BOMBARDIER
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PROPRIETARY INFORMATION

PPS 10.24

PRODUCTION PROCESS STANDARD

PREPARATION OF HONEYCOMB CORES FOR LAY-UP IN SANDWICH PANEL ASSEMBLIES

Issue 16
- This standard supersedes PPS 10.24, Issue 15.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	May 7, 2019
	PPS Group	
Approved By:	(*H.Y. Tran*, for Stephen Mabee)	May 7, 2019
	Materials Technology	
	(Chris Schnitzler)	May 7, 2019
	Quality	

Issue 16 - 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.

- Added 350°F and 375°F honeycomb core forming temperature data to Table II (Honeycomb Core Heat Forming Schedule).
- Specified that it is also acceptable to use a 1" wide strip of DHMS P1.48 flyscreen only if specified on the engineering drawing.

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the preparation of honeycomb cores for lay-up in sandwich panel assemblies.

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.

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 shall 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 PPS 10.21 - Certification of Autoclaves.

3.2 PPS 10.22 - Preparation of Moulds.

3.3 PPS 10.23 - Storage, Handling and Preparation of Pre-Impregnated Materials.

3.4 PPS 10.25 - Storage and Application of Film Adhesives Used in Composite Assemblies.

3.5 PPS 10.26 - Platen Press Curing of 250°F Cure, Epoxy Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.6 PPS 10.28 - Assembly of Wire Thermocouples.

3.7 PPS 10.35 - Fabrication of 250°F Cure Epoxy Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.8 PPS 10.43 - Fabrication of 350°F Cure Epoxy Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.9 PPS 10.48 - Fabrication of 280°F Cure, Phenolic Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.10 PPS 10.51 - Certification of Ovens.

3.11 PPS 10.52 - Certification of Platen Press.

3.12 PPS 13.13 - Personal Protective Respiratory Equipment.

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

3.14 PPS 13.26 - General Subcontractor Provisions.

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

3.16 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.17 PPS 31.14 - Cleaning Aluminum Screen for Lay-Up in Composite Parts.

3.18 PPS 31.17 - Solvent Usage.

3.19 QAMTR 030 - Receipt Testing of Pre-Impregnated and Honeycomb Materials.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Abrasive paper, aluminum oxide, 180 - 240 grit size.

4.1.2 DHMS A6.06 expandable epoxy adhesive.

4.1.3 DHMS P1.26 phenolic coated aramid fibre base honeycomb core.

4.1.4 DHMS P1.29 fire retardant rigid foam.

4.1.5 DHMS P1.30 honeycomb core filler.

4.1.6 DHMS P1.48 flyscreen: Hexcel 1507A-F1551; Cytec Industries Inc. L-501-8800; or Axiom Materials Inc. AX-3114FR-8800.

4.1.7 DSC 234 composite manufacture expendable materials (see Table I).

4.1.8 Kraft paper.

TABLE I - LIST OF EXPENDABLE MATERIALS TO DSC 234

MATERIAL DSC 234	MATERIAL TYPE
-1	Nylon Vacuum Bagging Film, 250°F Cure Cycle
-3	2 Mil Nylon Tubular Vacuum Bagging Film, 250°F Cure Cycle
-5	1 Mil Perforated (pin prick) Release Film
-9	Breather/Bleeder Cloth, Non-Woven Polyester, Max Pressure 50 psi.
-12	Release Ply, Up to 350°F Cure Cycle (Note 1)
-12-3	Pre-Impregnated Peel-Ply (Note 1)
-15	High Temperature Pressure Sensitive Tape
-16	Double Sided Tape
-17	Vacuum Bag Sealant
-20	Fiberglass Tape, Pressure Sensitive Adhesive
Note 1. DSC 234-12 release ply may be used in place of DSC 234-12-3 pre-impregnated peel-ply and DSC 234-12-3 pre-impregnated peel-ply may be used in place of DSC 234-12 release ply.	

4.2 Equipment

4.2.1 Circular knife cutter (e.g., TS.562.21.10), with track mounted honeycomb core cutter (e.g., SD 8900).

4.2.2 Circular saw, equipped with guides and fences.

4.2.3 Gloves, lint-free cotton (e.g., DSC 422-1).

4.2.4 Gloves, leather (e.g., DSC 422-3).

4.2.5 Honeycomb core stabilizing and/or splicing oven or autoclave, certified according to PPS 10.51 or PPS 10.21, respectively.

4.2.5.1 All other ovens or autoclaves (i.e., used for forming and drying) do not require certification to PPS 10.51 or PPS 10.21, however, shall be equipped with temperature monitoring equipment.

4.2.6 Honeycomb core stabilizing platen press, certified according to PPS 10.52.

4.2.7 Hot air gun, maximum temperature of 160°F.

4.2.8 Shop vacuum source, capable of maintaining and monitoring a minimum vacuum of 10" Hg.

4.2.9 Slitting saw (e.g., TS.562.51.12).

4.2.10 Temperature and humidity control equipment capable of maintaining the requirements specified in section 6.6.

4.2.11 Temperature and relative humidity continuous chart recording equipment.

4.2.12 Thermocouple to PPS 10.28.

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 the preparation of honeycomb cores for lay-up in sandwich panel assemblies according to this PPS.

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

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, Bombardier Toronto Materials Technology 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 Bombardier Aerospace Supplier Quality Management.

4.3.3.1 For approval of subcontractor facilities to perform the preparation of honeycomb cores for lay-up in sandwich panel assemblies 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 If the ribbon direction is not specified on the engineering drawing, align the honeycomb core to minimize splicing.

5.1.2 When selecting honeycomb core material, ensure that the attached identification tag defines the honeycomb core thickness, cell size and type, and the weight or density.

5.1.3 Cut honeycomb cores according to section 5.2.

5.1.4 To ease the lay-up procedure according to the applicable part fabrication PPS, honeycomb cores may be heat formed according to section 5.3 before lay-up.

5.1.5 For honeycomb cores and DHMS P1.29 fire retardant rigid foam which has not been stored in a controlled environment, oven or autoclave dry for 30 ± 10 minutes at 275 ± 25°F before lay-up. Also, for DHMS P1.29 fire retardant rigid foam, a grainy/granular surface and/or discolouring, darkening or yellowing of the foam is indicative of UV damage and is not acceptable.

5.1.6 Thoroughly clean/vacuum DHMS P1.29 fire retardant rigid foam after machining, sanding, etc. to remove dust. Foam that has become contaminated with grease, oil, etc. is not acceptable and shall be discarded.

