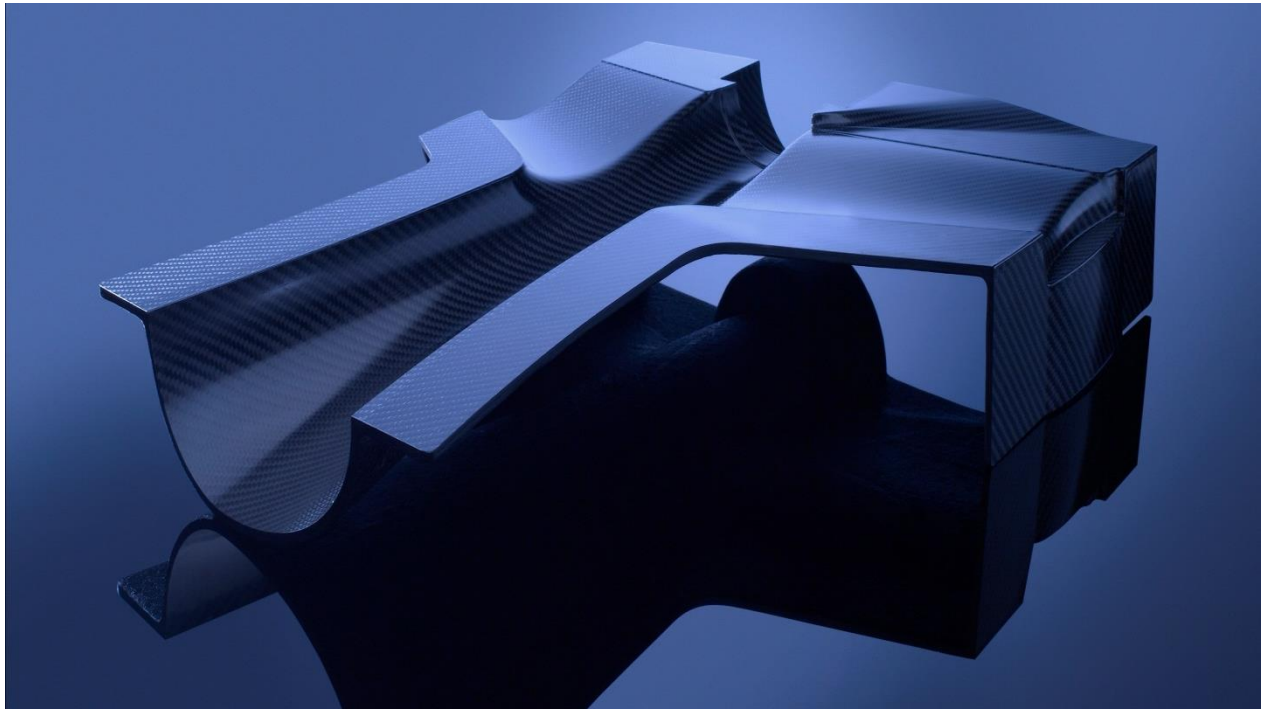
TOOLING PREPREG

A Group Company of
MITSUBISHI CHEMICAL

TOOLING TRAINING



Steffen Perner, Sales Manager

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Tooling Resin System **CP201**

- CM Preg F-T01 200/1250 CP201 45
- CM Preg F-T11 600/1250 CP201 35

Fibre type	Weight (gsm)	Weave Style	Moulded Thickness (mm)	Std. Resin content w/o	Roll sizes
Carbon High Strength	200	2x2T	0.23	45% (surface ply)	1.25m x 25lm
Carbon High Strength	600	2x2T	0.50	35%	1.25m x 25lm

