BOMBARDIER

Toronto (de Havilland)

PROPRIETARY INFORMATION

# PPS 27.03

## PRODUCTION PROCESS STANDARD

# Surface Finishing of Machined Parts

Issue 7
- This standard supersedes PPS 27.03, Issue 6.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

| | | |
|---|---|---|
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| | Production Process Standards (PPS) | |
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## 1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for surface finishing of machined parts.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

## 2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

## 3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 31.17 - Solvent Usage.

## 4 Materials and Equipment

### 4.1 Materials

4.1.1 Abrasive materials as specified below. It is acceptable to use abrasive materials from other suppliers in place of the particular brands specified provided the requirements specified herein are met.

- Aluminum oxide abrasive paper or cloth, 180 - 600 grit (e.g., 3M Canada Ltd.).
- Abrasive straps, 180 - 220 grit, 3M Canada Ltd.
- Abrasive belts, 120 - 220 grit, 3M Canada Ltd.
- Abrasive cones, 180 grit, 3M Canada Ltd.
- Scotch-Brite pads, Type A Fine, 3M Canada Ltd.
- Scotch-Brite polishing wheels, type A medium, Aluminum oxide, 3M Canada Ltd.
- Unitized wheel, Scotch-Brite, 3M Canada Ltd. (see Figure 1). The unitized wheel shall be driven by a suitable drillmotor.

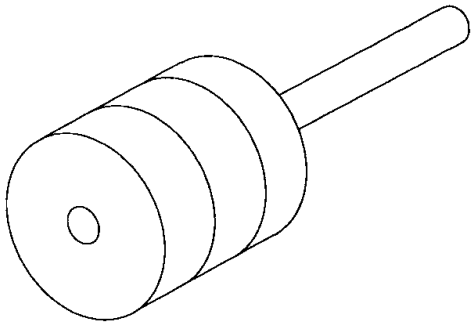

**Figure 1 - Unitized Wheel**

### 4.2 Equipment

4.2.1 Alternative equipment purchased from other suppliers may be used in place of the particular brands specified for the following equipment:

- Metal files, flat, half-round and round (see Figure 2). When using a metal file, use the draw method followed by light sanding if required.
- Richard type scraper, J.B. Reid Industrial Sales (see Figure 3). In order to prevent scratching of adjacent surfaces, all 4 corners of blades for Richard type scrapers shall be ground to a radius of approximately 3/32" prior to use.
- Vibratory sander, pneumatic, National Air Sander Co. (see Figure 4). The vibratory sander utilizes abrasive paper or Scotch-Brite pads (see Materials section, paragraph 4.1.1).
- Strap sander, pneumatic, Dynafile 55, Dynablade Co. (see Figure 5). The strap sander utilizes abrasive straps (ref. 4.1.2.2).

