
- (4) PR-1826 Class B-1/2 and B-1/4 primer, V83574

C. Parting Agents

- (1) AC962-73C
- (2) AZ534-2B, V0A3C8
- (3) AZ634-2, V0A3C8

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- (4) Coating solution – 1 weight part MIL-I-7444 vinyl tubing dissolved in 4 weight parts cyclohexanone with 1 weight percent Ferro F20629 chrome cobalt pigment, V94630
 - (5) FreKote 44NC, V1JB33 or V51257
 - (6) FreKote 48NC, V1JB33 or V51257
 - (7) FreKote 710NC, V1JB33 or V51257
 - (8) Guardsman 598-5002 green strippable coating, V17359 (new supply not available)
 - (9) MS 122A, V18598 (new supply not available)
 - (10) MS 122DF, V18598 (new supply not available)
 - (11) MS 143N, V18598 (new supply not available)
 - (12) MS 122RA, V18598
 - (13) MS 122RB, V18598
 - (14) Partall Coverall Film, V17629
 - (15) Spraylat SC-1071H-1 Blue (ZR-5827), V87354
- D. Solvents
- (1) Aliphatic naphtha – TT-N-95, Type 2
 - (2) Biogenic SE 377C, V13091
 - (3) Citra - Safe, V0K209
 - (4) Cleaning solvent, presealing – BMS 11-7
 - (5) Cyclohexanone
 - (6) Dowclene EC, V96717
 - (7) FCC-55, V87664
 - (8) Freon 113, V18873
 - (9) Glidsafe Prepsolv, V84397
 - (10) Isopropyl alcohol – TT-I-736
 - (11) Methyl ethyl ketone (MEK) – ASTM D740 or JIS-K-1524
 - (12) Methyl propyl ketone (MPK) – BMS 11-9
 - (13) Sec-butyl alcohol – ASTM D 1007 or TT-B-848
 - (14) Trichlorethane – O-T-620
 - (15) Toluene – TT-T-548
- E. Miscellaneous Materials
- (1) Abrasive sheet, aluminum oxide, 100 grit or finer – Scotch-Brite Type A, V76381
 - (2) Applicators, foam rubber
 - (3) Bottles, plastic spray, hand held, trigger action
 - (4) Brushes, non-metallic natural or synthetic – Marsell 311
 - (5) Caps, molded polysulfide seal – BACC50AJ
 - (6) Cloth, fiberglass – BMS 9-3 Type H-2 or H-3, Class optional
 - (7) Cones, kraft paper

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- (8) Covers, seal – BACC30H
- (9) Covers, seal – BACC30N
- (10) Detackifying solution for BMS 5-63 sealant – Dapocast 18-4, V58093
- (11) Enamel – BMS 10-11, Type 2 (SOPM 20-60-02)
- (12) Foam, polyimide – BMS 8-300, Type 1
- (13) Nozzles, roller – Semco 232693 (replacement roller: 232701), V85570
- (14) Nozzles, plastic sealant gun
- (15) Primer – BMS 10-11, Type 1 (SOPM 20-60-02)
- (16) Primer – BMS 10-20, Type 2 (SOPM 20-60-02)
- (17) Primer – BMS 10-103, Type 1 (SOPM 20-60-02)
- (18) Resin, fiberglass – BMS 8-201, Type 2 (SOPM 20-60-04)
- (19) Swabs, cotton
- (20) Tape, fiberglass joint – Perma-Tite, V22116
- (21) Tongue depressors
- (22) Tubs, paper, with lid (flex-style food cups), V21842
- (23) Wipers – BMS 15-5, Class A (SOPM 20-60-04)

3. EQUIPMENT

- A. Sealant removal tools
- B. Approved sealant removal tools are in Table 1. These tools can be used also during cleaning and paint removal operations.
- C. These tools agree with BSS7384 for removal of cured sealant from unpainted clad aluminum surfaces on the exterior of the airplane fuselage. Other sealant removal tools can be used if they agree with BSS7384.
- D. Scrapers can be sharpened with 220-grit or finer aluminum oxide paper. Before you use a sharpened scraper, rub it with a BMS 15-5 wiper to remove loose sanding particles. If you use an alternate method to sharpen the scraper, such as a metal sharpening wheel, rub the sharpened scraper on 220-grit or finer aluminum oxide paper to remove unwanted material, then rub the scraper on BMS 15-5 wipers to remove loose sanding particles.

Table 1: Approved Sealant Removal Tools

Vendor	Tool Description	Part Number ^{*[1][2]}
AC Tech V1DWR5	Plastic scraper, 6 inches long, rectangular with one end sharpened	TS1275-4
	Handle ^{*[3]}	SHR 0727-T
Bomatic, Inc. V63318	Plastic scraper, 9 inches long, tapered with both ends sharpened	1-6390-A
Cascade Plastics Co., Inc. V435R8	Squeegee, 4 inches long, rectangular	J5-0275-2010

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Table 1: Approved Sealant Removal Tools (Continued)

Vendor	Tool Description	Part Number ^{*[1]} ^{*[2]}
Custom Components Ltd. ^{*[4]}	Plastic scraper, 6 inches long, rectangular with one end sharpened, 20 or 40 mm wide	10810
Elixair VKA861	Plastic scrapers, 5 inches long, rectangular with one end sharpened, 3, 23, 34, 38 mm wide and 4 or 6 mm thick; other end to fit handle	311
	Skyholder, rubber handle ^{*[3]}	310/1
	Skymill & Skybag, pneumatic sharpener with bag ^{*[5]}	309/3, 309/3B
General Tool & Supply V3Z323	Plastic scraper, 9 inches long, rectangular with both ends sharpened	ST982LF
Jus N Tym Tooling V3DN12	Plastic scrapers, rectangular: 6 inches long with one end sharpened 9 inches long with both ends sharpened	411B60 411B90
PnJ Machining, Inc. ^{*[6]}	Plastic scrapers, 5 and 9 inches long with both ends sharpened, widths 1/16 to 1½ inches: Standard scraper Corner scraper Slot scraper	DFD5019 SCD5019 DAD5013
	Plastic handle ^{*[3]} Wooden handle ^{*[3]} Metal handle ^{*[3]}	SHN0272 SHW0215 SHR0272
PPG Aerospace Semco Division V83574	Plastic scraper, 6 inches long, rectangular with one end sharpened	23450

^{*[1]} It is recommended that scrapers be purchased in the color white whenever possible. But there is no color preference for the color of squeegees.

^{*[2]} It is recommended that part numbers of approved sealant removal tools be permanently attached to the tools.

^{*[3]} Handles are available for some scrapers and can be purchased separately.

^{*[4]} Unit 3, Feltrim Business Park, Swords Co., Dublin, Ireland

^{*[5]} The Elixair pneumatic scraper sharpener can be used with most scrapers.

^{*[6]} 2601 Inter Ave., Puyallup, Washington 98372, www.pnjmachining.com

4. DEFINITIONS

A. Application time – Same as pot life.

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- B. Cured sealant – The condition when the sealant has a hardness of 30 minimum on a Rex A or Shore A durometer.
- C. Cure time – The time necessary for sealant to become hard (see cured sealant), measured at 72-82°F and 45-55 percent relative humidity.
- D. Sealing levels
 - (1) Absolute level – All openings of all types, and fasteners, are sealed. An isolated operation on self-sealing fasteners is not necessary unless specified by overhaul instructions.
 - (2) Extensive level – All holes, slots, joggles and seams are sealed. Flanges of nutplates without O-rings are sealed. Bolts in holes larger than a specified diameter, in metal or composite structure, are sealed.
 - (3) Intermediate level – All holes, slots, joggles and seams are sealed.
 - (4) Limited level – All holes, slots and joggles are sealed.
- E. Seal types
 - (1) Backup seal – A seal that gives physical support to a primary seal, such as an injection or prepack seal.
 - (2) Injection seal – Sealant applied through an open-ended channel.
 - (3) Isolation seal – A seal that holds back fuel after failure of a primary seal.
 - (4) Prepack seal – Sealant applied in structure cavities before assembly to prevent air pockets in the cavities.
 - (5) Primary seal – Applied sealant that directly touches fuel.
 - (6) Secondary seal – Applied sealant that does not directly touch fuel.

5. GENERAL

- A. Use the sealant as specified by the overhaul instructions. If the overhaul instructions do not give the sealant, see Table 2 for recommended sealants.
- B. Identify all tools and equipment which you use on silicone sealants, and do not use them with other sealants. You can use a permanent label, or color codes, tape stripes or the equivalent, along with a sign in the area that identifies these codes or stripes. Equipment used for silicone sealants must not be used for non-silicone sealants because the silicone cannot be completely cleaned out. Silicone contamination of non-silicone sealants will not let them make a good bond with the surfaces.

Table 2: Sealant Selections by Type and Level

Type of Sealing	Level of Sealing	Application Method and Sealant				
		Fillet Sealing Fastener Sealing Injection Sealing	Bushing and Fastener Installation	Fay Surface Sealing and Prepack Sealing	Hole Filling	Wire Bundle Sealing
Acid	Absolute	BMS 5-45, Class B	BMS 5-45, Class B	BMS 5-45, Class B	Not applicable	Not applicable
Corrosion Protection ^{*[1]}	Not applicable	BMS 5-45, Class A, Grade 1 ^{*[2]}	BMS 5-45, Class A, Grade 1 ^{*[2]}	BMS 5-95, Class B, C or G	Not applicable	Not applicable

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Table 2: Sealant Selections by Type and Level (Continued)

Type of Sealing	Level of Sealing	Application Method and Sealant				
		Fillet Sealing Fastener Sealing Injection Sealing	Bushing and Fastener Installation	Fay Surface Sealing and Prepack Sealing	Hole Filling	Wire Bundle Sealing
		BMS 5-95 (Pref) BMS 5-142, Class B	BMS 5-95			
Electrical	As specified	BMS 5-45, Class B BMS 5-93, Class B	BMS 5-45, Class B	BMS 5-45, Class B or C	Not applicable	BMS 5-37, Class B BMS 5-45, Class B
Firewall, Silicone	Absolute or Intermediate *[3]	BMS 5-63, Class B	BMS 5-63, Class B	Not applicable	Not applicable	Not applicable
Fuel Cell Cavity	Absolute *[4]	BMS 5-45 Class B	BMS 5-45 Class B or C	BMS 5-45 Class B	BMS 5-16	BMS 5-45 Class B
Fuel Cell Cavity	Intermediate *[4]	BMS 5-45, Class B BMS 5-95, Class B BMS 5-142, Class B	BMS 5-45, Class B or C BMS 5-95, Class B or C	BMS 5-45, Class B BMS 5-95, Class B or C	BMS 5-16	BMS 5-37, Class B BMS 5-45, Class B
High Temperature (but not firewall, silicone) *[5]	Intermediate	BMS 5-63, Class B DC RTV 730 DC Q3-7063 DC 93-006 GE RTV 174 *[6]	DC RTV 730 DC Q3-7063 DC 93-006	BMS 5-63, Class B DC Q3-7063 DC 93-006 GE RTV 174	BMS 5-63, Class B	BMS 5-63, Class B
Pressure and Weather	Extensive, Intermediate or Limited	BMS 5-45, Class B BMS 5-93, Class B BMS 5-95, Class B	BMS 5-45, Class B or C BMS 5-95, Class B or C	BMS 5-45, Class B BMS 5-95, Class B or C	BMS 5-16	BMS 5-37, Class B BMS 5-45, Class B

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Table 2: Sealant Selections by Type and Level (Continued)

Type of Sealing	Level of Sealing	Application Method and Sealant				
		Fillet Sealing Fastener Sealing Injection Sealing	Bushing and Fastener Installation	Fay Surface Sealing and Prepack Sealing	Hole Filling	Wire Bundle Sealing
		BMS 5-142, Class B				
Weather, Exterior	Not applicable	BMS 5-95, Class B	BMS 5-95, Class B	BMS 5-95, Class B or C	Not applicable	Not applicable

*[1] Alternative name: Special Sealing Method for Corrosion Protection.

*[2] Preferred for Method 2, Wet Installation of Threaded Fasteners. Do not use Class A Grade 2 for this.

*[3] Absolute in engine firewall areas. Intermediate in all other firewall areas, such as in the APU vertical firewall area.

*[4] Absolute in liquid fuel areas. Intermediate in fuel vapor areas.

*[5] Use silicone sealants only in areas that will not be painted.

*[6] One-part silicone sealants cure slowly without access to air and moisture. The acetic acid in these sealants can cause corrosion of cadmium plated fasteners, electrical contacts, etc.

6. SURFACE PREPARATION

CAUTION: APPLY CLEANERS OR SOLVENTS FROM DISPENSERS. DO NOT USE TOO MUCH.

A. General

- (1) Remove chips and loose contamination from the areas with a blast of compressed air, vacuum, or clean wipers or clean bristle brushes wet with one of these solvents:
 - (a) BMS 11-7
 - (b) Citra Safe
 - (c) Dowclene EC
 - (d) FCC-55
 - (e) Methyl ethyl ketone
 - (f) Methyl ethyl ketone/sec-butyl alcohol mix, 42 to 58 ratio
 - (g) Methyl propyl ketone
 - (h) Trichloroethane
- (2) As an alternative to Paragraph 6.A.(1), you can clean the surfaces per BAC5744 (Ref SOPM 20-30-03) if the areas can be fully rinsed. Do not use this alternative in an enclosed structure where water can collect or get into cracks and joints.
- (3) Solvent clean hydraulic fluid contamination per SOPM 20-30-03.
- (4) Final clean the surfaces with a wiper only damp, not wet, with solvent. Wipe the surfaces dry with a dry wiper before the solvents evaporate.
 - (a) Do this immediately before you apply sealant or primer, unless the surface is unpainted composite laminate.

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- (b) Use a solvent from the list in Paragraph 6.A.(1). Citra Safe can become unwanted matter unless it is wiped dry with clean wipers.
 - (5) Give the cleaned surfaces protection from contamination. Cleaned assemblies can be masked along their edges.
 - (6) To prevent crazing, use only aliphatic naphtha to clean on or near acrylic surfaces.
- B. Painted Surfaces**
- (1) Use the procedures of Paragraph 6.A. unless specified below.
 - (2) BMS 10-60, Type 1 enamel:
 - (a) If sealants BMS 5-45 Class B-2 or BMS 5-93 will be applied, clean the enamel surface. Then sand the surface with Scotch-Brite sheets to remove all gloss, before you final clean. Do not sand through the enamel layer.
 - (3) BMS 10-11, Type 1 primer:
 - (a) Cured less than 72 hours – Do not clean the primer layer. You can apply sealants BMS 5-95, Class B or C, or BMS 5-142, Class B, to this primer layer if the primer was cured a minimum of 1 hour at 60°F minimum, and the surface did not get contamination. The relative humidity must not be higher than 85 percent.
 - (b) Cured more than 72 hours – Clean per Paragraph 6.A.
 - (c) If you must touch up the layer of primer, first solvent clean the old layer per Paragraph 6.A. Then touch up the layer as necessary. Let this primer cure per Paragraph 6.B.(3)(b) before you apply the sealant. Be sure to keep the primer layer clean during the cure.
- C. Surfaces Not Painted**
- (1) Clean metal surfaces per Paragraph 6.A.
 - (2) Abrasive clean composite laminate surfaces with 150-grit or finer abrasive paper (BAC5837 Cleaning Method 1 or 2) and solvents per Paragraph 6.A.(1).
- D. Surfaces with Contamination by BMS 3-23, Type 2 Corrosion Inhibiting Compound (LPS-3 only)**
- NOTE:** LPS-3 (V66724) is only one of the vendor products approved to be a BMS 3-23, Type 2 corrosion inhibiting compound. For instructions to remove the others, refer to Paragraph 6.E.
- (1) Remove as much of the compound as possible with wipers.
 - (2) Be sure to clean the area to approximately 6 inches out from the edges of the area which will get the sealant.
 - (3) Use masks and wipers as necessary to keep cleaners and rinse water only to the work area.
 - (4) Apply Biogenic SE377C cleaner with a hand-held spray bottle. Let the solvent soak approximately 5 minutes. Then rinse with water.
 - (5) Do Paragraph 6.D.(4) six more times. Use a non-metallic brush to clean the surface for the first two of these six times.
 - (6) Be sure to spray the solvent and the water only on the area to be cleaned, to prevent contamination by the BMS 3-23 compound from the adjacent areas.
 - (7) Examine the cleaned surface for water breaks after the final rinse.
 - (8) Let the surface dry before you apply sealant. Make sure the temperature is not more than 85°F. Be sure to prevent contamination of the cleaned surface.

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(9) Apply sealant per Paragraph 8.

- E. Surfaces with Contamination by Other BMS 3-23, Type 2 Compounds, and BMS 3-29 Corrosion Preventive Compound.

NOTE: If the BMS 3-23, Type 2 corrosion inhibiting compound on the surface is LPS-3 (V66724), refer to Paragraph 6.D. for removal instructions.

