



# **STANDARD OVERHAUL PRACTICES MANUAL**

## **HOW TO MAKE AND INSTALL MOLDABLE PLASTIC SHIMS**

**PART NUMBER  
NONE**

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## STANDARD OVERHAUL PRACTICES MANUAL

Revision No. 8  
Jul 01/2009

To: All holders of HOW TO MAKE AND INSTALL MOLDABLE PLASTIC SHIMS 20-50-23.

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

Description of Change

NO HIGHLIGHTS

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HIGHLIGHTS

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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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## STANDARD OVERHAUL PRACTICES MANUAL

### HOW TO MAKE AND INSTALL MOLDABLE PLASTIC SHIMS

#### 1. INTRODUCTION

- A. The data in this subject comes from Boeing Process Specification BAC5332. 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. Plastic shims – BMS 8-338
- B. Parting materials
  - (1) Fluorinated ethylene propylene (FEP) film
  - (2) Scotch YR-5498 Teflon tape, V76381
  - (3) Permacel P-422 Teflon tape, V99742
  - (4) Scotch 8402-2 mylar tape, V76381
  - (5) Scotch YR-866 tape, V76381
  - (6) Taconic 6083-03, V59688
  - (7) Permacel 11, V99742
  - (8) Permacel 733, V99742
  - (9) HS8171 PS, V0F451
  - (10) Tooltec A003, V53912
  - (11) Flash Breaker No. 2, V53912
  - (12) Teflon tubing AWG Size X
- C. Liquid release agents
  - (1) FreKote 48NC, V1JB33 or V51257
  - (2) FreKote 55NC, V1JB33 or V51257
  - (3) FreKote C200 or C210, V1JB33 or V51257
  - (4) FreKote 700, V1JB33 or V51257
  - (5) FreKote 710NC, V1JB33 or V51257
- D. Solvent cleaners (SOPM 20-60-01)
  - (1) BMS 11-7
  - (2) Methyl ethyl ketone (MEK)
  - (3) MEK and sec-Butyl alcohol, 42:58 volume percent
  - (4) 1,1,1 trichloroethane and MEK, 1:1
  - (5) Methyl propyl ketone (MPK)
  - (6) FCC-55, V87664
- E. Alkaline cleaners

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- (1) Airtech 23, V61102
  - (2) Daraclean 211, V04552
  - (3) Fleetline JC5, V44389
- F. Wipers - BMS 15-5, Class A (SOPM 20-60-04)
- G. Marking pens and pencils
- (1) C-Tex silver 1843, V73781
  - (2) Marsh 88, V38512
  - (3) Pentel 100W or 100WS, V53302
  - (4) Sharpie 30001, V86874
- H. Flash and masking tapes
- (1) Masking tape (SOPM 20-60-04)
  - (2) Permacel P-422 tape, V99742
  - (3) Scotch 8402 mylar tape, V76381
  - (4) Scotch YR-866 polyester tape, V76381
  - (5) Flash Breaker No. 2, V53912
  - (6) Flash Breaker No. 2R, V53912
- I. Miscellaneous
- (1) Super 77 spray adhesive, V76381
  - (2) 40 Durometer (Shore A) EPDM methylene propylene elastomer, adhesive backed (non-silicone adhesive)
  - (3) Pemko P261 weatherstrip

### 3. **EQUIPMENT**

**NOTE:** Equivalent substitutes can be used.

- A. Air bladder tools

### 4. **GENERAL**

- A. Refer to BAC5322 for details about material storage, tests, and facility requirements.

### 5. **SURFACE PREPARATION**

- A. Bond surfaces

- (1) Alkaline spray clean the surface per Paragraph 5.C., or solvent clean the surface by the General Cleaning procedure of SOPM 20-30-03, with the solvents given above.
- (2) Always clean an area larger than that to get the shim.
- (3) Immediately before you install the shim, solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03, with the solvents given above.
- (4) Give the cleaned bond surfaces protection from contamination.
- (5) Composite (without peel ply)
  - (a) Sand with 150 grit or finer abrasive paper or cloth. Sand to remove a minimum of 70 percent of the gloss. Be careful not to damage or sand down to the fibers.
  - (b) Solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03.

