BOMBARDIER

Toronto (de Havilland)

PROPRIETARY INFORMATION

PPS 17.02

PRODUCTION PROCESS STANDARD

Abrasive Blasting

Issue 13
- This standard supersedes PPS 17.02, Issue 12.
- Vertical bars 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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	Quality	

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for dry abrasive blasting of aircraft 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.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

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 16.01 - Application of Hard and Soft Film (F13) Corrosion Preventive Compound.

3.3 PPS 24.01 - Aluminum Wire Spray Coating (M1).

3.4 PPS 24.02 - Ion Vapour Deposited Aluminum Coating (M2).

3.5 PPS 27.06 - Decorative Surface Finishes.

3.6 PPS 31.04 - Degreasing Processes.

3.7 PPS 31.05 - Surface Treatment of Corrosion Resistant Steel.

3.8 PPS 31.07 - Cleaning and Stripping of Painted Surfaces.

3.9 PPS 31.17 - Solvent Usage.

3.10 PPS 32.07 - Corrosion Protection of Magnesium Alloys.

3.11 PPS 34.20 - Application of F42 Urethane Enamel.

4 Materials and Equipment

4.1 Materials

4.1.1 Abrasive blast media as specified in section 5.4. Store all abrasives used for abrasive blasting under moisture free conditions.

4.2 Equipment

4.2.1 The abrasive blast facilities available in-house at Bombardier Toronto (de Havilland) are as specified below. Alternate blasting equipment, operated according to the manufacturer's specifications, may be used provided that the requirements of this PPS are met.

- Pangborn walk-in abrasive blasting room equipped with ventilation and dust control systems and a re-circulating abrasive grit separator.
- Rumelin abrasive blasting cabinet fitted with a glass viewing door and through hole sleeves for external operation.
- Empire glass bead abrasive blasting cabinet fitted with side doors, a front viewing window and through hole sleeves for external operation.
- Two Vacu-Blast Custom Tumble Basket Cleaning Systems (Model number 700506); abrasive blasting cabinet fitted with side doors, a front viewing window, through hole sleeves for external operation, and an automatic timed tumble basket.

4.2.2 Protective clothing for use with Empire and Rumelin blasting cabinets, including:

- Bombardier Toronto (de Havilland) approved safety glasses
- hearing protectors
- dust masks.

4.2.3 Protective clothing for use inside the Pangborn walk-in abrasive blasting room, including:

- rubber gloves (e.g., DSC 422-4)
- overalls
- ear plugs
- abrasive blast helmet equipped with a regulated, constant flow air supply and fitted with a clear plastic face shield protected by a fine wire mesh screen.

4.2.4 Air supply lines for abrasive blasting equipment equipped with suitable moisture and oil traps.

4.2.5 Blanking plates, plastic plugs and caps, and masking tape, as required.

4.2.6 White cotton gloves (e.g., DSC 422-1).

5 Procedure

5.1 General

5.1.1 Before changing either the type of material being processed or the type of abrasive media being used in a blast facility, it is **IMPERATIVE** that the facility is thoroughly cleaned and that all trace of the old abrasive media is removed. Any residue which remains from the old parts or blast media can seriously damage the new parts. "Changing the type of material being processed" includes, but is not limited to, all of the following situations:

- Blast cleaning parts fabricated from different metals.
- Stripping paint from parts fabricated from different metals.
- Stripping paint from any type of part and blast cleaning any type of part.

5.1.2 At Bombardier Toronto (de Havilland), facilities are used as follows:

- The Pangborn abrasive blasting room with #G40 steel grit is primarily used for carbon and low alloy steel parts which are too large to be cleaned in the Rumelin abrasive blast cabinet.
- The Rumelin abrasive blast cabinet with #G50 cast iron grit is used for general blasting of small carbon and low alloy steel parts which can be readily handled by the operator.
- An Empire glass bead abrasive blast cabinet with glass beads as specified in Table I is used to: a) clean corrosion resistant steel and titanium alloys (these materials can only be blast cleaned using non-ferrous abrasive media); b) produce SF22 Semi-Bright Satin decorative surface finishes on stainless steel according to PPS 27.06; and c) prepare Ultem and Declar thermoplastic surfaces for the application of F42 enamel according to PPS 34.20.
- One Vacu-Blast abrasive blast cabinet is dedicated to aluminum oxide (grit size #220) and is used to prepare the surfaces of all parts before ion vapour deposition of aluminum (IVD aluminum coating).
- Another Vacu-Blast abrasive blast cabinet is dedicated to glass beads (as specified in Table I) and is used to peen the surfaces of all parts after ion vapour deposition of aluminum.

