BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 6.10

PRODUCTION PROCESS STANDARD

CLEANING OF FLUID SYSTEM COMPONENTS

Issue 21
- This standard supersedes PPS 6.10, Issue 20.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 6.10 related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

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Issue 21 – Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable sections of this PPS for detailed procedure and requirements.

- Specified that compressed air used must meet BAERD GEN-023.
- Added new Facilities Requirements section. Specified this process is categorized as a controlled special process according to PPS 13.39.
- Specified to refer to PPS 13.39 for additional Personnel requirements.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for cleaning of fluid lines and fluid system components between fabrication operations, after fabrication and after pressure testing.

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.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto, all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto 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 Environment, Health and Safety Department.

3 References

3.1 BAERD GEN-023 - Contamination Control for Compressed Air.

3.2 EHS-OP-005 - Hazardous Materials Management, *Bombardier Toronto internal operating procedure.*

3.3 PPS 6.01 - Fabrication of Rigid Fluid Lines.

3.4 PPS 6.05 - Closure of Fluid Lines and Fluid System Components.

3.5 PPS 13.26 - General Subcontractor Provisions.

3.6 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.7 PPS 31.02 - Cleaning Processes for Aluminum and Aluminum Alloys.

3.8 PPS 31.03 - Cleaning of Carbon and Low Alloy Steels.

3.9 PPS 31.04 - Degreasing Processes.

3.10 PPS 31.06 - Cleaning of Copper and Copper Alloys.

3.11 PPS 31.09 - Cleaning of Titanium and Titanium Alloys.

3.12 PPS 31.17 - Solvent Usage.

3.13 PPS 32.01 - Chemical Conversion Coating of Aluminum Alloys by Immersion.

4 Materials, Equipment and Facilities

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Cleaning solutions as specified in Table 1.

Table 1. Make-Up of Solutions

Type Of Bath	Bath Make-Up	Operating Temperature
Warm water	Tap water	90 - 110°F (32 – 43°C)
Hot water	Tap water	140 - 212°F (60 – 100°C)
Chloroclean 6156 (Brenntag Ltd.) (Note 1)	Step 1. Half fill the tank with tap water (Note 2). Step 2. Fill the tank to the operating level with Chloroclean 6156.	61 - 90°F (16 – 32°C)
Alkaline Cleaning Solution	According to PPS 31.02	
Rust-Off #2	According to PPS 31.03	
Bright Dip	According to PPS 31.06	
Nitric/Hydrofluoric	According to PPS 31.09	

Note 1. At least once every month, perform a bath analysis to ensure that the concentration of Chloroclean 6156 is maintained at 50 ± 5% by volume. Maintain a record of concentration results on file.

Note 2. Tap water must not exceed a total solid requirement of 500 ppm.

4.1.3 Aluminum oxide abrasive paper, 400 grit size.

4.1.4 Filtered nitrogen (e.g., BB-N-411, Type I, Grade A, Class 1, 1800 psig or Grade 4.8).

4.2 **Equipment**

4.2.1 Compressed air must meet the requirements of BAERD GEN-023.

4.2.2 Cotton gloves (e.g., DSC 422-1).

4.2.3 Neoprene gloves (e.g., DSC 422-5).

4.2.4 Wiping cloths (e.g., DSC 378-2).

4.3 **Facilities**

4.3.1 This PPS has been categorized as a Controlled Special Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform cleaning of fluid lines and fluid system components between fabrication operations, after fabrication and after pressure testing according to this PPS.

4.3.2 Bombardier subcontractors must direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities must direct requests for approval to the appropriate internal Quality Manager.

4.3.3 Facility approval must be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report must detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS must be detailed in the facility report. Based upon the facility report, Bombardier Toronto Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification must be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from Bombardier Aerospace Supplier Quality Management.