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- (6) Composite (with peel ply)
    - (a) Remove the peel ply immediately before you apply the shim. If the shim cannot be immediately applied after you remove the peel ply, give the surface protection with FEP film.
    - (b) If you removed the peel ply but did not give the surface protection, or you used a flash/masking tape on it for protection, solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03 immediately before you apply the shim.
  - (7) Primed surfaces – Solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03 immediately before you apply the shim.
  - (8) BMS 10-60 enamel
    - (a) Lightly sand the surface to remove all surface gloss.
    - (b) Solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03 immediately before you apply the shim.
  - (9) Bondable Tedlar – Solvent clean the surface by the Final Cleaning procedure of SOPM 20-30-03 immediately before you apply the shim.
- B. Mating surfaces**
- (1) Parting film or liquid release agent is necessary on these surfaces to prevent a bond with the shim.
  - (2) Clean the surfaces immediately before you apply the parting film or liquid release agent. Alkaline spray clean the surface per Paragraph 5.C., or solvent clean the surface by the General Cleaning procedure of SOPM 20-30-03, with the solvents given above.
  - (3) To prevent contamination of bond surfaces, be sure to apply the release agent only to the mating surfaces.
  - (4) Application of parting film
    - (a) Apply the of parting film to the mating surface (Figure 1). Apply it without wrinkles or bubbles.
    - (b) You can use a spray adhesive to help hold the film against structure.
  - (5) Application of liquid release agent
    - (a) Apply the agent to the mating surface (Figure 1). Do not apply the agent to surfaces to later get sealants, finishes, or adhesives. To help prevent accidental contamination of such surfaces, try not to apply the agent in the same shop area as where you will apply the later finishes or materials. Be sure to identify the surfaces to get the shim before you apply the agent, because you cannot usually see the agent on the surfaces.
    - (b) See the table below for the minimum number of layers to apply and how to bake or cure the agent.

| AGENT        | MINIMUM NUMBER OF LAYERS | CURE   |
|--------------|--------------------------|--|
| Frekote 48NC | 3 <sup>*[1]</sup>        | Air dry 3 hours minimum at 65-75°F or 15 minutes minimum at 240-260°F. |
| Frekote 55NC | 3 <sup>*[2]</sup>        | Air dry 30 minutes minimum at 65°F or above                            |

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| AGENT         | MINIMUM NUMBER OF LAYERS | CURE   |
|---------------|--------------------------|--|
| Frekote C200  | 5 <sup>*[1]</sup>        | Bake for 40 minutes minimum at 130-150°F, 20 minutes minimum at 200-220°F, or 15 minutes minimum at 240-260°F. |
| Frekote 700   | 3 <sup>*[1]</sup>        | Air dry 15 minutes minimum at 60°F or above  |
| Frekote 700NC | 3 <sup>*[1]</sup>        | Air dry 15 minutes minimum at 65°F or above  |
| Frekote 710NC | 3 <sup>*[1]</sup>        | Air dry 15 minutes minimum at 65°F or above  |

\*[1] Let the agent dry 15 minutes minimum between layers

\*[2] Let the agent dry 5 minutes minimum between layers

### C. Alkaline cleaning

- (1) Mix alkaline cleaner with 3 to 5 volumes of water. Apply the solution with spray equipment and scrub brushes.
- (2) Let the surfaces soak approximately 5 minutes. Do not let the cleaner dry on the surfaces. Apply more solution to keep the surfaces wet.
- (3) Rinse fully with clean warm water. Use a pressure spray or flush. Rinse a minimum of three times.
- (4) Visually examine the surfaces to make sure the dirt is gone. Clean again if necessary.
- (5) Let the surfaces dry fully to make sure the shim material will make a good bond. Use oil-free, water-free compressed air to help dry the surfaces faster.

## 6. SHIM PREPARATION

- A. Let the shim material adjust to room temperature before you open containers or mix the material.
- B. Mix the shim material fully, by the vendor's instructions, or until the color is constant and there are no streaks. The application time (pot life) and squeeze-out time start immediately when you mix the shim material.
- C. Before you apply shim material to a good part, squeeze out 1-4 linear inches of shim material from the applicator tube, because the shim material at the tip of the tubes could be not fully mixed. Such material will not cure completely.