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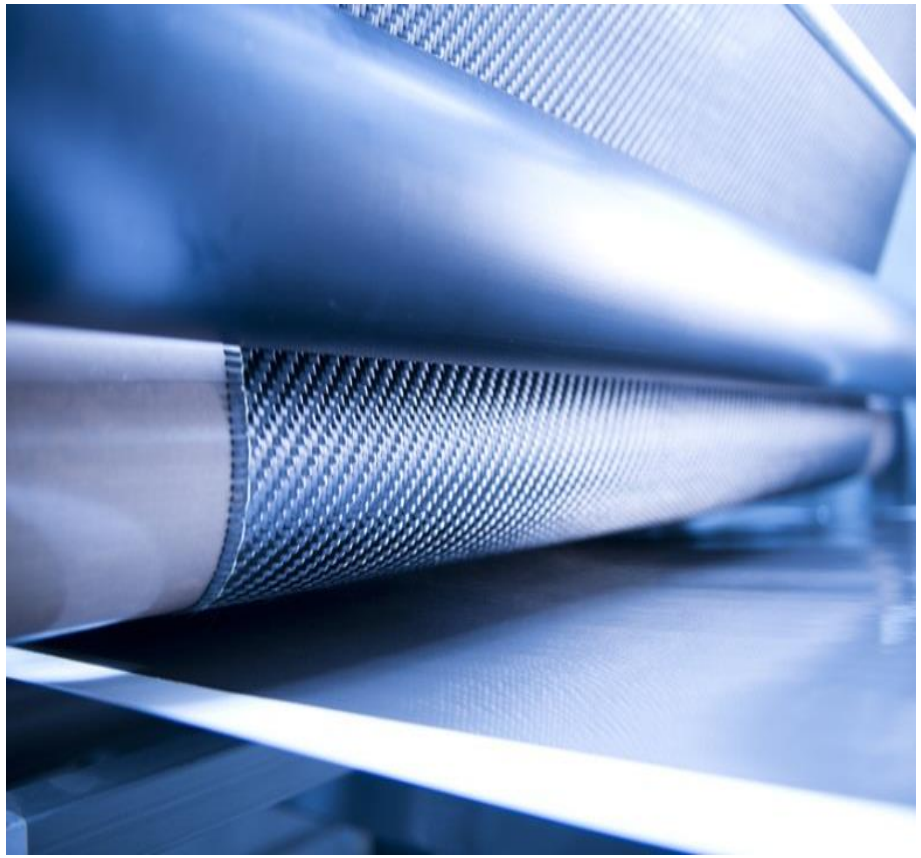
Benefits & Features

- Good handlability
- Economical
- User tolerant
- Availability
- Technical back-up
- Surface finish
- Laminating time
- Available curing temperature
- Accuracy of mould
- End use temperature



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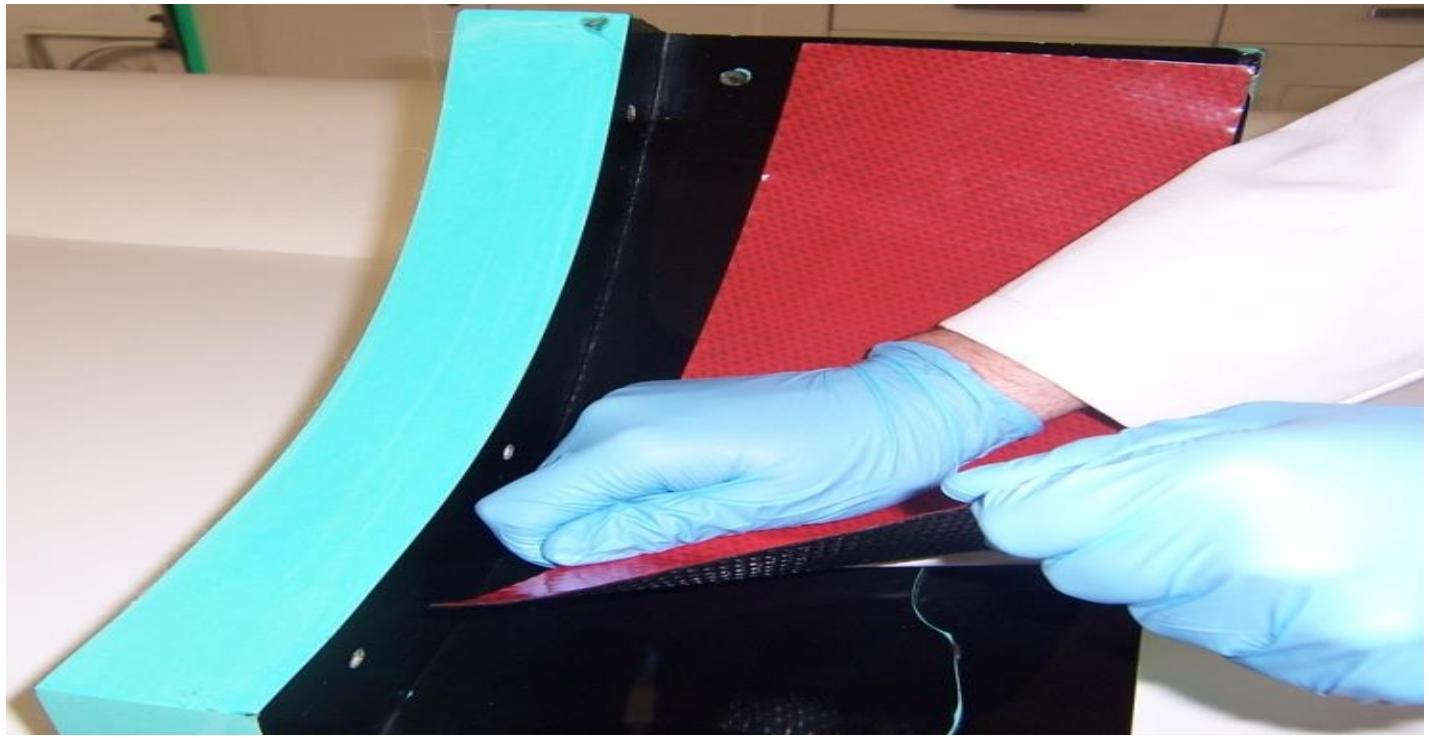
CP201 Laminating Process