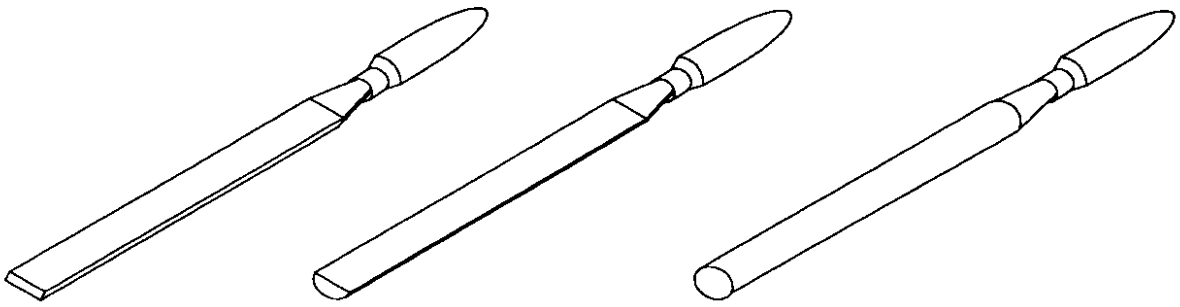


**Figure 2 - Metal Files**

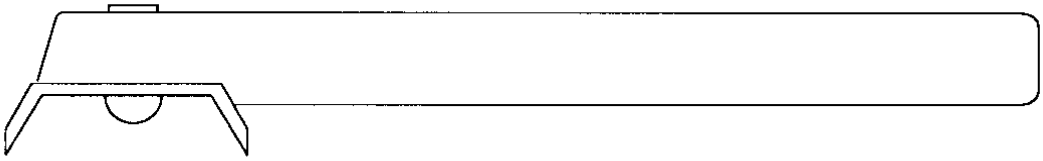

**Figure 3 - Richard Scraper**

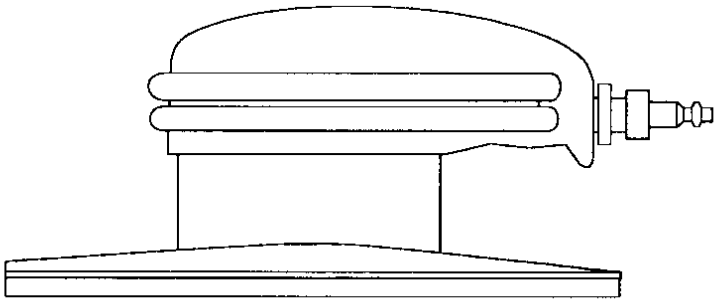

**Figure 4 - Vibratory Sander**

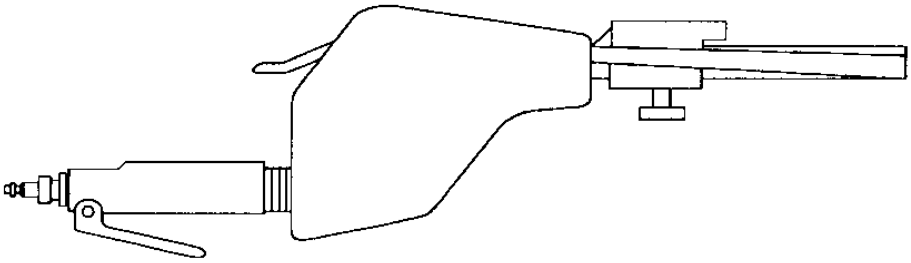

**Figure 5 - Strap Sander**

## 5 Procedure

### 5.1 General

5.1.1 Surface shapes resulting from machined contours shall be classified as *rework required* or *no rework required* according to the requirements specified on the engineering drawing. If the engineering drawing does not specify any particular requirements regarding the rework of surface shapes resulting from machined contours, classify shapes as *rework required* or *no rework required* according to Table 1.

5.1.2 The appearance of a shape resulting from machined contours should not be considered cause for rework if measurement of the shape reveals that the defect can be classified as no rework required according to the requirements of the engineering drawing or Table 1, as applicable.

5.1.3 Shapes resulting from machined contours shall be evaluated as rework required or no rework required by means of suitable measurement equipment such as dial gauges, micrometers, etc.

**Table 1 - Classification of Shapes Resulting from Machined Contours**

| TYPE OF SURFACE (Note 1) | SHAPE RESULTING FROM MACHINED CONTOURS | SIZE OF SHAPE (Note 2) | REWORK REQUIRED (Note 3) |
|---|---|---|---|
| Machined, non-attaching surface | Mismatch | less than 0.005" | No rework required |
| | | 0.005" - 0.010" | Blend according to section 5.2.2 |
| | | over 0.010" | Refer to MRB (Materials Review Board) for disposition |
| | Machined radius | less than 0.060" | Blend according to section 5.2.3 |
| | | 0.060" or greater | No rework required |
| Machined, attaching surface | Mismatch | less than 0.010" | Remove mismatch according to section 5.2.4 |
| | | over 0.010" | Refer to MRB (Materials Review Board) for disposition |
| Milled pocket or channel | Mismatch | less than 0.005" | No rework required |
| | | 0.005" - 0.010" | Blend according to section 5.2.2 |
| | | over 0.010" | Refer to MRB (Materials Review Board) for disposition |
| | Protrusion (i.e., ridges, pyramids & plateaus - see Figure 6) | 0.000" - 0.030" | No rework required |
| | | over 0.030" | Smooth according to section 5.2.5 |

Notes:
1. If the engineering drawing does not specify whether a particular surface is an attaching or non-attaching surface and there is doubt, contact Liaison Engineering.
2. The *rework required* and *no rework required* shape size dimensions specified in this table only apply when the engineering drawing does not otherwise specify.
3. When reworking, remove only as much material as is necessary to meet the specific requirements of the engineering drawing or this standard.