5.1.7 Unless otherwise specified on the engineering drawing, butt splice honeycomb cores according to section 5.4 if necessary to make up the required honeycomb core dimensions.

5.1.8 Prepare hardpoints, insert areas, and recessed doubler locations according to section 5.5.

5.1.9 If specified on the engineering drawing, stabilize honeycomb cores according to section 5.6 by curing a 3" wide strip of DHMS P1.48 flyscreen (see paragraph 4.1.6) onto the spanwise edges of the honeycomb core.

5.1.9.1 Use a 1" wide strip of DHMS P1.48 flyscreen only if specified on the engineering drawing.

5.1.10 If specified on the engineering drawing, chamfer honeycomb cores according to section 5.7.

5.1.11 Finish honeycomb cores according to section 5.8.

5.1.12 Clean honeycomb cores according to section 5.9.

5.1.13 Operators handling honeycomb core materials as specified herein shall wear DSC 422-1 cotton gloves.

5.2 Cutting Honeycomb Core Material

5.2.1 Cut honeycomb core material using a suitable sharp knife and straight edge. Unless otherwise specified on the engineering drawing, the honeycomb core ribbon direction (see Figure 1) shall be within ± 5° of the direction specified on the engineering drawing. Except as noted below, cut the honeycomb core material slightly oversize to facilitate final trimming of the finished sandwich panel assembly.

- Cut honeycomb cores that are to be heat formed before lay-up to sufficient size to allow for the additional material required to fill the specified contours.
- If rigid foam edges are to be incorporated into the lay-up or a chamfered edge panel closeout is required, cut the honeycomb core to the exact size required.

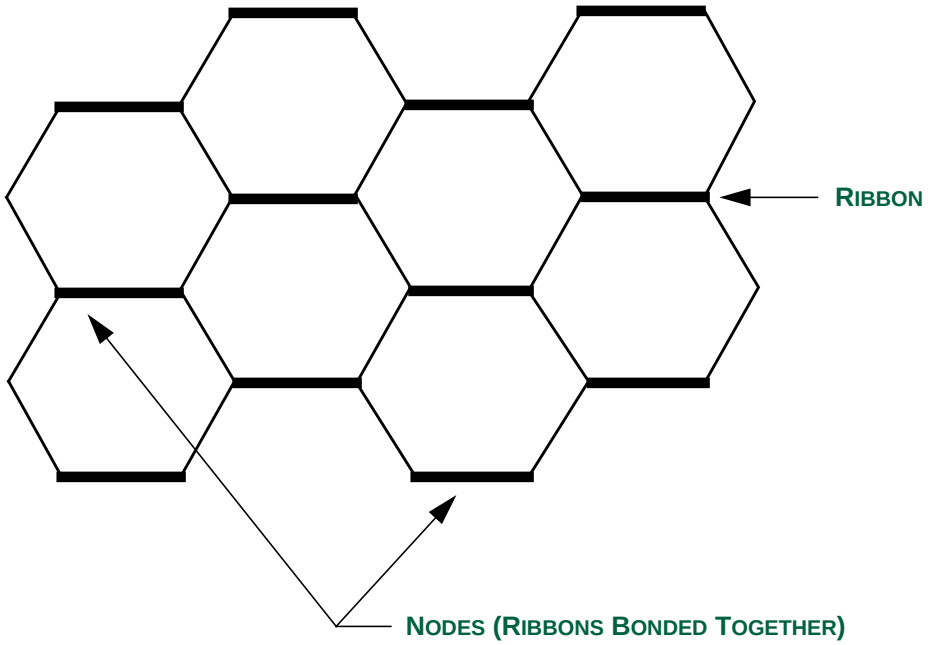

FIGURE 1 - HONEYCOMB CORE

5.3 Heat Forming Honeycomb Cores

5.3.1 Heat Forming Honeycomb Cores using the Vacuum Bag Method

5.3.1.1 Perform heat forming of the honeycomb core using the vacuum bag method as follows:

Step 1. Oven or autoclave dry the honeycomb core for 30 ± 10 minutes at 275 ± 25°F.

Step 2. Ensure the mould is clean and free of contaminants. **Do not** apply mould release agent when heat forming honeycomb cores.

Step 3. Place the honeycomb core, correctly oriented, on the mould.

Step 4. Apply DSC 234-17 vacuum bag sealant to the mould surface to surround the perimeter of the part. Leave a minimum of 1" from the honeycomb core edge to the vacuum bag sealant.

Step 5. Cover the honeycomb core with one layer of DSC 234-5 perforated release film.

Step 6. Cover the honeycomb core with a layer of DSC 234-9 breather cloth.

Step 7. Position the vacuum outlets as evenly spaced around the honeycomb core as possible. There shall be one vacuum outlet for every 9 square feet of honeycomb core area.

Step 8. Place 2 to 3 layers of DSC 234-9 breather cloth under each of the vacuum outlets.

Step 9. Cover the lay-up with DSC 234-1 or DSC 234-3 vacuum bagging film, as applicable, and work the edges firmly into the vacuum bag sealant. Apply additional vacuum bag sealant as necessary, if the vacuum bagging film has been doubled or pleated.

Step 10. Puncture the vacuum bagging film at the vacuum outlets.

Step 11. Place the vacuum bagged honeycomb core in the oven or autoclave and heat form according to Figure 2 while maintaining a vacuum of 10 to 14" Hg. When heat forming DHMS P1.26, 3 lb/ft^3, 3/16" cell, 1/2" thick, over expanded honeycomb core, as an alternative, the core may be exposed to a cure cycle according to PPS 10.35 or PPS 10.43 instead.

Step 12. After completion of the heat forming cycles according to Figure 2, cool the honeycomb core to 140 ± 5°F at no more than 5°F per minute before releasing the vacuum.

