

Process Specification for the Trimming and Drilling of Composites

Engineering Directorate

Structural Engineering Division

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REVISIONS		
VERSION	CHANGES	DATE
--	Original version	6/18/97
A	Author change	7/22/99
B	Reviewed per QMS requirement. Removed references to old division name. Removed reference to DPI-6000 series (not applicable).	10/16/02
C	Reviewed per QMS requirement. No changes.	3/8/05
D	Updated reference to JPR 8500.4. Updated section reference in paragraph 3.2.	5/11/07
E	Updated trimming and drilling operations to include change-out of bits due to wear (paragraph 6.4). Included verbiage on use of coolants (paragraph 6.4). Updated SDS reference (paragraph 6.5). Added Section 7.0 Process Qualification. Updated signatures	5/15/20

1.0 **SCOPE**

This document provides the standard requirements for the trimming and drilling of composite parts.

2.0 **APPLICABILITY**

This specification shall be applicable whenever a composite trimming or drilling process is invoked per Section 3.0, "Usage".

3.0 **USAGE**

This section gives the requirements for the proper use of this process specification.

In accordance with the drawing and part definition requirements of JPR 8500.4, "Engineering Drawing System Manual", a standard composite trimming or drilling process may be invoked by providing a process note in the applicable drawing or CAD model as illustrated in Figure 1.

TRIM LAMINATE PER JSC PRC-6003, LEVEL 1
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3.1 **LEVELS**

The "Level" designator governs the extent to which quality assurance provisions are applied and shall be specified in the process note on the basis of the following definitions:

- a. Level 1 — Level 1 processes shall include the practice of the quality assurance provisions as required by Section 8.1. Whenever invoking these Level 1 provisions, the designer should also consider calling out an NDE process specification on the drawing or CAD model.
- b. Level 2 — Level 2 processes shall include the practice of the quality assurance provisions as required by Section 8.2.

3.2 **EDGE SEALING**

If desired, specify the sealing of trimmed or drilled part edges in the process note and be sure to specify the sealing material. Sealants shall be applied per Section 6.6.

3.3 **NON-DESTRUCTIVE EVALUATION**

This specification does not address the application of non-destructive evaluation (NDE) methods. However, when calling for Level 1 processing, the designer should also consider the use of NDE inspection by calling out a separate NDE process specification on the drawing or CAD model.

4.0 REFERENCES

The following references were used in developing this process specification:

SOP-007.1 A	<i>Preparation and Revision of Process Specifications</i>
JPR 8500.4	<i>Engineering Drawing System Manual</i>

The following documents are called out as an extension of the requirements given in this specification:

ANSI/NCSL Z540-1	<i>Calibration Laboratories and Measuring and Test Equipment General Requirements</i>
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5.0 MATERIAL REQUIREMENTS

5.1 PART MATERIALS

Part materials to be trimmed or drilled shall satisfy the requirements of any applicable material specifications given on the applicable drawing or CAD model.

5.2 SEALANTS

Any applicable sealants shall remain chemically inert with respect to the part material (or materials) throughout the extent of processing. Sealants shall be stored in an environment as specified by an applicable Material Data Sheet (MDS). Contractors shall obtain applicable MDS's from JSC Manufacturing before processing. If a suitable MDS does not exist, then the sealant vendor's storage requirements shall apply.

6.0 PROCESS REQUIREMENTS

6.1 WRITTEN PROCEDURES AND STANDARDS

For work performed at JSC facilities, written procedures shall be used, and they shall consist of Detailed Process Instructions (DPIs) selected for use from DPI- 6003- series of work instructions. MDS's shall also be used internally.

For contracted work, refer to the contract for requirements concerning the use of written procedures. If an edge sealant is specified, then the Contractor shall also obtain applicable Material Data Sheets (MDS) from JSC Manufacturing before processing.

6.2 FACILITIES

Composite trimming and drilling facilities shall be performed in a Safety- approved airflow booth or area. This facility shall provide adequate airflow with which to remove airborne dust particles. Be sure that all trimming and drilling operations are performed outside of controlled clean room areas.

6.3 FIXTURES AND JIGS

Work pieces shall be held securely using suitable mechanical fixtures or jigs during trimming and drilling operations. Any mating surfaces on the fixtures or jigs shall be clean and free of debris in order to prevent damage to the part.

6.4 TRIMMING AND DRILLING OPERATIONS

Trimming and drilling shall be performed using carbide or diamond-impregnated cutting tools. Trimming and drilling material feed rates and cutting speeds shall be selected so as to provide safe machine operation and to prevent unacceptable defects or dimensional inaccuracies as defined in Section 8.0. Bits shall be changed when evidence of wear is present. Coolants are acceptable during trimming and drilling operations to prevent damage to the part by overheating. Coolants shall be chosen such that are inert to the part and will not interfere with any subsequent bonding operations.

6.5 PERSONAL SAFETY

Safety precautions shall be followed as defined by an applicable Safety Data Sheet (SDS).

6.6 SEALING OF EDGES

Sealants will be applied to trimmed edges as defined by the drawing or CAD model. Sealants shall be applied and cured in a safe manner according to an applicable MDS. If a suitable MDS does not exist, then the sealant vendor's application instructions shall be used.

6.7 HANDLING AND STORAGE

Composite parts shall be handled safely and stored in a manner that prevents damage and visible contamination from occurring to the part.

7.0 PROCESS QUALIFICATION

For work performed within the Structural Engineering Division, written procedures shall be used, and they shall consist of Detailed Process Instructions (DPI's) selected for use from the DPI-6003 series of work instructions. The DPI-6003 series of work instructions shall be validated on non-flight hardware. No untested DPI shall be used to manufacture flight hardware.

8.0 PROCESS VERIFICATION

8.1 LEVEL 1 PROCESS VERIFICATION

A second-party visual inspection, or Mandatory Inspection Point (MIP), of the trimmed part or drilled hole edges shall be performed for Level 1 processes prior to the

application of sealant. All visible edge defects (e.g., chips, cracks, delaminations) shall be formally reported as discrepancies using standard procedures. Note that additional process verification shall be employed if an NDE method is specified (see Section 3.3).

8.2 LEVEL 2 PROCESS VERIFICATION

A first-party visual inspection of the trimmed part or drilled hole edges shall be performed for Level 2 processes in which all visible edge defects (e.g., chips, cracks, delaminations) shall be formally reported as discrepancies using standard procedures.

No second-party inspection is required for Level 2 processing.

8.3 VERIFICATION RECORDS

Traceable records for all second-party inspection shall be kept as quality assurance records.

9.0 TRAINING AND CERTIFICATION OF PERSONNEL

No formal training is required for drilling or trimming technicians. On-the-job training is satisfactory for handheld drilling or trimming pending that safe shop work practices are being followed and records are kept of OJT personnel.

10.0 DEFINITIONS

First-party inspection	Inspection performed by the manufacturing technicians performing the work.
Second-party inspection	Inspection performed by an individual other than the technician performing the work specially authorized to perform second-party inspect.