4.3.3.1 For approval of subcontractor facilities to perform cleaning of fluid lines and fluid system components between fabrication operations, after fabrication and after pressure testing according to this PPS, completion of a test program and submission of suitable test samples representative of production parts may be required. Test samples must meet the requirements as specified by Bombardier Toronto Engineering.

5 **Procedure**

5.1 **General**

5.1.1 Always wear clean cotton gloves when handling cleaned parts.

5.2 Preparation of Solutions

5.2.1 Refer to Table 1 for the make-up of cleaning baths.

5.3 Cleaning

5.3.1 Cleaning of Corrosion Resistant Steel Tubes After Bending

5.3.1.1 Remove oil-based lubricants from corrosion resistant steel tubes by degreasing according to PPS 31.04.

5.3.1.2 Remove water soluble lubricants from corrosion resistant steel tubes as follows:

Step 1. Flush the tubes with warm water (90 - 110°F (32 – 43°C)) until all traces of drawing lubricant are removed. If necessary, use a suitable nylon bristle brush, while rinsing.

Step 2. Allow the tubes to drain.

Step 3. Completely dry the tube using a clean wiping cloth or a filtered hot air dryer.

5.3.2 In-Process Cleaning of Aluminum Oxygen Tubes

5.3.2.1 Clean aluminum oxygen tubes as follows:

Step 1. Alkaline clean according to PPS 31.02.

Step 2. Deoxidize according to PPS 31.02. If necessary, use a suitable nylon bristle brush, while rinsing with warm water (90 - 110°F (32 – 43°C)), to remove any foreign matter left inside the tube.

Step 3. Cap ends according to PPS 6.05.

Step 4. Apply chemical conversion coating to exterior surfaces only according to PPS 32.01.

Step 5. After parts are cut to length and again after all fabrication operations and before priming with F19, remove any traces of lubricants as follows:

- If parts are contaminated with oil-based lubricants, degrease parts according to PPS 31.04.
- If parts are contaminated with water soluble lubricants, rinse and flush through with warm water (90 - 110°F (32 – 43°C)).

5.3.3 In-Process Cleaning of Titanium Tubes

5.3.3.1 After forming and before parts are cut to length, remove any traces of lubricants as follows:

- If parts are contaminated with oil-based lubricants, degrease parts according to PPS 31.04.
- If parts are contaminated with water soluble lubricants, rinse and flush through with warm water (90 - 110°F (32 – 43°C)).

5.3.4 Cleaning of Titanium Tubes before Welding

5.3.4.1 Prepare titanium tubes before welding as follows:

Step 1. Clean trimmed tubes according to PPS 31.09.

Step 2. Keep parts clean by enclosing them in plastic bags.

Step 3. Immediately before welding, mechanically clean the area to be welded using a stainless steel brush or aluminum oxide abrasive paper.

Step 4. Solvent wipe the area to be welded according to PPS 31.17. See para. 10.1 for limitations/restrictions.

5.3.5 Cleaning After Fabrication and After Pressure Testing

5.3.5.1 After fabrication and after pressure testing each particular system, clean all fluid system lines and components according to the Flow Chart specified in Table 2.

Table 2. Cleaning Procedures after Fabrication and Pressure Test

System	Cleaning After Fabrication	Cleaning After Pressure Test
Oxygen	Flow Chart 1	Flow Chart 4
Hydraulic	Flow Chart 2	Flow Chart 1
High pressure fuel	Flow Chart 2	Flow Chart 5
All others	Flow Chart 2	Blow dry with clean compressed air

5.4 Sealing Fluid Lines

5.4.1 Except as noted below, seal all fluid system lines and components according to PPS 6.05 immediately after cleaning and drying. For parts which are to be installed, pressure tested or inhibited in the same work area and immediately after cleaning, sealing may be delayed until completion of the particular operation.

5.5 **Handling and Storage of Fluid Lines**

5.5.1 Do not handle fluid lines by their fittings. Ensure that protective caps are not loosened or removed unless the end is being fitted to an assembly.