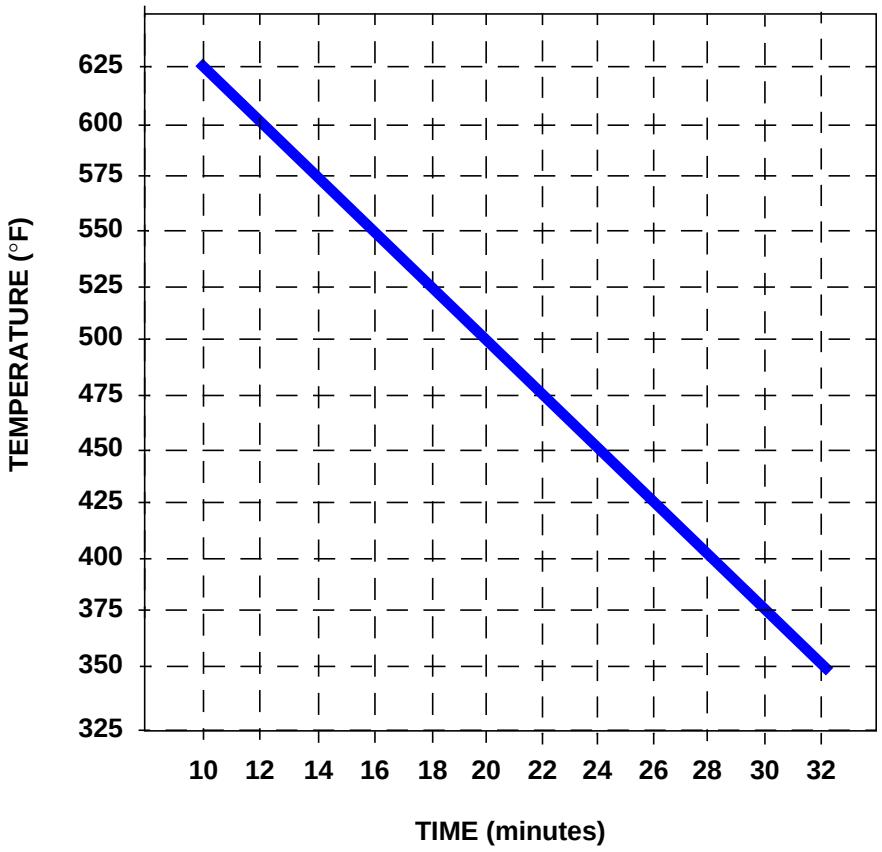

FIGURE 2 - HONEYCOMB CORE HEAT FORMING SCHEDULE

5.3.2 Heat Forming Honeycomb Cores using the Weighting Method

5.3.2.1 Perform heat forming of the honeycomb core using the weighted screen method as follows:

Step 1. Oven or autoclave dry the honeycomb core for 30 ± 10 minutes at 275 ± 25°F.

Step 2. Ensure the mould is clean and free of contaminants. **Do not** apply mould release agent when heat forming honeycomb cores.

Step 3. Place the honeycomb core, correctly oriented, on the mould.

Step 4. Cover the honeycomb core with release film to prevent contamination when weights and/or clamps are placed over the honeycomb core as specified in Step 5.

Step 5. Place suitable weights (e.g., weighted screen or mesh, tube or circular bar of appropriate diameter, etc.) over the honeycomb core to hold it as near the desired shape as possible. Add or remove weights and/or clamps as necessary to achieve the desired contour.

Step 6. Place the honeycomb core in the oven or autoclave and heat form according to Figure 2. When heat forming DHMS P1.26, 3 lb/ft^3, 3/16" cell, 1/2" thick, over expanded honeycomb core, as an alternative, the core may be exposed to a cure cycle according to PPS 10.35 or PPS 10.43 instead.

Step 7. After completion of the heat forming cycle according to Figure 2, cool the honeycomb core to 140 ± 5°F at no more than 5°F per minute.

5.4 Butt Splicing of Honeycomb Cores

5.4.1 Honeycomb core splicing before lay-up renders the honeycomb core inflexible and shall only be done when the honeycomb core is to be laid up flat or has been heat formed.

5.4.2 Accomplish butt splicing by joining honeycomb core sections using DHMS A6.06 expandable epoxy adhesive (see Figure 3). Prepare and handle the adhesive according to PPS 10.25. Use 0.05" thick sheet for splicing 1/8" cell sizes and use 0.10" thick sheet for splicing 3/16" and 1/4" cell sizes.

5.4.3 Process honeycomb core sections that are to be spliced before laying up in the mould as follows:

Step 1. Thoroughly clean both splice edges according to section 5.9.

Step 2. Cut a strip of expandable adhesive the same width as the honeycomb core thickness.

Step 3. Place the strip of adhesive between the cleaned splice edges and join with light hand pressure.

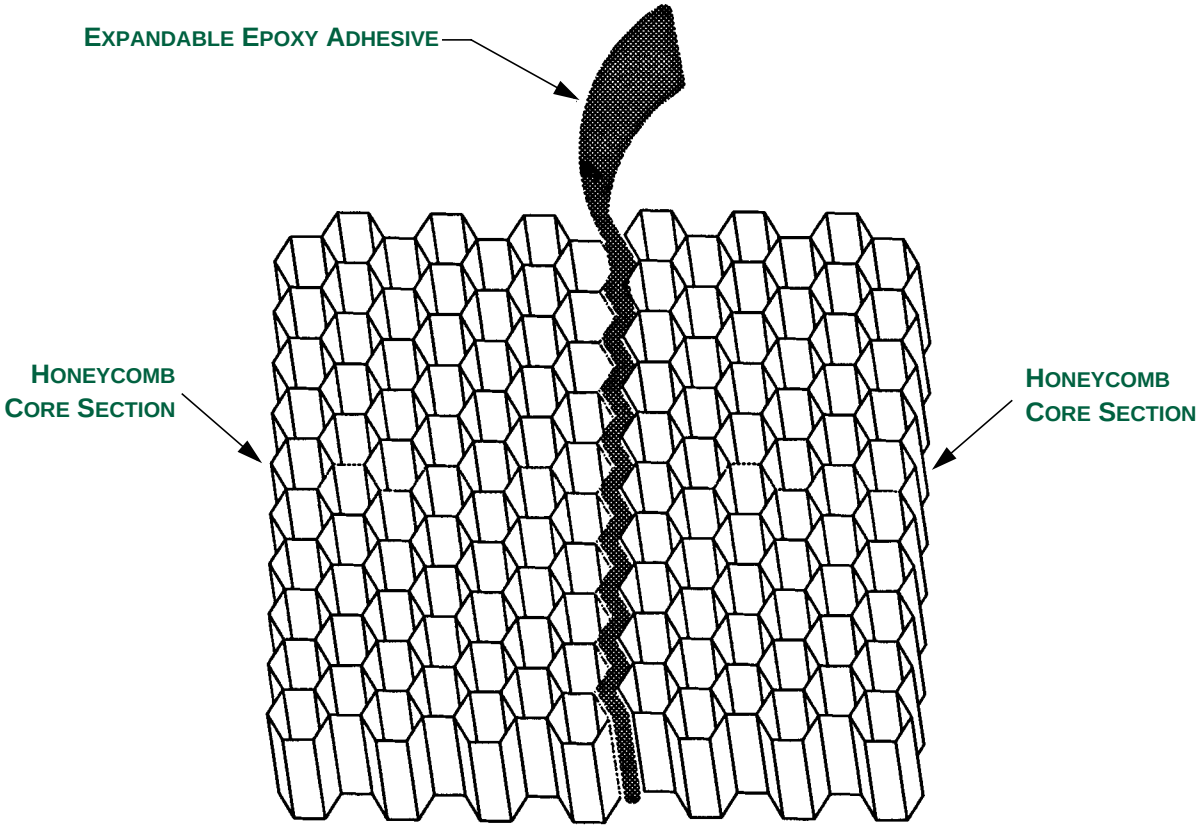

FIGURE 3 - HONEYCOMB CORE SPLICING

Step 4. Securely hold the splice joint in place. If possible, the splice joint shall be backed on both faces by metallic strips, coated with a release agent.

