# Tooling Prepreg Processing Guide

## AmberTool®

## Composite Tooling

TORAY
Toray Advanced Composites

# Product Portfolio

## **Toray AmberTool®** Composite Tooling Prepregs

| | Resin | $T_g$ (onset)*1 | $T_g$ (Peak) | Min cure temp | Typical cure time and temp*2 | Out life | Key product characteristics | Aerospace | Industrial | Motorsport | Automotive | Energy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HX56*3 | Epoxy | 185°C (365°F) | 209°C (408°F) | 40°C (104°F) | 6 hours at 55°C (131°F) | 60 hours | Improved handleability | | ○ | ○ | ○ | ○ |
| HX42*3 | Epoxy | 219°C (426°F) | 234°C (453°F) | 50°C (122°F) | 8 hours at 60°C (140°F) | 5 days | Proven system for aerospace | ○ | ○ | ○ | ○ | |
| HX40 | Epoxy | 203°C (397°F) | 229°C (444°F) | 50°C (122°F) | 12 hours at 65°C (149°F) | 8 days | Large tooling applications | ○ | ○ | | | ○ |

*1 after post cure *2 followed by post cure *3 sourced from: Europe

For product reinforcement options please refer to **Appendix IV.**

Tooling material calculators are available at
**www.toray**tac.com/calculators

# Table of Contents

# Introduction to Composite Tooling

## Tooling Reinvented

The increased use of composites materials is driving the need for more advanced composite tooling solutions. Part manufacturers are demanding tools with longer life and tighter tolerances while pushing for more efficient production methods. The market demands a trusted technology partner that can provide world-class innovation, manufacturing, and service.

With more than 30 years of pedigree in demanding tooling applications, the Toray AmberTool® collection of prepregs comprised of the HX and TC series, is sold globally by a proven team of tooling experts. Our comprehensive range of prepregs for aerospace applications cure from 40°C (104°F) while delivering $T_g$ properties up to 229°C (444°F). These materials are available on a wide range of reinforcements, ranging from 205g to 990g, allowing our customers to have complete tool design freedom and flexibility. Toray Advanced Composites is your partner for your next tooling program.

## Complete Tool Design Freedom

Toray AmberTool® composite tooling prepregs allow high precision for molded and machined tooling applications with a superior degree of accuracy. We support our products globally, offering customers a complete technical support service including tailored training courses. For more information, please go to our website **www.toray**tac.com/tooling

AmberTool®

# Step-by-step Processing Information

## 1. The Master Pattern

**(a) Selection of Materials**

The selection of suitable materials for the master is of prime importance when striving for dimensional accuracy and optimum surface finish. In order to maximize the benefits of low coefficient of thermal expansion and excellent surface finishes, the following alternative combinations of materials are recommended:

**(I)** A high-quality epoxy tooling block coated with fully post cured epoxy or vinyl ester surface coat (see Appendix V for suggested ancillary materials);

**(II)** Epoxy/wet lay-up splashes;

**(III)** There are a number of alternative materials currently in use with Toray AmberTool®; however, any nonspecified materials must be proven by physical testing prior to use;

**(IV)** Toray particularly warn against the use of non epoxy tooling block products as they may affect the curing mechanism of the matrix, leading to uncured / poor surface finishes.

**(b) Release Coating**

Thoroughly degrease the surface using an organic solvent such as Chemlease® Mold Cleaner EZ*, allowing all traces to evaporate by drying at 60°C (140°F) for 30 minutes.

* Alternate mold release cleaners may be used. Please follow manufacturer's recommendations.

**(I)** For minimum block seal, producing a matt finish on final mold. Apply 1–2 coats of Chemlease® MPP 712 EZ using a wipe-on, buff-off technique, allowing 30 minutes between coats. After the final coat, allow a minimum of 1 hour to cure at room temperature. Apply the appropriate mold release as per the manufacturer's guidelines[1].

**(II)** To achieve a gloss finish on the final mold. Apply multiple (12–15) coats of Chemlease® MPP 712 EZ, building up the master surface to a gloss finish that will be repeated on the mold tool.

**(c) Vacuum Integrity**

In all cases, the master must be proved prior to lamination of the mold tool, by carrying out a "mock cure." This will enable any potential problems such as lack of vacuum integrity or poor stability under pressure to be checked before any actual laminate construction (see Section 6: Autoclave Cure).