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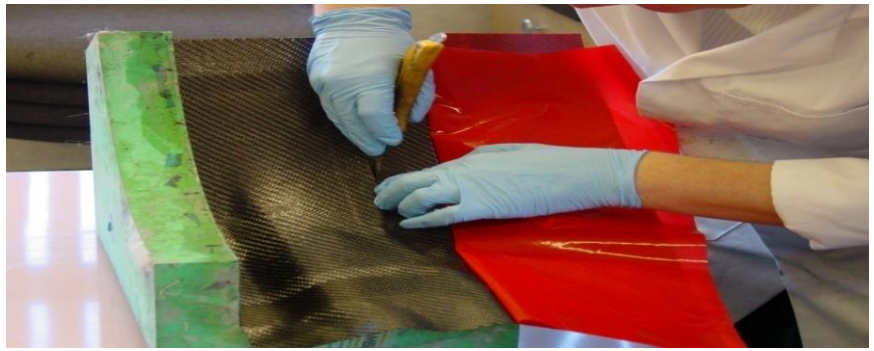
Typical Laminat Construction



1 ply	Carbon 200gsm 2x2T CP201…..45
8 plies	Carbon 600gsm 2x2T CP201…..35
1 ply	Carbon 200gsm 2x2T CP201…..45

Selection of Master Materials

- The selection of suitable materials for the master is very important when striving for dimensional accuracy and optimum surface finish.
- Typically - A high quality epoxy tooling block coated with a Surface Coat.
- Also Typical is a Master made of Aluminium. You can use the master several times.
- Don’t forget to release the Master….. ;-)

