DE HAVILLAND AIRCRAFT OF CANADA LIMITED

PPS 2.64

PRODUCTION PROCESS STANDARD

PROPRIETARY INFORMATION

Installation of Potting Type Sandwich Panel Fasteners

Issue 14
- This standard supersedes PPS 2.64, Issue 13.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Signed original on file. Validation of paper prints is the responsibility of the user.

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Issue 14 - 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.

- Replaced throughout PPS where “Bombardier” is specified with “De Havilland Aircraft of Canada Limited” or “DHC”.
- Specified that NAS 1836-08-06 inserts are interchangeable with TYE2001-08-06 inserts as permitted by EO7336.
- Specified to refer to PPS 13.23 for the temperature and relative humidity requirements, deleted the details from this PPS.
- Added Disposal of Chemical Wastes section.
- Revised Storage information (i.e., specified storage temperature of resins shall be at 60 to 90°F in place of 60 to 80°F, etc.).

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the installation of fastener inserts in sandwich panel assemblies using potting compound.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall 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 De Havilland Aircraft of Canada Limited (DHC), all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the DHC 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 DHC Environment, Health and Safety Department.

3 REFERENCES

3.1 DHMS P1.30 - Resin, Epoxy Base, Low Density, Honeycomb Core Filler.

3.2 DSC 536 - Potting Compound, Epoxy (C&D Retrofit Only).

3.3 Engineering Order (E.O.) 7336 - DM9010.05 Supersession List.

3.4 PPS 1.09 - Drilling and Reaming.

3.5 PPS 10.39 - Machining of Fibre Reinforced Composite Parts.

3.6 PPS 13.23 - Preparation & Use of DHMS P1.30 Resin.

3.7 PPS 13.26 - General Subcontractor Provisions.

3.8 PPS 13.28 - Storage Life of Adhesives, Sealants, Paints and Composite Products.

3.9 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.10 PPS 25.62 - Bonding using Fast-Weld #10 Epoxy Adhesive.

3.11 PPS 31.17 - Solvent Usage.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 NAS potting type sandwich panel inserts as specified on the engineering drawings. Refer to Figure 1 for a general description drawing of NAS potting type sandwich panel inserts. Refer to Figure 2 for a breakdown of the NAS insert part numbering system.