Step 5. Prepare a thermocouple according to PPS 10.28.

Step 6. Cover the thermocouple end with two layers of DSC 234-9 breather cloth and tape it to the support sheet using DSC 234-15 tape.

Step 7. Place the honeycomb core sections in an oven or autoclave and commence heating at a rate of 2 to 5°F per minute.

Step 8. Heat the oven or autoclave to 260 ± 10°F and maintain for 60 to 90 minutes.

Step 9. If the temperature indication falls below 250°F during the temperature soak period (260 ± 10°F for 60 to 90 minutes), consider the cure cycle to have stopped and restart only when the variance has been corrected. Extend the soak period by the amount of the time the cycle was out of tolerance.

Step 10. In cases where the expandable foam adhesive has not completely filled the splice line, fill the gaps with DHMS P1.30 Grade 2 or 2A low density core filler prepared according to PPS 13.23. If the splice line contains gaps bigger than specified below, refer the spliced core to Bombardier Toronto MRB or Bombardier Toronto delegated MRB for disposition:

Maximum allowable gap size: 0.5" in length, 0.25" in width, and 0.2" or 10% of the core thickness in depth.

5.4.4 If specified on the engineering drawing, other methods of honeycomb core splicing (i.e., crush splicing) may be employed.

5.4.5 If the honeycomb core is to be spliced as part of the laid-up assembly, process the parts according to the applicable part fabrication PPS.

5.5 Preparation of Honeycomb Core Hardpoints & Edging

5.5.1 If hardpoints (doubler or inserts) or edging are specified on the engineering drawing, prepare the location at which the hardpoint is to be installed as follows:

Step 1. Route doubler locations to the size and depth necessary to enable the doubler, when installed, to be correctly seated according to the engineering drawing and meet the dimensional requirements of section 6.2.

Step 2. If specified on the engineering drawing, pot the cells below and surrounding the doubler with core filler according to PPS 13.23.

Step 3. If the honeycomb core will not be further contoured, the applicable cells may be potted with the honeycomb core filler before lay-up according to the applicable part fabrication PPS. Except if a suitable curing jig is used, if further contouring of the honeycomb core will be required, the applicable cells may not be potted with honeycomb core filler before lay-up according to the applicable part fabrication PPS.

5.5.2 Insert locations may be cut from the honeycomb core using a sharp knife or other suitable cutting tool.

5.5.3 If possible, install doublers and inserts in the honeycomb core according to the applicable part fabrication PPS during lay-up.

5.6 Stabilizing Honeycomb Core Edges

5.6.1 Oven or Autoclave Cure Method

5.6.1.1 Stabilize honeycomb core edges using the oven or autoclave cure method as follows:

Step 1. Prepare the mould according to PPS 10.22.

Step 2. Prepare a thermocouple according to PPS 10.28.

Step 3. Cover the thermocouple end with two layers of DSC 234-9 breather cloth and tape it to the tool using DSC 234-15 tape.

Step 4. Lay-up one ply of either DSC 234-12 release ply or DSC 234-12-3 peel-ply.

Step 5. Lay-up one ply of DHMS P1.48 flyscreen (see paragraph 4.1.6) approximately 3" wide (warp 0°) onto the edge of the honeycomb core. Ensure the resin rich side of the flyscreen is facing the core. Handle flyscreen according to PPS 10.23.

Step 6. Position honeycomb core onto the lay-up and apply DSC 234-17 vacuum bag sealant to the mould surface to surround the perimeter of the honeycomb core. Leave a minimum of 1" from the honeycomb core edge to the vacuum bag sealant.

Step 7. Cover the honeycomb core with one layer of DSC 234-5 perforated release film.

Step 8. Cover the honeycomb core with a layer of DSC 234-9 breather cloth.

Step 9. Position the vacuum outlets as evenly spaced around the honeycomb core as possible. There shall be one vacuum outlet for every 9 square feet of honeycomb core area.

Step 10. Place 2 to 3 layers of DSC 234-9 breather cloth under each of the vacuum outlets.

Step 11. Cover the honeycomb core with DSC 234-1 or DSC 234-3 vacuum bagging film, as applicable, and work the edges firmly into the vacuum bag sealant. Apply additional vacuum bag sealant as necessary, where the vacuum bagging film has been doubled or pleated.

Step 12. Puncture the vacuum bagging film at the vacuum outlets.

Step 13. Place the vacuum bagged honeycomb core in an oven or autoclave and commence heating at a rate of 2 to 5°F per minute.

Step 14. Cure at 260 ± 10°F while maintaining a vacuum of 10 to 14" Hg for 90 to 95 minutes if Hexcel 1507A-F1551 flyscreen was used in Step 5 or for 60 to 90 minutes if Cytec L-501-8800 or Axiom AX-3114FR-8800 flyscreen was used.