5.5.2 Store lines so that their designed shapes are not distorted. Store similar shapes together.

6 **Requirements**

6.1 After cleaning, all parts must be free of grease, hydraulic fluid, flux, drawing lubricant, oxides and any other foreign matter.

7 **Safety Precautions**

7.1 The safety precautions specified herein are specific to Bombardier Toronto to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

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

7.3 Wear neoprene rubber gloves, boots and aprons when working with the cleaning baths specified herein. Operators with any broken skin or open wounds on the hands must not work with the cleaning baths specified herein.

7.4 Take care to avoid skin contact with cleaning solutions. If skin contact occurs, wash the affected area with soap and warm water. Report to the Health Centre immediately if irritation of the skin occurs.

7.5 Wash hands thoroughly after working with any of the cleaning baths or solvents specified herein.

7.6 Do not keep, handle or eat food near the cleaning baths. Cleaning baths, including the hot water bath, must not be used for heating or cooling food or drink.

7.7 Keep coats and jackets out of the vicinity of the cleaning baths.

7.8 When working with compressed air, observe standard shop safety practices.

7.9 If necessary, dispose of solutions according to EHS-OP-005.

8 Personnel Requirements

8.1 This PPS has been categorized as a Controlled Special Process according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 Maintenance of Equipment

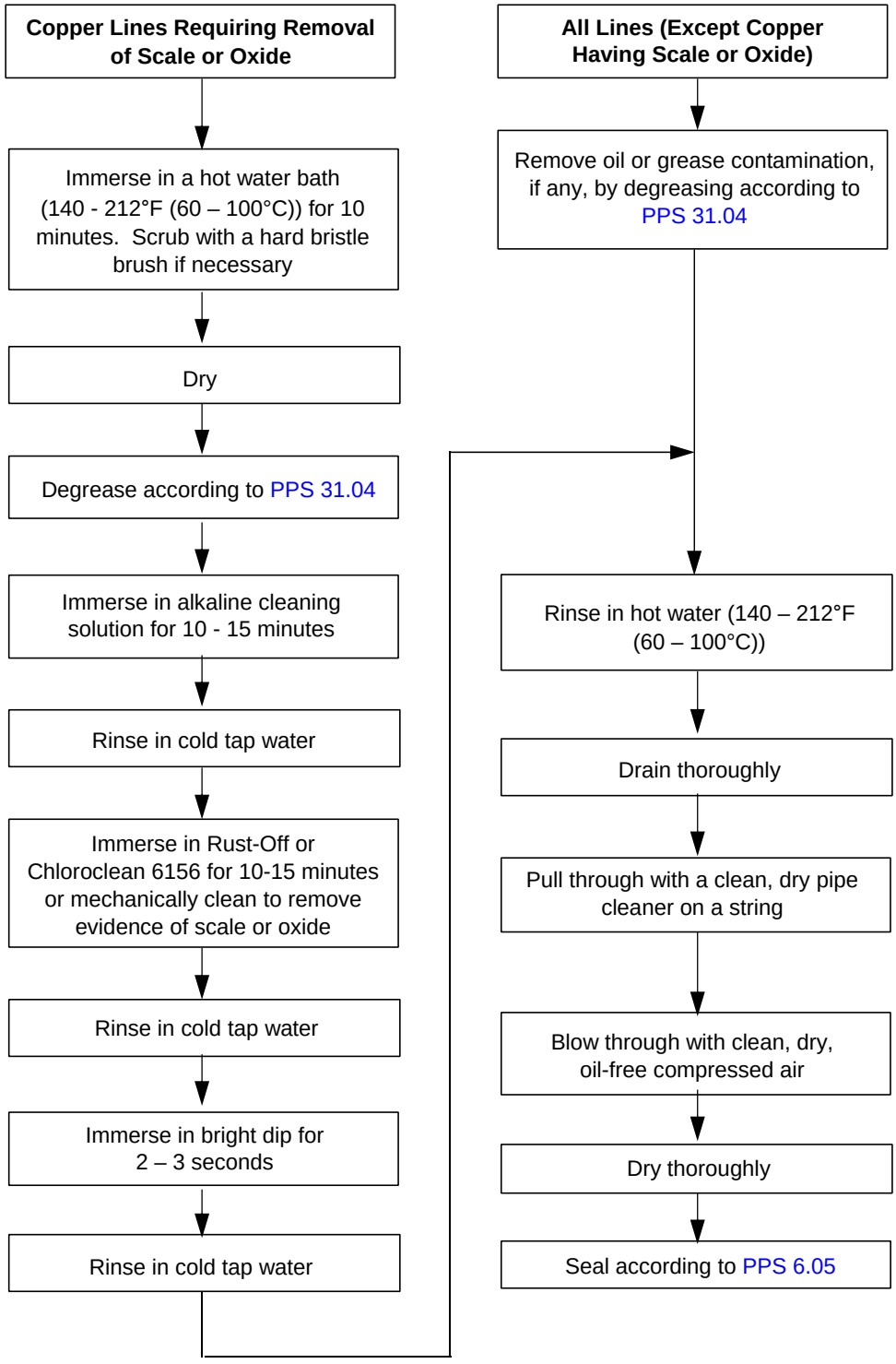
9.1 Maintain cleaning solutions and water baths according to Table 1.