## 7. SHIM INSTALLATION

- A. Preassembly and gap measurement
  - (1) Temporarily put the parts together and drill holes for fasteners as necessary. Holes for temporary fasteners are not necessary if an air bladder tool is used.
  - (2) Disassemble the parts. Remove burrs from fastener holes. Clean the parts.
  - (3) Assemble the parts again. If you use an air bladder tool, put the parts in position, then install the air bladder tool. Make sure all tools are in position to hold up the backside of the unit before you inflate the air bladders. Then apply the temporary load as specified by the overhaul instructions and hold this during gap measurement.
  - (4) Measure all gaps. Make a note of all areas to get shims, and their gap widths.

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- (5) If necessary to identify the areas on a part for flash or masking tape, be sure to use an approved marker.
  - (6) Disassemble the parts.
- B. Solid shim installation
- (1) Make a solid shim (SOPM 20-50-20) and to agree with Figure 3.
  - (2) Clean and prepare the bond surfaces per Paragraph 5.A.
  - (3) Prepare the moldable plastic shim material per Paragraph 6.
  - (4) Apply a thin continuous layer of the plastic material (approximately 10 mils, 0.010 inch or 0.25 mm) to each mating surface.
  - (5) Install the solid shim and apply pressure to make sure all of the surfaces touch. Make sure the solid shim is the minimum distance from the part edges, as shown in Figure 3, to make sure it is completely encapsulated by the plastic shim material. Be sure to complete this assembly in 5 minutes or less, before an amine skin can occur on the shim material.
  - (6) Remove unwanted plastic shim material, before it cures, with a clean wiper wet with solvent. Do not let solvent get into the bond line.
  - (7) Let the plastic shim material cure until the solid shim is tightly bonded. To make the cure faster, you can locally apply heat to the area.
  - (8) Drill temporary fastener holes through the shim if necessary.
- C. Structure preparation
- (1) Clean and prepare the bond surfaces per Paragraph 5.A. Apply flash/masking tape to the structure. Be sure to go out more than the possible squeeze-out area of the plastic shim material. If necessary, use rubber dams to control the pushed out shim material, as shown in Figure 2.
  - (2) Clean and prepare the mating surfaces per Paragraph 5.B.
- D. Plastic shim application
- (1) Prepare the plastic shim material per Paragraph 6.
  - (2) Apply the shim material to the bond surface. Be careful not to catch air. Fill the gaps in the assembled mating surfaces. Apply the mixed shim material within its 20-minute maximum application time. Discard shim material you will not use. Do not try to freeze it for future jobs.
  - (3) After you apply all of the shim material to the structure, make a sample coupon of the shim material, 0.05-0.125 inch thick. Label it and put it on the structure. Do hardness tests on this coupon per ASTM D 2240.
  - (4) Assemble the parts again.
- E. Temporary load application
- (1) Apply the temporary load to the unit as specified by the overhaul instructions.
    - (a) If there are temporary fasteners, give them the protection of a parting material or release agent. Then install the fasteners. Start in the center of the part and work out to the ends.
    - (b) If you use an air bladder tool, put the parts in position, then install the air bladder tool. Make sure all tools are in position to hold up the backside of the until before you inflate the air bladders. Then apply the temporary load. Keep the load on until the shim material is cured.