5.1.2.1 Magnesium parts which require abrasive blasting are sub-contracted for such cleaning.

5.2 Limitations on Paint Stripping Using Abrasive Blasting

5.2.1 If steel parts that are ivadized or plated have had paint stripped through abrasive blasting, ensure that the coating has not been damaged before further processing the parts.

5.2.2 Do not use abrasive blasting to strip paint from:

- Sheet aluminum with a thickness of less than 0.080".
- Steel parts with a thickness of less than 0.060".
- Machined aluminum parts (i.e. castings and forgings) with a wall thickness of less than 0.080".

5.3 Preparation of Parts

5.3.1 Refer to Flow Chart 1 for preparation of parts to be abrasive blasted.

5.3.2 Refer to Flow Chart 2 for the abrasive blast process for parts to be IVD aluminum coated.

5.4 Selection of Abrasive Media

5.4.1 For abrasive blasting application other than paint stripping, refer to Table I for the abrasive media types and (where applicable) grit sizes to be used.

Table I - Selection of Abrasive Media

MATERIAL TO BE BLASTED	ABRASIVE MEDIA (NOTE 1)				
	STEEL GRIT #G40 (NOTE 11)	ANGULAR CAST IRON #50 (NOTE 11)	GLASS BEAD (NOTE 2)	ALUMINUM OXIDE (NOTES 4 & 5)	WASHED SILICA SAND
Carbon & Low Alloy Steels (Notes 3, 4 & 6)	Yes	Yes	Yes	Yes	Yes
Aluminum & Aluminum Alloys (Notes 4, 6, 7 & 10)	No	No	Yes	Yes	Yes (Note 8)
Corrosion Resistant Steel (Notes 4, 6 & 9)	No	No	Yes	Yes	Yes (Note 8)
Titanium & Titanium Alloys (Notes 4 & 6)	No	No	Yes	Yes	Yes (Note 8)
Magnesium & Magnesium Alloys (Note 7)	No	No	Yes	Yes	Yes
Copper Alloys (Notes 4 & 6)	No	No	Yes	Yes	No
Ultem & Declar Thermoplastics	No	No	Yes	No	No

Notes
1. Choose abrasive media for cleaning operations such that the surface roughness of the part after cleaning does not exceed drawing requirements.
2. Either AGB-9 glass bead to AMS 2431/6 or Blastolite BT12 glass bead.
3. Except as noted in Note 4, use only #G40 steel grit to abrasive blast AMS 6418 Hy-Tuf parts.
4. Before IVD aluminum coating, use #220 grit Aluminum Oxide, to DSC 460, to grit blast all parts.
5. For applications other than preparation for IVD coating, use Aluminum Oxide grit size #150 or finer.
6. After IVD aluminum coating, use glass beads as specified in this table to lightly peen all parts.
7. Only abrasive blast aluminum or magnesium alloys (excluding castings) if specified on the engineering drawing, Product Specification, or PPS.
8. Use iron free sand only (i.e. not previously used on ferrous parts).
9. Only abrasive blast parts made from Series 300 corrosion resistant steel if specified on the engineering drawing, Product Specification, or PPS.
10. Use aluminum oxide (grit size #100 or finer) to abrasive blast aluminum investment castings before fluorescent penetrant inspection.
11. Do not use steel or cast iron grit abrasive media when abrasive blast cleaning close tolerance machined parts.

5.4.2 To strip paint through abrasive blasting, use cured thermoset polyester styrene plastic media with a hardness of 3.5 Mohs and a sieve size of -20/+30 (i.e., 100% of the media must pass through a size 20 sieve and 0% of the media may pass through a size 30 sieve; the particle size must be between 0.058 and 0.084mm). For metallic parts, as an alternative to stripping paint via abrasive blasting it is acceptable to strip paint by chemical stripping according to PPS 31.07.

5.5 Process Parameters

5.5.1 Use the following parameters for paint stripping through abrasive blasting:

- Maximum blast pressure = 90psi.
- Minimum part-to-nozzle distance = 1".
- Impingement angle = 90°.