[1] Europe: Chemlease® 2185; North America: Frekote® 44-NC or 770-NC

## 2. Preparation of Materials

Due to the low temperature curing nature of the prepregs, it is essential for out life to be optimized by keeping it in a frozen state at -18°C (0°F) prior to use. At this stage, the customer may find it appropriate to construct a series of templates to enable single-ply kits of materials to be prepared prior to lamination. The following points should be noted:

**(a)** The material must be allowed to reach room temperature before opening the sealed packaging. This is to avoid the formation of condensation on the material surface as it warms up. In cases where the product is already manufactured in pre-cut squares, the individual sealed packages can be spread out to thaw more quickly.

**(b)** Materials should be cut on a clean stable surface that is not likely to introduce any potential contaminants in the final lay-up. Typical surfaces are a glass sheet, polypropylene, nylon, or rubber.

**(c)** Individual kits of a single ply each should be prepared and stored in a freezer separately. This will enable operators to ensure that a minimal amount of material is out of the freezer at any time—refer to Appendix I for ply type and orientation.

**(d)** The material can also be precut into a series of conveniently cut squares, typically 0.4m x 0.4m (approx. 16 inches x 16 inches) in size.

## 3. Lamination to Tool

Appendix I provides examples of worksheets with an easy reference for ply type and fiber orientation. The first and final plies will be lighter surfacing plies (lower fiber areal weights including the integrity seal process if required) with the composite core made from the heavier material to bulk up the center of the laminate.

**(a)** Trim strips: Lay-up a series of 45° trim strips into all external corners and tight radii, ensure the pattern runs in a consistent direction for aesthetics. Strips should be approximately 40 mm (1.25 inches) wide positioned evenly on the center of the corner.

**(b)** Lay-up the first ply, carefully cutting and fitting, bearing in mind the following points:

**(c)** All pieces should be butt joined, no overlaps are permissible at this stage;

**(d)** The weave pattern should be consistent if the fiber orientation is correct;

**(e)** Cut material to fit into all external radii and corners, taking care not to disturb the trim strips.

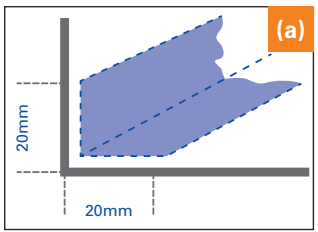
(f) On all internal right-angled corners, allow material to form around angle but by no more than 5 mm (0.25 inch).

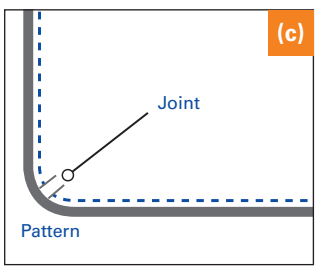
(g) On large external radii, the material should be tailored to fit in midpoint of the radius.

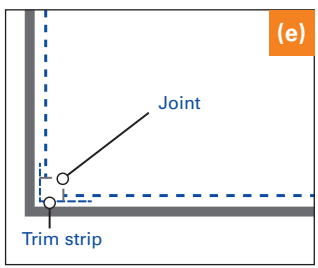
(h) Avoid pushing material into corners with a sharp implement, as this is likely to cause unseen damage to fibers and can lead to a structurally weakened laminate.

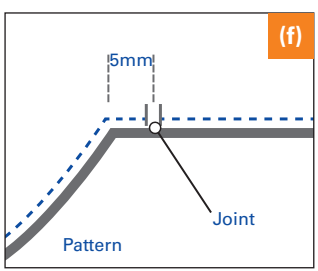
This procedure is repeated throughout the laminate, with the following additional points for the heavier plies (refer to Appendix I):

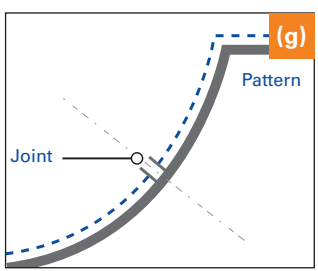
**Note:** Joint gaps are shown for illustration purposes only.