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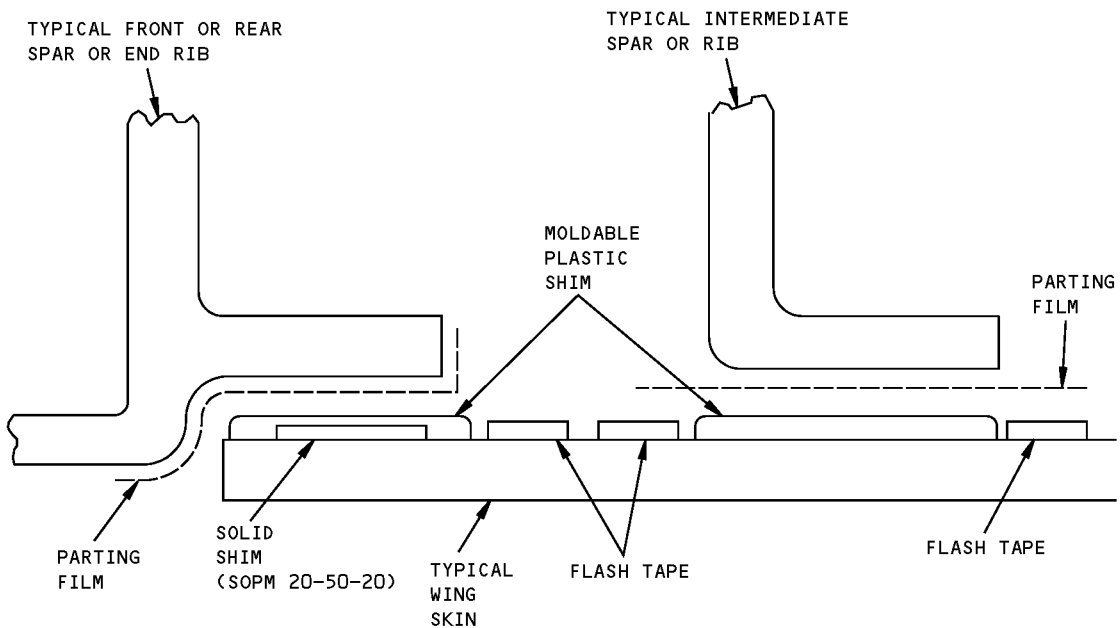
## STANDARD OVERHAUL PRACTICES MANUAL

- (c) Remove unwanted plastic shim material with fairing tools or a clean wiper wet with solvent. Make the edge of the shim approximately as shown in Figure 3. Do not let solvent get into the bond line.
- F. Cure the plastic shim material
- (1) Cure the shim material to a minimum Shore D hardness of 75 before you remove the temporary load or drill holes for fasteners through the shims. Use the coupon as a specimen for the hardness tests.
  - (2) You can use heat from lamps, heat guns and hot air blowers to make the cure faster, but:
    - (a) Keep the heat sources a minimum of 13 inches (33 cm) from the plastic shim material.
    - (b) Use thermocouples or other approved temperature measuring devices. Put the thermocouples within one inch (2.5 cm) of the shim and sample coupon, with a minimum of one thermocouple per 4 linear feet (120 cm).
    - (c) Do not let the temperature get hotter than 140 degrees F. (60 degrees C).
  - (3) You can use heat blankets to make the cure faster, but:
    - (a) The blankets must have no visual wear or damage.
    - (b) Make a check of the blanket resistance immediately before you use it. The blanket resistance must not be more than 3.5 percent different than the last time the blanket was approved.
    - (c) Use a minimum of 3 thermocouples, with a minimum of one thermocouple per 4 linear feet (120 cm) on the heat blanket against the part, and one thermocouple against the sample coupon. Connect one of the thermocouples on the part to the controller. Be sure to monitor all of the thermocouples.
    - (d) If the heat blankets will be squeezed by a pressure device, such as an air bag or a clamp on the backup plate, monitor the blanket with a thermocouple at every one foot (30 cm), unless the heat blanket has a fail-safe device to stop runaway temperatures that will damage the part.
    - (e) Do not let the plastic shim material get hotter than 140 degrees F. But the blanket could be hotter.
- G. Drilling and disassembly
- (1) Unless the overhaul instructions are different, disassemble the parts after the shim material is cured. Drill holes for fasteners through the shims as specified by the overhaul instructions.
  - (2) As applicable, disassemble the parts. Remove parting film and tape. Solvent clean all mating surfaces to remove release agents and remaining adhesive.
  - (3) Examine the cured shim material. There must be no soft or uncured shim material, surface voids, gouges, or bubbles. Refer to BAC5332 for limits and correction procedures.