5.5.2 Unless otherwise specified by a parameter set up card, engineering drawing, etc., use process parameters as follows for abrasive blasting operations other than paint stripping:

- At Bombardier Toronto (de Havilland), use the process parameters specified in the applicable sub-section of section 5.6
- At other facilities, select process parameters which will meet the criteria specified in section 6.

5.6 Set-Up and Operation of Equipment

5.6.1 Abrasive Blast Room

5.6.1.1 Before abrasive blasting a batch of parts, transfer as many parts of the batch as practical into the abrasive blast room.

5.6.1.2 Before turning on the main air valve, put on the protective clothing specified in paragraph 4.2.3. Connect the abrasive blast helmet air supply line to the air pressure line and adjust the regulator to provide a constant flow of air to the helmet.

5.6.1.3 Immediately before commencing the blasting operation, close and latch the blast room doors. Do not open the blast room doors at any time when abrasive blasting is being performed.

5.6.1.4 To start the abrasive blasting machine, push the wall mounted control lever in, this will open the main air valve to the abrasive blast generator.

5.6.1.5 Before commencing abrasive blasting, check the operation of the hose mounted control handle by squeezing the handle against the hose to start the abrasive blast stream and releasing the handle to stop the blast stream.

5.6.1.6 See section 5.7 for the manual blasting procedure.

5.6.1.7 Direct the nozzle away from the operator and hold the blast hose firmly at all times during abrasive blasting.

5.6.1.8 Periodically during abrasive blasting, shovel the abrasive grit which accumulates inside the blast room back into the hopper/separator through the floor grate.

5.6.1.9 On completion of abrasive blasting (before opening the blast room doors), close the main air valve by pulling the wall mounted lever out.

5.6.2 Rumelin Abrasive Blast Cabinet

5.6.2.1 Before abrasive blasting a batch of parts, transfer as many parts of the batch as practical into the abrasive blast cabinet.

5.6.2.2 Before turning on the air line shut-off valve, close the cabinet door and put on the protective clothing specified in paragraph 4.2.2. Do not open the cabinet door at any time during abrasive blasting.

5.6.2.3 When using angular cast iron (G50) abrasive media, adjust the air line pressure regulator to 95 psi (unless otherwise specified by the engineering drawing, set-up card, etc.). When abrasive blasting thin sections, reduce the air pressure as necessary to prevent warpage.

5.6.2.4 To start abrasive blasting, open both the air line shut-off valve on the side of the cabinet and the shut-off valve on the side of the nozzle.

5.6.2.5 See section 5.7 for the manual blasting procedure.

5.6.2.6 On completion of abrasive blasting (before opening the cabinet door), fully close the air line shut-off valve to shut off the abrasive stream.

5.6.3 Empire Abrasive Blast Cabinet

5.6.3.1 Before abrasive blasting a batch of parts, transfer as many parts of the batch as practical into the abrasive blast cabinet.

5.6.3.2 Before turning on the power, close the cabinet and reclaimer doors and put on the protective clothing specified in paragraph 4.2.2. Do not open the cabinet door at any time during abrasive blasting.

5.6.3.3 Adjust the tuning band on the Empire glass bead cabinet media reclaimer to control the average size of media retained in the reclaimer. Set the tuning band so that approximately 1/2 of the vent hole is visible through the slots in the band. If an excessive amount of dust is evident in the cabinet during operation, open the tuning band slightly. If excessive amounts of glass beads are found in the dust collector, close the tuning band slightly.

5.6.3.4 Except as specified in paragraph 5.6.3.6, when using glass bead abrasive media (as specified in Table I) to clean corrosion resistant steel or titanium alloys, set the air line pressure regulator to 40 ± 10 psi (unless otherwise specified by the engineering drawing, set-up card, etc.).

5.6.3.5 Except as noted in paragraph 5.6.3.6, when using glass bead abrasive media (as specified in Table I) to clean Ultem or Declar thermoplastic parts, set the air line pressure regulator to 20 ± 5 psi (unless otherwise specified by the engineering drawing, set-up card, etc.).

5.6.3.6 When abrasive blasting thin sections, reduce the air pressure as necessary to prevent warpage.

5.6.3.7 To start abrasive blasting, turn on the power switch and, firmly gripping the nozzle assembly, press down the foot treadle. Wait a few seconds to allow the abrasive flow to stabilize.