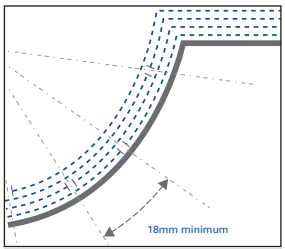
**Heavier Plies:**

(a) All joints should be staggered between plies with a minimum of 18 mm (0.75 inch) spacing for adjacent plies. Overlaps should be avoided if possible;

(b) **Under no circumstances should any gaps be left as this is likely to cause voids in the completed tool;**

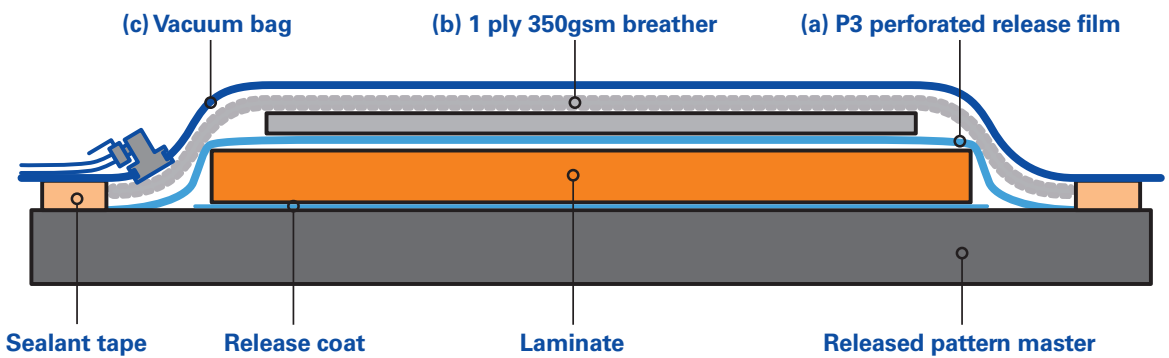
(c) The weave pattern should be consistent if the fiber direction is correct;

(d) Avoid pushing material into corners with a sharp implement.




**Note:** Joint gaps are shown for illustration purposes only.

## 4. Debulking (Reference to Appendix I)



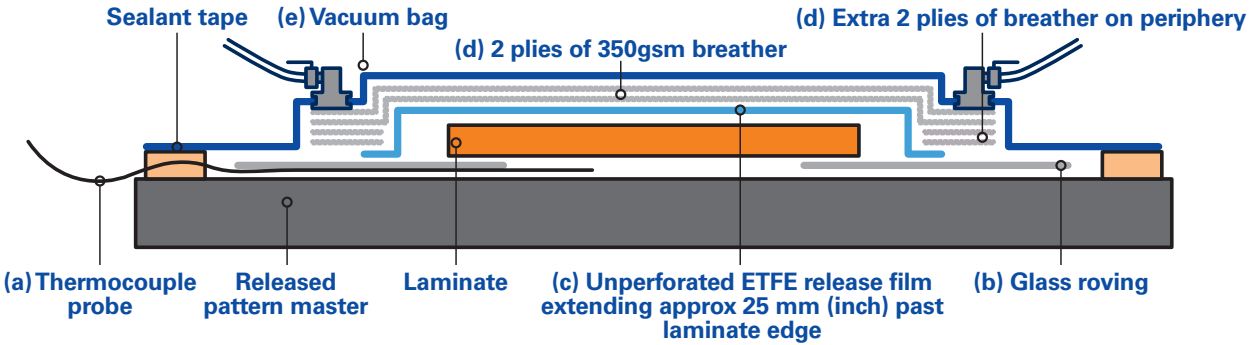
It is essential to debulk the prepreg, at least at the stages stated below:

- After ply 1;
- Approximately every subsequent 3 plies;
- After the final ply has been completed.

This will ensure even consolidation and remove air from the laminate prior to final curing. More complex shapes can sometimes be easier to laminate if more frequent debulks are used, however in these cases, the time factor must be taken into consideration. If a laminate will take more than one day to lay-up, then it must be debulked overnight to ensure that it remains consolidated..