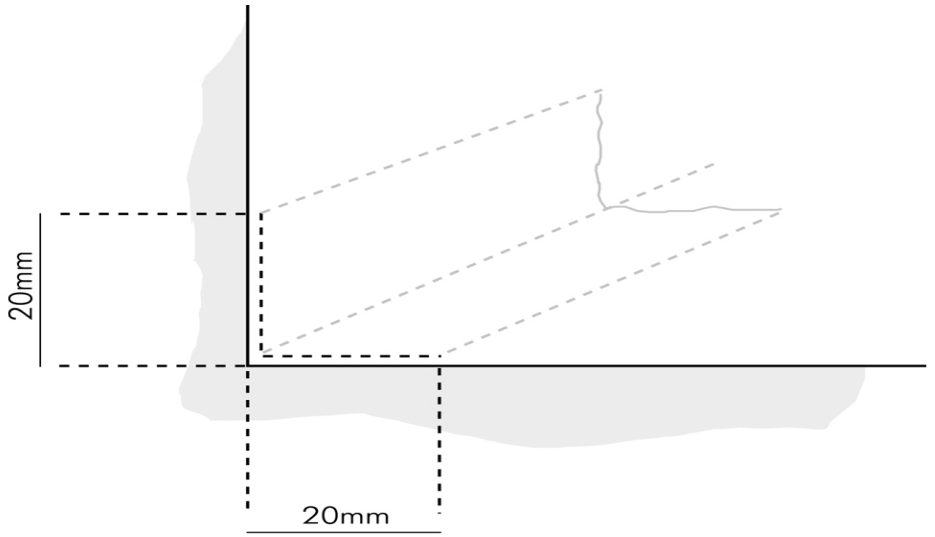
Jobsheet

Procedure	Ply Number	Fibre Orientation	Pattern Direct^{n}	Operator(s)	Inspected	Date
Trim Strips PPI	-	+/- 45º	-			
Laminate PP1*	1	0^{o}	↗			
Debulk						
Laminate PP2	2	0^{o}	↗			
Laminate PP2	3	$+45^{o}$	↑			
Laminate PP2	4	-45^{o}	→			
Debulk						
Laminate PP2	5	90^{o}	↖			
	LAMINATE MID PLANE					
Laminate PP2	6	90º	↖			
Laminate PP2	7	-45^{o}	→			
Debulk						
Laminate PP2	8	$+45^{o}$	↑			
Laminate PP2	9	0^{o}	↗			
Laminate PP1	10	0^{o}	↗			
Final debulk						
Preparation for autoclave						
Autoclave cure						
Post cure						
Preparation and release prime						

Laminating the Tool

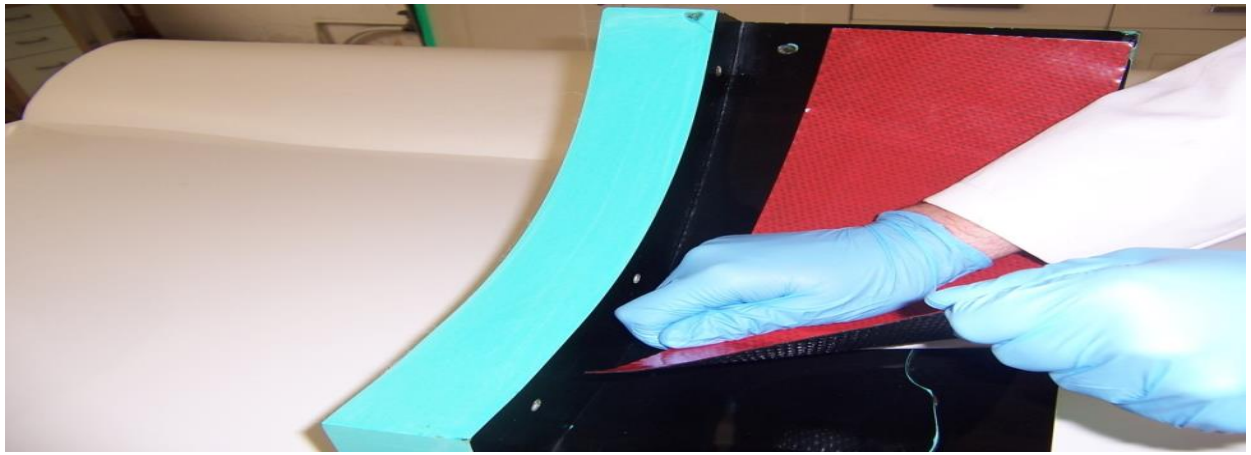
- Trim strips – Lay up a series of 45° trim strips in to all external corners and tight radii, ensure pattern runs in a consistent direction for aesthetics.

- Strips should be approximately 40mm wide positioned evenly on centre of corner.



Laminating the Tool

- Lay up the first ply, carefully cutting and fitting, bearing in mind the following points:
- All pieces should be butt joined, no overlaps are permissible at this stage
- The weave pattern should be consistent if the fibre orientation is correct
- Cut material to fit into all external radi and corners taking care not to disturb the trim strips