5.6.3.8 See section 5.7 for the manual blasting procedure.

5.6.3.9 On completion of abrasive blasting, release the foot treadle and blow the parts clean using the cabinet compressed air supply. Turn off the power switch and allow the abrasive dust to settle before opening the cabinet doors.

5.6.4 Vacu-Blast Custom Tumble Basket Blast Cleaning System

5.6.4.1 The Vacu-Blast system can be used in two modes, manual or automatic. See section 5.7 for the manual blasting procedure.

5.6.4.2 Before abrasive blasting a batch of parts, ensure that the pressure vessel is fully charged with the appropriate blast media.

5.6.4.3 Abrasive blast parts in automatic mode as follows:

Step 1. Load the tumble basket with the parts that are to be abraded. Do not fill more than 30% of the total basket volume with parts.

Step 2. Open the side door and move the tumble basket into the cabinet.

Step 3. Close the side door and lock down the locator pin.

Step 4. Ensure that the front door is closed. The machine will not run in the automatic mode if the front door is open.

Step 5. Switch on the cabinet lights and the power exhaust. Ensure that the through hole gloves are clear of the tumbler basket.

Step 6. Press the jog button to ensure that the parts inside the basket will rotate freely.

Step 7. Set the blast air pressure. Unless otherwise specified by the engineering drawing, set-up card, etc., when using aluminum oxide abrasive media to prepare the surfaces of parts **before** ion vapour deposition of aluminum, set the blast air pressure to 45 psi. Unless otherwise specified by the engineering drawing, set-up card, etc., when using glass bead abrasive media (as specified in Table I) to peen the surfaces of parts **after** ion vapour deposition of aluminum, adjust the air line pressure regulator to between 25 and 40 psi.

Step 8. Set the automatic timer to the cycle time specified on the process card and press the cycle start button.

Step 9. When the abrasive cycle has finished, use the blow off gun to remove any excess media.

Step 10. Open the side door and remove the basket from the cabinet. If the door to the basket is in an inappropriate position, press the tumble basket jog button, this will cause the tumble basket to rotate and allow the door to be opened.

5.7 Manual Abrasive Blasting Operation

5.7.1 When manually abrasive blasting parts listed in Table I, hold the nozzle at 30° - 60° and at 6" to 9" from the part, depending on the ductility and thickness of the material, so as to minimize warpage of the part.

5.7.2 Continuously move the abrasive blast nozzle over the part to provide a uniform degree of abrasive blasting over the entire part surface. Do not allow the abrasive stream to dwell on one area of a part, as this may cause uneven or excessive erosion of the part.

5.7.3 Carry out abrasive blasting for the shortest time necessary to accomplish the cleaning operation.

5.7.4 Take particular care when abrasive cleaning Hy-Tuf (AMS 6418) parts. Thoroughly and evenly clean such parts using steel grit #G40 abrasive media. Process Hy-Tuf (AMS 6418) parts that are to receive an ion vapour deposit of aluminum according to Flow Chart 2.

5.8 Post Cleaning Processing

5.8.1 Except as noted, passivate corrosion resistant steel parts according to PPS 31.05 after abrasive blasting.

- If the engineering drawing specifies “do not passivate after fusion welding”, weld area heat discolouration may be removed using glass bead abrasive cleaning without subsequent passivation.
- Do not passivate corrosion resistant steel parts that are to receive an ion vapour deposit of aluminum after abrasive blasting.

5.8.2 Pickle magnesium alloy parts according to PPS 32.07 after abrasive blasting. If sand has been used to clean magnesium alloys, perform pickling immediately after abrasive blasting.

5.8.3 Clean, white cotton gloves must be worn when handling Hy-Tuf (AMS6418) parts after abrasive blasting.

5.8.4 If Hy-Tuf and 300M parts are to be metal sprayed according to PPS 24.01, spray them immediately after abrasive cleaning. The maximum allowable delay between abrasive cleaning and metal spraying is 30 minutes.

5.8.5 The maximum allowable delay between abrasive blasting and IVD coating parts according to PPS 24.02 is 4 hours.

5.8.6 If carbon and low alloy steel parts are to be placed in stores or shipped after abrasive blasting, protect them with F13 - Type 3 Water Displacing Corrosion Preventive Compound according to PPS 16.01.

5.8.7 The following parts do not require any processing after blasting:

- Ultem and declar thermoplastic parts.
- Titanium alloys.
- Aluminum alloys.
- Copper alloys.