**(a)** Cover entire laminate surface with a perforated release film type P3, extending beyond the lay-up by approximately 25 mm (1 inch).
**(b)** Apply a breather coat of around 350gsm (10.3 oz./yd$^2$) in total to the surface. Tailor to fit to avoid bridging. At this stage, the breather can be omitted from the tightest corners if not practical.
**(c)** Cover the laminate/assembly with a vacuum bag, ensuring that enough slack has been provided to pull into all corners without any bridging.
**(d)** Apply full vacuum and leave for 20 minutes.
**(e)** When removing materials from the surface, be careful not to disturb the laminate.

## 5. Preparation for Autoclave




**(a)** Fit a thermocouple underneath the first ply of material on an area that is not a critical mold surface. Note: care should be taken to monitor temperature in inaccessible places of the laminate, as cool spots within the molding may take longer to reach curing temperature.

**(b)** Lay in strips of glass rovings every 600 mm (24 inches) around the edge of the laminate, continuing to the area on the periphery about to be covered with breather and described in (d).

**(c)** Cover entire laminate with a **nonperforated** ETFE release film, extending the edges by around 25 mm (1 inch).

**(d)** Apply a breather coat of around 700gsm total weight, typically 2 plies of 350gsm (10.3 oz./yd$^2$). Tailor to fit and ensure all areas are interlinked. Fit an extra 2 plies around the periphery between the edge of the laminate and the inside of the vacuum seal. At this stage, it is not advisable to miss breather from any of the surface.

**(e)** Cover with a vacuum bag, ensuring that enough slack has been provided to pull into all corners without bridging paying attention to tight and deep geometry. At this stage, the vacuum pack will appear very bulky, care must be taken to ensure all materials remain in position as the vacuum bag pressurizes.

(f) Apply full vacuum pressure and leave for 25 minutes prior to autoclave processing. Check for vacuum integrity, internal corner consolidation, and position of tucks in the bag.

## 6. Autoclave Cure

Due to the highly reactive nature of the resin systems, it is essential that curing is carried out under the strictest control possible, to ensure entire laminate is fully cured and to avoid potential exotherm:

1. Apply vacuum pressure and hold at 38°C (100°F) for 30 minutes;
2. Apply 1.45 bar (21 psi) with vacuum;
3. Vent to atmosphere, then raise pressure to between 4.15 bar (60 psi) and 6.20 bar (90 psi);
4. Increase air temperature at 0.5–1°C (1–2°F) per minute ramp to the required curing temperature and cure for at least the stated minimum time.

**Initial Curing Cycles (in hours)**

Important: Time and temperatures shown are **minimums** assuming a low mass master model/tool. Increase time at temperature for high mass, thicker master models, or to allow areas of difficult geometry to reach full curing temperature. If the master used is thin walled, e.g., epoxy/wet lay-up splash, an alternative cure should be used to include a dwell at low temperature. To satisfy this requirement, introduce a dwell at 40°C (104°F) for 2 hours, then continue with the standard cure cycle. Initial cure cycles must be followed by a higher temperature post cure for ultimate $T_g$.

| Temperature | HX40 | HX42 | HX56 |
|---|---|---|---|
| 35°C (95°F) | | | |
| 40°C (104°F) | | | 18 |
| 45°C (113°F) | | | 12.5 |
| **50°C (122°F)** | **40** | **18** | **8.5** |
| 55°C (131°F) | 24 | 11 | 6 |
| 60°C (140°F) | 18 | 8 | |
| 65°C (149°F) | 12 | 5 | |
| 70°C (158°F) | 9 | | |
| 75°C (167°F) | 6 | 2.5 | |
| 80°C (176°F) | | | Exotherm risk increases |
| 182°C (360°F) | | | |

## 7. Removal from Master

Should the tool require a backing structure (i.e., to prevent a large tool from distorting under its own weight), it should be fitted at this stage prior to release from the master. Care should be taken not to induce stresses on removing the tool from the master since it will be mechanically weak at this stage. The mold should be gently released and lifted evenly all around.