4.1.1.1 NAS1836-08-06 potting type inserts may be interchanged with TYE2001-08-06 inserts as permitted by EO7336.

4.1.2 NAS 1837 adhesive backed aluminum alloy tabs.

4.1.3 DHMS P1.30 Grades 2, 2A or 3 low density epoxy resin.

4.1.4 Fast-Weld #10.

4.1.5 Circular removable labels (e.g., Avery colour coding labels).

4.1.6 DSC 536 potting compound, epoxy, two part kits.

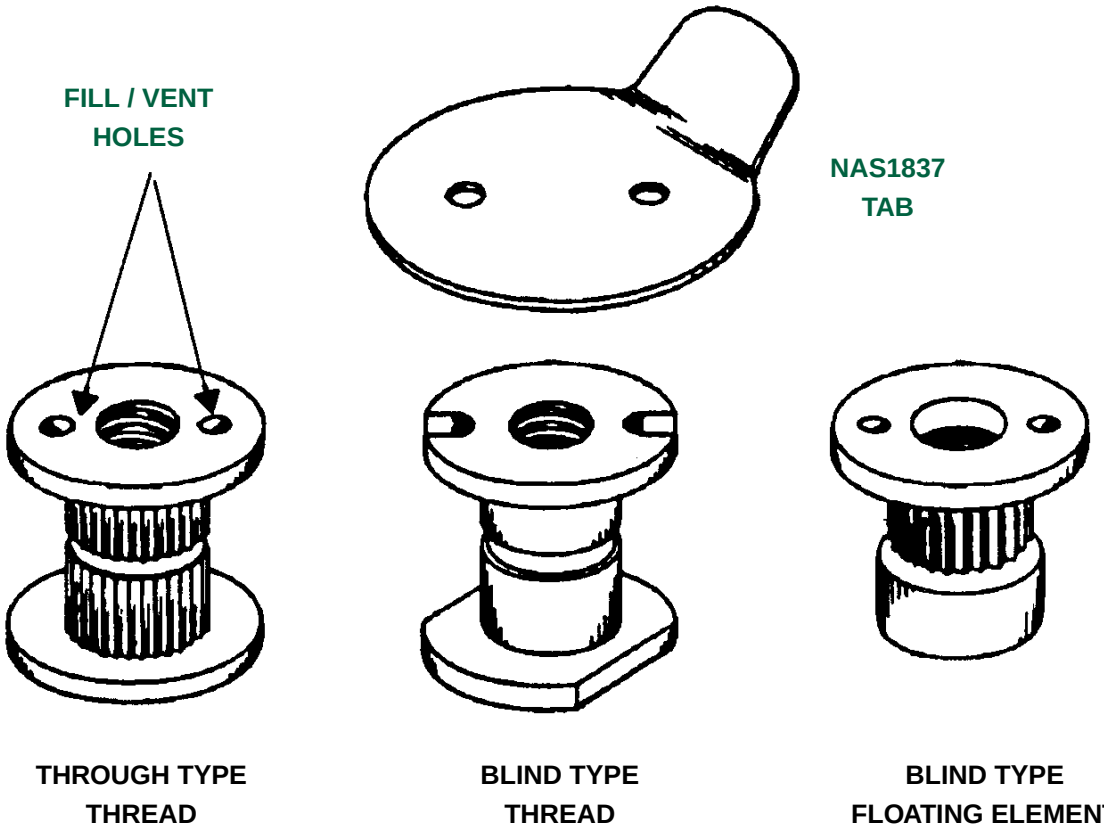

FIGURE 1 - GENERAL DESCRIPTION OF NAS POTTING TYPE INSERTS

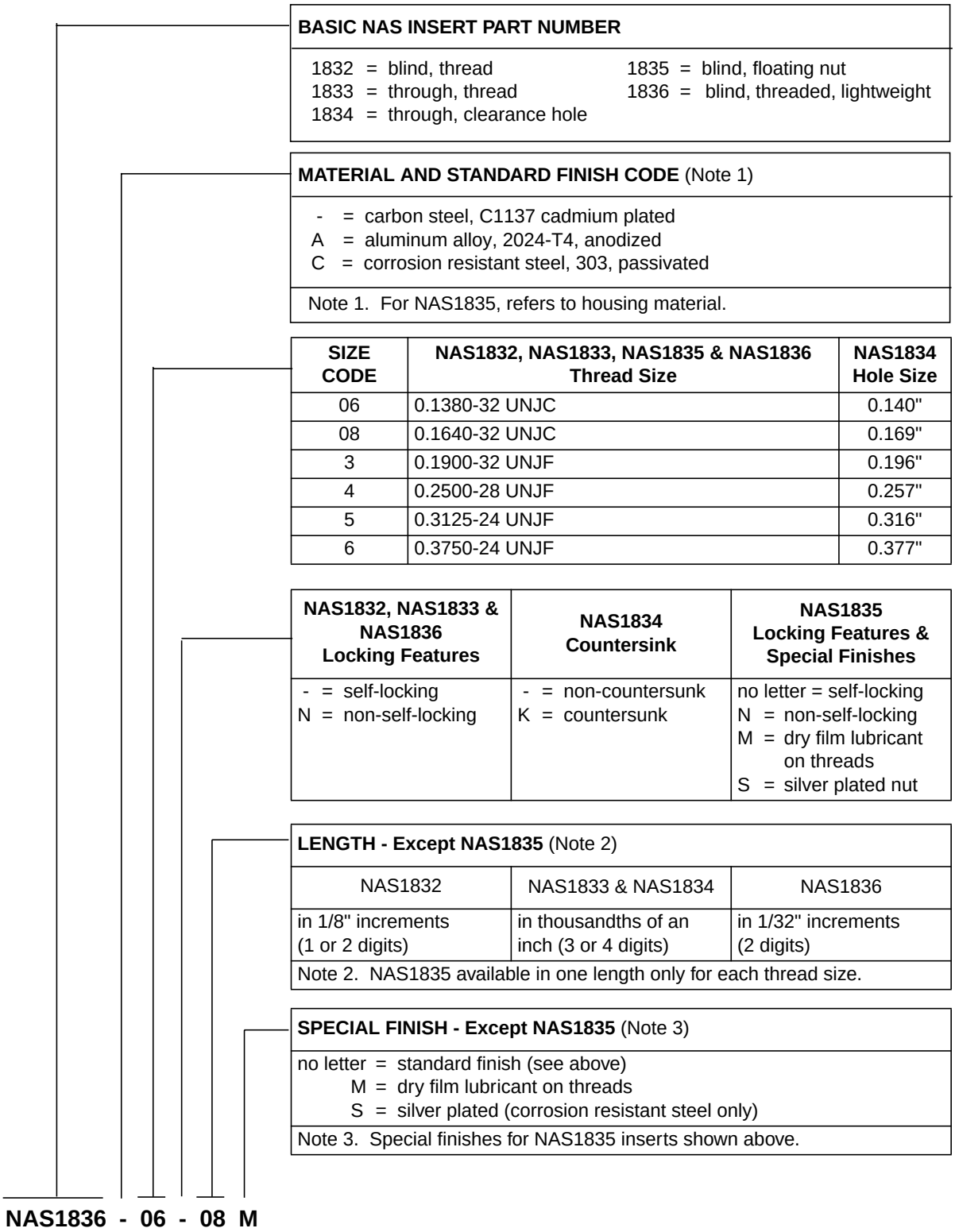

FIGURE 2 - NAS INSERT PART NUMBER BREAKDOWN

4.2 Equipment

4.2.1 Suitable cutting tools (e.g., drills and hole saws as listed in Table I).

4.2.2 Bushed drill bar (e.g., TS.519.10.13).

4.2.3 Deburring tool (e.g., SD8066 vixen file).

4.2.4 Rotary file or similar cutting tool (e.g., 3/8" to 1/2" diameter ball, 1/4" shank).

4.2.5 Forceps, tweezers or similar tool.

4.2.6 Disposable hypodermic syringe (e.g., B-D Plastipak 10cc).

4.2.7 Weighing scales, triple beam balance type or similar, capable of weighing to ± 0.5 grams.

4.2.8 Disposable, wax-free paperboard containers (e.g., MELO take-out food containers).

4.2.9 Air operated sealant guns (e.g., Semco #250 or Pyles #950).

4.2.10 Polyethylene cartridges and plungers (e.g., Semco #250 or Pyles #950).

4.2.11 Polyethylene nozzles, 1/16" diameter orifice (e.g., Semco #420 or equivalent).

4.2.12 Tab alignment fixture (e.g., SD6219).

4.3 Facilities

4.3.1 This PPS has been categorized as a Controlled Critical Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform installation of fastener inserts in sandwich panel assemblies using potting compound according to this PPS.

4.3.2 Subcontractors shall direct requests for approval to DHC Quality.

4.3.3 Facility approval shall be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report shall 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 shall be detailed in the facility report. Based upon the facility report, DHC Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification shall be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from DHC Quality.

4.3.3.1 For approval of subcontractor facilities to perform installation of fastener inserts in sandwich panel assemblies using potting compound according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples shall meet the requirements specified in section 6.