6 Requirements

6.1 Parts which have been abrasive blasted shall show a uniform grit blast texture over the entire surface. There shall be no evidence of localized erosion of material resulting from abrasive blasting.

6.2 Abrasive blasted parts shall be clean and free from all evidence of scale, rust, paint, etc.

6.3 There shall be no evidence of damage to abrasive blasted IVD aluminum coatings.

6.4 There shall be no damage to the plating of steel parts which have had paint stripped by abrasive blasting.

6.5 There shall be no evidence of warpage or deformation of parts attributable to abrasive blasting.

6.6 Abrasive blasted surfaces shall not exceed the surface roughness requirements specified on the engineering drawing.

6.7 After abrasive blasting, parts shall be processed and handled according to section 5.8.

7 Safety Precautions

7.1 Wear protective clothing as specified in paragraph 4.2.3 or paragraph 4.2.2, as applicable, at all times when abrasive blasting.

7.2 Keep blast room and blast cabinet doors closed at all times when abrasive blasting is being performed.

7.3 Take care when operating the Pangborn abrasive blast equipment to ensure that the abrasive blast stream is directed away from the operator at all times. If the Pangborn abrasive blast control handle fails to operate properly according to paragraph 5.6.1.5, shut down the equipment and the contact the Maintenance Department to provide the necessary corrective action.

7.4 It is recommended that the blasting area be kept as clean and as free as possible of abrasives.

8 Personnel Requirements

8.1 Personnel responsible for abrasive blasting must have a good working knowledge of the procedure and requirements as specified herein and shall have exhibited their familiarity to their supervisor.

9 Maintenance of Equipment

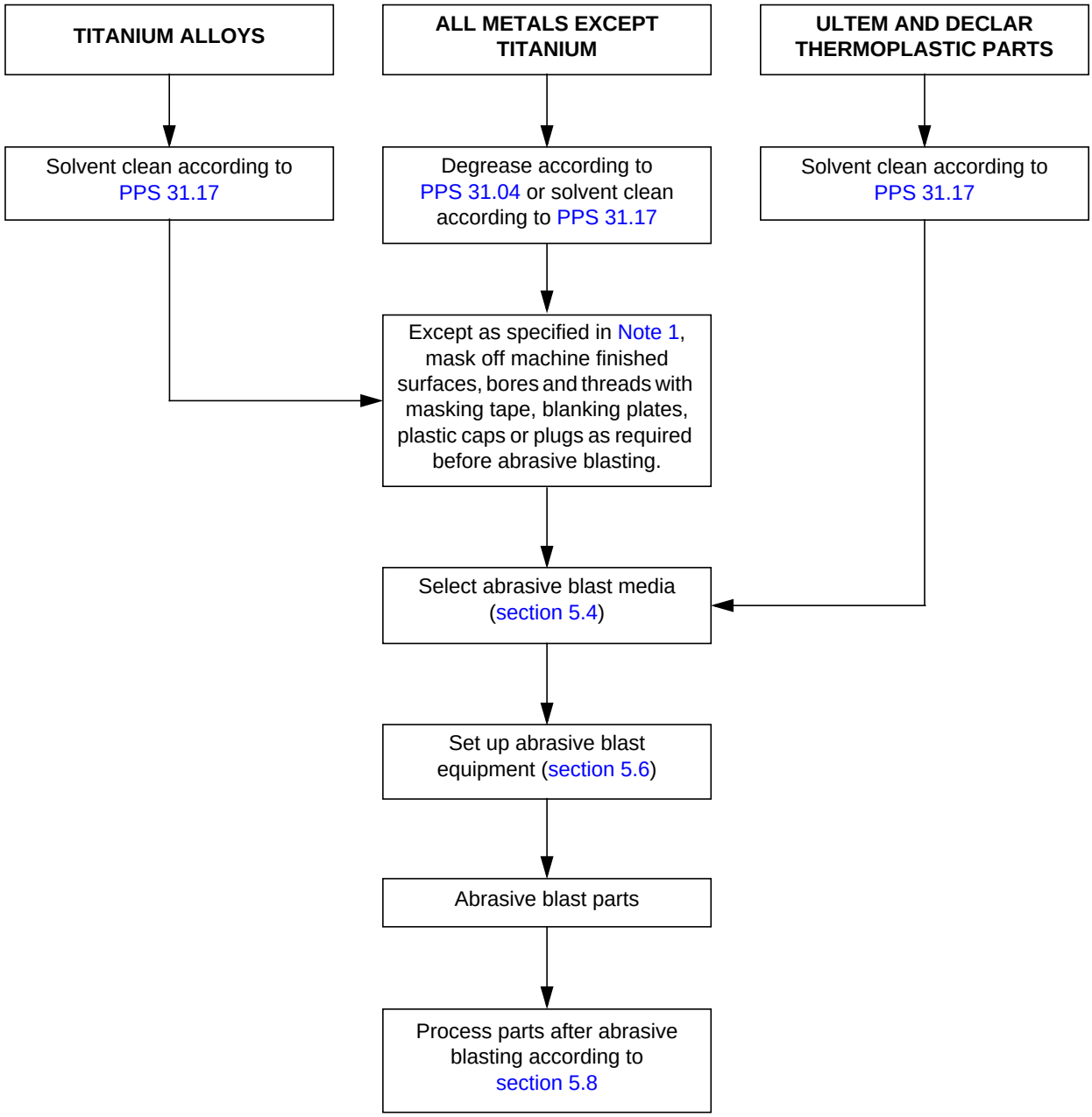
9.1 For grit blasting and glass bead blasting equipment associated with the IVD aluminum coating process as specified in PPS 24.02, maintain the abrasive blast and dust control equipment according to a regular maintenance schedule. A regular maintenance schedule for abrasive blast equipment which is not associated with the IVD aluminum coating process is recommended but is not required.