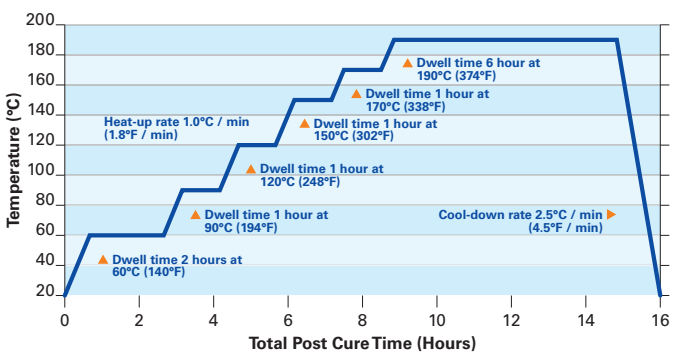
## 8. Post Cure

The tool should be set up with suitable support around the base with its weight spread as evenly as possible. Carry out any one of the following curing schedules from the product datasheet, e.g., 120°C (248°F) end use = 140°C (284°F) maximum post cure temperature plus dwell for 6 hours.

In cases where the end-use temperature is likely to be lower than 180°C (356°F), the post cure can be modified, providing the final stage is at least 20°C (68°F) higher than maximum end-use temperature, and held at this temperature for the appropriate final dwell time of 6 hours. E.g., 120°C (248°F) end use = 140°C (284°F) maximum post cure temperature plus dwell for 6 hours.

| Post Cure Schedule A for Toray AmberTool® HX-Series | | |
|---|---|---|
| Ramp | 1°C (0.6°F)/min to 60°C (140°F) | Dwell for 2 hours |
| Ramp | 1°C (0.6°F)/min to 90°C (194°F) | Dwell for 1 hour |
| Ramp | 1°C (0.6°F)/min to 120°C (248°F) | Dwell for 1 hour |
| Ramp | 1°C (0.6°F)/min to 150°C (302°F) | Dwell for 1 hour |
| Ramp | 1°C (0.6°F)/min to 170°C (338°F) | Dwell for 1 hour |
| Ramp | 1°C (0.6°F)/min to 190°C (374°F) | Dwell for 6 hours |
| Cool to 50°C (122°F) at 2.5°C (4.5°F)/min before removing tool from oven/autoclave. | | |

Post Cure Schedule A

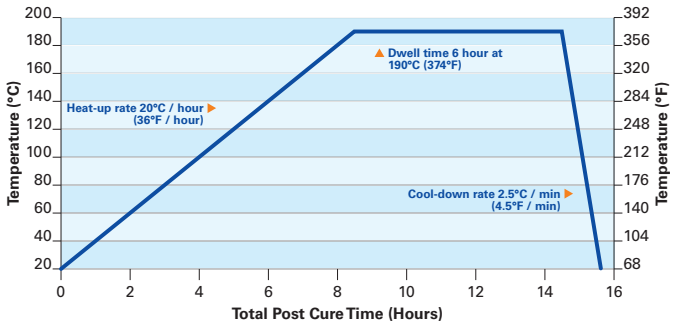


An alternative post cure schedule may also be used as follows for all Toray AmberTool® products. This is the post cure schedule recommended for the HX-Series:

| Post Cure Schedule B for Toray AmberTool® HX-Series | | |
|---|---|---|
| Ramp | 20°C (36°F)/hour to 190°C (374°F) | Dwell for 6 hours |
| Cool to 50°C (122°F) at 2.5°C (4.5°F)/min before removing tool from oven/autoclave. | | |

It is essential to carry out post curing as close as possible to the above schedules to retain maximum end use properties. In cases where the end use temperature is likely to be lower than 180°C (356°F), the post cure can be modified, providing the final stage is at least 20°C (68°F) higher than maximum end use temperature, and held at this temperature for the appropriate final dwell time (6 hours), e.g., 150°C (302°F) end use = 170°C (338°F) maximum post cure temperature plus dwell for 6 hours.

Post Cure Schedule B



## 9. Release Preparation / Priming

It is essential to consider the correct regime for coating and releasing the mold at this stage:

**(a)** Wash surface thoroughly with clean water and allow to dry.

**(b)** Clean surface with mold cleaner[1], apply with a clean 100% cotton cloth. While the mold surface is still wet, vigorously wipe the mold dry with a second clean cloth, until the mold is "squeaky clean" by thumb rub test. Frequently exchange saturated cloths for new ones and repeat several times until all residue is removed. Alternatively, test on an "off part" area with a non-silicone adhesive tape.