9.2 Ensure all compressed air lines are double filtered to remove all solids, moisture and oil and that the filters are checked on a regular schedule.

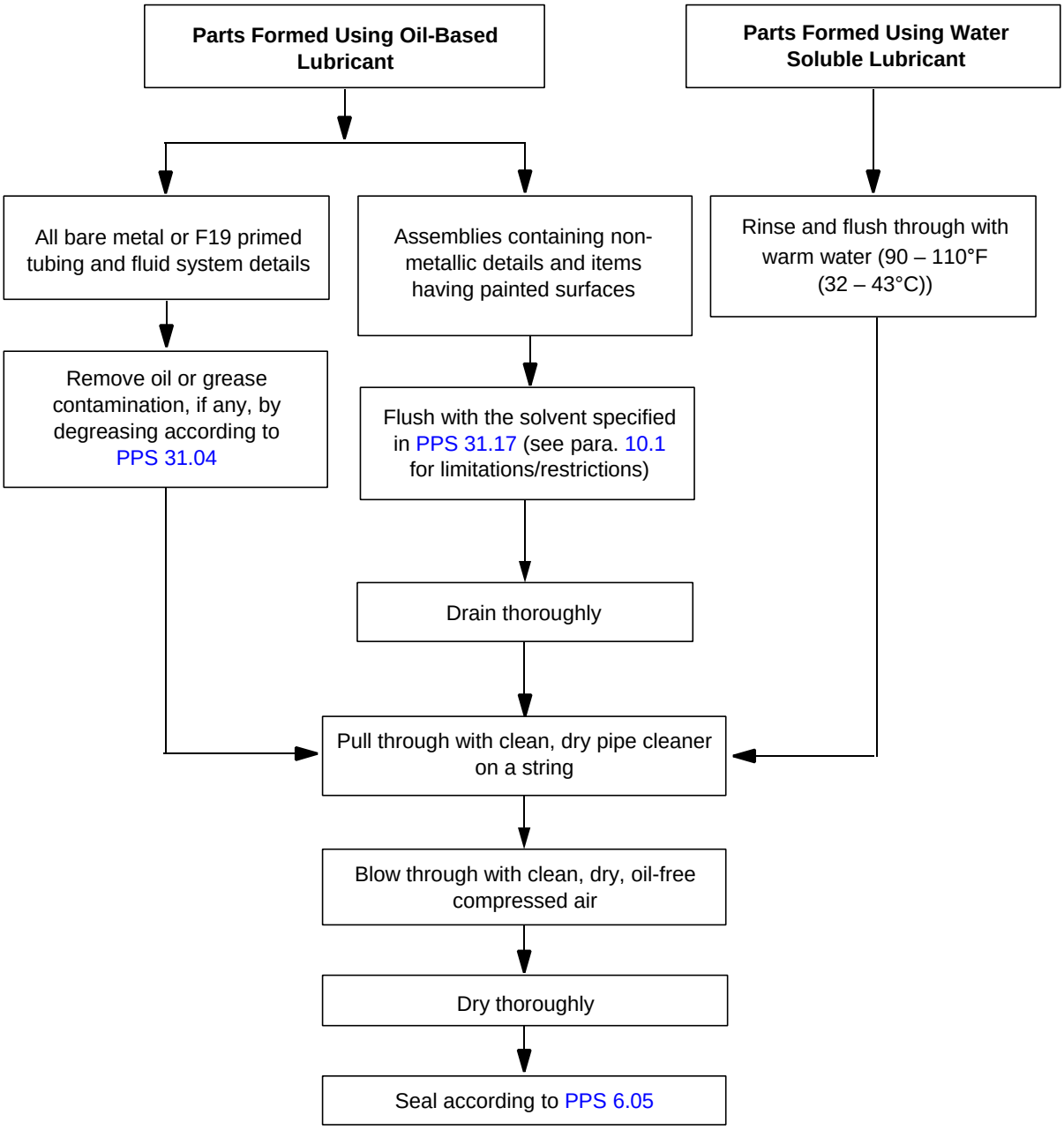
10 Additional Information

10.1 Take care to ensure that hydraulic fluid lines and hydraulic system components used with MIL-H-5606 hydraulic fluid do not come into contact with solvent blends containing isopropyl alcohol (IPA), also known as isopropanol and 2-propanol. Hydraulic fluid lines and hydraulic system components used with MIL-H-5606 hydraulic fluid which have been contaminated with solvent blends containing isopropyl alcohol must be cleaned according to the appropriate procedure specified herein.