5 PROCEDURE

5.1 General

5.1.1 For the purposes of this PPS, the term “MRB” (Material Review Board) is considered to include DHC MRB and DHC delegated MRB.

5.1.2 Potting type inserts are used where fastener attachment points are required on aluminum faced, balsa or aluminum core sandwich panel assemblies and composite faced, honeycomb core sandwich panel assemblies.

5.1.3 Inserts may be installed in either the faces or edges of the panel assembly. If edge mounted inserts are required, the panel edge shall be reinforced by the method specified on the relevant engineering drawing.

5.1.4 Self-adhesive aluminum tabs (NAS1837) are used to hold the insert in position during the potting operation.

5.1.5 Unless otherwise specified by the engineering drawing, pot inserts using DHMS P1.30 Grade 2, Grade 2A or Grade 3 potting compound, depending on the desired pot life and cure time.

5.1.6 In areas used for potting compound preparation, potting of inserts and curing, maintain the temperature and relative humidity within the limits specified in PPS 13.23. Record the temperature and relative humidity on continuous chart recording equipment whenever parts are being processed according to this PPS.

5.2 Preparation of Sandwich Panels

5.2.1 Hole locations for inserts shall be as specified on the relevant engineering drawing.

5.2.2 Refer to Table I for the required hole diameters and recommended cutter sizes for particular inserts.

5.2.3 For hole preparation in aluminum faced panels, the use of a hole saw (e.g., as specified in Table I) is recommended. Pre-drill a hole in the panel using a standard twist drill of the required size for the locating bushings in the drill template. For blind insert installations, drill the pilot hole only through the top facing panel. Select a hole saw arbor the same size as the pre-drilled pilot hole in the panel.

5.2.4 For hole preparation in laminate faced panels, the use of a Brad Point Type (KEVLAR) twist drill (e.g., as specified in Table I) is recommended. If a drill fixture or template is not provided for drilling holes in flat panels, use a bushed drill guide bar to ensure that the hole is drilled square (i.e., perpendicular) to the surface of the panel.