- I
- (1) Remove as much of the compound as possible with wipers and BMS 11-7 solvent, or the mixture of methyl ethyl ketone and sec-butyl alcohol, or methyl propyl ketone, or FCC-55 solvent. Immediately wipe the surface dry with a clean wiper.
 - (2) Clean an area approximately one inch out from the area which will get the sealant.
 - (3) Replace the wipers when they become dirty because of the removed corrosion preventive compound.
 - (4) Wipe the area until you see no corrosion preventive compound on the wipers.
 - (5) If this is a painted surface, sand the area with 240 grit or finer sandpaper. Be careful to do this only to the area which will get the sealant. Do not sand through the primer. Then solvent clean the surface with wipers and a solvent from the list in Paragraph 6.A.(1).
 - (6) Examine the cleaned area for water breaks.
 - (a) If the surface does not have water breaks, let it dry.
 - (b) If the surface has water breaks, clean the surface again and again until there are no water breaks.
 - (7) Be sure to prevent contamination of the cleaned surface.
 - (8) Apply sealant per Paragraph 8.

7. TWO-PART SEALANT PREPARATION

A. General

- (1) Be sure to use the base component with the accelerator component of the same batch number. Do not mix components of different batch numbers. The batch number is identified on the containers.
- (2) Weigh the two components in the proportions specified on the container, within +/-5 percent.
- (3) Mix the base by itself until its color is continuous.
- (4) Mix the accelerator by itself, as recommended by the vendor.
- (5) Fully mix the base with the accelerator until smooth and continuous. A machine mixer is recommended.
- (6) Equipment used to mix silicone sealants must not be used to mix non-silicone sealants, because the silicone cannot be completely cleaned out. This silicone contamination can prevent a good bond of non-silicone sealants.

B. Machine Mixing

- (1) We recommend that you mix the sealant materials in a machine mixer. Use a mixer sufficiently large for the quantity of material necessary for the task.
- (2) Use the procedure of Paragraph 7.A. to mix the sealants.

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- (3) If mixed batches of Class B sealants BMS 5-45, BMS 5-95 or BMS 5-142 will be put in refrigerated storage, do tests of the cure time with a Rex A durometer. The specimen must be a minimum of 0.25 inch thick. The surface of the specimen must have a sufficiently large area to let the presser foot of the durometer touch the specimen. Keep the hardness data available until the sealant pot life expires. Do not use the mixed sealant until the cure time test is complete.

C. Hand Mixing

- (1) Small quantities (50-200 grams) of sealant can be mixed by hand, as for small tasks or repairs.
 (2) Use the procedure of Paragraph 7.A. to mix the sealants.

D. Semkit Mixing

- (1) Mix by hand or with a machine the sealants that come in vendor-supplied kits, such as Semkits.
 (2) Use the vendor instructions to mix the sealant.
 (3) Make sure the mixed sealant comes out from the cartridge as a smooth material with a continuous color.

E. Mix Ratios

- (1) Use the mix ratios recommended by the sealant vendor. These ratios can be by volume or weight.
 (2) Do not use other mix ratios, because the application life could become too short or too long.

Table 3: Sealant Special Mix Ratios

Sealant	Class	Mix Ratio Parts Accelerator to 100 Parts Base	
		By Volume	By Weight
BMS 5-45	B-2 ^{*[1]}	8.4 - 16.8 ^{*[2]}	10 - 20 ^{*[2]}
BMS 5-95	B-2	12.24 - 16.32	15.3 - 20.4
BMS 5-142	B-2	5.7 - 7.6	9 - 12
DC 3-6093	—	—	8
DC 3-6376	—	—	10

^{*[1]} Machine mixing is preferred for these materials.

^{*[2]} If the maximum ratios are machine mixed, the mixed sealant must be quick frozen.

- (3) See Table 3 for recommended mix ratios for some sealants.

F. Refrigerated Storage of Bulk Machine-Mixed Sealants

- (1) These sealants can be refrigerated, immediately after they are mixed, to let them be used for longer than their usual application time:
- (a) BMS 5-16
 - (b) BMS 5-37
 - (c) BMS 5-45
 - (d) BMS 5-63
 - (e) BMS 5-95
 - (f) BMS 5-142

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- (g) Dow Corning 93-006
- (2) All mixed material put into refrigerated storage must be in polyethylene cartridges or aluminum toothpaste-type tubes. Mixed BMS 5-95, Class B or BMS 5-142, Class B sealants can also be put into refrigerated storage in kraft paper cones. Unwaxed paper tubs with lids can be used for refrigerated storage of BMS 5-45, Class A sealant. Each container must have this data on it:
 - (a) Vendor's part number
 - (b) BMS number, type, and application time
 - (c) Batch number
 - (d) Date the sealant was mixed
 - (e) Date the sealant will expire
 - (f) Who mixed the sealant
 - (g) Applicable hazard warnings, per Hazard Communication Standard OSHA 1910.1200
- (3) We recommend that the mixed sealants be quick-frozen to get the maximum application time and storage life. To quick freeze the sealants:
 - (a) Immediately after you mix the sealant, fill the polyethylene cartridges or aluminum toothpaste-type tubes with the sealant.
 - (b) Put polyethylene caps or plugs on the tubes.
 - (c) Put the cartridges or tubes in a liquid bath at -60°F for a minimum of 10 minutes.
 - (d) Do not quick freeze silicone sealants in liquids cooled by dry ice.
 - (e) Do not quick freeze in air. Put the polyethylene cartridges directly in the solution. Application time will be shorter if these cartridges are put in metal containers.
- (4) The refrigerated storage can be in air, dry ice or carbon dioxide. But do not use dry ice or carbon dioxide for storage of silicone sealants, because the gas will change the cure of the sealant.
- (5) Refer to BAC 5000 Tables II and III for data about storage temperatures and times for the different sealants.

G. How to Thaw Refrigerated Sealant

- (1) When you thaw the refrigerated sealant, let it warm to approximately 70°F before you use it. Make sure the condensation is gone from the container, and, when it is wiped, the condensation does not come back.
- (2) Do not use a microwave oven to thaw the refrigerated sealant.
- (3) If the sealant is warmed to above 80°F, it could become too thin and have a shorter application time. If the sealant is colder than 60°F, it could be too thick, not come out in a good bead, or the moisture on it could prevent a good bond.
- (4) Do not freeze the thawed sealant. Discard the thawed sealant if you cannot use it during its application time.

8. APPLICATION OF SEALANT

- A. Do not apply sealants when the temperature of the structure is below 50°F.

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- B. The sealant will cure faster if you warm the structure before you apply the sealant, and also if you blow warm air over the applied sealant. You can also apply heat with a radiative device or an oven. Monitor the temperature of the sealant and the adjacent structure to make sure it stays at 140°F or less. Because relative humidities below 40 percent will slow down the sealant cure, you can add water to the air to increase the relative humidity. Refer to BAC5000 par. 8.4.7. and Table IV for properties of the sealants such as application time, squeeze-out time, tack free time and cure time.
- C. Silicone materials can give contamination to each other and get contamination from other materials. Then the cure or bond quality could be decreased. Be very careful when you clean the areas. Isolate the operation and the equipment from other operations. Do not cure silicone sealants near or in the same oven as polysulfide sealants. Be sure the equipment used with silicone sealant is not used with other sealants, and has labels to tell you this.
- D. If the overhaul instructions do not tell you which sealant to use on a surface that has a specified primer or enamel, see Table 4 for recommended sealants when you know the primer or enamel. Refer to Paragraph 6.B. for procedures to prepare the painted surface.
- E. After you apply the sealant, do not let grease, oil, metal chips or other such contamination get into the sealant.

Table 4: Sealant Application on Painted Surface

Sealant Type	Sealant	Cured Primer or Enamel	Before Enamel Application	Enamel		
				BMS 10-11 Type 2		BMS 10-60 Type 1
				Fully Cured	After 4 Hr Flashoff	
Silicone	BMS 5-63 DC RTV 730 DC Q3-7063 DC 93-006 GE RTV 174	X				
	All others		X			
Non-Silicone	BMS 5-45 Class B					X ^{*[1]}
	BMS 5-93			X	X	X ^{*[1]}
	BMS 5-95 Class B			X	X	X
	BMS 5-142 Class B			X	X	X

*[1] This enamel must be sanded first per Paragraph 6.B.(2).

- F. To give the applied sealant protection from contamination, you can apply BMS 10-11 Type 1 primer or Type 2 enamel, BMS 10-20 Type 2 primer, or BMS 10-103 Type 1 primer on non-silicone sealants. (Do not try to apply primer to silicone sealants, because primer will not bond to or stay on silicone sealant.) Use a brush or spray equipment to apply the primer or enamel, and apply it at these sealant conditions:

- (1) Class A – When the sealant is tack-free.
- (2) Classes B, D – Immediately after you apply the sealant.

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- (3) Classes C, G – Immediately after you completely assemble the structure.
- (4) Class E – One hour minimum after you apply the sealant.
- G. To get a good seal, apply the sealant in this sequence:
 - (1) Apply faying surface seals and preassembly seals.
 - (2) Fill holes and slots.
 - (3) Fill joggles and inject sealant into holes.
 - (4) Apply fillet seals.
 - (5) Apply seals to fasteners

9. **FAYING SURFACE SEALING**

- A. Complete all preassembly operations (refer to Figure 1) such as hole drilling, cold working and burr removal before you apply sealant. As an alternative, you can drill and ream through uncured faying surface sealant if you clamp the parts together to keep chips and burrs from between the mating surfaces.
- B. Clean the areas per Paragraph 6.
- C. Basic Procedure
 - (1) Apply a smooth, continuous layer of sealant to one mating surface with a sealant gun, spatula, brush, roller, smooth or serrated scrapers, or spray gun. Make the layer cover all of the surface. A roller is the best tool for this. But do not roll or work the sealant too much as you apply it, because that could decrease the squeeze-out life of the sealant.
 - (2) Apply the layer sufficiently thick to fill the assembled faying surface and give a continuous bead at the edges when the parts are put together. Usually, a layer approximately 0.005 inch thick is sufficient. But a layer 0.010-0.030 thick could be necessary for some assemblies.
 - (3) To make sure the sealant will come out at the edges, you can also apply a small bead of sealant near the edges of the mating surface, as shown.
 - (4) Make sure the sealant is applied correctly and sufficiently, along with other necessary sealant installation, before the surfaces are put together.
 - (5) Put the surfaces together within the application time specified for the sealant.
- D. Areas Where the Access Is Not Easy
 - (1) As an alternative to the basic procedure, you can apply the sealant in approximately parallel beads to one of the mating surfaces. But you must be sure the parts can be held together sufficiently tightly, and you apply the sealant in beads of a size, interval, and direction to make the sealant become a continuous layer with a continuous bead at the edges when the parts are assembled and held together.
 - (2) Apply a bead of sealant between each row of fasteners. Apply a minimum of one bead of sealant between the fastener rows and the edge of the faying surface.
 - (3) Put the mating surfaces together and apply sufficient clamping force to make the beads of sealant become a continuous layer of sealant, with a continuous bead of sealant at the edges. Be sure to do this within the application time specified for the sealant.
- E. Fasteners
 - (1) Temporary or permanent fasteners that go through or adjacent to the faying surface seal must be installed before the end of the squeeze-out life of the sealant.

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- (2) If temporary fasteners are used, they must give approximately the same clamping pressure as the permanent fasteners specified by the overhaul instructions. Spring-loaded plunger-type Cleco fasteners do not give sufficient clamping force to make the sealant come out at the edges correctly.
- (3) When temporary fasteners are removed before the sealant is cured, be sure to keep the clamping pressure on the mating parts to hold them together, unless permitted by the overhaul instructions. Keep the parts tightly held together until the permanent fasteners are installed or until the sealant is fully cured.
- (4) The faying surface sealant layer is not as strong a bond as an adhesive. If you must move the unit after the sealant is cured but without the fasteners installed, be sure to hold the parts together or the seal could come apart.

F. Squeezed-out Sealant

- (1) After the parts are assembled, make sure there is a small bead or fillet of sealant all along the joint. Then remove or adjust this bead or fillet of sealant by applicable Paragraph 9.F.(2), Paragraph 9.F.(3) or Paragraph 9.F.(4).
- (2) On the exterior side of body laps and where fuel tank sealant will be applied, remove the squeezed-out sealant with a plastic or wooden tool, a dry wiper, or a clean cloth wet with a solvent from the list in Paragraph 6.A.(1).
- (3) Where laminated shims are included in faying-surface-sealed joints, the sealant must completely cover the laminated ends of the shims. If it does not, or if necessary to make the fillet, add more Class B sealant to make a continuous fillet of the dimensions shown.
- (4) For all other locations, do one of these steps:
 - (a) Apply more Class B sealant along the joint edge to get the fillet as shown, or
 - (b) Make the squeezed-out sealant into a fillet approximately as shown, or
 - (c) Remove the squeezed-out sealant with a plastic or wooden tool, or a clean wiper wet with a solvent from the list in Paragraph 6.A.(1). The remaining sealant must fill the faying surface out to the edge of the part, as shown. If the squeezed-out sealant has contamination in it or the application time or squeezed-out time is expired, remove it and apply more Class B sealant as shown.
- (5) If the overhaul instructions specify a reduced fillet, make the sealant configuration as shown in Figure 1 or Figure 2, as applicable.

G. Removable Seals and Formed-in-Place Gaskets (Figure 3)

- (1) Be sure the two mating surfaces are clean.
- (2) Apply a parting agent to one of the surfaces.
 - (a) If one of the surfaces is acrylic, apply the agent to the acrylic surface.
 - (b) If the parting agent will be applied by spray, give protection to the adjacent surfaces. Be sure to clean away all overspray with solvent.
- (3) When the parting agent layer is dry to the touch, apply sealant to the other mating surface or on the layer of parting agent.
- (4) If you disassemble the parts which have a removable seal between them, you must remove the sealant and the parting agent and start all over again.
- (5) If you disassemble the parts which have a formed-in-place gasket after the sealant is cured, the sealant can stay, but you must remove the parting agent and apply new parting agent.

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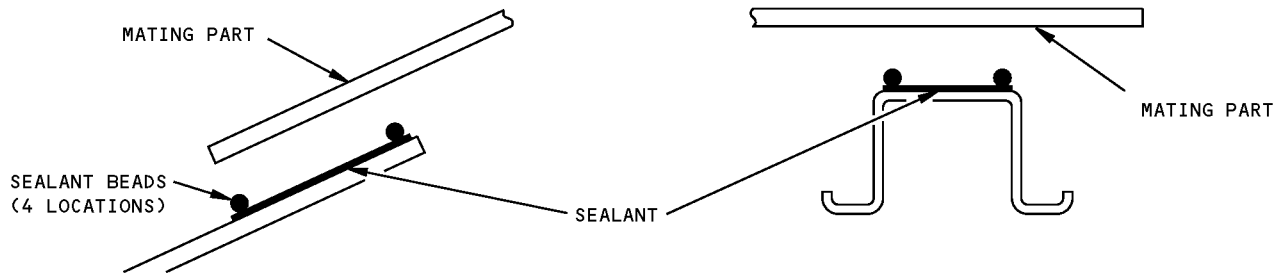
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H. Low Adhesion Sealing

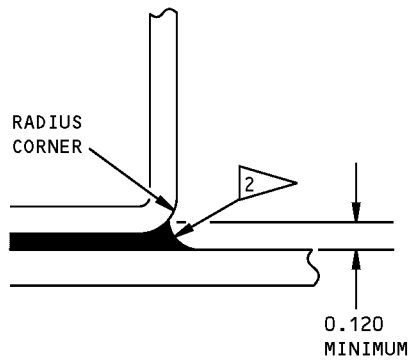
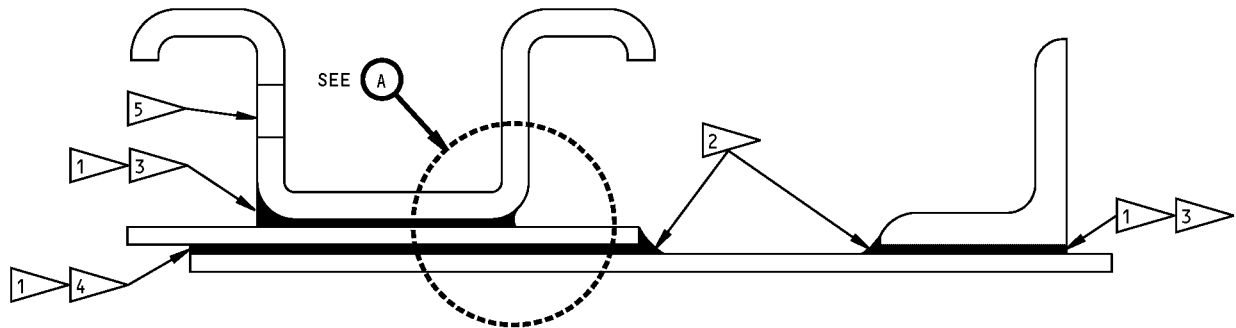
- (1) This method is specified when corrosion resistance and parts removal are important and subsequent fillet sealing is not necessary.
- (2) Unless the overhaul instructions are different, use PR-1405G sealant. This sealant is a two-part paste of a polysulfide polymer and has corrosion-resistant properties. The sealant will stay tacky and will not cure. It has a 24-hour application time and a 4320-hour (180-day or 6-month) squeeze-out time.
- (3) Usually the PR-1405G sealant is supplied in a kit where the two parts are pre-measured. If you use only part of a kit, mix 3 weight parts of Part A with 100 weight parts of Part B. Fully mix the two parts together and be sure to include the material around the sides and the bottom of the mixing container.