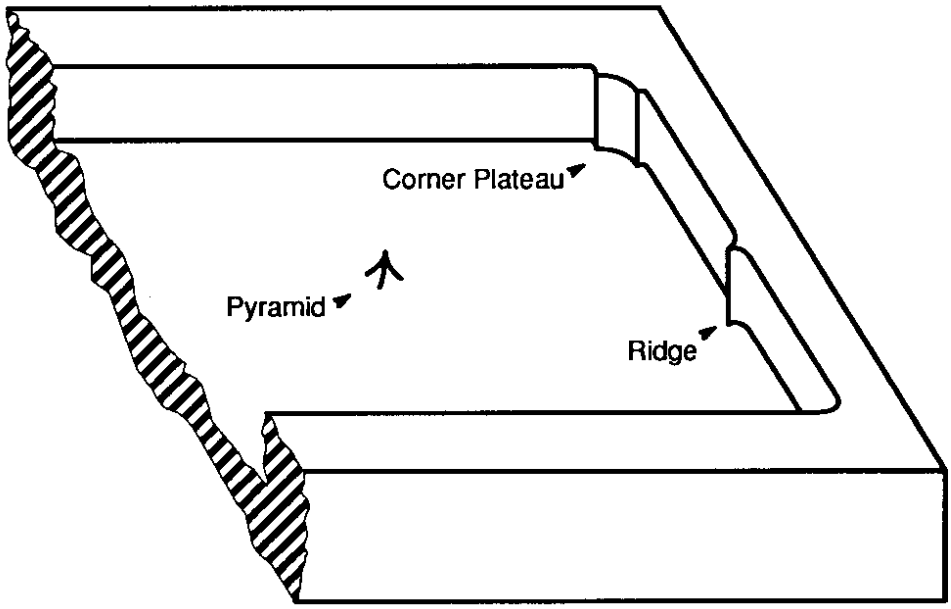


**Figure 6 - Shapes Resulting from Machined Contours in Milled Pockets**

## 5.2 Rework of Shapes Resulting from Machined Contours

### 5.2.1 General

5.2.1.1 Blending, removal and smoothing of shapes resulting from machined contours shall be performed using the appropriate abrasive materials and equipment specified in section 4.

5.2.1.2 When reworking shapes resulting from machined contours, remove only the amount of material required to meet the requirements of the engineering drawing or this standard.

### 5.2.2 Blending of Mismatches

5.2.2.1 Unless otherwise specified on the engineering drawing, on machined non-attaching surfaces any mismatch greater than 0.005" shall be blended as shown in Figure 7.

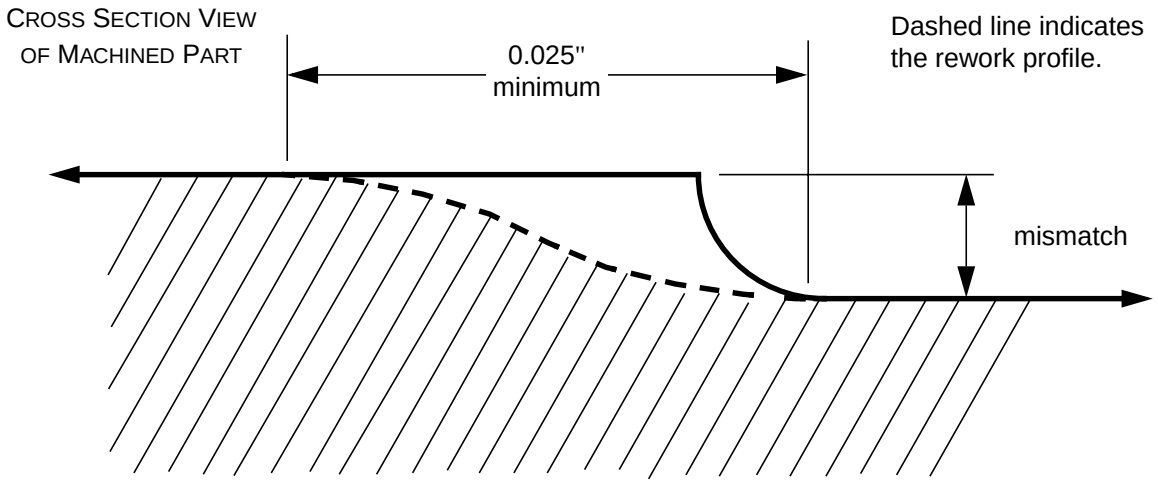


**Figure 7 - Blending of Mismatches**

### 5.2.3 Blending of Tight Radii

5.2.3.1 Unless otherwise specified on the engineering drawing, on machined non-attaching surfaces a machined radius less than 0.060" shall be blended as shown in Figure 8.