5.2.5 Refer to PPS 1.09 for general practices for drilling aluminum faced panels.

5.2.6 Refer to PPS 10.39 for general practices for drilling composite (laminate) faced sandwich panels.

TABLE I - HOLE PREPARATION DATA

INSERT		RECOMMENDED CUTTER SIZE	RECOMMENDED CUTTER		HOLE SIZE
TYPE	SIZE CODE		BRAD POINT DRILL TS.561.11.20	HOLE SAW TS.561.22.11 (NOTE 1)	
NAS1832 NAS 1833 NAS1834	-06	9/16"	MK 3	MK 18	0.561" - 0.571"
	-08				
	-3				
	-4	11/16"	MK 4	MK 22	0.686" - 0.696"
	-5				
	-6	27/32"	Mk 7	MK 27	0.842" - 0.852"
NAS1835	-08	11/16"	MK 4	MK 22	0.686" - 0.696"
	-3				
	-4	3/4"	MK 5	MK 24	0.750" - 0.760"
	-5	13/16"	Mk 6	MK 26	0.811" - 0.821"
	-6	7/8"	MK 8	MK 27	0.875" - 0.885"
NAS1836 (Note 2)	-06	29/64"	MK 1	n/a	0.452" - 0.462"
	-08				
	-3				
	-4	1/2"	MK 2	MK 16	0.499" - 0.509"

Note 1. Refer to TS.561.22.21 for a listing of hole saw arbors.
Note 2. Use same hole preparation data for TYE2001-08-06 insert as that specified for NAS1836-08-06 insert.

5.2.7 **Do not** use cutting lubricants or waxes on any cutting tools used to prepare holes for inserts. Remove residual lubricant, if any, from cutting tools by dipping them in the solvent specified by PPS 31.17.

5.2.8 Prepare panels for face installation of through inserts as follows:

Step 1. Ensure that panels are firmly backed at the exit hole to prevent fuzzing or delamination of the laminate.

Step 2. Using a drill or hole saw, drill completely through the sandwich panel at the locations specified on the relevant engineering drawing.

Step 3. For composite laminate faced panels, remove fuzz or loose fibre strands from the hole according to PPS 10.39. For aluminum faced panels, remove any standing burr from the hole using a vixen file or similar flat deburring tool.

Step 4. Undercut the sandwich panel core using a 3/8" - 1/2" ball type rotary file or other suitable tool to increase the potting cavity diameter by approximately 3/8".

Step 5. Remove broken-out cell walls from partially drilled honeycomb cells using forceps or tweezers, to allow potting compound to fill the cell.

Step 6. Carefully vacuum insert holes and cavities to remove metal chips, swarf, laminate fibres, etc.