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SEALANT LAYERS WITH BEADS AT EDGES



ALL DIMENSIONS ARE INCHES



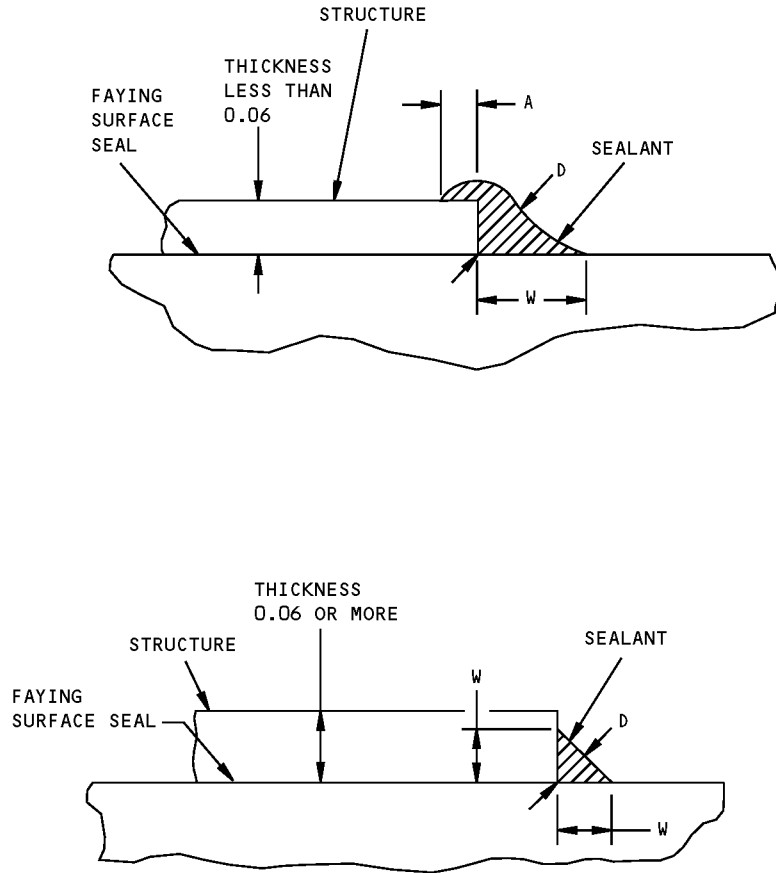
- 1 REMOVE SQUEEZED-OUT SEALANT TO MAKE THE REMAINING SEALANT FLUSH WITH THE EDGE OF THE PART
- 2 MAKE THE FILLET APPROXIMATELY IN THIS SHAPE
- 3 OPTIONAL

- 4 FOR EXTERIOR BODY SECTIONS AND FUEL SIDE OF WING SPARS
- 5 DO NOT BLOCK DRAIN HOLES

Faying Surface Seal Details
Figure 1**20-50-19**



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NOTE: USE THIS METHOD ONLY TO
A JOINT THAT HAS A FAYING
SURFACE SEAL

D = 0.06 MINIMUM
W = 0.06-0.15
A + B = W
A = 0 WHEN B = 0.06 OR MORE

ALL DIMENSIONS ARE IN INCHES

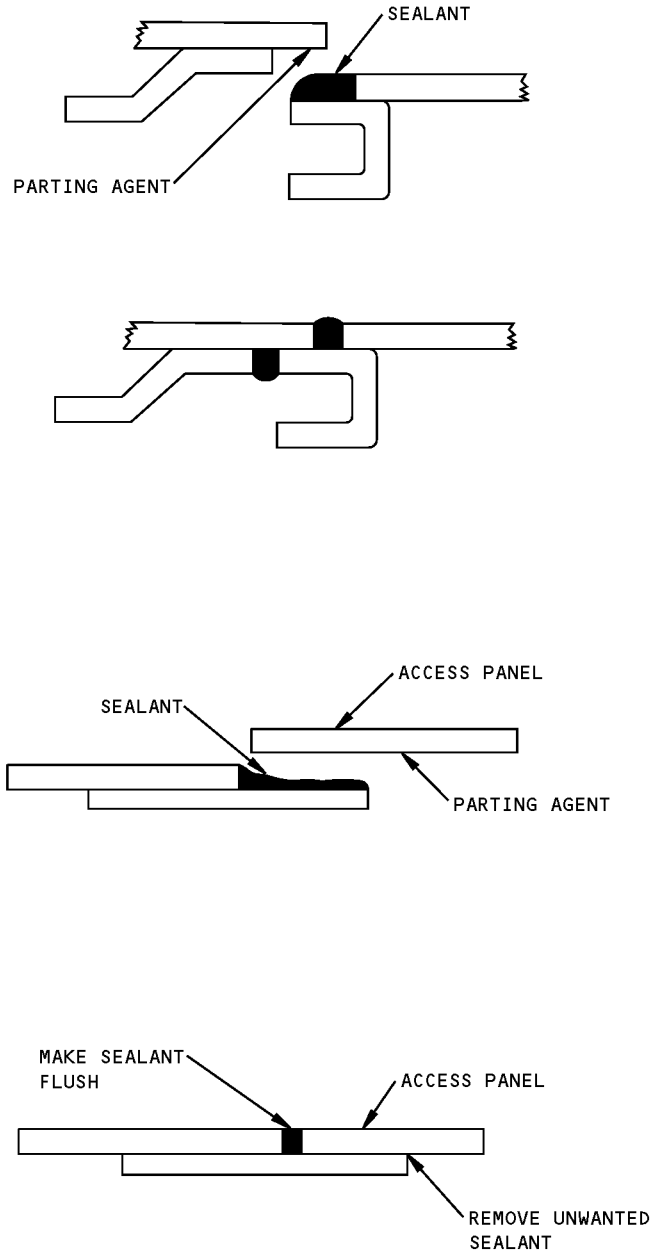
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Reduced Size Fillet Seal For Faying Surface Sealed Joints
Figure 2

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Removable Seals and Formed-in-Place Gaskets
Figure 3

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10. PREPACK SEALING

- A. Fill all of the void or cavity with sealant until no more sealant will go in and there will be sealant squeezed out when the parts are assembled.
- B. Put the parts together. Install fasteners on the two sides of the void or cavity to hold the parts together before the end of the application time or squeeze-out time of the sealant. Temporary fasteners can be used to hold the parts together with the correct force until the permanent fasteners are installed.

11. INJECTION SEALING

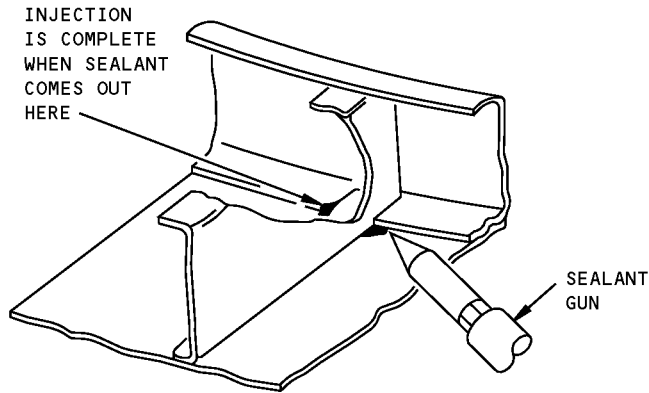
- A. When the seal must be continuous or block a passage or hole, the holes and joggles must be fully filled with sealant, as shown in Figure 4.
- B. When an opening is to be closed to hold up a fillet seal, it is not necessary to inject sealant to the full depth of the opening.
- C. When a seal is made at the bottom of a slot, apply the sealant to fill and touch all surfaces of the bottom and sides of the slot, as shown.

12. HOLE FILLING

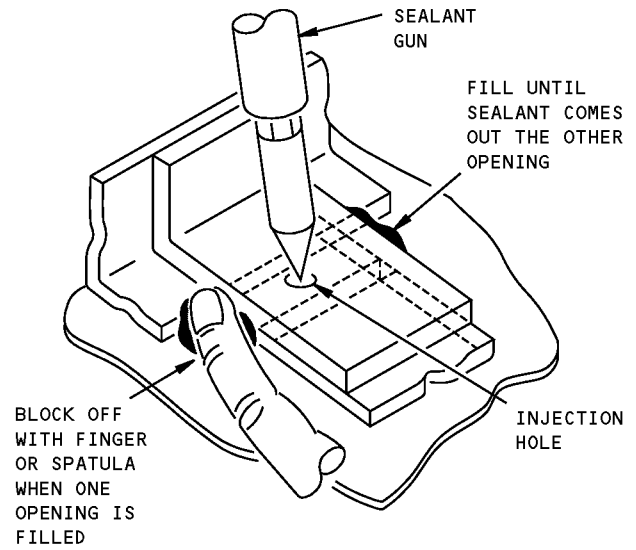
- A. Push the sealant tightly into the space to be filled. Do this from the pressure side of the hole, unless specified by the overhaul instructions. Make the sealant into a smooth fillet on the adjacent surfaces, as shown in Figure 5.
- B. If the holes or slots to be filled are large, you can use masking tape to make a temporary bottom. Be sure to remove the tape after the sealant is cured. Clean off all tape adhesive per Paragraph 6.
- C. If you cannot get access to the rear of holes or gaps, you can use Perma-Tite tape and a high-temperature silicone sealant, as shown, unless these holes are in the firewall.
- D. Fill the tool holes and coordination holes that do not have soft rivets installed in them. In absolute sealed areas, apply a layer of sealant over the soft rivets.

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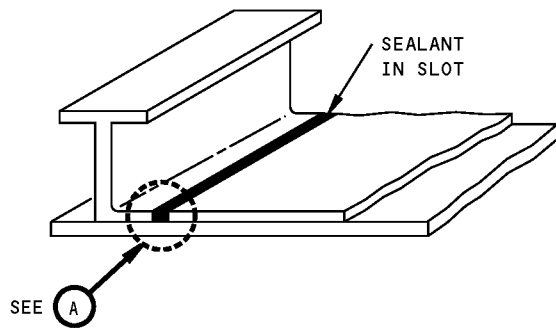
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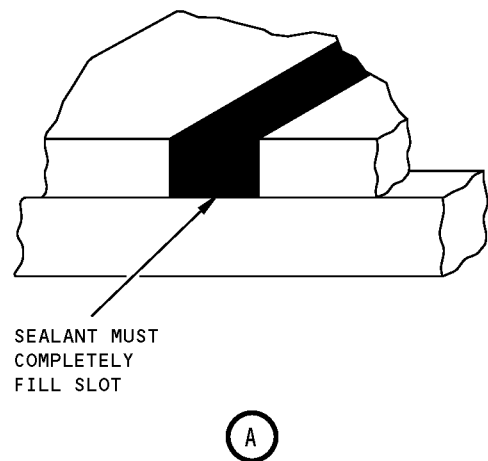
INJECTION SEALING



BLOCK-OFF INJECTION SEALING



SLOT SEALING

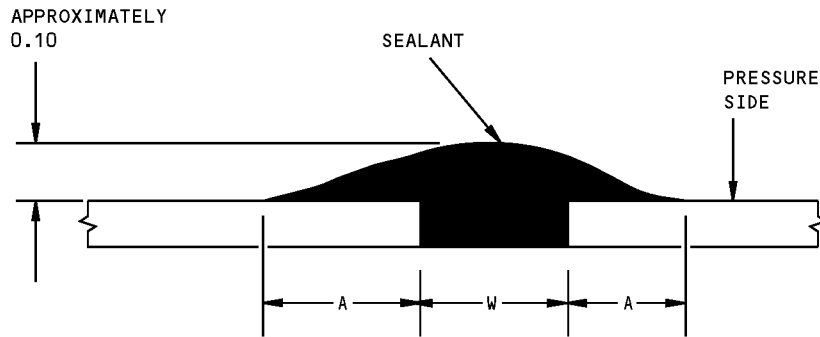


**Injection Sealing Details
Figure 4**

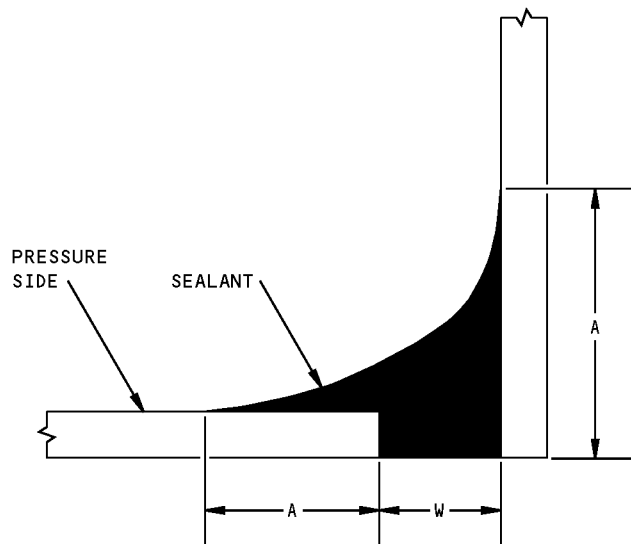
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HOLE IN FLAT PART



HOLE ADJACENT TO ANGLE

$A = 0.25$ MINIMUM, BUT NOT LESS THAN W
 $W = 0.50$ MAXIMUM

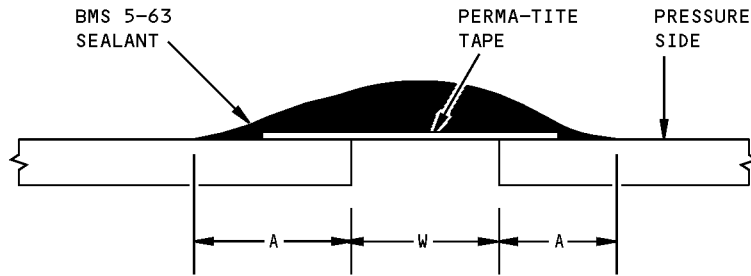
ALL DIMENSIONS ARE IN INCHES

Hole Filling Details
 Figure 5 (Sheet 1 of 2)

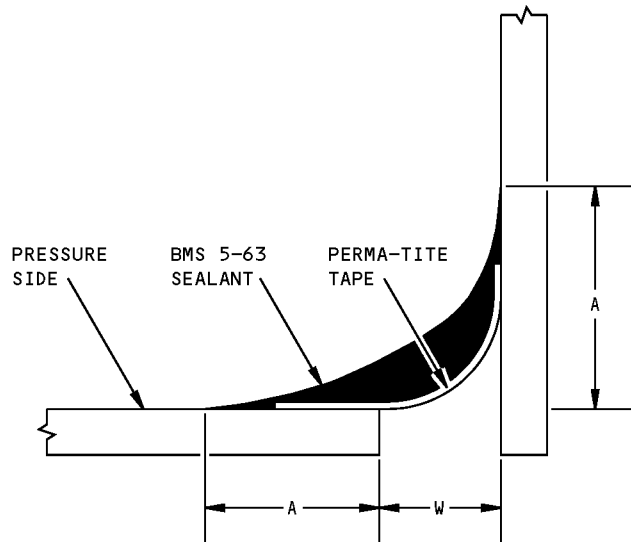
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STANDARD OVERHAUL PRACTICES MANUAL



HOLE IN FLAT PART WITH NO BOTTOM ACCESS



HOLE ADJACENT TO ANGLE WITH NO BOTTOM ACCESS

A = 0.25 MINIMUM, BUT NOT LESS THAN W
W = 0.50 MAXIMUM

ALL DIMENSIONS ARE IN INCHES

Hole Filling Details
Figure 5 (Sheet 2 of 2)

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STANDARD OVERHAUL PRACTICES MANUAL

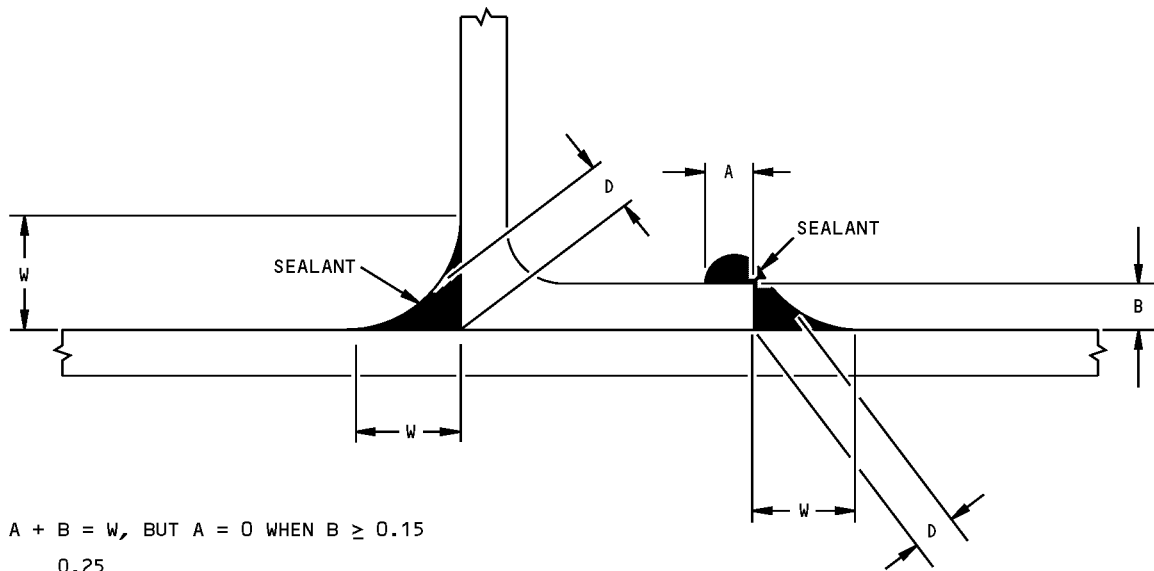
13. FILLET SEALING

- A. Apply sealant with a Semco-type sealant gun or equivalent. Make the sealant fillets smooth with plastic or metal tools or a brush as shown in Figure 6, Figure 7, Figure 8.
 - (1) To help prevent air pockets as you apply the sealant, point the nozzle tip into the seam, keep it nearly perpendicular to the line of travel, and push a bead of sealant ahead of the nozzle tip.
 - (2) To help prevent a bond between sealant and tools, wet the tools with a clean solution of 1 volume part of isopropyl alcohol to 5 or 6 volume parts of distilled water.
- B. If the fillet of sealant will be applied over cured structural adhesive such as BMS 5-42, BMS 5-51, BMS 5-70 or BMS 5-101, be sure to remove all adhesive which did not bond to the metal or composite surface. Use an approved scraper to prevent damage to the surface. If you cannot easily remove the adhesive, let it stay on the surface.
- C. These sealants can be applied over cured BMS 8-45 tamper-proof inspection putty: BMS 5-45, BMS 5-95 and BMS 5-142.
- D. If the overhaul instructions specify fillet seals per Boeing drawings 65-89033 or 69B13372, see Figure 7 and Figure 8 for instructions.