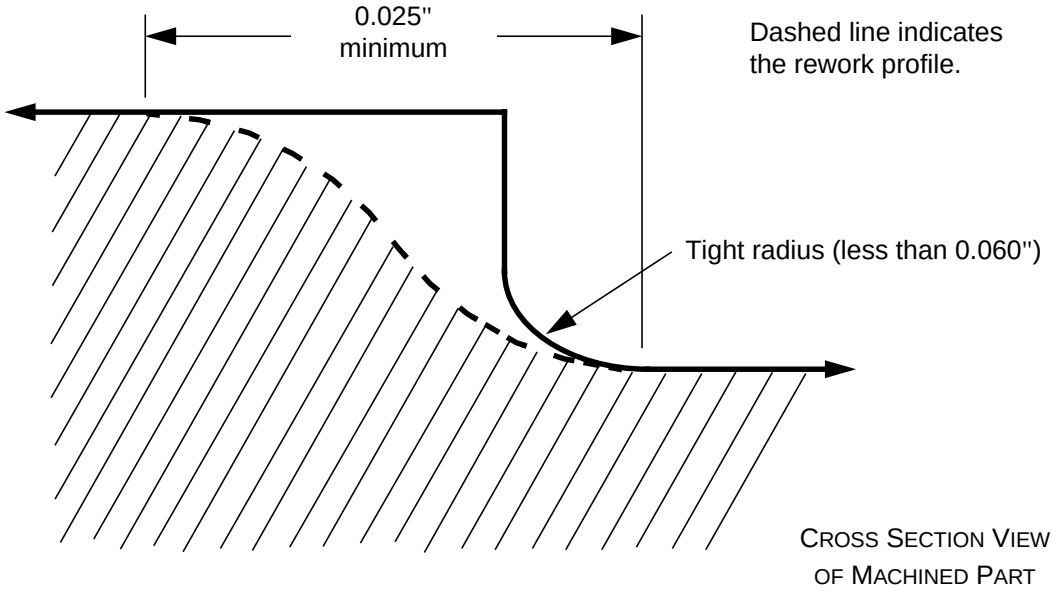


**Figure 8 - Blending of Tight Radii**

### 5.2.4 Removal of Steps

5.2.4.1 Unless otherwise specified on the engineering drawing, on machined attaching surfaces any mismatch shall be removed as shown in Figure 9.

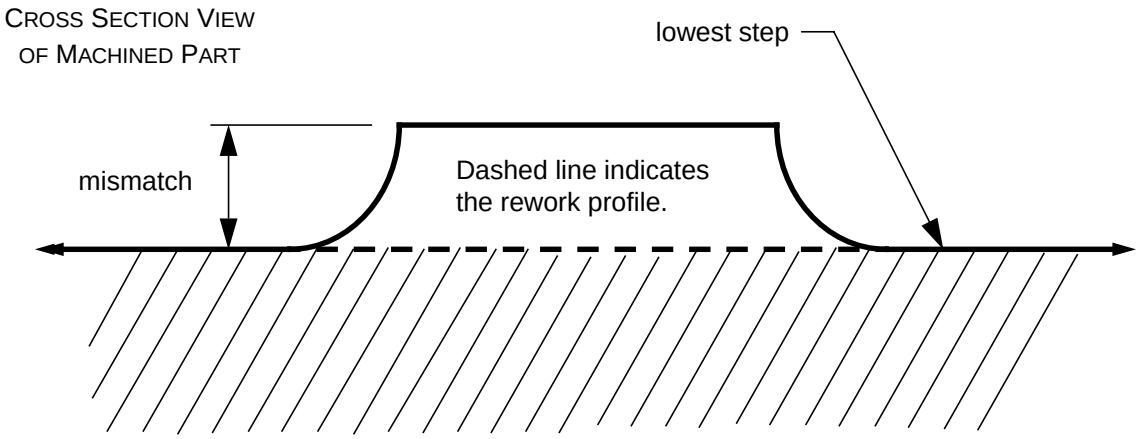


**Figure 9 - Removal of Steps**

### 5.2.5 Smoothing of Protrusions

5.2.5.1 Unless otherwise specified on the engineering drawing, protrusions (i.e., ridges, pyramids & plateaus) over 0.030" high shall be smoothed as shown in Figure 10 or Figure 11, as applicable.