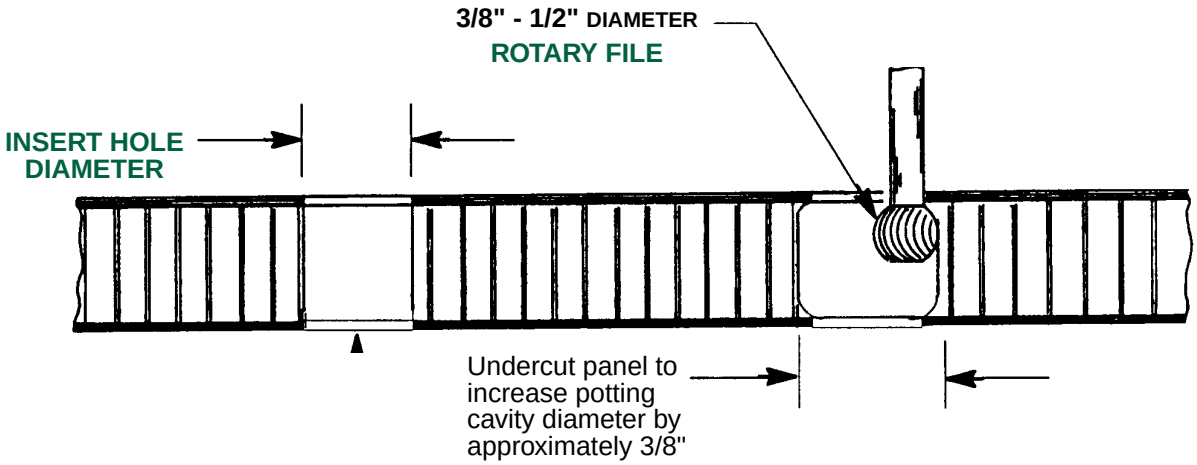

FIGURE 3 - PANEL PREPARATION FOR FACE INSTALLATION OF THROUGH TYPE INSERTS

5.2.9 Prepare panels for face installation of through inserts as follows:

Step 1. Using a drill or hole saw, drill through the sandwich panel at the locations specified on the relevant engineering drawing to a controlled depth to within approximately 1/16" (0.060" - 0.080") of the inner surface of the back face of the panel. When using a hole saw it may be necessary to modify the hole saw arbor to extend approximately 1/16 beyond the teeth of the hole saw to facilitate cutting to the required depth.

Step 2. If the hollow plug produced during drilling of balsa core panels does not break off flush with the bottom of the hole, break the plug off and trim flush with the bottom of the hole using a flat blade screwdriver or other suitable tool.

Step 3. For composite panels remove fuzz or loose fibre strands from the hole according to PPS 10.39. For aluminum faced panels remove any standing burr from the hole using a vixen file or similar flat deburring tool.

Step 4. Undercut the sandwich panel core using a 3/8" - 1/2" ball type rotary file or other suitable tool to increase the potting cavity diameter by approximately 3/8".

Step 5. Remove broken-out cell walls from partially drilled honeycomb cells using forceps or tweezers, to allow potting compound to fill the cell.

Step 6. Carefully vacuum insert holes and cavities to remove metal chips, swarf, laminate fibres, etc.

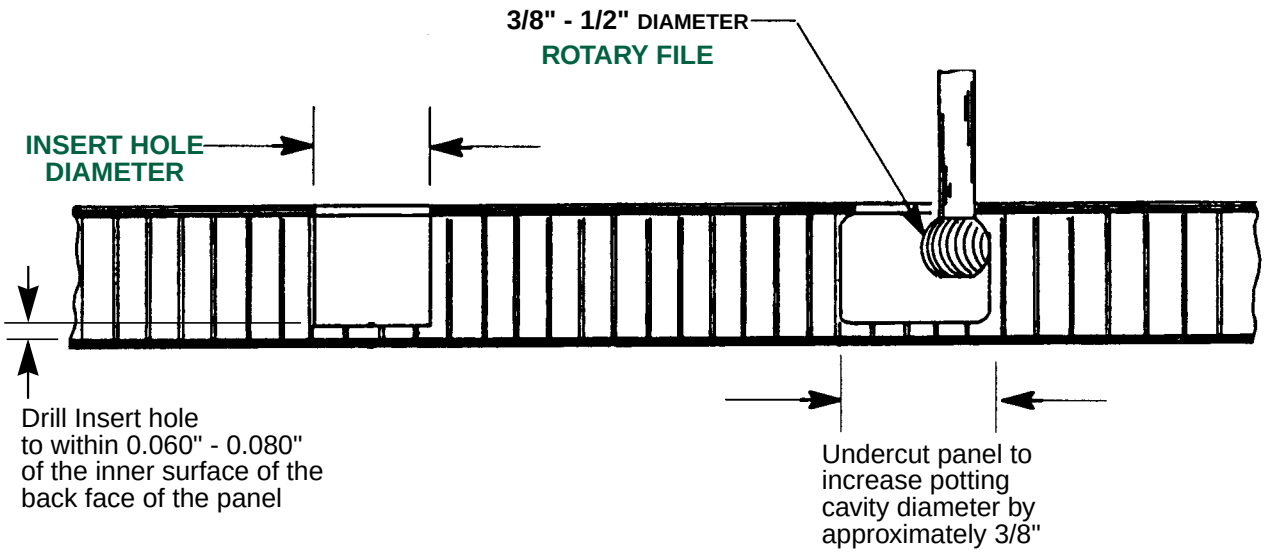

FIGURE 4 - PANEL PREPARATION, FACE INSTALLATION - BLIND INSERTS

5.2.10 Prepare panels for edge installation (see Figure 5) using a drill (e.g., as specified in Table I) to drill into the edge of the sandwich panel at the locations specified on the engineering drawing to a depth equal to 1 1/2 times the insert length.