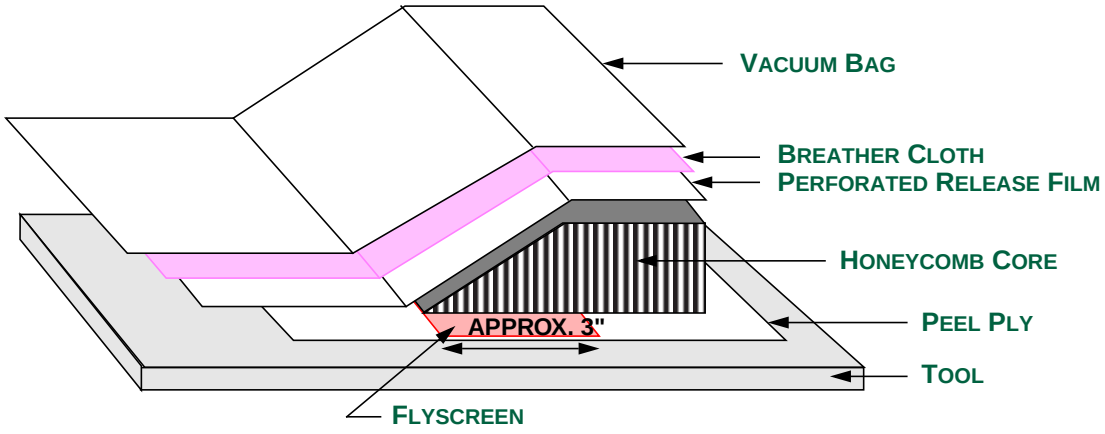

FIGURE 4 - STABILIZATION OF CORE EDGES (OVEN OR AUTOCLAVE CURE METHOD)

5.6.2 Platen Press Curing Method

5.6.2.1 Stabilize honeycomb core edges using the platen press curing method as follows:

Step 1. Prepare the mould according to PPS 10.22.

Step 2. Prepare a thermocouple according to PPS 10.28.

Step 3. Cover the thermocouple end with two layers of DSC 234-9 breather cloth and tape it to the tool using DSC 234-15 tape.

Step 4. Lay-up one ply of DSC 234-12 release ply or DSC 234-12-3 peel-ply.

Step 5. Lay-up one ply of DHMS P1.48 flyscreen (see paragraph 4.1.6) approximately 3" wide (warp 0°) onto the edge of the honeycomb core. Ensure the resin rich side of the flyscreen is facing the core. Handle flyscreen according to PPS 10.23.

Step 6. Position honeycomb core onto the lay-up.

Step 7. Unless otherwise specified on the engineering drawing, platen press cure the honeycomb core at 25 to 35 psi for 90 to 95 minutes if Hexcel 1507A-F1551 flyscreen was used in Step 5 or for 60 to 90 minutes if Cytec L-501-8800 or Axiom AX-3114FR-8800 flyscreen was used at 260 ± 10°F according to PPS 10.26.

5.6.3 Stabilizing Honeycomb Core Edges Using Unsupported DHMS A6.08 Film Adhesive

5.6.3.1 Stabilize honeycomb core edges using unsupported DHMS A6.08 film adhesive as follows:

Step 1. Prepare the mould according to PPS 10.22.

Step 2. Apply one ply of DHMS A6.08 film adhesive (Class and Type as specified on the engineering drawing) onto the edge of the honeycomb core and then use a hot air gun (maximum temperature 160°F) to melt and flow the adhesive into the cells of the core (see Figure 5).

Step 3. If any curvature is involved in the part into which the core detail is to be placed, shape the core to profile.

Step 4. Perform one of the following free standing curing methods:

- If the engineering drawing specifies Class 1 DHMS A6.08 film adhesive, either oven or autoclave cure the honeycomb core at 260 ± 10°F for 60 to 90 minutes or platen press cure at 25 to 35 psi for 60 to 90 minutes at 260 ± 10°F according to PPS 10.26.
- If the engineering drawing specifies Class 2 DHMS A6.08 film adhesive, oven or autoclave cure the honeycomb core at 355 ± 10°F for 120 to 180 minutes.

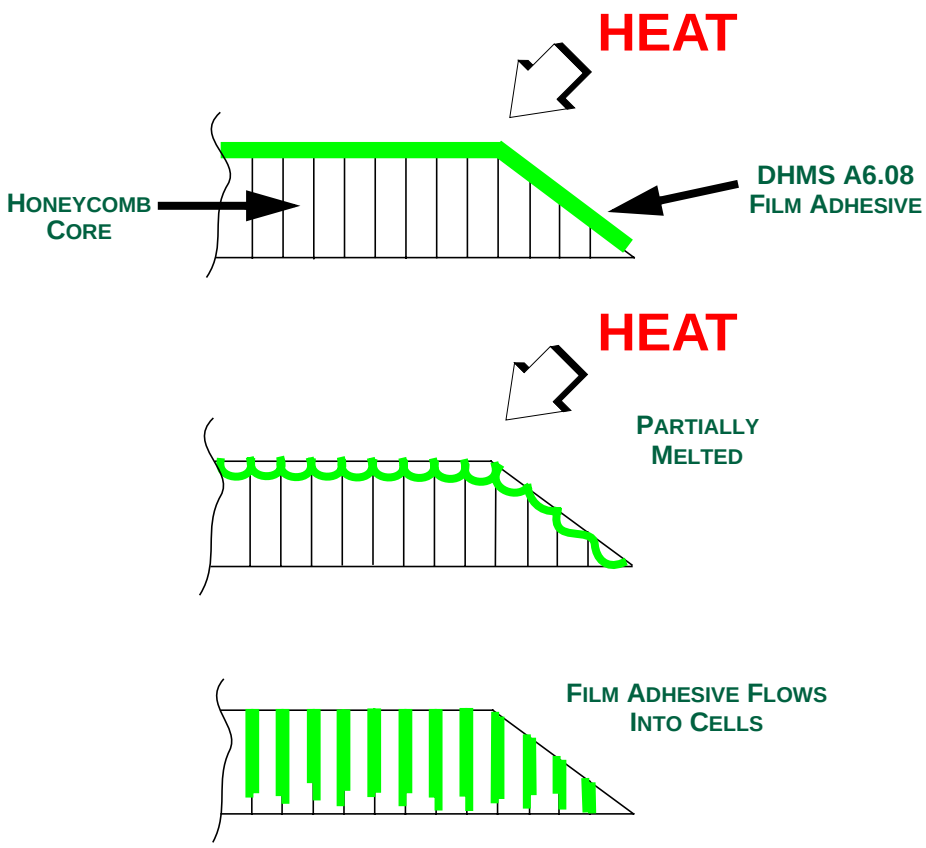

FIGURE 5 - STABILIZATION OF CORE EDGES USING DHMS A6.08 FILM ADHESIVE (CLASS AND TYPE AS SPECIFIED ON THE ENGINEERING DRAWING)

5.7 Chamfering of Honeycomb Cores

5.7.1 Chamfer honeycomb core using a circular saw (see paragraph 4.2.2), slitting saw (see paragraph 4.2.9), or using a circular knife cutter (see paragraph 4.2.1).

5.7.2 Securely hold the honeycomb core on a suitable support board to prevent excessive movement while machining.

5.7.3 Strips of DSC 234-16 double sided tape may be applied to the honeycomb core and support board to secure the honeycomb core for machining (see Figure 6).