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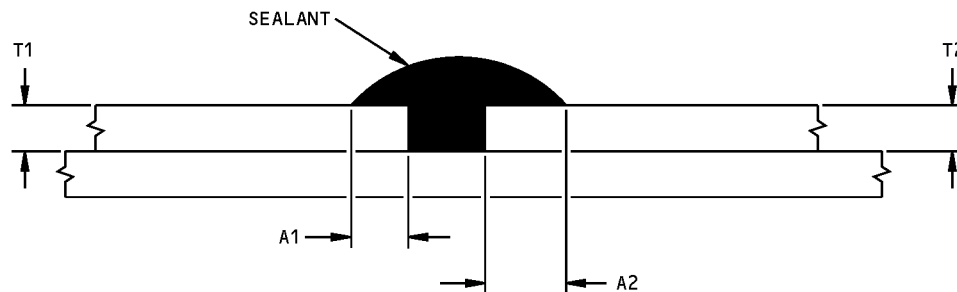


$A + B = W$, BUT $A = 0$ WHEN $B \geq 0.15$

$W = 0.25$

0.15

$D = 0.08$ MINIMUM



$A_n + T_n = \frac{0.25}{0.15}$, BUT $A_n = 0$ WHEN THE ADJACENT $T_n \geq 0.15$

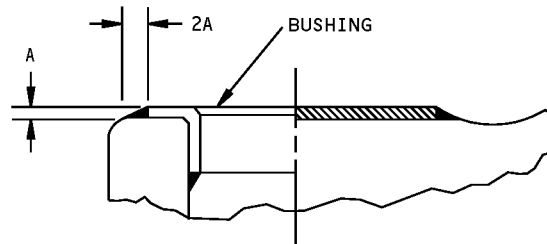
ALL DIMENSIONS ARE IN INCHES

Sealant Fillets
Figure 6

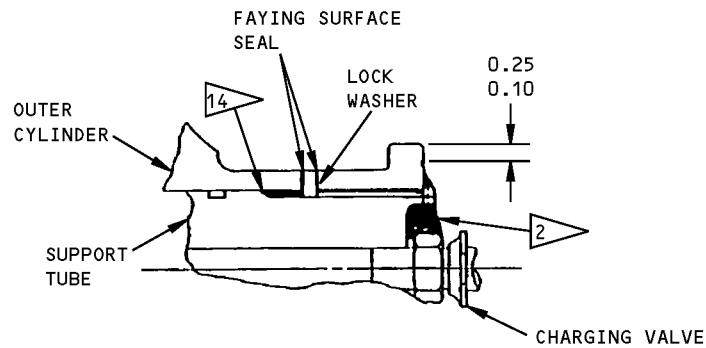
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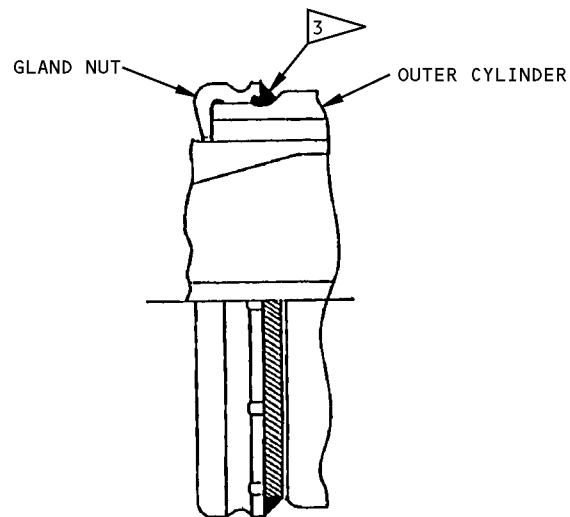
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METHOD 1



METHOD 2



METHOD 3

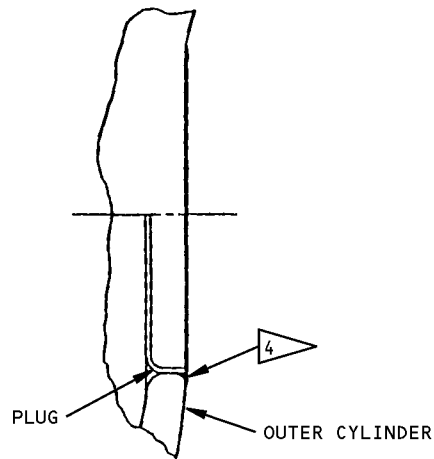
65-89033

Fillet Sealing
Figure 7 (Sheet 1 of 9)

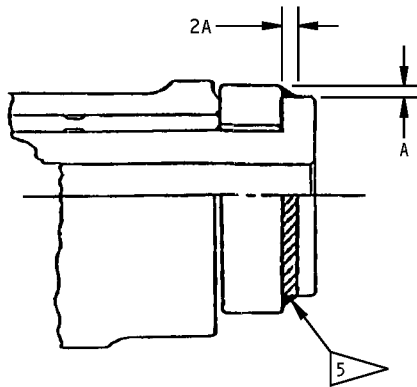
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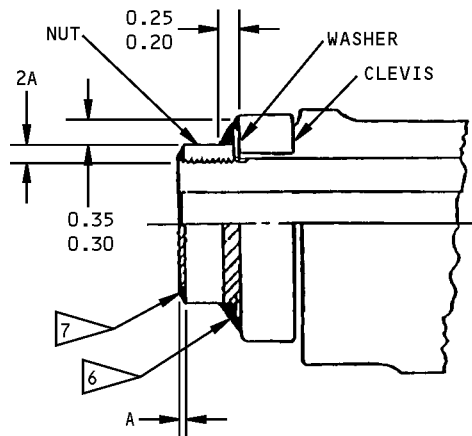
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METHOD 4



METHOD 5



METHOD 6

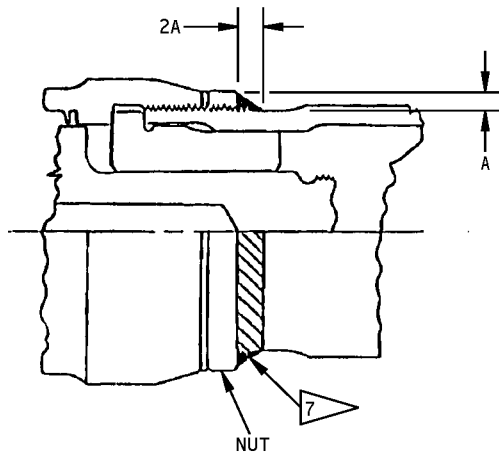
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Fillet Sealing
Figure 7 (Sheet 2 of 9)

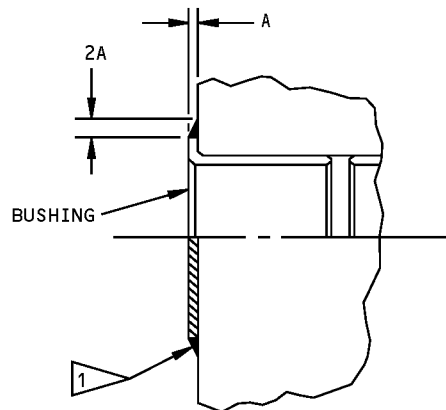
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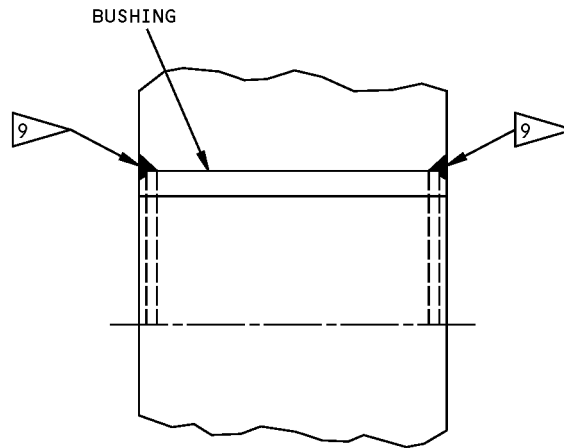
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METHOD 7



METHOD 8



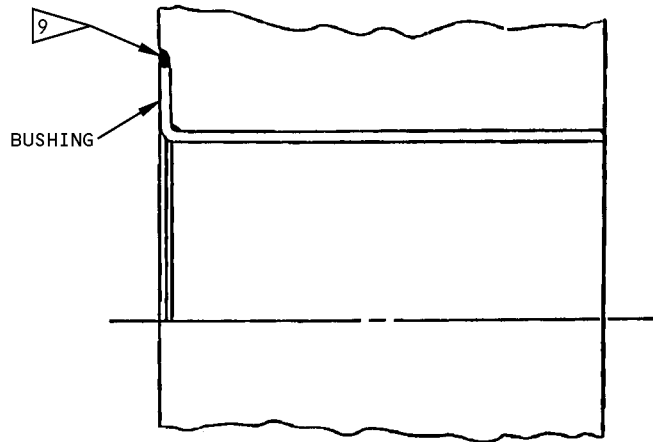
METHOD 9

65-89033

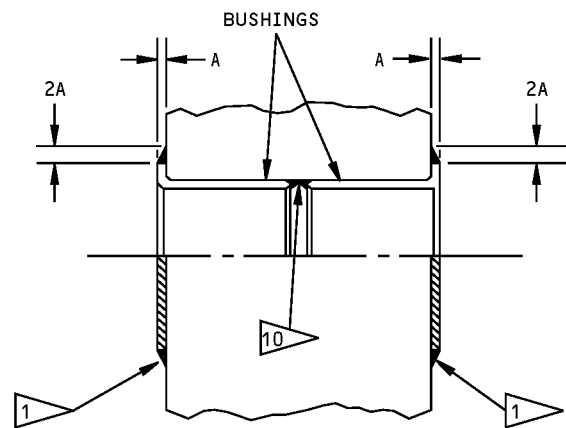
Fillet Sealing
Figure 7 (Sheet 3 of 9)

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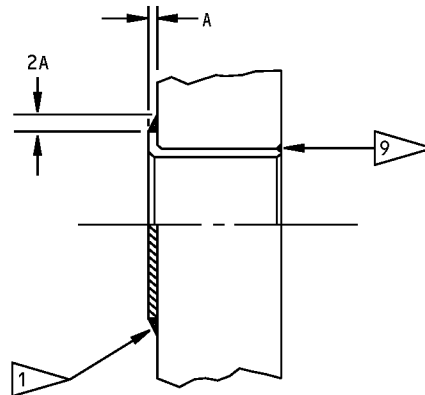
STANDARD OVERHAUL PRACTICES MANUAL



METHOD 10



METHOD 11



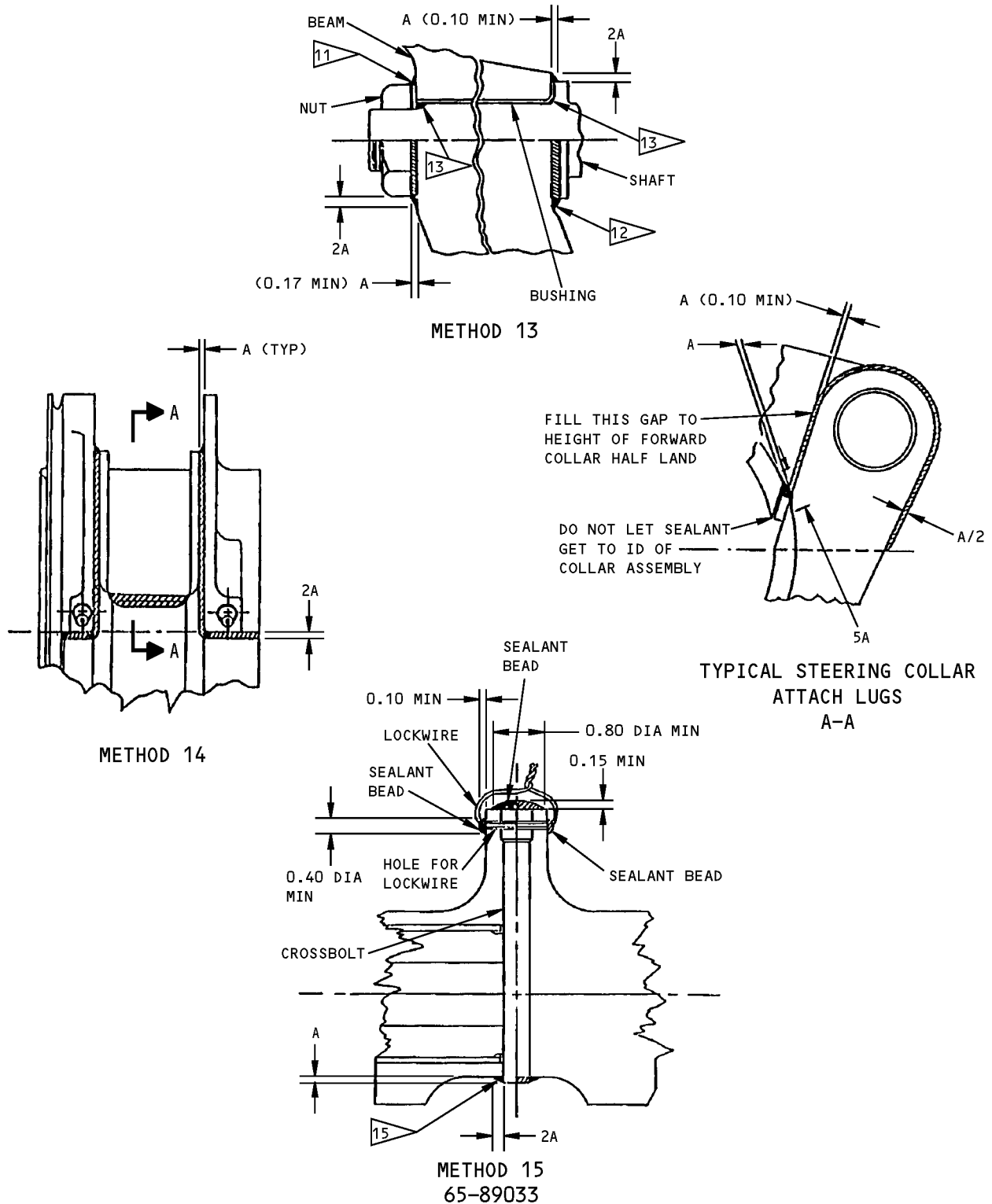
METHOD 12

65-89033

Fillet Sealing
Figure 7 (Sheet 4 of 9)

20-50-19

STANDARD OVERHAUL PRACTICES MANUAL

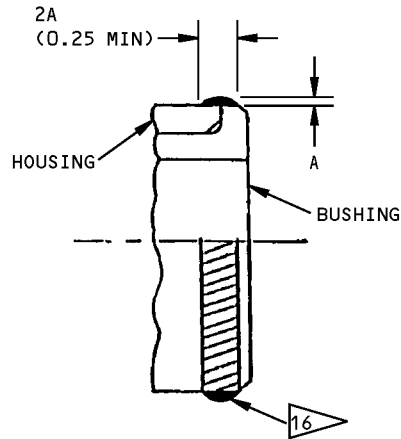


Fillet Sealing
Figure 7 (Sheet 5 of 9)

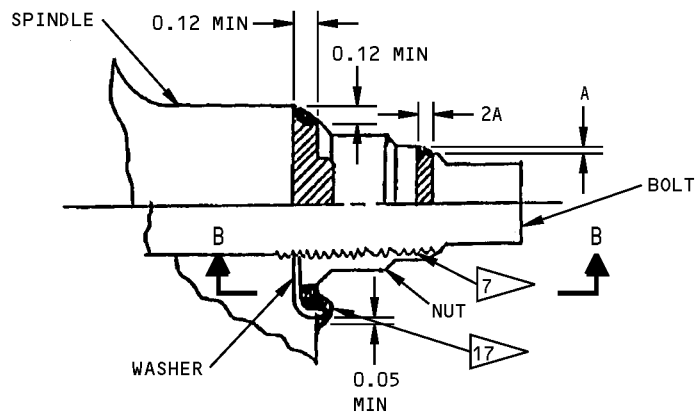
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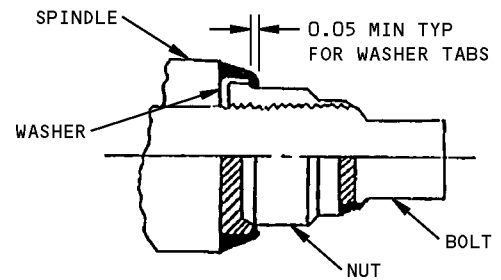
STANDARD OVERHAUL PRACTICES MANUAL