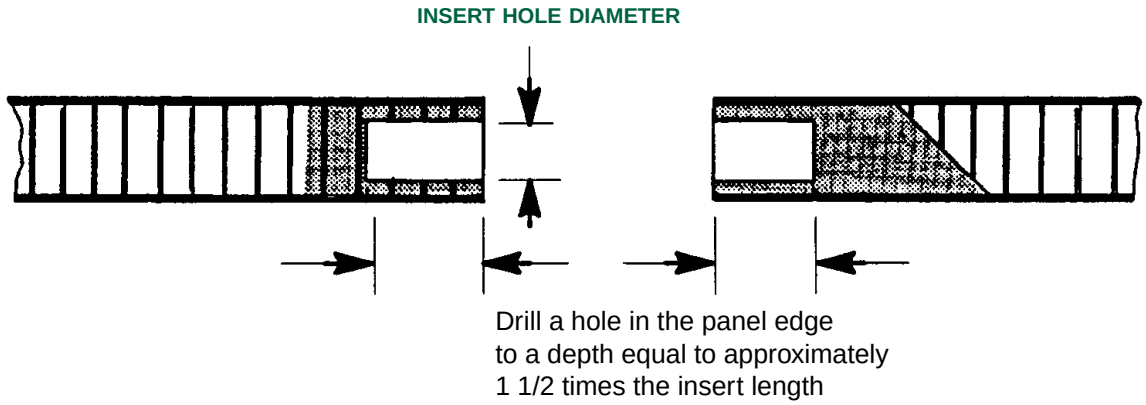

FIGURE 5 - PANEL PREPARATION FOR EDGE INSTALLATION

5.3 Preparation of Inserts

5.3.1 Solvent clean all inserts according to PPS 31.17 just before installation.

5.3.2 After cleaning, assemble the insert and the self-adhesive tab using a tab alignment fixture as follows:

Step 1. Rotate the fixture index table to position the applicable set of alignment pins for the insert to be installed, under the clamp screw.

Step 2. Peel off the protective backing from the tab and place the tab on alignment pins, adhesive coated side up.

Step 3. Place the cleaned insert in position on the tab so that the top face of the insert is against the adhesive and the fill/vent holes are aligned with pins.

Step 4. Adjust the clamp screw length so that the swivel clamp bottoms against the insert with the toggle clamp lever approximately 10° - 20° from vertical and lock in position.

Step 5. Pull the toggle clamp lever forward to apply full pressure to the insert/tab assembly, push the lever back and remove the assembly.

5.3.3 Handle cleaned insert/tab assemblies by the tabs to prevent contaminating the bond surfaces with finger oils.

5.4 Preparation of Potting Compound

5.4.1 Prepare DHMS P1.30 potting compound according to PPS 13.23.

5.4.2 Prepare Fast-Weld #10 according to PPS 25.62.

5.4.3 Refer to Table II for the mixing ratio, pot life and cure times for DSC 536 potting compound. Do not use DSC 536 for potting inserts unless it is specifically specified by the engineering drawing.

5.4.4 Pot life is the time and condition during which mixed compound remains suitable for application. Pot life of mixed compounds as specified in Table II, is based on a temperature of 75°F (24°C) and 50% relative humidity. Higher humidity and temperature conditions will shorten the pot life.

TABLE II - POTTING COMPOUND MIXING/CURING DATA

POTTING COMPOUND		PARTS BY WEIGHT	POT LIFE (@75°F (24°C))	FULL CURE
DHMS P1.30	All Grades	Refer to PPS 13.23		
DSC 536-1	Part A (White)	100	20 - 25 minutes	7 days at 75°F (24°C) (Note 1) or 3 hours at 150°F (66°C)
	Part B (Blue)	8		
DSC 536-2	Part A (White)	100	12 - 20 minutes	24 hours at 75°F (24°C) or 1 hour at 150°F (66°C)
	Part B (Green/Brown)	10		
Fast-Weld #10		Refer to PPS 25.62		

Note 1. After curing DSC 536-1 for 24 hours at 75°F (24°C) it is acceptable to handle the assembly, etc. However, unless the high temperature cure is employed, 7 days cure at 75°F (24°C) is required before the installation of fasteners.

5.5 Installation of Inserts

5.5.1 Install blind type inserts as follows (see Figure 6):

Step 1. Using a hypodermic syringe or sealant gun and cartridge fill the potting cavity in the panel approximately 1/3 full with compound.

Step 2. Slowly press the insert into the hole, pressing down firmly on the tab to ensure full contact between the tab and panel.

Step 3. Inject potting compound through one of the tab fill/vent holes until the cavity is filled, as evidenced by extrusion of the compound through the opposite fill/vent hole in the tab.