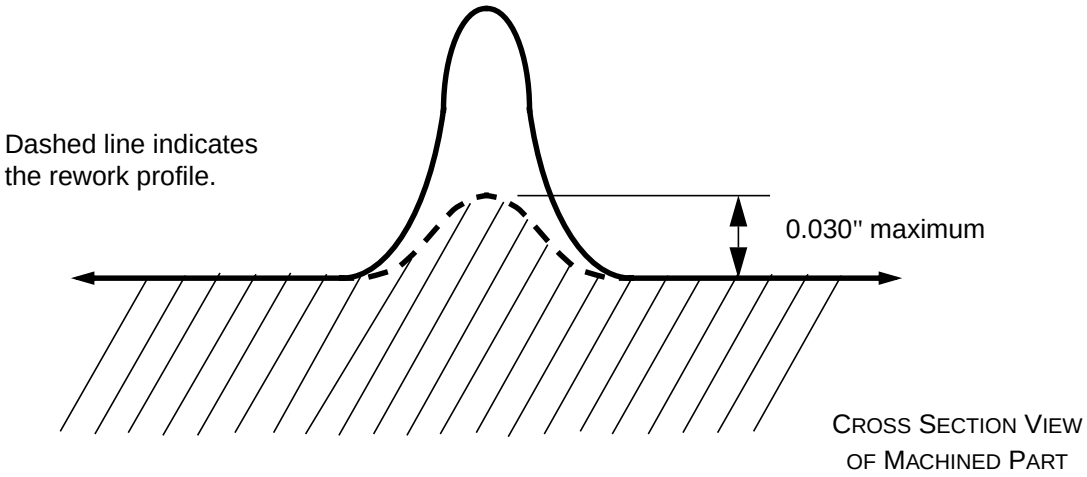


**Figure 10 - Smoothing of Ridges and Pyramids**

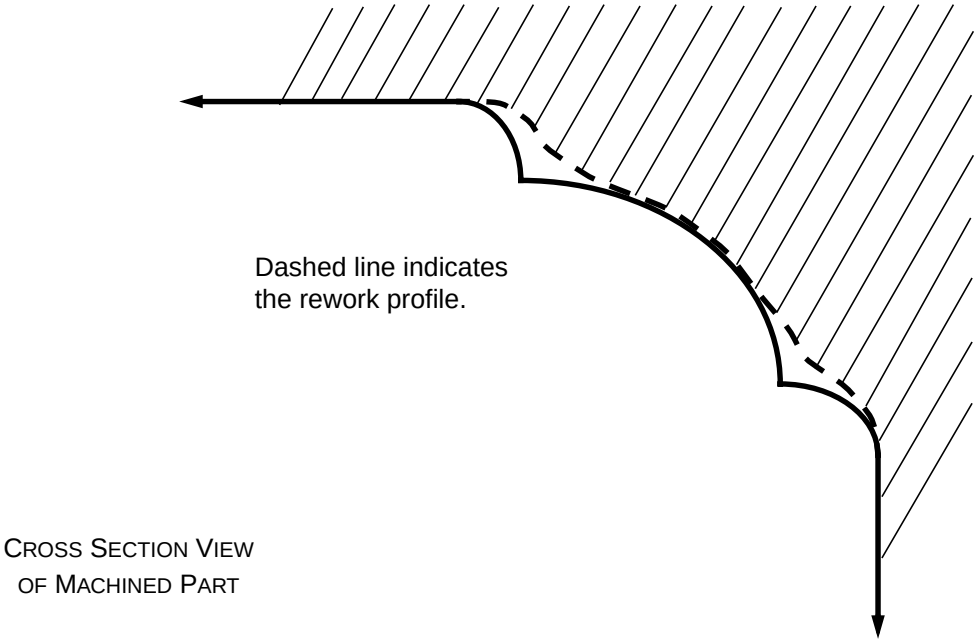


**Figure 11 - Smoothing of Corner Plateaus**

### 5.3 Rework of Processing Flaws in Machined Parts

5.3.1 Blend/polish out processing flaws such as isolated tool marks, notches, scratches, ridges, clamp marks, surface tears, etc. which are over 0.001" deep as follows:

Step 1. Remove burrs and pile-up using a curved metal scraper, taking care not to remove excess material.

Step 2. Mask off the area surrounding the defect with masking tape to minimize the rework and to protect the surrounding material.

Step 3. Radius, smooth and blend the defect as shown in Figure 12, using 400 - 600 grit abrasive paper or cloth wrapped around a suitably shaped rubber sanding block. Remove only sufficient material to ensure complete removal of the defect.