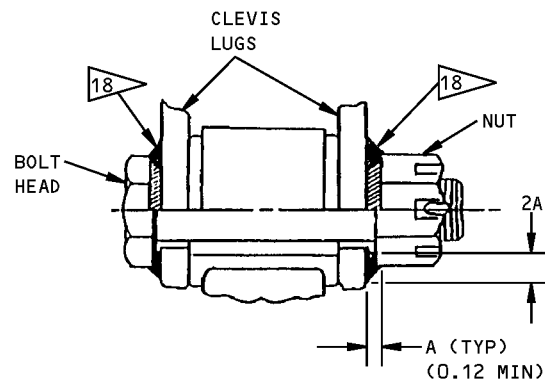
METHOD 16



METHOD 17



B-B



METHOD 18

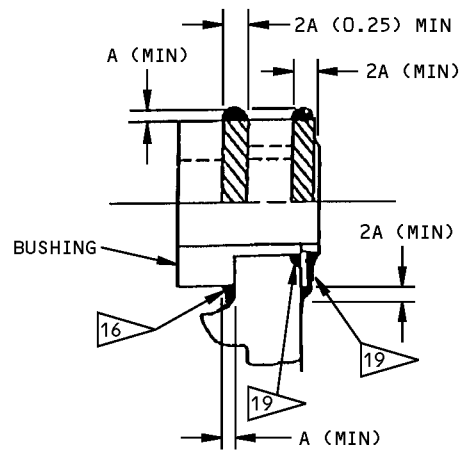
65-89033

Fillet Sealing
Figure 7 (Sheet 6 of 9)

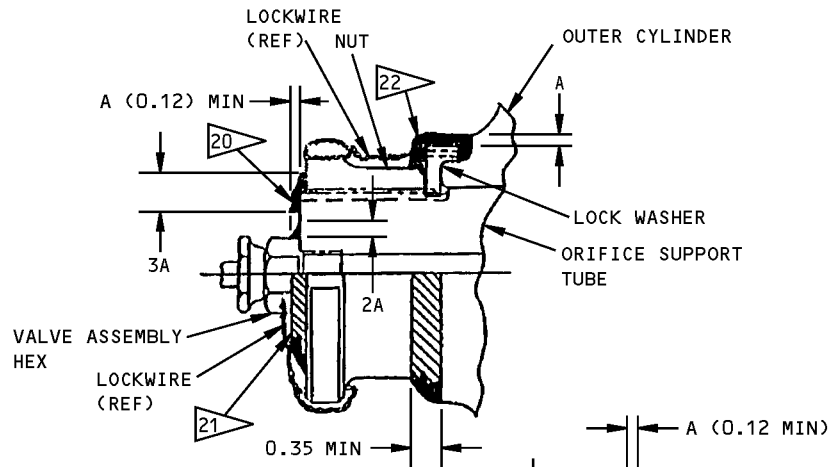
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STANDARD OVERHAUL PRACTICES MANUAL

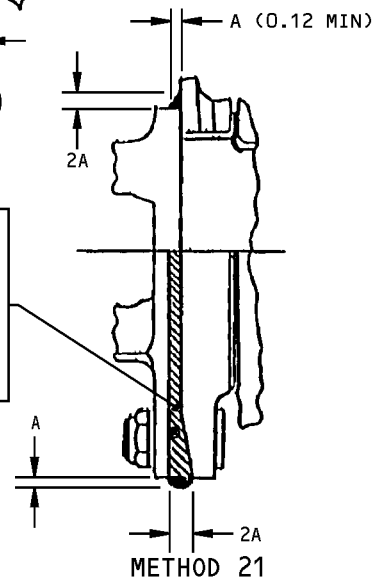


METHOD 19



METHOD 20

SEALANT TO BLEND
SMOOTHLY AT TRANSITION
FROM A BEAD ON EDGE OF
TRUNNION LINK/TRUNNION
PIN FLANGE TO FILLET
BETWEEN FLANGE OF
TRUNNION PIN/TRUNNION
LINK FACE



METHOD 21

65-89033

Fillet Sealing
Figure 7 (Sheet 7 of 9)

20-50-19

**STANDARD OVERHAUL PRACTICES MANUAL****FILLET SEALING INSTRUCTIONS**

1. APPLY ALL PAINT, AND THE FINAL GRAY TOPCOAT, BEFORE YOU APPLY THIS SEALANT.
2. SOLVENT CLEAN THE AREA TO BE SEALED, AND THE ADJACENT AREA (SOPM 20-30-03).
3. APPLY BMS 5-95 SEALANT AS SHOWN IN THE APPLICABLE METHOD VIEW. THE OVERHAUL INSTRUCTIONS WILL SPECIFY THE METHOD NUMBER, WHICH IS THE SAME AS THE FIGURE NUMBER ON SOURCE DOCUMENT DRAWING 65-89033.
4. PAINT THE SEALANT AND THE ADJACENT AREA TO AGREE WITH THE ADJACENT SURFACES. BE CAREFUL NOT TO PAINT THE FACES OF BUSHINGS OR BOLT HEADS.

- 1 A CONTINUOUS FILLET SEAL MUST EXTEND TO THE TOP OF THE BUSHING FLANGE EDGE AND BE IN THE PROPORTIONS SHOWN. OPTIONAL: SEAL AS SHOWN IN FIG. 8. DO NOT APPLY SEALANT TO THE BUSHING FACE.
- 2 THE FILLET MUST EXTEND FROM THE EDGE OF THE CHARGING VALVE TO THE TOP OF THE ATTACH NUT. FILL THE CAVITY AND COVER THE THREADS AS SHOWN.
- 3 THE FILLET MUST EXTEND FROM THE EDGE OF THE GLAND NUT TO THE OUTER CYLINDER. FILL THE CAVITY APPROXIMATELY AS SHOWN.
- 4 FILL THE CAVITY BETWEEN THE PLUG AND THE RADIUS OF THE OUTER CYLINDER AS SHOWN.
- 5 THE FILLET MUST EXTEND TO THE TOP OF THE BOLT HEAD, OR 0.15 MAXIMUM, AND BE IN THE PROPORTIONS SHOWN.
- 6 THE FILLET MUST EXTEND FROM THE NUT TO THE CLEVIS, COVER THE WASHER, AND BE IN THE DIMENSIONS SHOWN AROUND THE NUT.
- 7 THE FILLET MUST EXTEND TO THE OUTSIDE EDGE OF THE NUT, OR 0.15 MAXIMUM, AND BE IN THE PROPORTIONS SHOWN.
- 8 FILLET SEAL THE UNFLANGED EDGE OF THE BUSHING AS SHOWN.
- 9 FILL THE CAVITY ALL AROUND THE BUSHING. MAKE THE SEALANT FLUSH WITH THE SURFACE.
- 10 FILL THE CAVITY BETWEEN THE BUSHINGS AS SHOWN. DO NOT LET THE SEALANT BE ABOVE THE BORE SURFACES. DO NOT PAINT THIS SEALANT.
- 11 THE FILLET MUST EXTEND FROM THE BEAM SURFACE TO THE NUT, COVER THE WASHER(S), AND BE IN THE DIMENSIONS SHOWN ALL AROUND THE NUT.
- 12 THE FILLET MUST EXTEND FROM THE BEAM SURFACE TO THE SHAFT, COVER THE EDGE OF THE BUSHING FLANGE, AND BE IN THE DIMENSIONS SHOWN ALL AROUND THE SHAFT.
- 13 THIS CAVITY MUST BE FULL OF SEALANT AFTER INSTALLATION.
- 14 FILL THE KEYWAY IN THE SUPPORT TUBE BEFORE YOU INSTALL THE LOCKWASHER.
- 15 THE FILLET MUST EXTEND TO THE BOTTOM OF THE CROSSBOLT AND BE IN THE PROPORTIONS SHOWN.
- 16 APPLY A BEAD OF SEALANT AROUND THE EDGE OF THE BUSHING FLANGE WHERE IT TOUCHES THE HOUSING AS SHOWN. DO NOT GET SEALANT ON THE BUSHING FLANGE FACE.

65-89033

Fillet Sealing
Figure 7 (Sheet 8 of 9)**20-50-19**

**STANDARD OVERHAUL PRACTICES MANUAL**

- 17 THE FILLET MUST EXTEND FROM THE NUT TO THE SPINDLE, COMPLETELY COVER THE WASHER, AND BE IN THE DIMENSIONS SHOWN.
- 18 THE FILLET MUST EXTEND FROM THE NUT OR BOLT HEAD TO THE CLEVIS, AND FILL THE CAVITY AS SHOWN.
- 19 WITH THE RETAINING RING REMOVED, FILL THE CAVITY BETWEEN THE BUSHING AND THE CHAMFER OF THE TOW FITTING. APPLY A LAYER OF SEALANT TO THE RETAINING RING, AND INSTALL THE RING WHILE THE SEALANT ON IT IS WET. APPLY SEALANT OVER THE RETAINING RING AND MAKE THE SEALANT OVERLAP ONTO ADJACENT COMPONENTS. DO NOT GET SEALANT ON THE END OF THE BUSHING.
- 20 THE SEALANT BEAD MUST EXTEND FROM THE ORIFICE SUPPORT TUBE TO THE RETAINING NUT AS SHOWN.
- 21 THE FILLET MUST EXTEND FROM THE VALVE HEX TO THE END OF THE ORIFICE SUPPORT TUBE. FILL THE CAVITY AS SHOWN.
- 22 THE FILLET MUST EXTEND FROM THE OUTER CYLINDER TO THE RETAINING NUT AND COMPLETELY COVER THE LOCK WASHER.

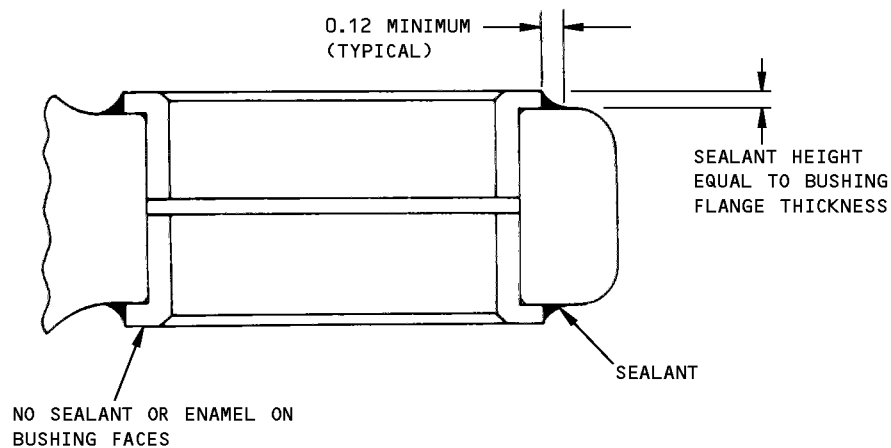
65-89033

Fillet Sealing
Figure 7 (Sheet 9 of 9)

20-50-19

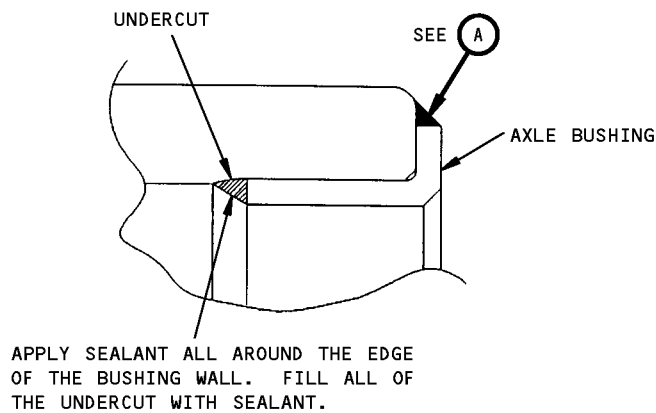


STANDARD OVERHAUL PRACTICES MANUAL



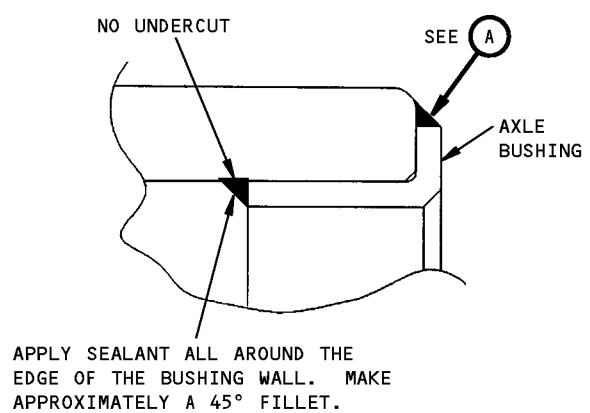
TYPICAL FLANGED BUSHINGS

(A)



FOR STEP BORE WITH UNDERCUT

(B)



FOR BORE WITHOUT UNDERCUT

(B)

1. BEFORE YOU APPLY THIS SEALANT, APPLY ALL PAINT AND THE FINAL TOPCOAT. OPTIONAL: APPLY SEALANT BEFORE THE FINAL TOPCOAT.
2. SOLVENT CLEAN THE SURFACES TO GET THE SEALANT, 0.38 MINIMUM OUT FROM THE BUSHING FLANGE OUTSIDE DIAMETER.
3. APPLY A FILLET OF BMS 5-95 SEALANT TO THE EDGES OF THE BUSHINGS AS SHOWN, OR AS SHOWN IN FIG. 6.
4. AFTER THE SEALANT IS CURED, APPLY BMS 10-60 GRAY GLOSS ENAMEL (F-19.39-707) TO THE SEALANT AND THE ADJACENT AREAS.

69B13372

ALL DIMENSIONS ARE IN INCHES
D55275 S0000160974_V2Bushings Sealant Application
Figure 8**20-50-19**

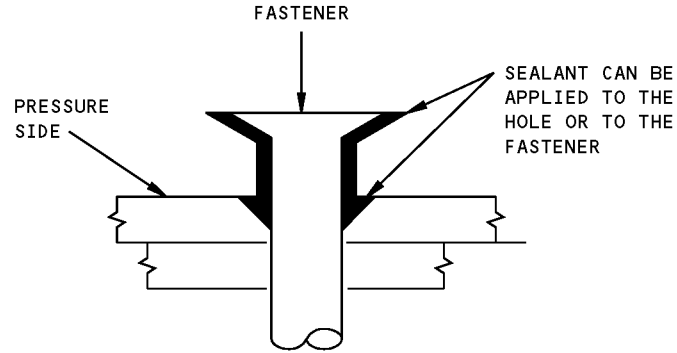
**STANDARD OVERHAUL PRACTICES MANUAL****14. FASTENER SEALING TO CONTAIN PRESSURE**

- A. Install fasteners through a faying surface seal during the application time or squeeze-out time of the sealant. Refer to Figure 9.
- B. If fasteners must be installed through a faying surface seal after the application time or squeeze-out time is expired, or if there is no faying surface seal, use one of these methods, as specified by the overhaul instructions:
 - (1) Method 1 – Apply sealant to the fastener or hole at installation, as shown. The sealant which squeezes out must be continuous all around the fastener.
 - (2) Method 2 – With a brush, apply a Class A sealant to the installed fastener, or apply a fillet of Class B sealant around the installed fastener, as shown.
 - (3) Method 3 – Use BACC50H metal seal covers or BACC50AJ molded polysulfide seal caps.
 - (a) BACC50H seal covers
 - 1) Put the cover on the fastener.
 - 2) Inject sealant into the cover as shown.
 - 3) Remove unwanted sealant and make the edges smooth, as shown.
 - (b) BACC50AJ seal caps
 - 1) Be sure the cap does not have release agent in it. If necessary, clean the agent off with a solvent from the list in Paragraph 6.A.(1).
 - 2) Fill the cap with sealant.
 - 3) Put the cap down on the fastener and push it down until the flange of the cap touches the structure. Make sure the sealant comes out all around the base of the cap and from the hole in the top of the cap.
 - 4) Hold the cap in position. Remove unwanted sealant, and make the edges of the sealant smooth all around the cap, as shown.