Step 4. Leave a small bead of compound at the tab fill/vent hole to allow for shrinkage during curing. If necessary, remove excess compound by solvent cleaning according to PPS 31.17.

5.5.2 Install through type inserts as follows (see Figure 6):

Step 1. Fit the insert squarely into the hole and press down firmly on the tab ensuring that full contact between tab and panel exists.

Step 2. Check the backside of the panel to ensure that the rear face of the insert is flush within ± 0.015" with the face of the panel.

Step 3. Apply pressure sensitive tape to the rear face of the insert and panel to prevent extrusion of the compound past the insert.

Step 4. Using a hypodermic syringe or sealant gun and cartridge inject potting compound into one of the tab fill/vent holes until the cavity is filled, as evidenced by extrusion of the compound through the opposite fill/vent hole in the tab.

Step 5. Leave a small bead of compound at the tab fill/vent holes to allow for shrinkage during curing. If necessary, remove excess compound by solvent cleaning according to PPS 31.17.

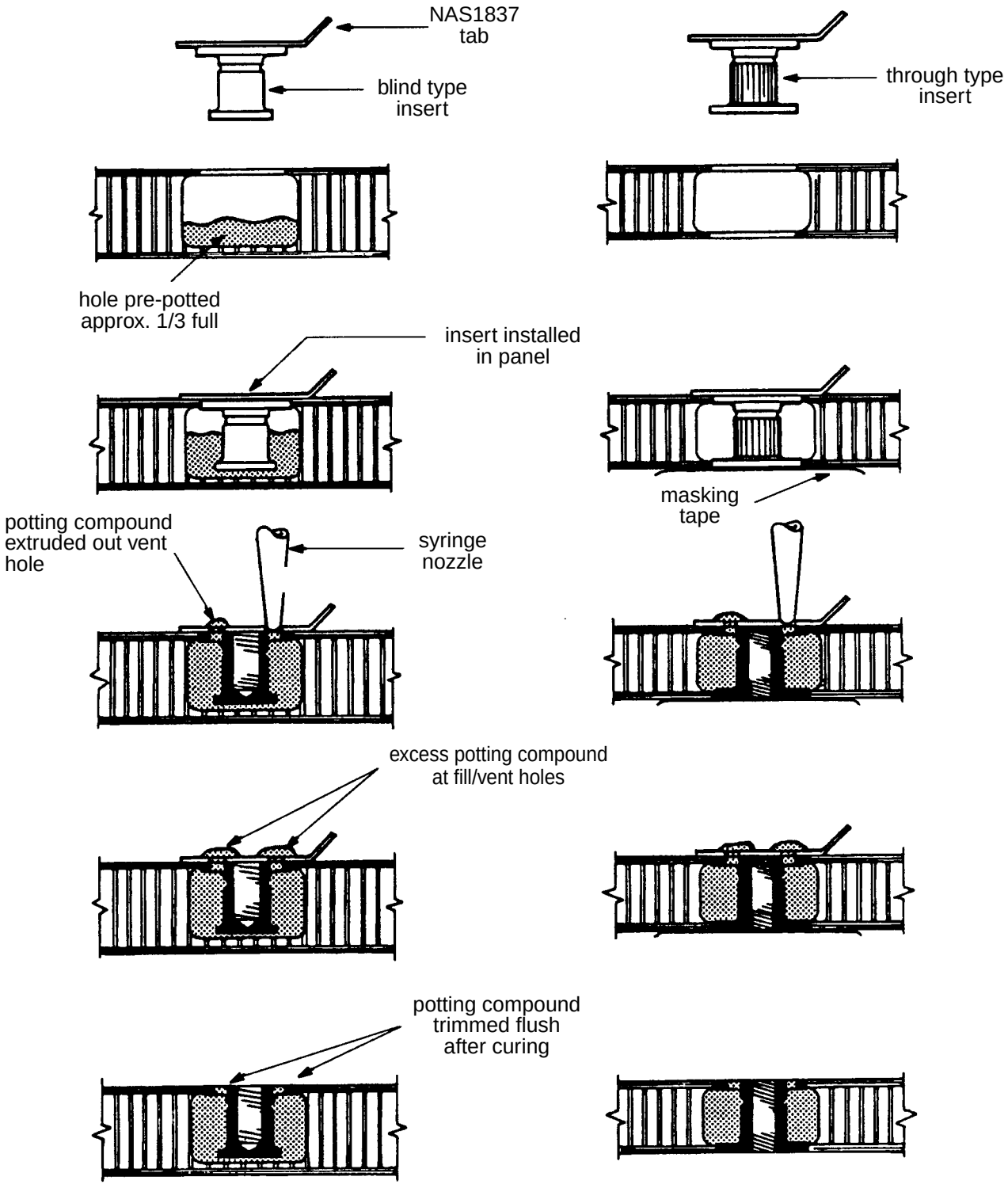

FIGURE 6 - POTTING OF INSERTS

5.6 Curing

5.6.1 Cure potted inserts according to the cure schedule shown in Table II. Leave tabs in place on the inserts until the compound has fully cured.