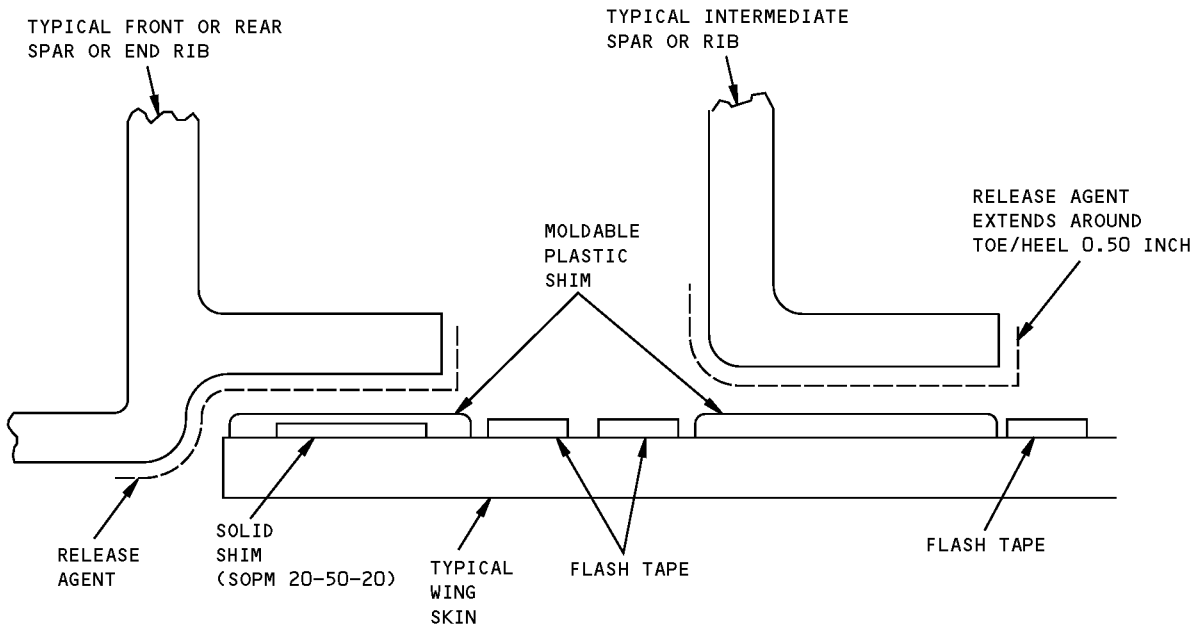
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WITH PARTING FILM APPLICATION