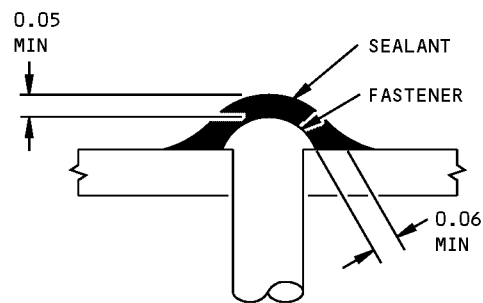
20-50-19



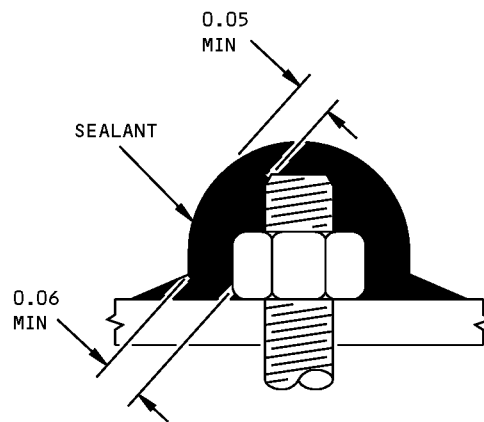
STANDARD OVERHAUL PRACTICES MANUAL



WET SEALING DURING INSTALLATION



BRUSH SEALING OF INSTALLED FASTENER



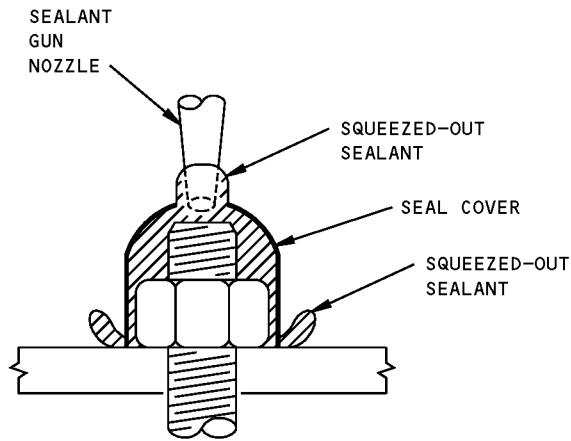
FILLET SEALING OF INSTALLED FASTENER

ALL DIMENSIONS ARE IN INCHES

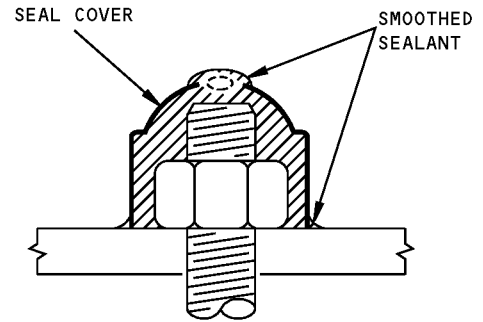
Fastener Sealing to Contain Pressure
Figure 9 (Sheet 1 of 2)

20-50-19

STANDARD OVERHAUL PRACTICES MANUAL

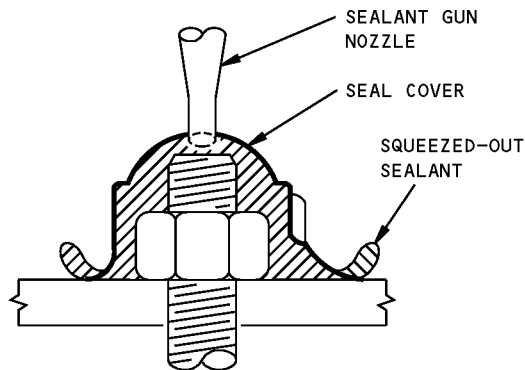


DURING INJECTION WITH SEALANT

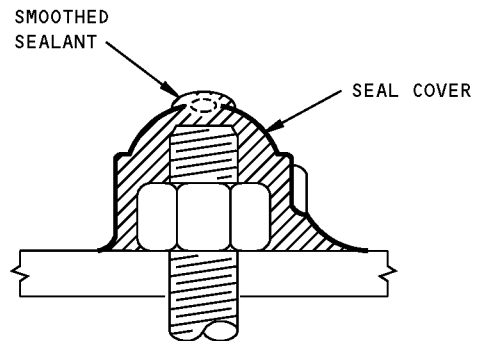


UNWANTED SEALANT REMOVED

SEALING WITH BACC50H OR BACC50AJ SEAL COVERS



DURING INJECTION WITH SEALANT



UNWANTED SEALANT REMOVED

SEALING WITH BACC50N SEAL COVER

Fastener Sealing to Contain Pressure
Figure 9 (Sheet 2 of 2)

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STANDARD OVERHAUL PRACTICES MANUAL

15. CORROSION PROTECTION SEALING

NOTE: This procedure could be specified as the Special Sealing Method for Corrosion Protection.

A. Faying surface seals – Refer to Paragraph 9.

B. Injection seals – Refer to Paragraph 11.

C. Fillet seals – Refer to Paragraph 13.

D. Fastener sealing

(1) Installation of fasteners with wet sealant

(a) Hole preparation

- 1) When you drill holes for fasteners, use only those lubricants approved by BAC5008 (for metals) and BAC5063 (for composites).
- 2) After you make the holes and countersinks, remove contamination such as dust, chips and filings.
- 3) If you used a lubricant when you drilled the hole, clean the lubricant away per Paragraph 6.
- 4) Clean the surfaces to be sealed, and the countersink, but not the hole itself, per Paragraph 6.
- 5) If BMS 5-63 sealant will be used, apply a thin layer of BMS 5-63 primer to all surfaces which will touch the sealant. This primer is not necessary on the fastener or washer surfaces. Let this primer dry a minimum of 60 minutes before you install the fasteners with the sealant. BMS 10-11, Type 1 primer can be used as an alternative, but it must be fully cured before you install the fasteners with the sealant. Uncured BMS 10-11, Type 1 primer could cause a problem with the cure of the BMS 5-63 sealant.
- 6) BMS 10-11, Type 1 primer can be applied as a base coat for the other sealants, if necessary.

(b) Apply the sealant by Method 1, 2, or 3 as specified by the overhaul instructions. If the method is not specified, use Method 1.

1) Method 1 – Sealant under the head of the fastener

- a) Apply a sufficient quantity of sealant to make a layer on all surfaces and countersinks under the fastener head.
- b) Install the fasteners during the squeeze-out life of the sealant.
- c) Make sure the sealant comes out as a continuous bead all around the fastener head.
- d) Remove unwanted sealant.

2) Method 2 – Sealant under the head and on the shank of the fastener.

- a) Threaded fasteners not used with self-sealing collars or nuts – Apply sealant as shown to the hole and the shank and all threads of the bolt. Then install the bolt into the hole and install the nut or collar.
- b) Threaded fasteners used with self-sealing collars or nuts – Apply sealant only to the shank. Keep sealant off the threads, but signs of sealant are acceptable. Then install the bolt into the hole and install the nut or collar.

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STANDARD OVERHAUL PRACTICES MANUAL

- c) Lockbolts and other fasteners with annular grooves – Apply sealant only to the shank, 0.06 inch minimum thick. Do not apply sealant to the hole surfaces. Keep sealant away from the grooves. If necessary, wipe the grooves off before you swage the collar on the lockbolt. Sealant in the annular grooves will decrease the function of the fastener.
 - d) A continuous bead of sealant must come out all around the fastener head. Remove unwanted sealant from flush fastener heads with a dry wiper, to make the squeezed-out sealant smooth with the fastener heads or the adjacent surface.
- 3) Method 3 – Sealant under the fastener head, on the shank, and on the base of assembled hardware.
 - a) Clean per Paragraph 6. the surfaces to get the sealant, and the countersinks, but not the holes.
 - b) Apply a layer of sealant to the shank and threads of the fastener.
 - c) Install the fastener in the hole. More sealant can be applied to the shank if necessary to get a good bead of sealant around the base of the related washer. Or sealant can be applied under the washer before installation.
 - d) Install the collar or the nut and tighten it to the specified torque during the application time of the sealant.
 - e) Make sure there is a continuous bead of squeezed-out sealant around the fastener head, the base of the collar or nut, and the washer, if one is included.
 - f) Remove unwanted sealant from flush fastener heads with a dry wiper to make the sealant smooth with the fastener head or the adjacent surface. Do not remove the squeezed-out sealant from the base of the collar or nut or the washer until after the quality-control inspection.
- (2) Fillet sealing around the edge of installed fasteners (Figure 10).
 - (a) Use only Class B or Class A (brush-on) sealants.
 - (b) Apply sealant to make fillets as shown. Use the standard fillet dimensions unless the overhaul instructions tell you to use the reduced fillet dimensions.
 - (c) Brush marks are acceptable if the sealant dimensions are within the specified limits.
- (3) Installation of BACB30PT fasteners.
 - (a) Remove chips, filings and other unwanted matter after the hole is made.
 - (b) If necessary, apply BMS 10-11, Type 1 primer as a base layer for the sealant.
 - (c) Apply BMS 5-95, Class B or C sealant to the countersink surface with an injection tool. Make a continuous ring of the sealant in the countersink area.
 - (d) Install the fastener during the squeeze-out life of the sealant.
 - (e) Remove unwanted sealant with a wiper wet with a mixture of equal volume parts of methyl ethyl ketone and toluene, or with a solvent from the list in Paragraph 6.A.(1). Use only a small amount of solvent. Then wipe dry with a dry wiper.
- (4) Brush sealing over installed fastener threaded ends and mating components (Figure 11)
 - (a) Unless the overhaul instructions are different, use this special mix of sealant and solvent; of sealant 1) or 2) plus 12 percent by weight maximum of solvent 3):
 - 1) BMS 5-45, Class A, Grade 1

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STANDARD OVERHAUL PRACTICES MANUAL

- 2) BMS 5-95, Type 1, Class B-2
 - 3) Equal volume parts methyl ethyl ketone and toluene
 - (b) With a brush, apply the sealant to make a visually smooth layer which completely cover these joints, as shown:
 - 1) Between the fastener threads and the nut or collar
 - 2) Between the nut or collar (and washers if used) and the structure
 - (c) As an alternative, you can completely cover all components as shown.
- E. Sealing of bushings and bearings
- NOTE:** Some components could have special standard sealing procedures in the overhaul instructions, such as those specified for landing gear bushings per Boeing drawings 65-89033 or 69B13372.
- (1) Fillet sealing without wet installation.
 - (a) Clean the surfaces of the bushing or bearing and the housing to get the sealant. Use the procedure of Paragraph 6. Clean the bearings with wipers lightly wet with a solvent from the list of Paragraph 6.A.(1).
 - (b) Use the specified sealant to put fillet seals on the bushing ends as shown in Figure 12. Do not let sealant get on the flange faces or on the inner surfaces of the end without the flange.
 - (2) Wet installation and sealing of bushings and bearings.
 - (a) Clean the surfaces of the bushing or bearing and of the housing to get the sealant. Use the procedure of Paragraph 6. Clean the bearings with wipers lightly wet with a solvent from the list of Paragraph 6.A.(1).
 - (b) Apply a thin, continuous layer of the specified sealant to all surfaces of the mating hole in the housing. Apply a continuous bead of sealant to the surface of the housing which will be under the flange of the installed bushing. If the overhaul instructions do not give the sealant, refer to SOPM 20-50-03 for recommended sealants.
 - (c) As applicable, install the bushing by the shrink fit or press fit method of SOPM 20-50-03 within the squeeze-out life of the sealant.
 - (d) Make sure the squeezed-out sealant makes a continuous fillet which seals all along the joint between the bushing and the housing. If it does not, push the squeezed-out sealant to make the seal continuous. Add more sealant, if necessary.
 - (e) Remove sealant from the face of the bushing flange and the bore surfaces. Use a plastic or wooden scraper, or a wiper or cotton swab wet with a solvent from the list of Paragraph 6.A.(1).
 - (f) When bushings are installed back-to-back as in Figure 12, seal the inside ends unless the gap between the bushings is used as a lubrication path. See Figure 12 for minimum and maximum limits for sealant in the gap.
- F. Edge Sealing of Components Adjacent to Aluminum Structure (Figure 13)
- (1) Clean per Paragraph 6. the surfaces to get the sealant.
 - (2) Apply the sealant by Method 1 or 2 as specified by the overhaul instructions. If the method is not specified, use Method 2.
 - (a) Method 1

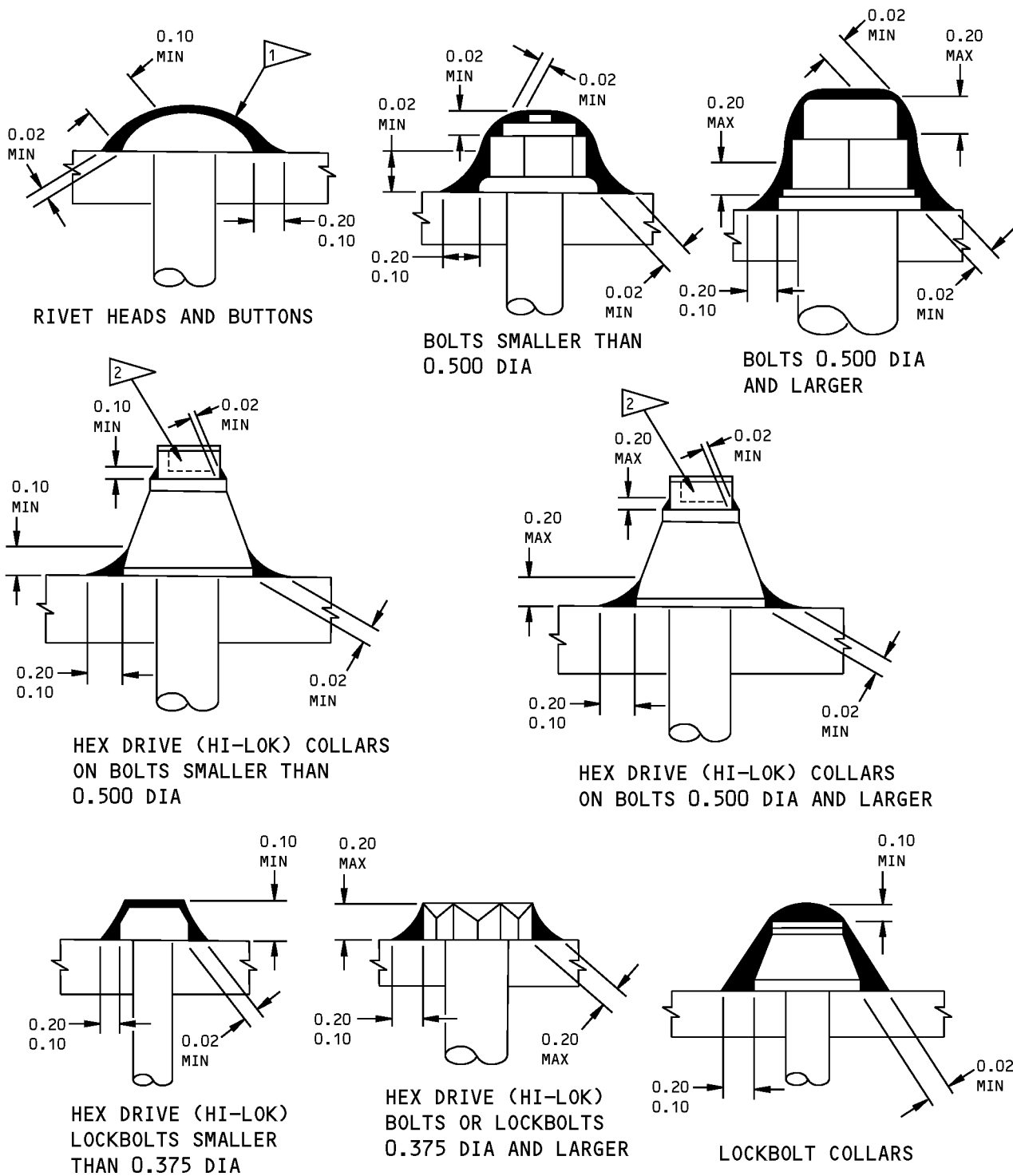
20-50-19

**STANDARD OVERHAUL PRACTICES MANUAL**

- 1) Apply BMS 5-92, Type 1 adhesive (Type 70 in SOPM 20-50-12) with a Semco roller, to make a continuous layer on the edge with the maximum thickness at the midpoint, as shown. The thickness of this layer can decrease from the center to the corners, but there must be a continuous layer of sealant on all edge surfaces and corners.
 - 2) Unless specified by the overhaul instructions, overlap of the sealant on the adjacent surfaces is permitted, but keep the overlap as small as possible. Some overhaul instructions could specify that no overlap is permitted, to keep the edge seal away from aerodynamic surfaces, or areas which could become mating surfaces in a subsequent assembly. Remove the adhesive from such surfaces before it cures, to make the adhesive flush with the part surface, as shown.
 - 3) Cure the adhesive per Type 70 in SOPM 20-50-12, or for 6 hours at 70°-80°F before you apply primer, but do not apply pressure during the cure of the edge seal.
- (b) Method 2
- 1) Use the same procedure as Method 1, but the overlap on the edges is necessary as shown, unless the overhaul instructions specify that there be no overlay.
 - 2) Cure the adhesive per Type 70 in SOPM 20-50-12, or for 6 hours at 70°-80°F before you apply primer, but do not apply pressure during the cure of the edge seal.