**Mold preparation and primer (follow manufacturer's guidelines for usage).**

**(c)** For a high-quality finish, apply 1 or 2 coats of mold sealer EZ by wipe on/wipe off, allowing 30 minutes between each coat and at least 1 hour at an ambient temperature to finally cure. **Note:** Use of this product without a release agent may result in severe damage to the mold.

**(d)** Apply 1 to 2 coats of mold sealer[2] following manufacturer's instructions. Saturate a clean cloth and wipe on a smooth film of no more than 0.6 $m^2$ (6.5 sf) at a time. When the film begins to evaporate at the edges, wipe the surface with a second clean cloth using a circular motion. Repeat until entire mold surface has been covered. Allow 1 hour at an ambient temperature to cure prior to applying mold release.

**(e)** Apply 6 wipes on/polish off coats of a release agent allowing 15 minutes between coats and 30 minutes for a full cure at ambient temperature. Follow manufacturer's instructions.

**(f)** For touch-up coats of your selected release agent, apply 2 coats as before.

## 10. In-service maintenance

Points in general to note are:

**(a)** Avoid any aggressive abrasion on the surface, i.e., when removing components from the mold.

**(b)** Avoid cutting into mold surface during lamination.

**(c)** Do not use excessive force when releasing from the mold.

**(d)** Follow release agent data sheets as recommended.

[1] Europe: Chemlease® Mold Cleaner EZ; North America: Frekote PMC Mold Cleaner, or equivalent

[2] Europe: Chemlease® 15 Sealer; North America: Frekote B15 sealer

**(e)** Different release agents and different prepregs can have a wide variation in effects on the surface of the mold.

## 11. Repriming Mold Surface

Surface deposits can be removed by fine abrasion by hand with either fine nylon scouring pads or cutting paste. Generally, the use of mechanical means is not recommended.

For touch-up coats, it is best to do preventative maintenance, therefore reapply after 15 releases, or as trials determine. Wipe on and polish off 1 coat and allow a minimum of 15 minutes prior to recommencing lay-up.

**(a)** The surface should be cleaned with mold cleaner[2]. Change cloths frequently and use liberal quantities of cleaner.
**(b)** Take mold to 60°C (140°F) for 30 minutes to ensure all moisture/solvent is removed.
**(c)** Revert back to 9 (d) for all release preparation/priming.

## Further Information

For additional information, contact Toray Advanced Composites at the following locations:

**Toray Advanced Composites**
18255 Sutter Blvd.
Morgan Hill, California 95037, USA
T : +1 (408) 465 8500
E : explore@toraytac-usa.com

**Toray Advanced Composites**
Amber Drive, Langley Mill
Nottingham, NG16 4BE, UK
T : +44 (0) 1773 530899
E : explore@toraytac-europe.com

**www.toray**tac.com
**www.toray**tac.com/tooling

Tooling material calculators are available at **www.toray**tac.com/calculators

# Appendices

## Appendix I. Job Sheets

**For Standard 1-8-1 Lay Up**

Here is an example of a typical customer job sheet for a carbon fiber reinforced laminate of standard 1-8-1 construction with a thickness of 5.68 mm (0.22 inches).

**Part number:** **Job number:** **Issue date:**

| Procedure (gsm) | Ply no. | Fiber orientation | Pattern direction | Operator(s) | Inspected | Date |
|---|---|---|---|---|---|---|
| Trim strips 205 2x2T | - | +/- 45° | - | | | |
| Laminate 205 2x2T | 1 | 0° | ↗ | | | |
| Debulk | | | | | | |
| Laminate 650 2x2T | 2 | 0° | ↗ | | | |
| Laminate 650 2x2T | 3 | + 45° | ↑ | | | |
| Laminate 650 2x2T | 4 | - 45° | → | | | |
| Debulk | | | | | | |
| Laminate 650 2x2T | 5 | 90° | ↖ | | | |
| LAMINATE MID PLANE | | | | | | |
| Laminate 650 2x2T | 6 | 90° | ↖ | | | |
| Laminate 650 2x2T | 7 | - 45° | → | | | |
| Debulk | | | | | | |
| Laminate 650 2x2T | 8 | + 45° | ↑ | | | |
| Laminate 650 2x2T | 9 | 0° | ↗ | | | |
| Laminate 205 2x2T | 10 | 0° | ↗ | | | |
| Final debulk | | | | | | |
| Preparation for autoclave | | | | | | |
| Autoclave cure | | | | | | |
| Post cure | | | | | | |
| Preparation and release prime | | | | | | |