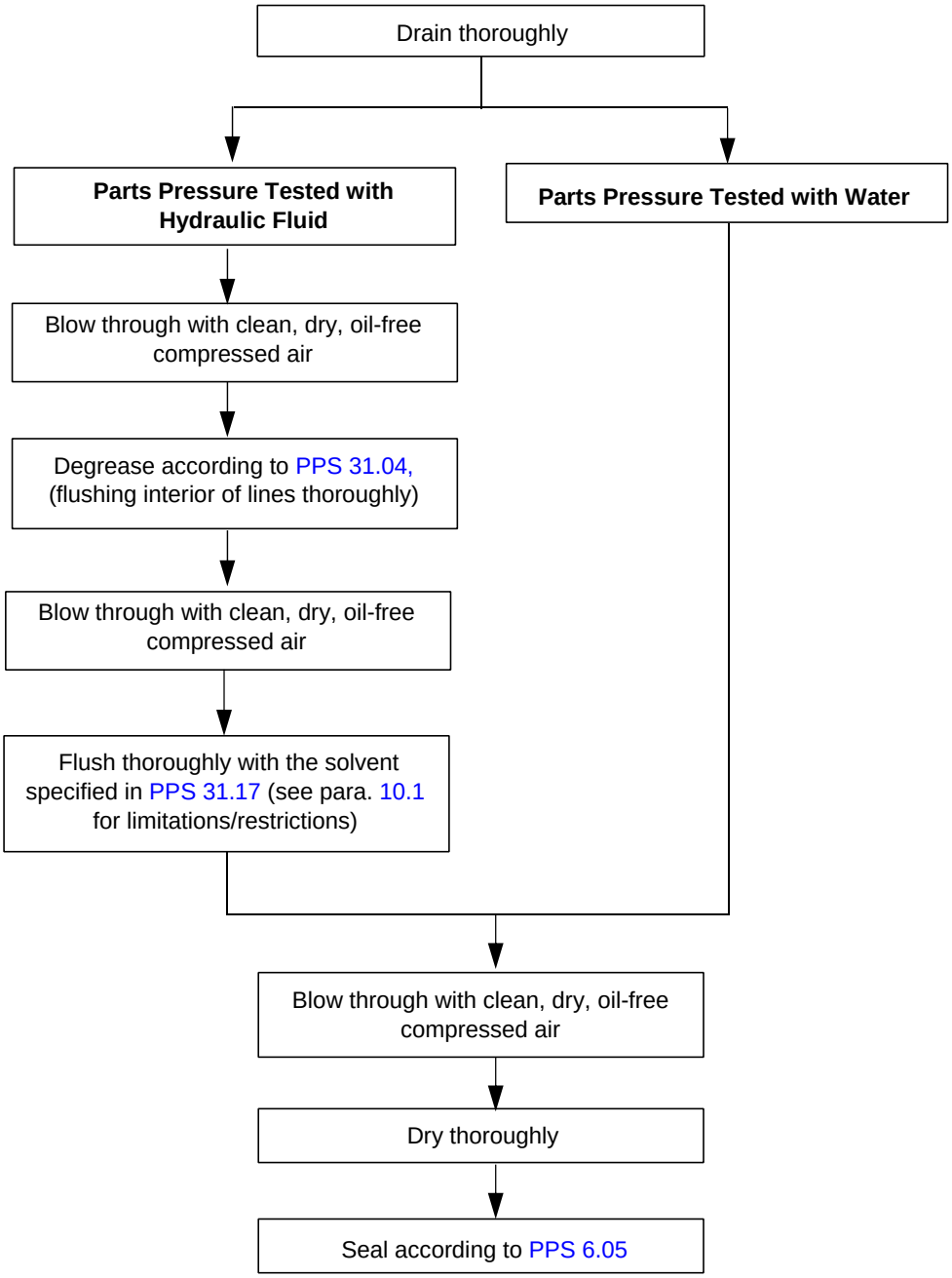
Flow Chart 1. **Cleaning Oxygen System Lines after Fabrication**



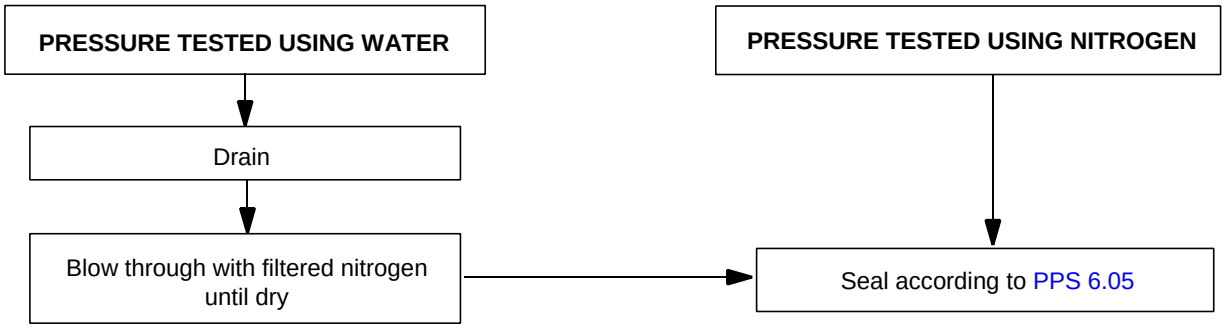
Flow Chart 2. Cleaning General Fluid System Lines after Fabrication



Flow Chart 3. Cleaning Rigid Hydraulic Lines after Pressure Testing



Flow Chart 4. Cleaning Oxygen System Lines after Pressure Testing



Flow Chart 5. Cleaning Fuel System Lines after Pressure Testing