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STANDARD OVERHAUL PRACTICES MANUAL



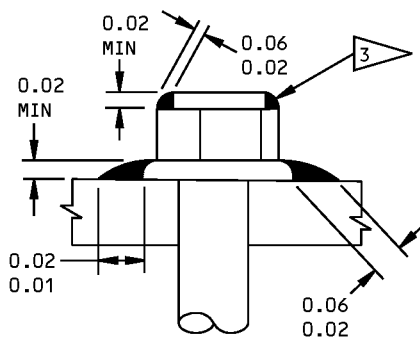
STANDARD FILLET SEALS

ALL DIMENSIONS ARE IN INCHES

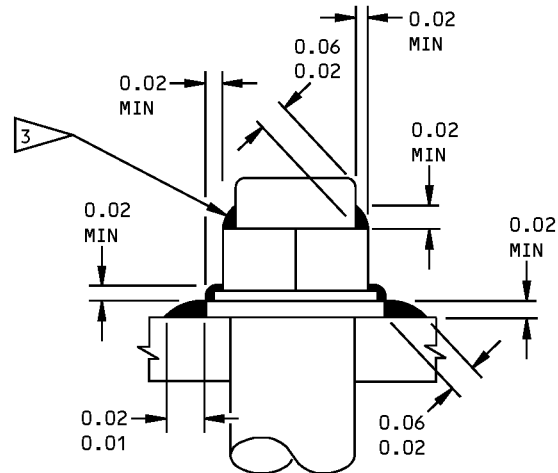
Fillet Sealing at Installed Fasteners
Figure 10 (Sheet 1 of 2)

20-50-19

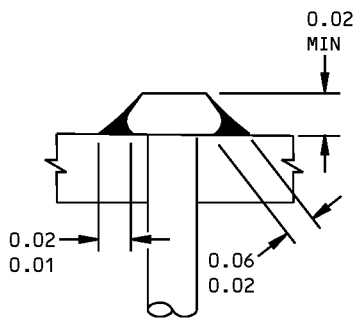
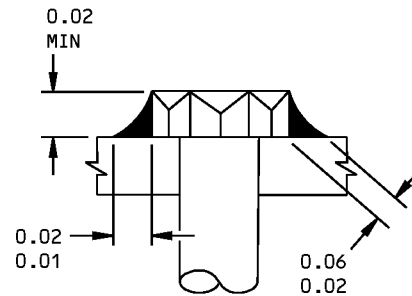
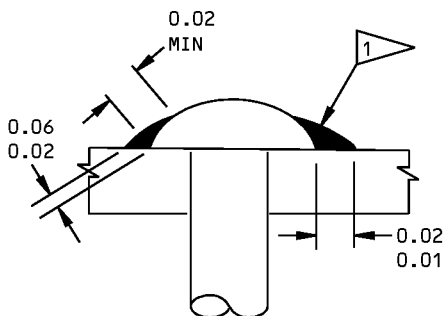
STANDARD OVERHAUL PRACTICES MANUAL



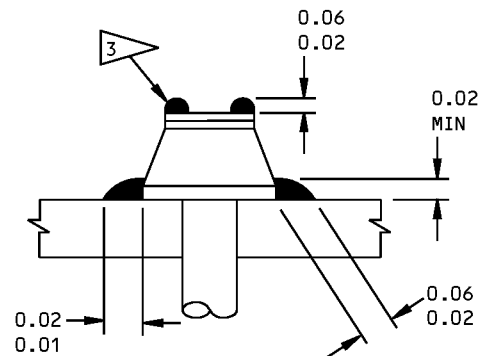
BOLTS SMALLER THAN 0.500 DIA



BOLTS 0.500 DIA AND LARGER

BOLTS OR LOCKBOLTS
SMALLER THAN 0.375 DIABOLTS OR LOCKBOLTS
0.375 DIA AND LARGER

RIVET HEADS AND BUTTONS



LOCKBOLT COLLARS

REDUCED FILLET SEALS

- 1 IF YOU USE CLASS A (BRUSH-ON) SEALANT, YOU CAN APPLY IT TO THE HEAD AS SHOWN
- 2 IT IS NOT NECESSARY TO FILL THE RECESS IN THE END OF THE PIN
- 3 THIS SEALANT IS NOT NECESSARY ON SELF-SEALING FASTENERS

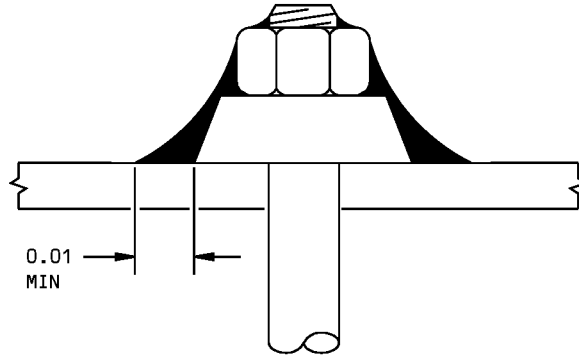
ALL DIMENSIONS ARE IN INCHES

Fillet Sealing at Installed Fasteners
Figure 10 (Sheet 2 of 2)

20-50-19

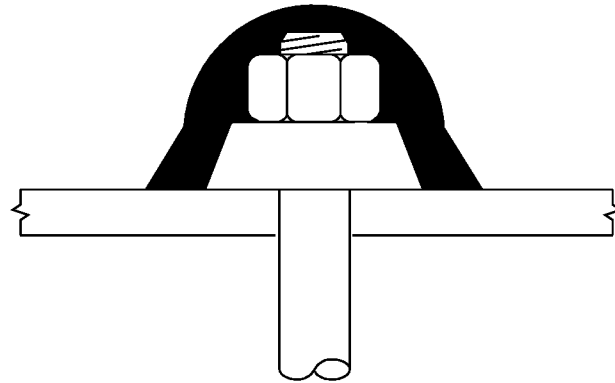


STANDARD OVERHAUL PRACTICES MANUAL



0.01
MIN

MINIMUM LIMITS



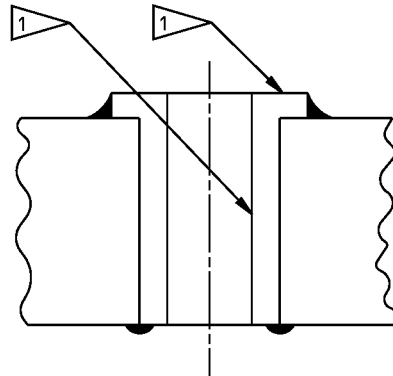
OPTIONAL ALTERNATIVE

ALL DIMENSIONS ARE IN INCHES

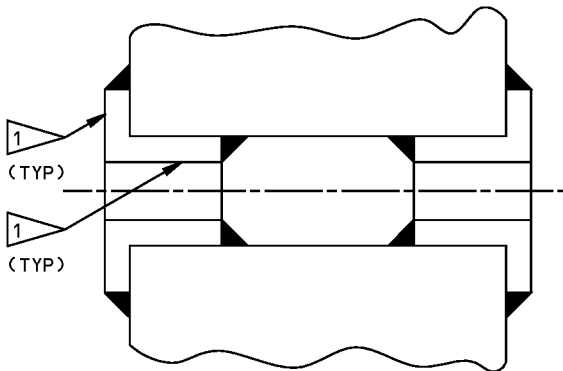
Brush Sealing on Installed Fastener
Figure 11

20-50-19

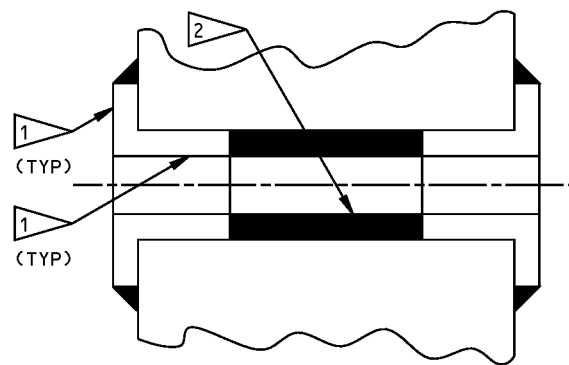
STANDARD OVERHAUL PRACTICES MANUAL



ONE BUSHING



MINIMUM



MAXIMUM

BACK-TO-BACK BUSHINGS

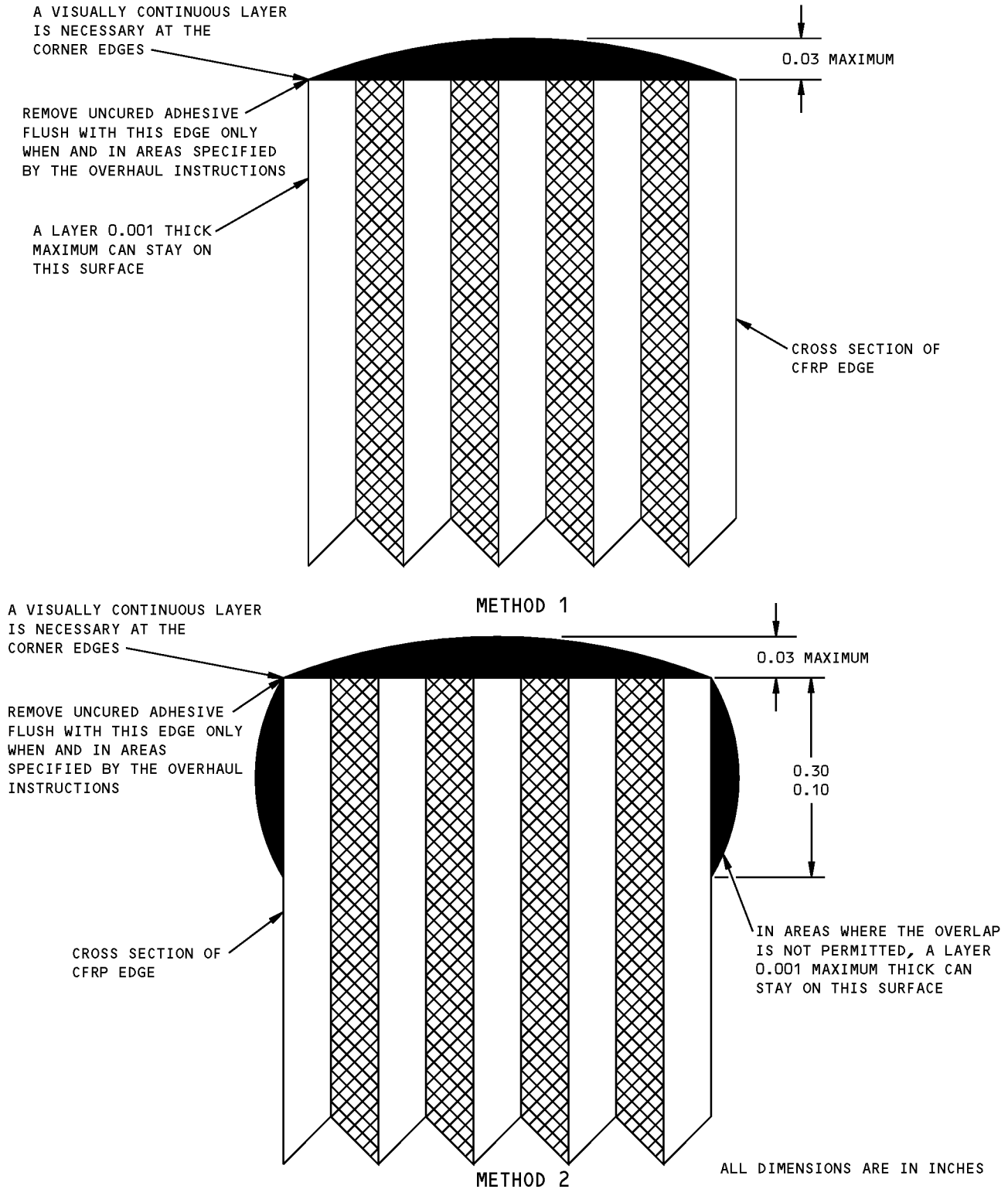
 NO SEALANT PERMITTED ON THESE SURFACES

 NO SEALANT ABOVE BUSHING BORE SURFACES

Fillet Sealing of Bushings
Figure 12

20-50-19

STANDARD OVERHAUL PRACTICES MANUAL



Edge Sealing of Composites
Figure 13

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**STANDARD OVERHAUL PRACTICES MANUAL****16. ELECTRICAL SEALING****A. General**

- (1) Use these procedures to apply sealant to electrical installations unless specified by the overhaul instructions, or if the installation uses BACS45A seal fittings or ground studs.
- (2) Seal installations with BACS45A seal fittings per BAC5108.
- (3) Seal ground studs per Paragraph 16.B. below.
- (4) The seals shown in these procedures are for absolute, extensive, and intermediate levels of sealing. For limited level of sealing, ignore the fillet sealant which is shown in the figures.
- (5) Push each wire in the bundle apart and apply a layer of the specified sealant to the length of each wire which will go through the fairlead or coupling. Be sure to complete this task during the application time of the sealant.
- (6) After each wire has a layer of sealant, pull the bundle into position in the fairlead or coupling. Then fill completely around the bundle with sealant. Make sure all spaces are filled. See Figure 14 for sealing of typical wire installations.

B. Ground Studs

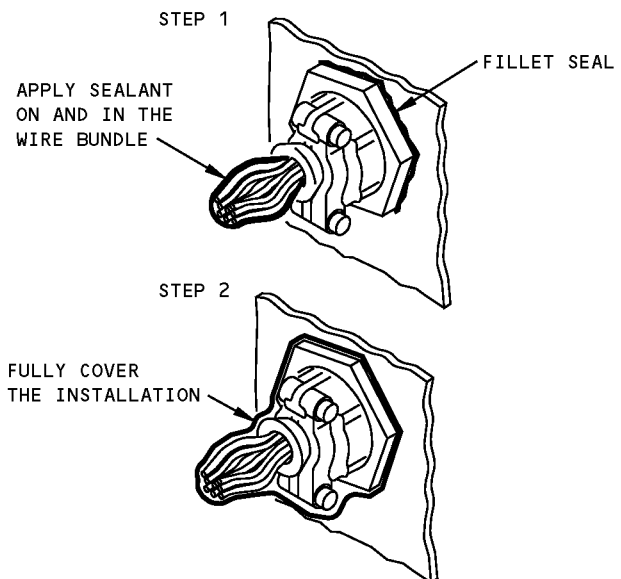
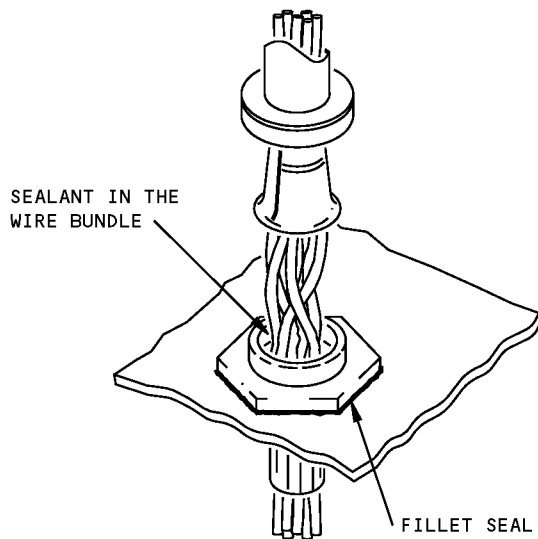
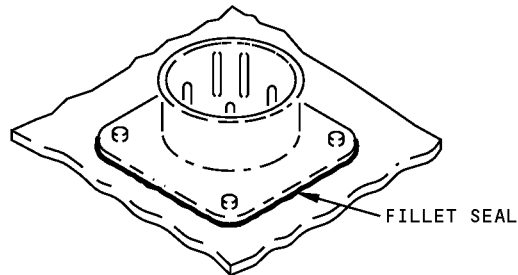
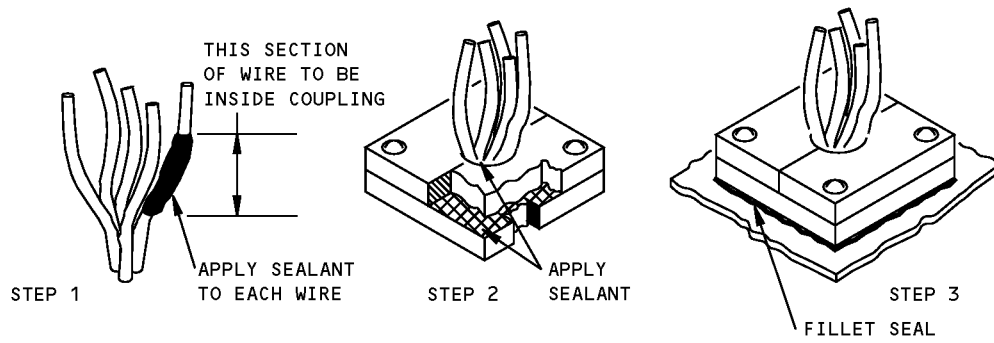
- (1) When specified by the overhaul instructions, apply sealant to ground studs as shown in Figure 15.
- (2) Do not apply sealant to the terminal contact surfaces of the nut or stud. The sealant will prevent correct electrical conductivity of the stud, and will prevent correct fit of the environmental cap.

C. Installations With 287W1619-Type Seal fittings (Figure 16)

- (1) If there is a gap between the wire bundle and the seal fitting, wrap the wire bundle with a strip of BMS 8-300, Type 1 polyimide foam, or a wiper. Use one piece 0.050-0.75 inch wide, and of sufficient length to fit tightly between the wire bundle and the seal fitting when the wraps are tightly made.
- (2) Compress this wire wrap material and push it into the wire penetration hole if necessary.
- (3) Fill the other wire penetration holes with a coiled and compressed strip of wire wrap material, as shown.
- (4) Apply sealant (as specified by the overhaul instructions or per Table 2) to completely cover the flat face of the fitting, the wire bundle, and the wire wrap material, as shown. It is not necessary to seal between the individual wires, but there must be no voids or bare surfaces of wire wrap material.
- (5) If the clearance between the wire bundle and the seal fitting is not sufficient to wrap the wire bundle, fill the space with sealant.
- (6) If the gap between the wire bundle and the seal fitting is not sufficient to fill with sealant, put the wire bundle into the seal fitting and apply sealant to the other side as shown. It is not necessary to seal between the individual wires.