9.2 Dispose of waste and foreign materials from the sorting mechanisms and clean the mechanisms, as required.

9.3 Replenish the hoppers with new abrasives as necessary so that the hopper will not become completely empty. Replace or replenish abrasives in the blast cabinets as necessary to maintain cleaning efficiency and prevent clogging the hopper or abrasive feed line.

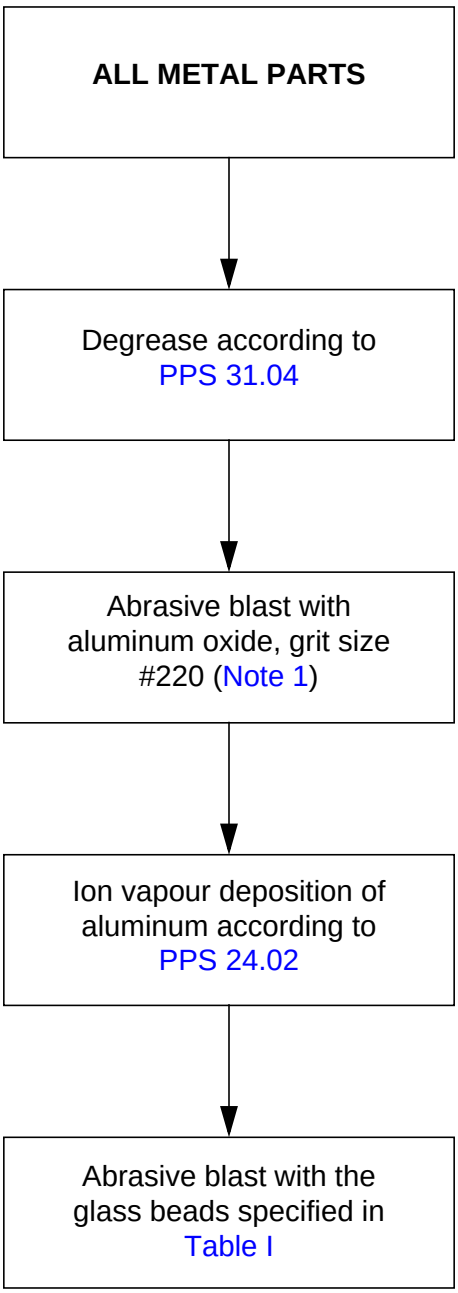
9.4 It is recommend that cabinet interiors be kept as free as possible of abrasives (with salvaged abrasives returned to the hoppers).

Flow Chart 1 - Preparation for Abrasive Blasting



Notes 1. Before abrasive cleaning with fine glass bead or fine aluminum oxide (grit size 180 maximum), only surfaces having a surface finish finer than 32 RMS require masking.

Flow Chart 2 - Abrasive Blast Process for Parts to be IVD Aluminum Coated



Notes 1. The maximum time allowed between abrasive blasting using aluminum oxide grit and the ion vapour deposition of aluminum is 4 hours.