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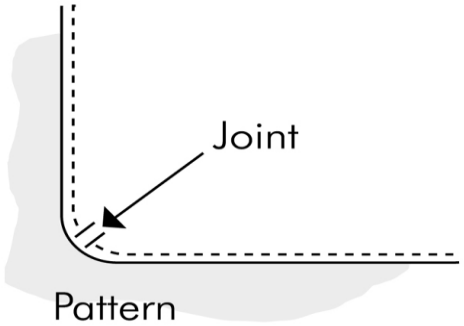
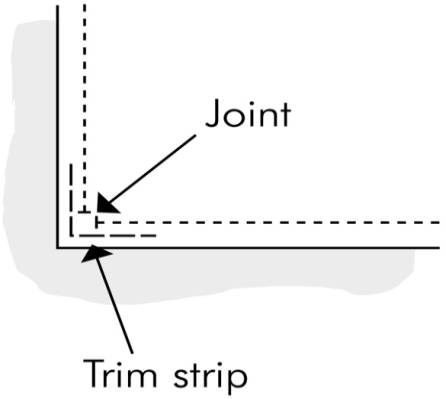
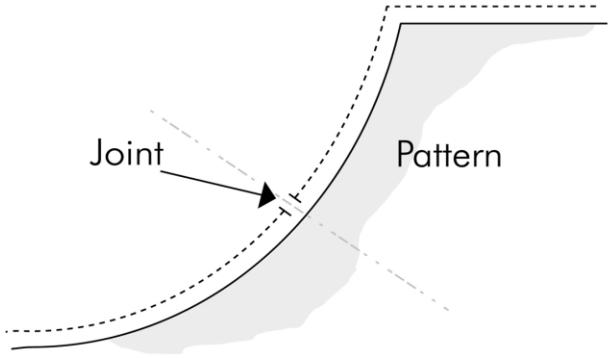
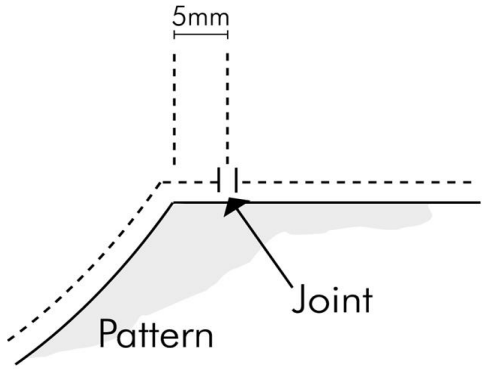
Laminating the Tool









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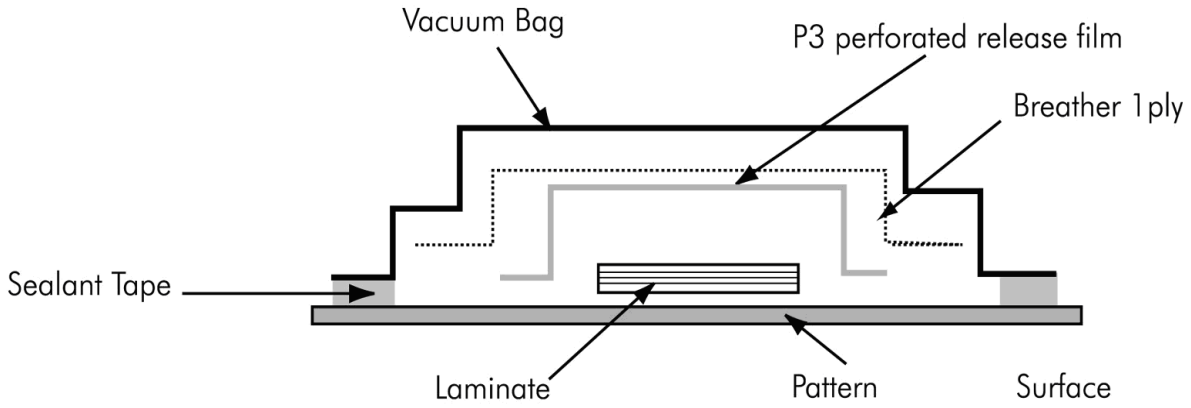
Laminating the Tool

DEBULK:

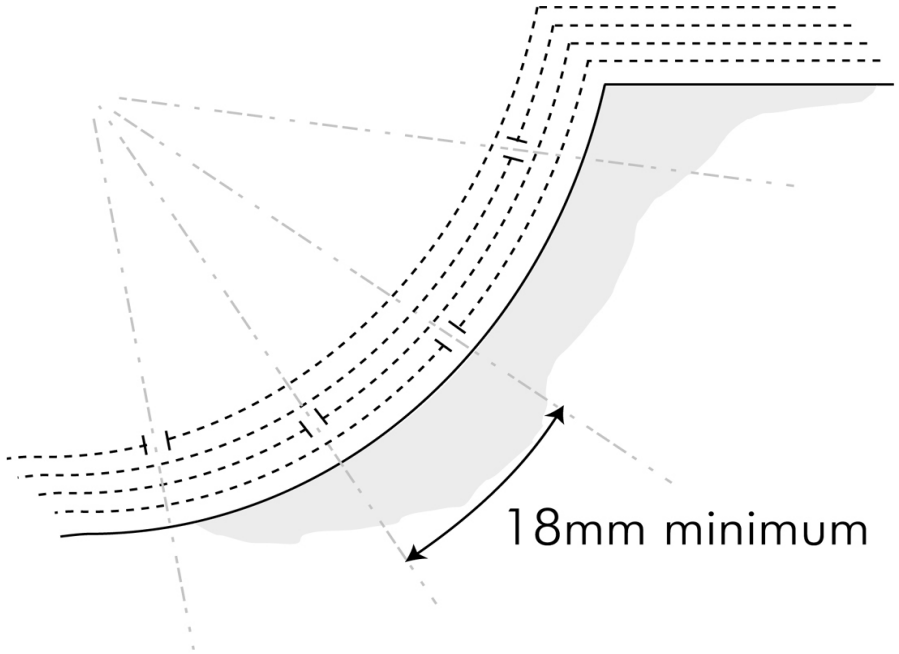
- This will ensure even consolidation and remove air from the laminate prior to final curing.
- After ply 1, Approximately every subsequent 3 plies,
- After the final ply has been completed.
- More complex shapes can sometimes be easier to laminate if more frequent debulks are used, but in these cases the time factor must be taken into consideration.
- If a laminate is to take more than one day to lay-up then it must be de-bulked overnight to ensure that it stays in place



Laminating the Tool

- All joints should be staggered between plies with a minimum of 18mm spacing for adjacent plies. Overlaps should be avoided if possible.

- Under no circumstances should any gaps be left as this is likely to cause voids in the completed tool



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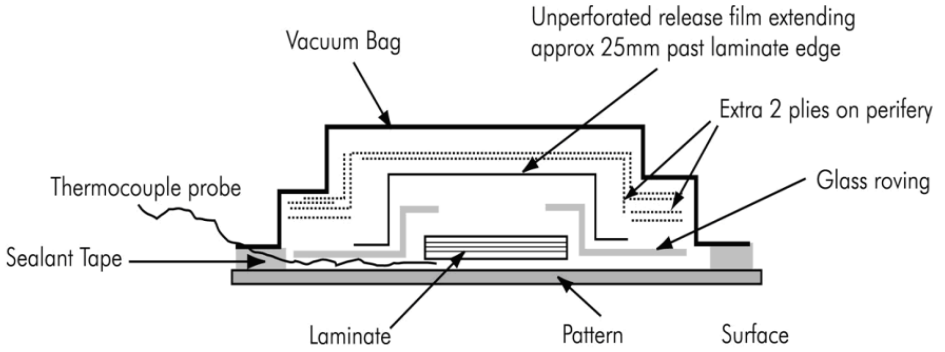
Laminating the Tool