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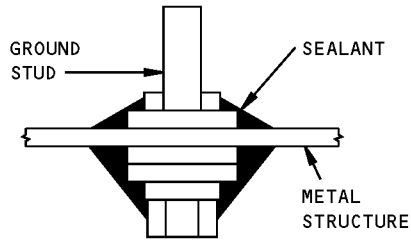


Wire Bundle Sealing
Figure 14

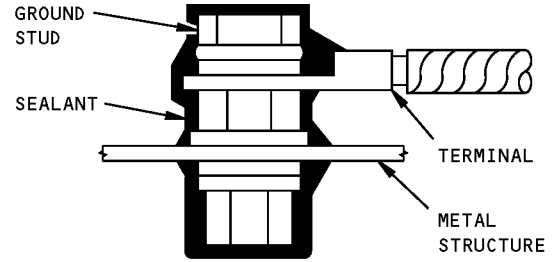
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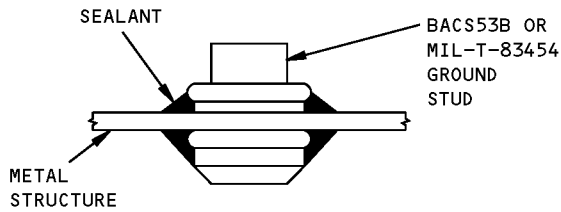


WITHOUT TERMINAL

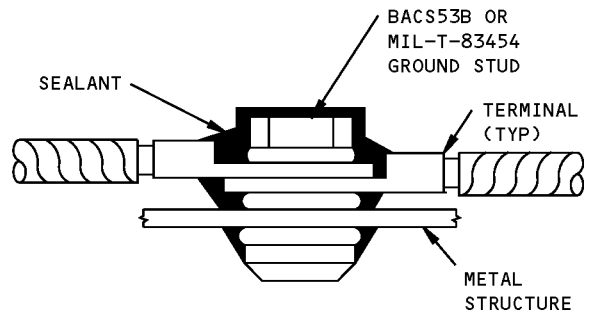


WITH TERMINAL

STANDARD GROUND STUDS

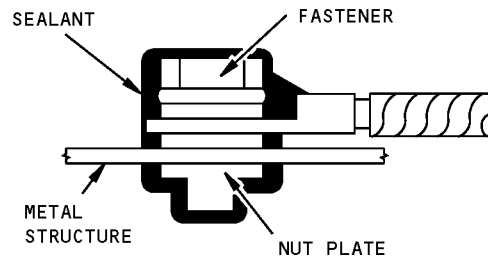


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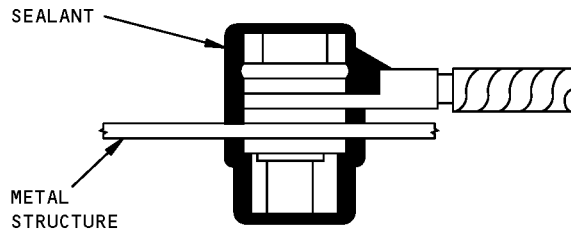


WITH TERMINAL

BACS53B OR MIL-T-83454 GROUND STUDS



TYPICAL TERMINATED GROUND STUD INSTALLATIONS



DIRECT STANDARD GROUND STUD

Sealing of Ground Studs
Figure 15

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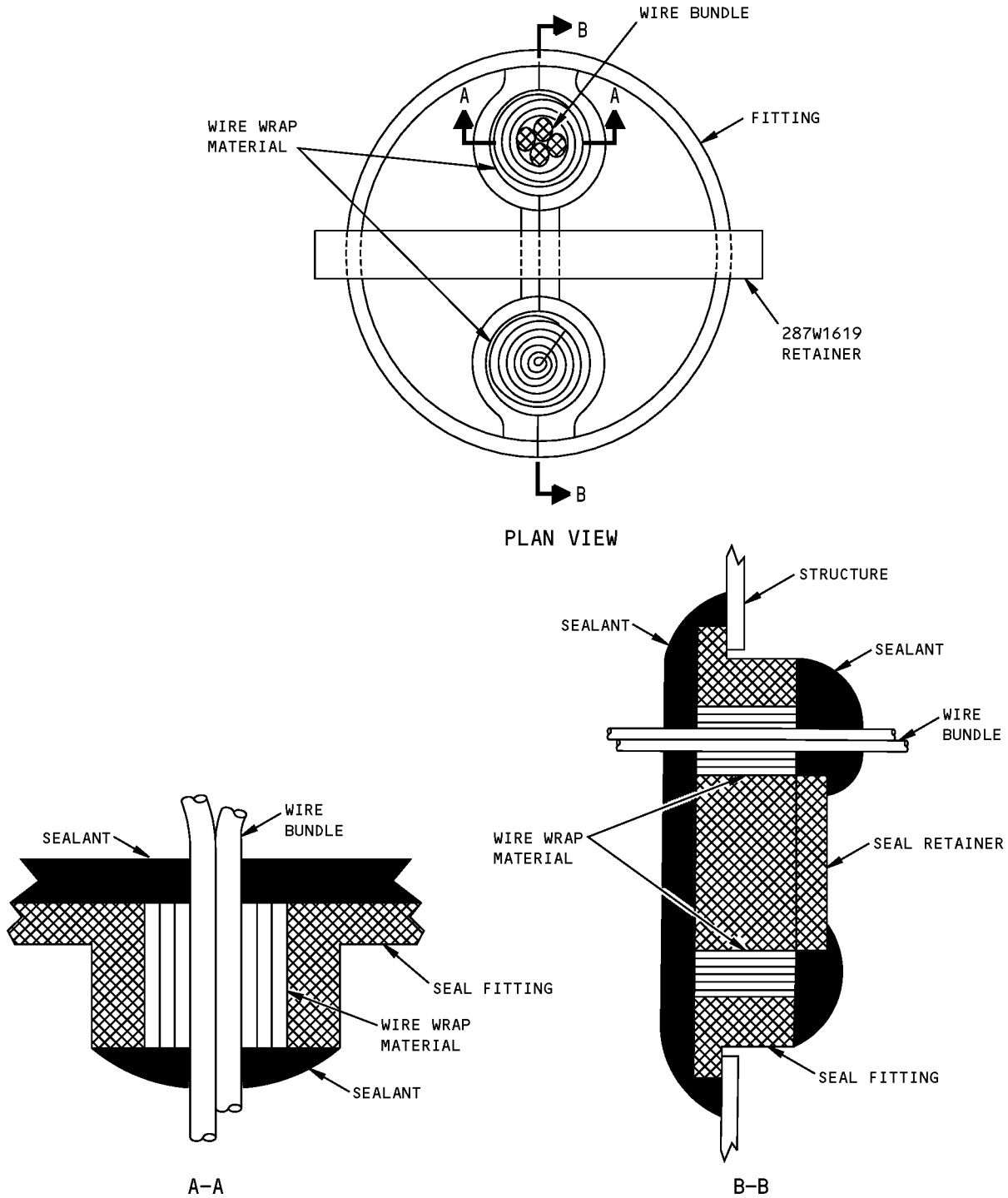
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17. CAULKING

- A. Use this procedure to seal large holes or channels with fiberglass cloth and sealant.
- B. Clean the surfaces per Paragraph 6.
- C. Soak small pieces of clean fiberglass cloth with BMS 5-45, Class B sealant.
- D. Put the soaked fiberglass cloth pieces into the void or channel, then push the pieces down. Put more pieces in, then push them down, until the void or channel is completely filled.
- E. Make the filled surfaces flush with the adjacent surfaces of the part with a fairing tool.

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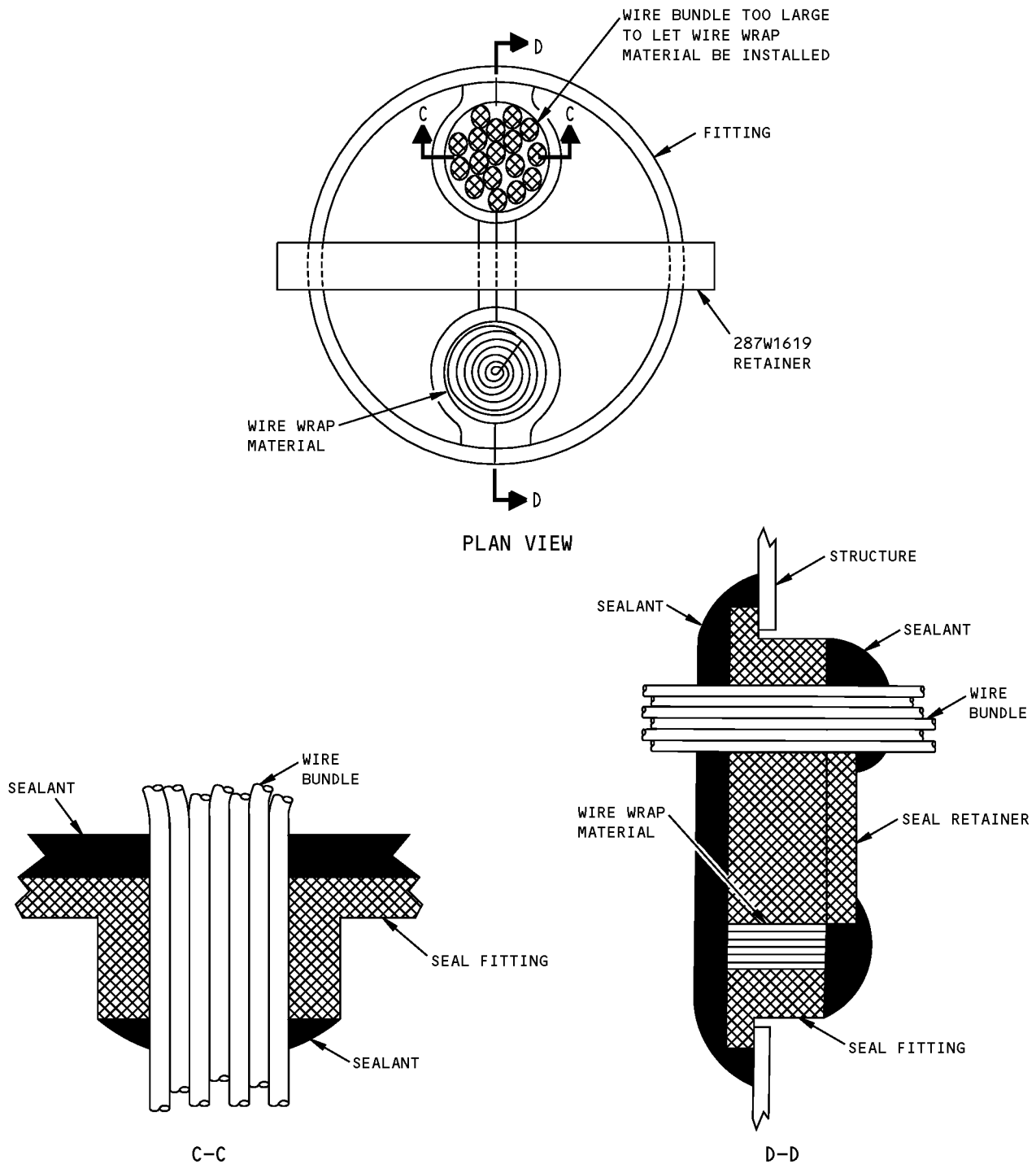
CONFIGURATIONS WITH WIRE WRAP MATERIAL AROUND WIRE BUNDLE

Sealing with 287W1619 - Type Seal Fittings
Figure 16 (Sheet 1 of 2)

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CONFIGURATIONS WITHOUT WIRE WRAP MATERIAL AROUND WIRE BUNDLE

Sealing with 287W1619 - Type Seal Fittings
Figure 16 (Sheet 2 of 2)

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**STANDARD OVERHAUL PRACTICES MANUAL****18. REPAIR OF BULB SEAL ON COCKPIT WINDOW**

- A. Use this procedure to repair cracks or air leaks in the bulb seal. If the bulb seal material contains silicone, be sure to use only silicone sealants or adhesives. Others will not bond to silicone surfaces.
- B. Find and mark the areas which have cracks or air leaks.
- C. Clean the area to be filled. Use the procedures of Paragraph 6.
- D. Get and mix the sealant. If the bulb seal material contains silicone, use Dow Corning 3-6093 or 3-6376 silicone sealant unless the overhaul instructions are different.
- E. Apply the sealant to the areas you found and marked in Paragraph 18.B. Make the sealant smooth with the adjacent bulb seal surfaces until the cracks are gone.
- F. Let the sealant cure.
- G. If the cracks or air leaks are not gone, clean the surfaces and apply more sealant per Paragraph 18.C. through Paragraph 18.F., as necessary.

19. REPAIR OF APPLIED SEALANT

- A. Use these procedures if the new sealant is damaged or was not applied correctly. There are procedures for sealant before and after the application time expires, and a special procedure for problems with edge seals in composites.
- B. Fillets Damaged, Incorrect or Too Small
 - (1) Before the sealant application time expires.
 - (a) Remove the damaged fillets and apply new sealant per Paragraph 13., or
 - (b) Add more sealant, or use a tool to make the fillet correct.
 - (2) After the sealant application time expires
 - (a) Damaged or incorrect fillets
 - 1) Completely remove the fillet. Or cut out the bad areas to let solid sealant stay, as shown in Figure 17. Be sure to cut the sealant with tools that do not contain abrasives, to prevent damage to the surface of the part. Make sure the cuts are clean and include notches for access.
 - 2) Remove loose chunks or flaps of sealant from the cut area.
 - 3) Clean the area per Paragraph 6.
 - 4) Apply new fillets per Paragraph 13.
 - (b) Fillets Too Small
 - 1) Clean the fillet and the adjacent area per Paragraph 6.
 - 2) Apply more sealant and make it smooth with the fillet that was there.
- C. Quick Repair
 - (1) Do not use this procedure to repair silicone sealants. Examples of silicone sealants are:
 - (a) BMS 5-63
 - (b) Dow-Corning Q3-7063, RTV 730, 93-006
 - (c) GE RTV 174
 - (2) Use the procedure of Paragraph 19.B. above and these sealants:
 - (a) BMS 5-45, Class B-1/2
 - (b) BMS 5-95, Class B-1/2

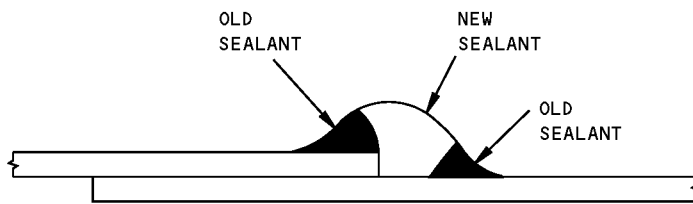
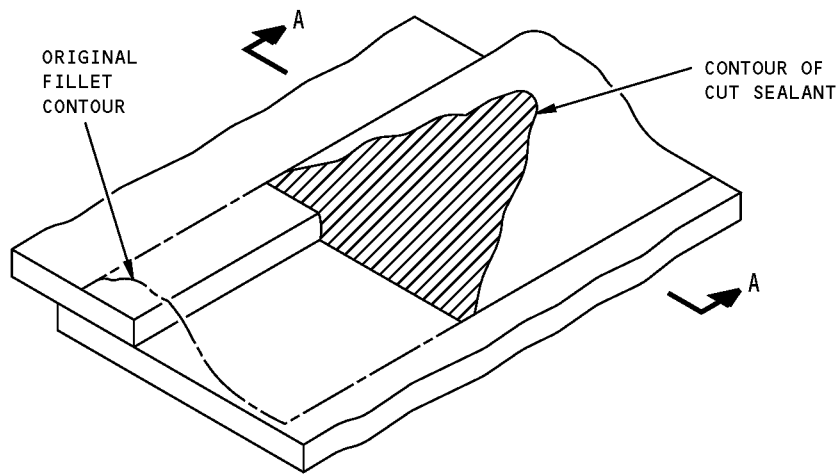
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- (c) PR-1826, Class B-1/2 or B-1/4 (but not on clad aluminum)
 - (d) PR-1828, Class B-1/2 or B-1/4
 - (3) For the PR-1826 sealant, a primer is necessary on all surfaces.
 - (4) The PR-1828 sealant will bond to most surfaces. On clad aluminum, you can rub the surface with Scotch-Brite until the surface is dull, to make a better bond.
 - (5) Do not apply the PR-1826 or PR-1828 sealants on or near acrylic windows or other acrylic components. These sealants can cause crazing of acrylics.
- D. Problems With Edge Seals on Composite Surfaces.
- (1) Sealant on surfaces where it is unwanted – If the material is 0.001 inch thick or less, it can stay. If the material is more than 0.001 inch thick, remove the material as necessary to decrease the thickness to 0.001 inch or less. Be careful not to damage the composite surface under the sealant.
 - (2) Surface scratches are permitted in the edge seal if they do not go through to the surface of the part.
 - (3) Missing sealant from the edges – Solvent clean the areas. Lightly sand, then solvent clean the surfaces again. If there is primer on the surfaces, it can stay. Apply more sealant and let it cure per Paragraph 15.F.
 - (4) Surface pits, depressions, and edges with primer applied over the edge seal – Solvent clean the areas. Lightly sand, then solvent clean the surfaces again. Apply more sealant and let it cure per Paragraph 15.F.
 - (5) Surfaces rough or with high spots – Sand the local area to remove the defects. Do not sand into fibers. Apply more sealant only if this makes the composite surface bare.



STANDARD OVERHAUL PRACTICES MANUAL



A-A

Fillet Repair
Figure 17

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