**For Alternative 1-5-1 Lay Up**

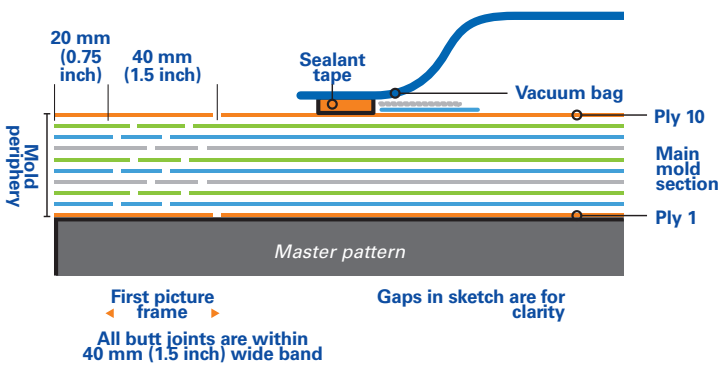
Customer job sheet for a carbon fiber reinforced laminate of an alternative 1-5-1 construction (incorporating 990g plies) with a thickness of 5.43 mm (0.21 inches).

**Part number:** **Job number:** **Issue date:**

| Procedure (gsm) | Ply no. | Fiber orientation | Pattern direction | Operator(s) | Inspected | Date |
|---|---|---|---|---|---|---|
| Trim strips 205 2x2T | - | +/- 45° | NA | | | |
| Laminate 205 2x2T | 1 | 0° | ↗ | | | |
| Debulk | | | | | | |
| Laminate 990 2x2T | 2 | 90° | ↖ | | | |
| Debulk | | | | | | |
| Laminate 990 2x2T | 3 | +45° | ↑ | | | |
| Laminate 990 2x2T | 4 | 0° | ↗ | | | |
| Debulk | | | | | | |
| Laminate 990 2x2T | 5 | -45° | → | | | |
| Laminate 990 2x2T | 6 | 90° | ↖ | | | |
| Laminate 205 2x2T | 7 | 0° | ↗ | | | |

## Appendix II. Integrity Seal

Some tools will be subjected to a large number of autoclave cycles in service, and there is a possibility that the tool surface may become damaged due to operators cutting on its surface or from impact damage. A leak path could possibly form through the damage site and along a fiber bundle exiting at the trimmed edge of the tool. To avoid this, the tool laminate should be laid up in squares. As an additional barrier to this form of leakage, it is desirable to ensure that all fiber bundles are cut at least twice in the area between the strip where the vacuum bag sealant tape will be applied and the tool edge. This will build up a "picture frame" of cut plies around the vacuum bag seal area.




## Appendix III. Machining of Toray AmberTool® products

Utilizing the correct machine tool, speeds, and feeds, Toray AmberTool® HX-series of composite tooling prepregs can be machined, blocked, and prepared to produce a near-net molded surface.

**Pocketing***

- Surface Feet per Minute (SFM) – 800
- RPM – 6.112
- Chip Load/Tooth – .004 Feed/Rate - 50"/min.
- Axial Depth/Pass – .0625"
- Radial Width of Cut – 0.07" (.0025 mm Cusp Height)

**3D Contour***

- SFM – 800
- RPM– 6.112
- Chip Load/Tooth – .002 Feed/Rate - 25"/min.**
- Axial Depth/Pass – .025"
- Radial Width of Cut – 0.07" (.002 mm Cusp Height)

Both conditions use Robb Jack Cutter P/N – PCD-201-16BN (0.5" Ball, 2-Flute PCD). For more information, refer to RobbJack.com/campaign/composite-machining

* Based on Mori Seiki NV5000AI 30AP.