5.7.4 After all chamfering, round off the upper edges and corners of the honeycomb core by sanding according to section 5.8 to a radius of 1/2" to 2". Do not sand or radius the lower edge of the chamfer unless otherwise specified on the engineering drawing.

5.7.5 Chamfered honeycomb cores shall meet the requirements of the engineering drawing and the dimensional requirements of section 6.2.

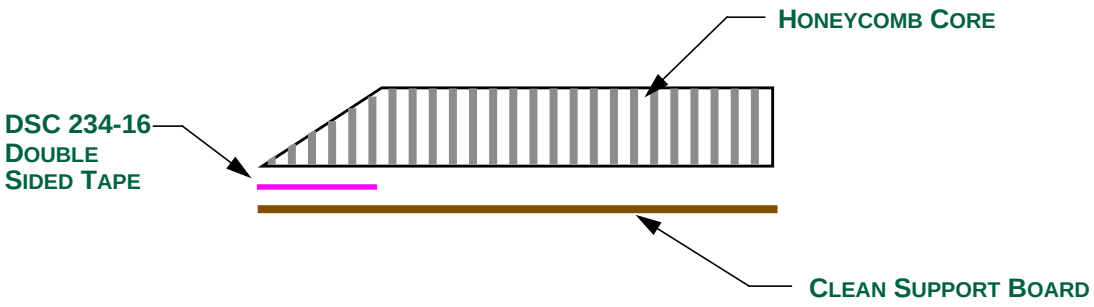

FIGURE 6 - SECURING HONEYCOMB CORE FOR MACHINING

5.8 Finishing of Honeycomb Cores

5.8.1 After splicing, chamfering and the addition of doublers, the operator shall inspect the honeycomb core for surface irregularities that may cause rejection of the finished part.

5.8.2 Check the honeycomb core surface at splice joints for any rough areas and thickness mismatch. If necessary, restore the surface by lightly sanding with 180 - 240 grit abrasive paper.

5.8.3 Radius chamfered edges and corners by sanding with 180 - 240 grit abrasive paper. Take care to prevent notching of the honeycomb core. Oscillating sanders may be used to form the radii on the honeycomb core edge.

5.8.4 Thoroughly check honeycomb cores for evidence of torn or broken cell wall pieces and edge band tear out. Carefully remove torn or broken cell wall pieces from the honeycomb core so as not to damage adjacent cell walls. Edge band tear out due to chamfering shall not exceed 0.25 square inches in a 12 inch section of the chamfered edge.

5.8.5 Ensure all vacuum bagging material is removed after curing and before any further processing.

5.9 Cleaning of Honeycomb Cores

5.9.1 Thoroughly clean honeycomb core after splicing, machining, forming, sanding, etc. to remove dust, machining debris or other dry contaminants using a vacuum cleaner. Solvent wipe honeycomb core according to PPS 31.17 to remove any residue contaminants. Do not use chlorinated solvents to clean honeycomb cores.

5.9.2 Clean honeycomb core under a fumehood in a contaminant free area (e.g., away from release agents such as Frekote).

5.9.3 If the honeycomb core has become contaminated with grease, oil, etc., dip it in the solvent specified in PPS 31.17 for up to 60 seconds. The honeycomb core may be dipped a maximum of four times. Ensure that the solvent has completely evaporated from the honeycomb core before laying-up. Do not use chlorinated solvents (e.g., trichloroethylene) to clean honeycomb cores.

5.9.4 Wrap cleaned honeycomb cores that are not used immediately in Kraft paper to prevent contamination and stored at 60 to 80°F with the relative humidity not exceeding 60%.

6 REQUIREMENTS

6.1 General

6.1.1 Upon receipt, identify and test all honeycomb core material according to QAMTR 030 before releasing the material to production. Disposition material failing the receipt testing according to QAMTR 030.

6.1.1.1 Where the QAMTR conflicts with the DHMS, the DHMS shall take precedence.

6.1.2 All honeycomb core material shall have an attached identification tag defining the honeycomb core thickness, batch/block number, cell size and type and the weight or density.

6.1.3 Doubler locations shall be routed to the size and depth necessary to enable the doubler, when installed, to be correctly seated according to the engineering drawing.

6.2 Edge Chamfer

6.2.1 The lower edge of the chamfer shall be as near to sharp as possible. The maximum acceptable height shall be 0.100" (see Figure 7).