5.7 Finishing

5.7.1 After curing finish the installation as follows:

Step 1. Remove the installation tab and any pressure sensitive tape applied.

Step 2. Trim excess potting compound flush with the surface using a sharp knife.

Step 3. Cover insert holes with suitable circular labels to prevent foreign matter from entering.

5.8 Removal and Repair

5.8.1 Fill incompletely filled potting cavities, as evidenced by voids at the fill/vent holes in the insert or between the insert and the drilled skin at the surface with potting compound using a hypodermic syringe.

5.8.2 If necessary, remove installed inserts as follows.

- Inserts may be removed by drilling out the inserts. When drilling, take care not to damage the surrounding panel surface.
- Inserts may also be removed by heating the insert using a soldering iron. Once the heat softens the potting compound, remove the insert. If Type 2 or Type 2A potting compounds were used, removal of inserts by heating is preferred.

5.8.3 If a replacement insert is to be installed in the same hole, prepare the hole and install the insert as specified herein. If replacement inserts are to be re-located, refer to MRB for written authorization to repair.

6 REQUIREMENTS

6.1 In areas used for potting compound preparation, potting of inserts and curing, the temperature and relative humidity shall be maintained within the limits specified in PPS 13.23. Temperature and relative humidity shall be recorded on continuous chart recording equipment whenever parts are being processed according to this PPS.

6.2 Unless otherwise specified on the engineering drawing, the bore of installed inserts shall be at right angles (i.e., perpendicular) to the surface of the panel. Remove and replace inserts failing to meet alignment requirements according to section 5.8.

6.3 Locations of installed inserts shall meet the dimensional requirements of the engineering drawing or MRB in the case of re-located inserts.

6.4 Insert faces shall be flush within ± 0.015" with the face of the panel. Remove and replace inserts failing to meet the flushness requirements according to section 5.8.

6.5 The fill/vent holes in each installed insert and the area between the insert and the drilled skin at the surface shall be completely filled. Fill voids according to the section 5.8.

6.6 Insert threads shall be free of potting compound and floating type inserts shall show free movement of the nut element. Refer self-locking or floating inserts which fail to meet these requirements to MRB. Non self-locking threads which have become contaminated with potting compound may be cleaned out using the appropriate size tap.

7 DHC SAFETY PRECAUTIONS

7.1 The safety precautions specified herein are specific to DHC to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is strongly 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 standard plant safety precautions when performing the procedure specified herein.

7.3 Keep potting compounds away from fire and other sources of ignition.

7.4 Smoking and eating are not permitted in areas in which potting compounds are being applied. Avoid ingestion of potting compounds. If ingestion has occurred, obtain medical attention immediately.

7.5 Avoid skin contact with potting compounds. If contact occurs, wash thoroughly with soap and water.

7.6 Wear safety glasses when working with the materials specified herein. Should accidental eye contact occur, flush eyes immediately for a minimum of 15 minutes at the nearest eye-wash station and obtain immediate medical attention.

7.7 Perform heating of inserts under a fume hood or in a well ventilated area.

7.8 Refer to PPS 31.17 for the safety precautions for handling and using solvents.

8 PERSONNEL REQUIREMENTS

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

9 DISPOSAL OF CHEMICAL WASTES

9.1 Dispose of all chemical wastes according to national legislation and local regulations. At DHC, dispose of chemical wastes according to EHS-OP-005.

10 STORAGE

10.1 Always use the oldest stock first (i.e., first in/first out (FIFO) basis).

10.2 Store the potting compounds specified herein in their original containers at 60°F to 90°F according to precautions necessary for flammable materials.

10.3 Store potting compounds in containers clearly marked with the storage life expiry date. Storage life shall be as specified in PPS 13.28. Do not issue resin to Production if the storage life expiry date has passed.

10.4 Keep containers of resins tightly closed when not in use.