Step 4. Remove the masking tape and clean off all residue by solvent washing according to PPS 31.17.

Step 5. Manually etch in the area of the repair according to PPS 31.02 to remove 0.0002" - 0.0004" from the surface.

Step 6. Fluorescent penetrant inspect the repair area according to PPS 20.03.

5.3.2 If the minimum thickness requirement specified by the engineering drawing cannot be maintained, refer the part to MRB for disposition.

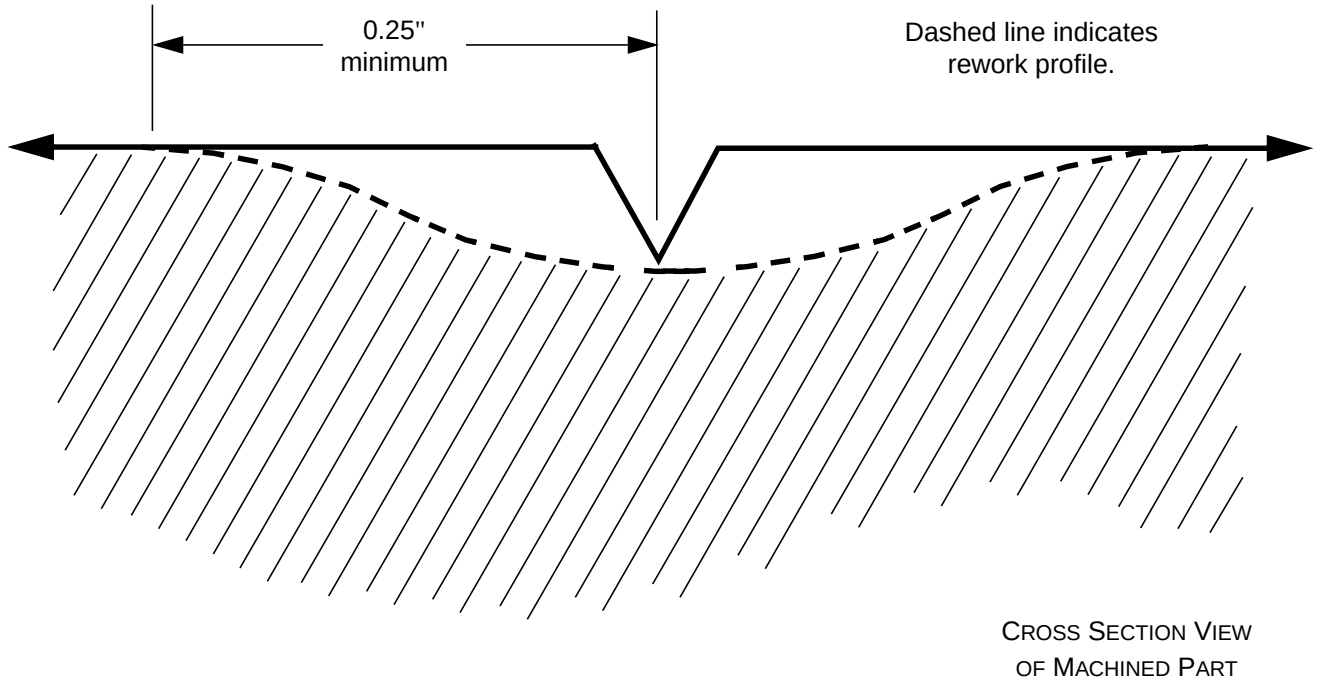


**Figure 12 - Blending/Polishing Out of Processing Flaws**

### 5.4 Post Rework Treatment

5.5 After any rework, for surfaces which had received a protective treatment (i.e., chemical conversion coating, anodized, etc.), touch up in the area of the rework with the coating specified by the engineering drawing.

## 6 Requirements

6.1 On completion of rework, ensure that the surface roughness of the reworked area and surroundings does not exceed the value specified on the engineering drawing.

6.2 Any surface shape resulting from machining contour, acceptable without rework or reworked according to this PPS, must meet the dimensional requirements of the engineering drawing.

## 7 Safety Precautions

**7.1 Observe general shop safety precautions when performing the procedure specified herein.**

**7.2 Disconnect air lines from pneumatic sanding equipment when changing the abrasive belt, strap, pad, etc.**

## 8 Personnel Requirements

8.1 Personnel responsible for surface finishing of machined parts must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

## 9 Care of Equipment

9.1 When replacing an abrasive belt or strap, ensure that the arrow on the belt or strap is pointing in the direction of rotation.