6.2.2 Unless otherwise specified on the engineering drawing, the chamfer angle shall be 30° ± 2.5°.

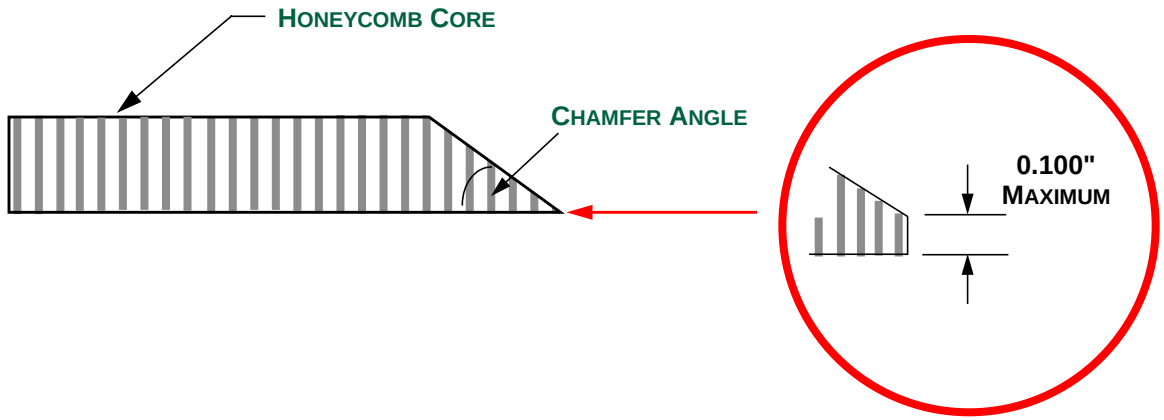

FIGURE 7 - EDGE CHAMFERING

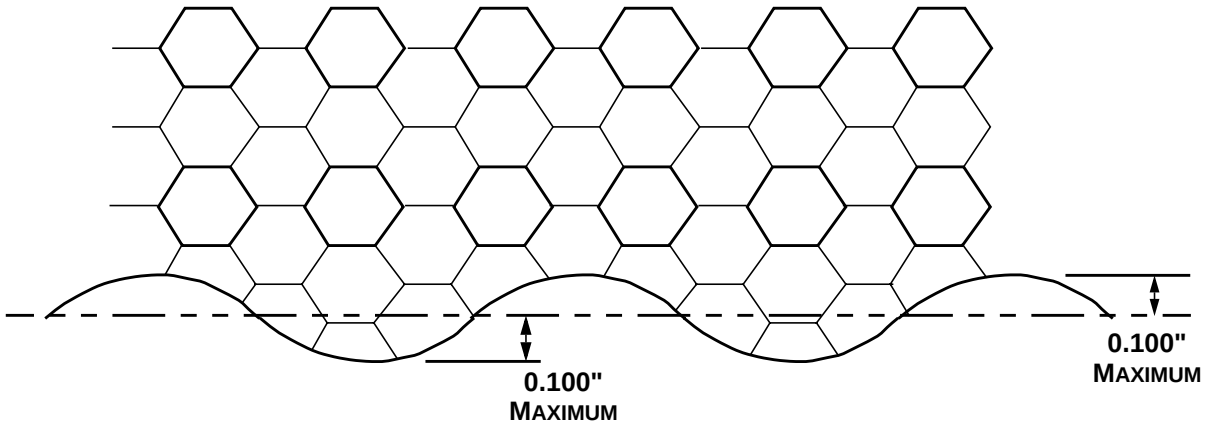

FIGURE 8 - EDGE CHAMFER DEVIATION

6.3 Potted or Foam Edging

6.3.1 The thickness mismatch at the splice joints shall not exceed ± 0.100" for parts that are to be autoclave or oven cured (see Figure 9).

6.3.2 The thickness mismatch at the splice joints shall not exceed ± 0.002" for parts that are to be platen press cured (see Figure 9).

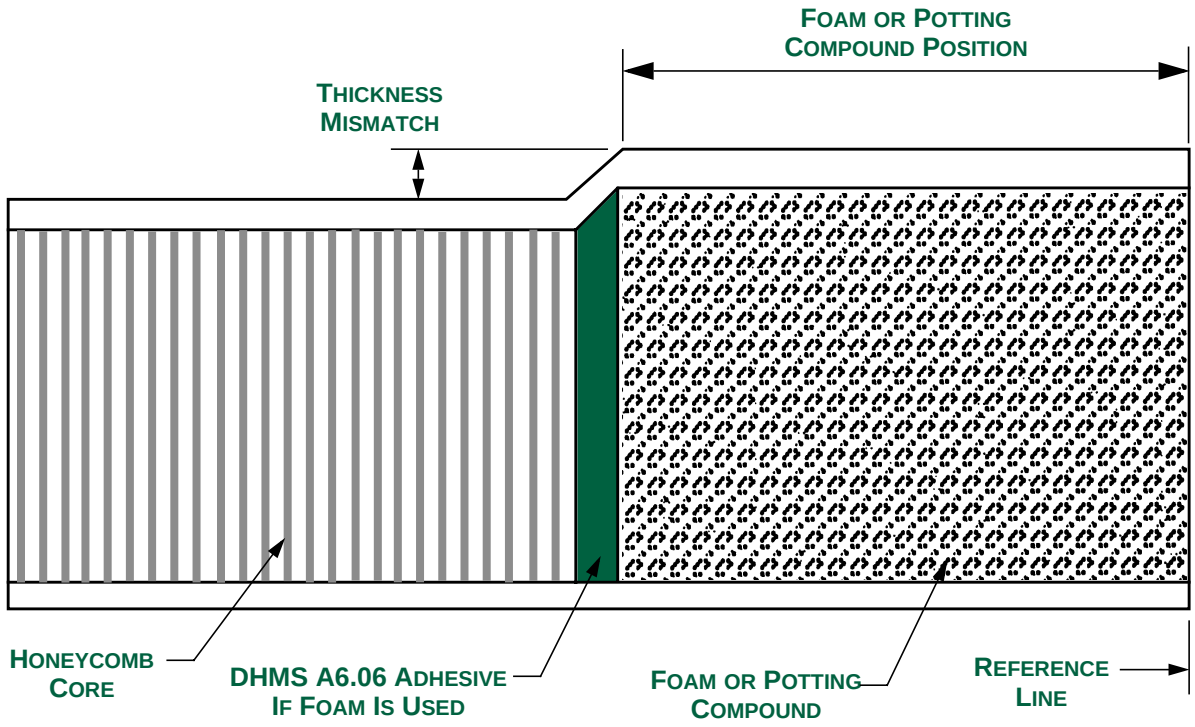

FIGURE 9 - POTTED OR FOAM EDGING

6.3.3 Foam edging shall not deviate by more than ± 0.100" from the position specified on the engineering drawing.

6.3.4 Potted edging shall not deviate more than $^{+1}_{-0}$ cells from the position specified on the engineering drawing.

6.4 Potted or Foam Inserts

6.4.1 The centre line of potted or foam inserts shall not deviate by more than ± 0.100" from the position specified on the engineering drawing (see Figure 10).

6.4.2 Foam inserts shall be within ± 0.100" of the dimension specified on the engineering drawing as measured from the centreline of the insert (see Figure 10).

6.4.3 Potted inserts shall not deviate by more than $^{+2}_{-0}$ cells from the dimension specified on the engineering drawing as measured from the centreline of the insert.