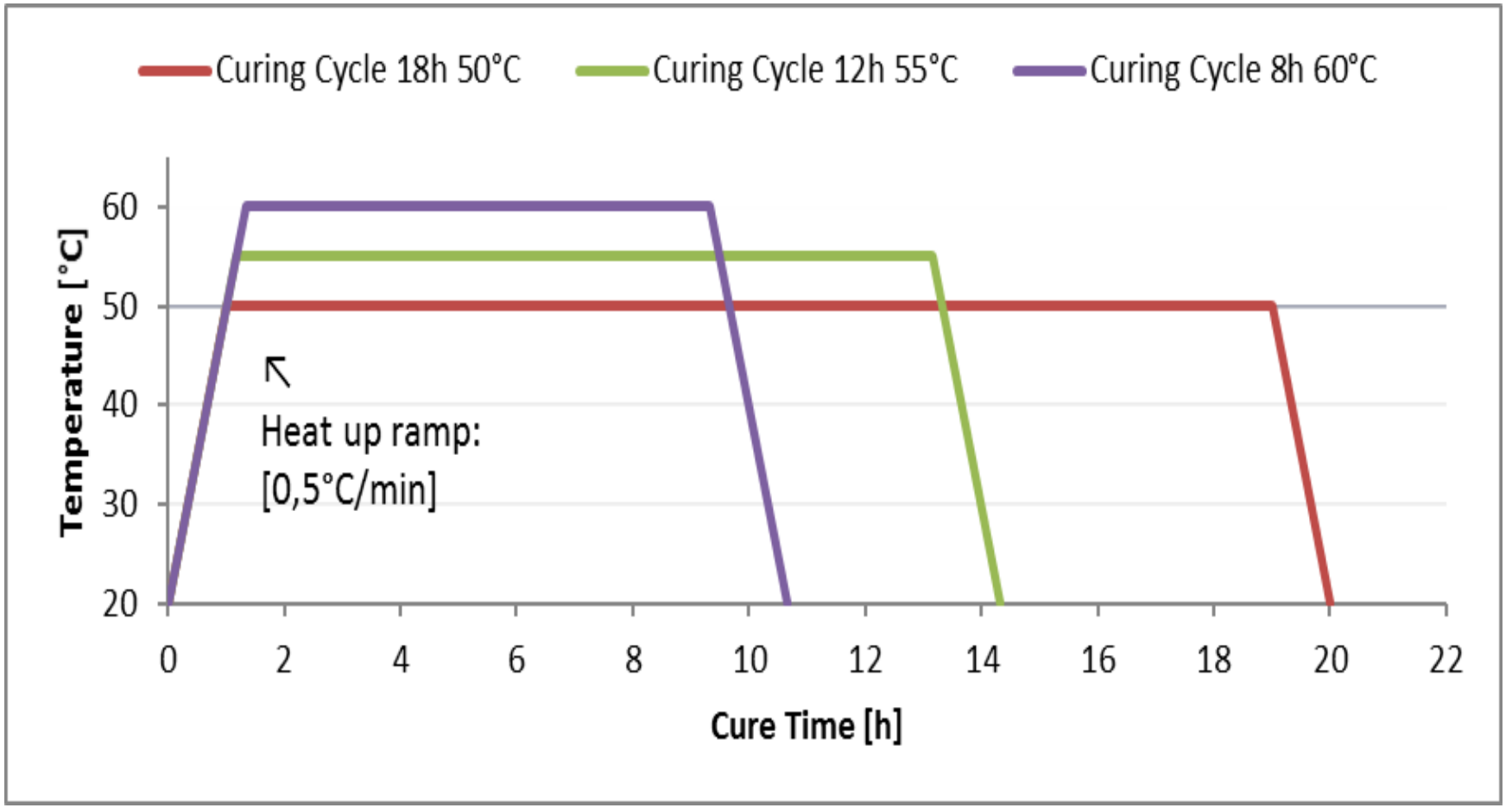
- Cover entire laminate surface with a non-perforated release film extending beyond the lay-up by approximately 25mm (1 inch).

- Apply a breather coat of around 350gsm 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.

- Cover the laminate/assembly with a vacuum bag ensuring that enough slack has been provided to pull into all corners without any bridging.