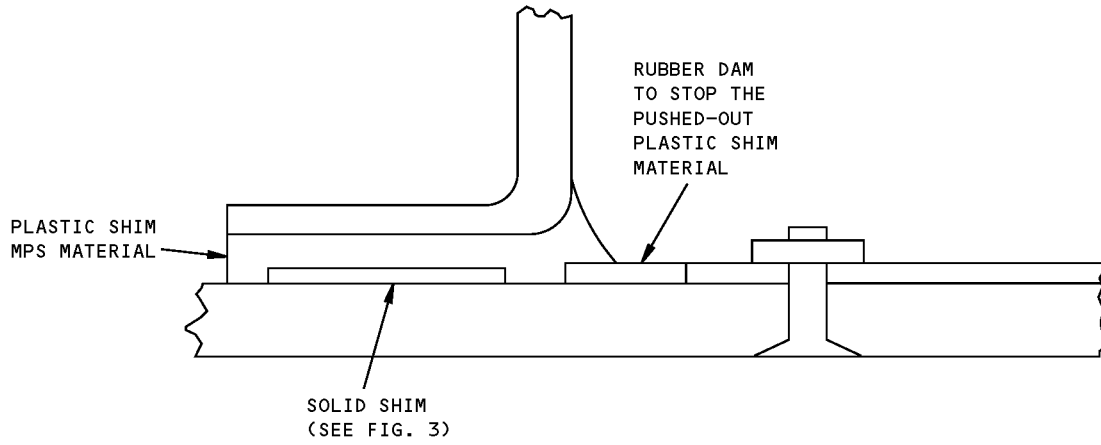


WITH LIQUID RELEASE AGENT APPLICATION

Example Assembly Preparation  
Figure 1

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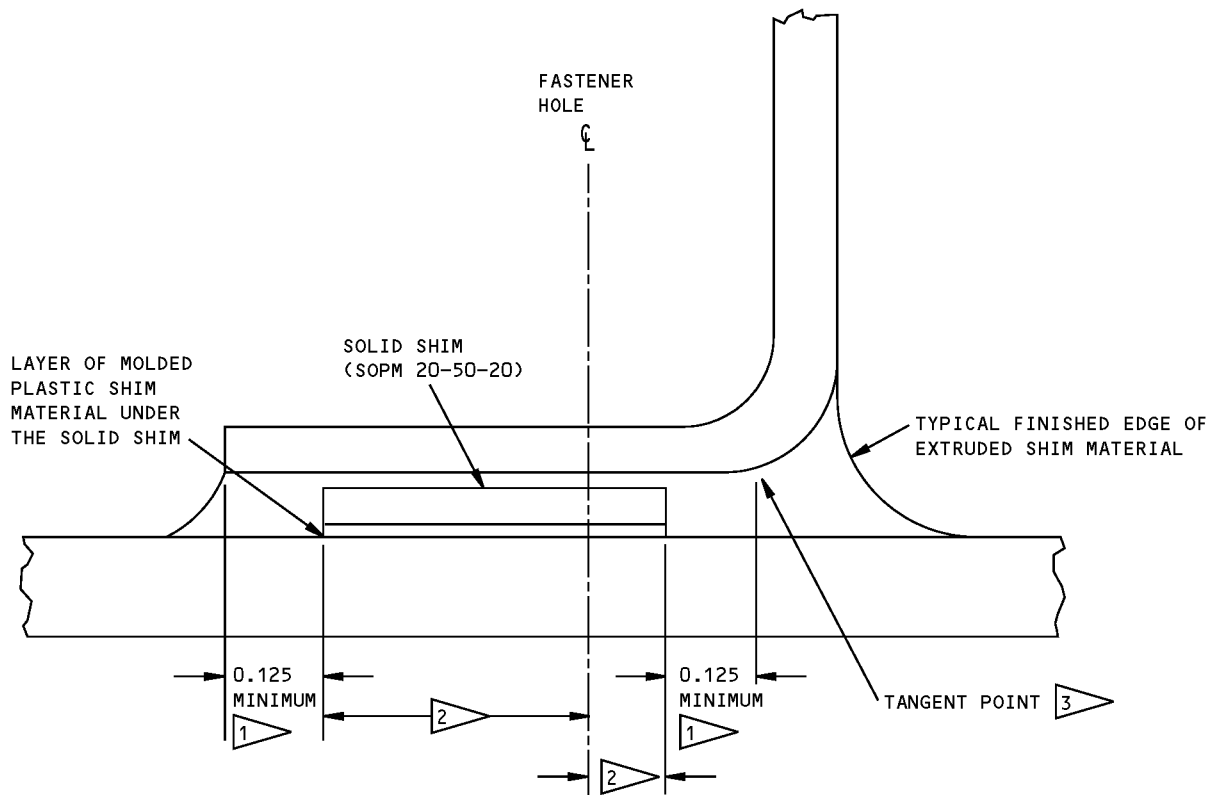
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Control of Pushed-Out Plastic Shim Material  
Figure 2

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- 1 THE SOLID SHIM MUST BE IN THIS MINIMUM DISTANCE FROM THE EDGE OF THE PART OR FROM THE TANGENT POINT OF THE NEAREST RADIUS TO BE SURE IT IS ENCAPSULATED IN THE MOLDED PLASTIC SHIM MATERIAL.
- 2 THE EDGES OF THE SOLID SHIM MUST BE A MINIMUM OF 1.5 TIMES THE HOLE DIAMETER FROM THE CENTERLINE OF THE FASTENER HOLE.
- 3 THE MOLDED PLASTIC SHIM MATERIAL MUST COME OUT TO THE TANGENT POINT OF THE RADIUS. BUT IT IS ACCEPTABLE TO HAVE EXTRUDED SHIM MATERIAL AS SHOWN IF THERE IS NO ACCESS TO REMOVE THE UNWANTED SHIM MATERIAL.

ALL DIMENSIONS ARE IN INCHES

Finished Installation  
Figure 3

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