** Could be increased to 50"/min. depending on the rigidity of the part.

# Appendices

## Appendix IV. Toray AmberTool® Product Order Codes

**UK and EU standard carbon fiber products**

| Product in roll format | | | |
|---|---|---|---|
| **Resin Matrix** | **Fabric gsm** | **Description** | **Area (msq)** |
| HX40 | 205g | HX40-00 HS0800 46% CAR205g 2x2T 1.25m | 25 |
| HX40 | 650g | HX40-00 HS2016 35% 34-700 12K CAR650g 2x2T 1.25m | 25 |
| HX42 | 205g | HX42-00 HS0800 46% CAR205g 2x2T 1.25m | 25 |
| HX42 | 650g | HX42-00 HS2016 35% 34-700 12K CAR650g 2x2T 1.25m | 25 |
| HX42 | 990g | HX42-00 HS3929 35% 34-700 24K CAR990g 2x2T 1.25m | 25 |
| HX56 | 205g | HX56-00 HS0800 46% CAR205g 2x2T 1.25m | 25 |
| HX56 | 650g | HX56-00 HS2016 35% 34-700 12K CAR650g 2x2T 1.25m | 25 |

| Product in square format (400mmx 400mm) | | | |
|---|---|---|---|
| **Resin Matrix** | **Fabric gsm** | **Description** | **Area (msq)** |
| HX56 | 205g | HX56-00 HS0800 46% CAR205g 2T Superpack PK10x10 | 16 |
| HX56 | 650g | HX56-00 HS2016 35% CAR650g 2T Superpack PK10x10 | 16 |
| HX56 | 990g | HX56-00 HS3929 35% CAR990g 2T Superpack PK10x5 | 8 |

**US standard carbon fiber products**

| Product in roll format | | | |
|---|---|---|---|
| **Resin Matrix** | **Fabric gsm** | **Description** | **Area (msq)** |
| HX40 | 206g | AmberTool® HX40/3K 2x2 Twill, 206 gsm, 46% RC, 50", OSI | 10 |
| HX40 | 670g | AmberTool® HX40/12K 2x2 Twill, 670 gsm, 35% RC, 50" | 25 |
| HX42 | 206g | AmberTool® HX42/3K 2x2 Twill, 206 gsm, 46% RC, 50", OSI | 10 |
| HX42 | 670g | AmberTool® HX42/12K 2x2 Twill, 670 gsm, 35% RC, 50" | 25 |
| HX56 | 205g | HX56-00 HS0804 46% T300 3K CAR205g 2x2T 1.25m | 25 |
| HX56 | 650g | HX56-00 HS2016 35% 34-700 12K CAR650g 2x2T 1.25m | 25 |

Other reinforcements including glass fiber are available on request

## Appendix V. ancillary materials

**Model Materials**

- Rampf WB-0700 with density matched adhesive and repair paste
- Axson Lab 975 and adhesive

**Cleaners and Releases**

- Chemlease® MPP712EZ Sealer
- Chemlease® 2185 Mold Release
- Chemlease® Mold Cleaner EZ
- Chemlease® 15 Sealer EZ
- Chemlease® 255 Release Agent
- Chemlease® PMR EZ Release Agent

**Vacuum Bagging Supplies**

- Bagging film – Tygavac KM1300
- P3 and NP ETFE release film – Tygavac WL5200B P3 & NP
- Autoclave breather 350gsm – AW N10
- Tacky tape/bag sealant – AT200Y

**Repair Paste**

- SikaAxson APF-7 Filler Paste

# Locations

Manufacturing Locations

**Toray Advanced Composites**
18255 Sutter Blvd.
Morgan Hill, CA 95037, USA
Tel:+ 1 408 465 8500
explore@toraytac-usa.com

**Toray Advanced Composites**
Amber Drive, Langley Mill
Nottingham, NG16 4BE, UK
Tel:+44 (0)1773 530899
explore@toraytac-europe.com

Other Business Locations

**Toray Advanced Composites**
2450 Cordelia Road
Fairfield, CA 94534, USA
Tel:+1 707 359 3400
explore@toraytac-usa.com

**Toray Advanced Composites**
G. van der Muelenweg 2
7443 RE Nijverdal, NL
Tel: +31 (0)548 633 933
explore@toraytac-europe.com

**Toray Performance Materials Corp.**
1150 Calle Suerte
Camarillo, CA 93012, USA
Tel: +1 805 482 1722
contact@torayPMC.com



Toray_AmberToolPrepregProcessingGuide_V75_2023-12-01