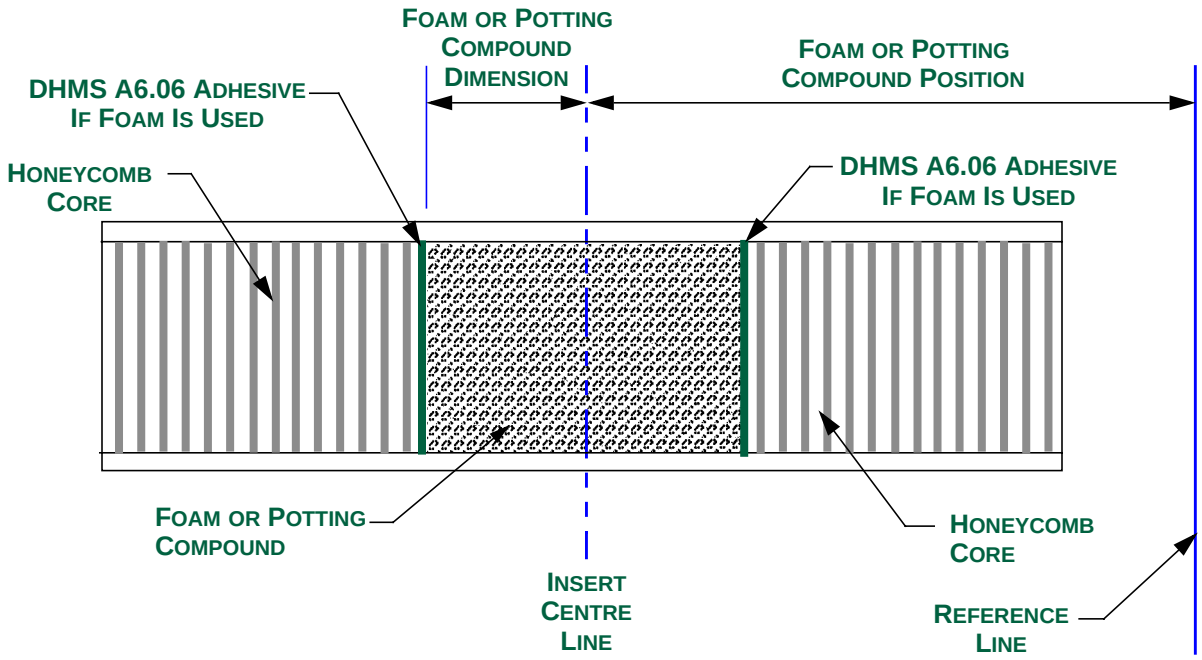

FIGURE 10 - POTTED OR FOAM INSERTS

6.5 Ribbon Direction

6.5.1 Unless otherwise specified on the engineering drawing, the honeycomb core ribbon direction shall be within ± 5° of the direction specified on the engineering drawing.

6.6 Work Area Conditions

6.6.1 Prevent machines and tools used for cutting raw materials from depositing internal lubricating fluids onto the work surfaces.

6.6.2 Inspect and clean working areas at the intervals specified in Table II or sooner if any accumulation of dust, dirt or other contamination is evident. Maintain records of dates of cleaning.

6.6.3 Maintain the temperature and relative humidity of the working areas within the range specified in Figure 11.

6.6.4 Record the temperature and relative humidity of the working areas on continuous chart recording equipment when parts are being processed for Bombardier Toronto. If the temperature or relative humidity fall outside the specified limits, suspend processing and take appropriate corrective action to restore the working area back to the acceptable specified limits.

TABLE II - SCHEDULE FOR INSPECTING AND CLEANING BONDING AREAS

ITEMS	MAXIMUM INSPECTION TIME INTERVAL	MAXIMUM CLEANING TIME INTERVAL	METHOD OF CLEANING
Tables	24 hours	24 hours	Re-cover with clean Kraft paper
Floors	24 hours	24 hours	Vacuum and damp mop
Equipment	24 hours	24 hours	Wipe with damp cloth
Walls from the floor to a height of 7 ft. (Note 1)	7 days	6 months	Wash with water
Walls above 7 ft. high, ceilings, beams, light fixtures, etc. (Note 1)	30 days	6 months	Wash with water
Note 1. In designated working areas only (i.e., clean rooms, plastic shop, etc.).			

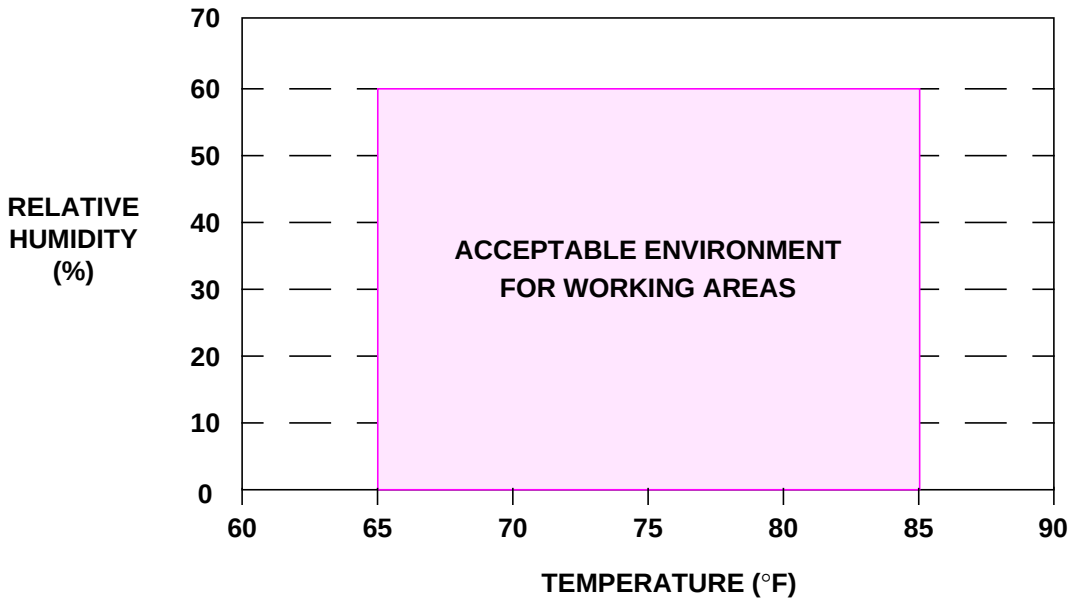

FIGURE 11 - TEMPERATURE AND HUMIDITY LIMITS FOR WORKING AREAS

7 SAFETY PRECAUTIONS

7.1 Safety precautions applicable to the materials and procedures specified herein shall be defined by the subcontractor performing the work for Bombardier Toronto.

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 additional personnel requirements. Certified and/or qualified personnel shall have a good working knowledge of the following, as applicable:

- engineering drawing and work order notes regarding the lay-up of composite parts.
- relevant sections regarding the lay-up of composite parts in the PPS's specified in section 3.

9 STORAGE

9.1 Store DHMS P1.30 honeycomb core filler according to PPS 13.23.

9.2 Store DHMS P1.26 honeycomb core material and DHMS P1.29 fire retardant rigid foam material in a temperature and humidity controlled environment (60°F to 80°F with the relative humidity not exceeding 60%). Also, DHMS P1.26 honeycomb core material shall be stored flat (i.e., cells in the vertical position), in its shipping container or other suitable protection from contamination or damage. For DHMS P1.29 fire retardant rigid foam material, the foam shall be stored sealed within a bag protected from UV light.

9.3 Store film adhesives according to PPS 10.25.

9.4 Store DHMS P1.48 flyscreen according to PPS 10.23.

9.5 The storage life of composite materials and products (i.e., DHMS A6.06 expandable epoxy adhesive and DHMS P1.30 honeycomb core filler) shall be as specified in PPS 13.28.