Cure Temparature



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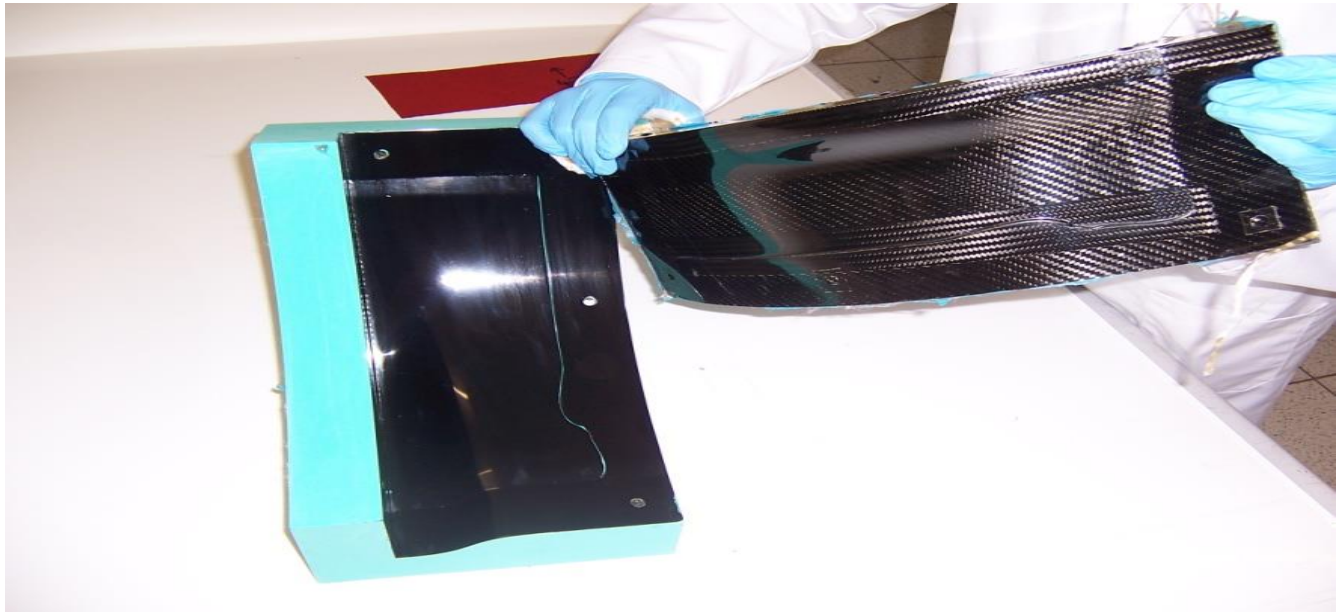
Removal from Master

- 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 mould should be gently eased off the master and lifted evenly all round.



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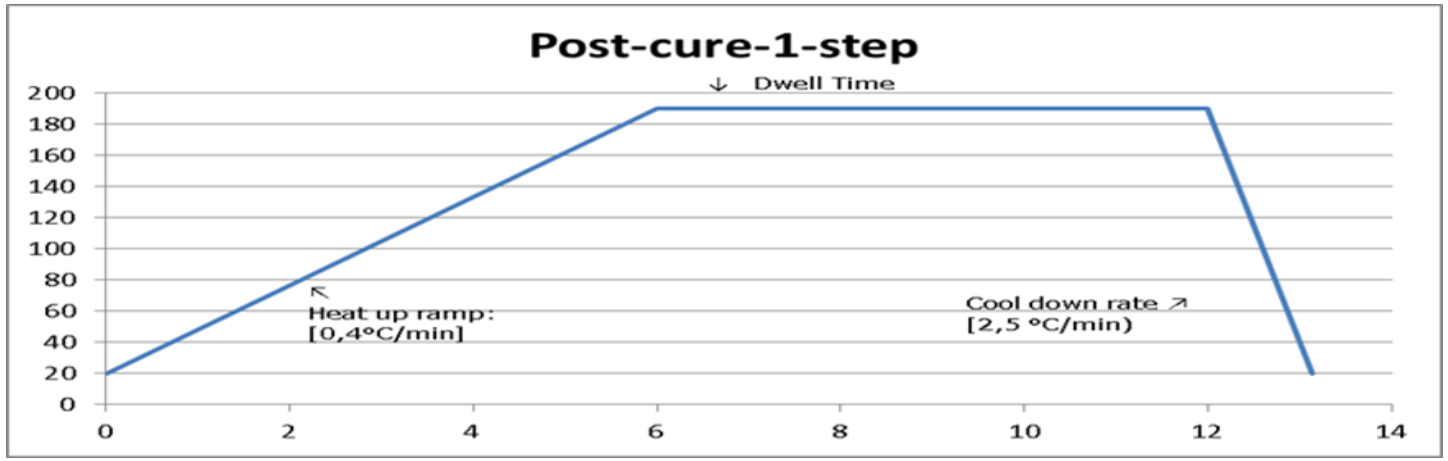
Post - Cure

- It is essential to carry out post-curing as close as possible to the above schedules to retain maximum end use properties.
- The tool should be set up with suitable support around the base with its weight spread as evenly as possible.
- In cases where the end use temperature is likely to be lower than 180°C (356°F) , the post cure can be suitably 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).
- Carry out any one the following two curing schedules on the following two slides.



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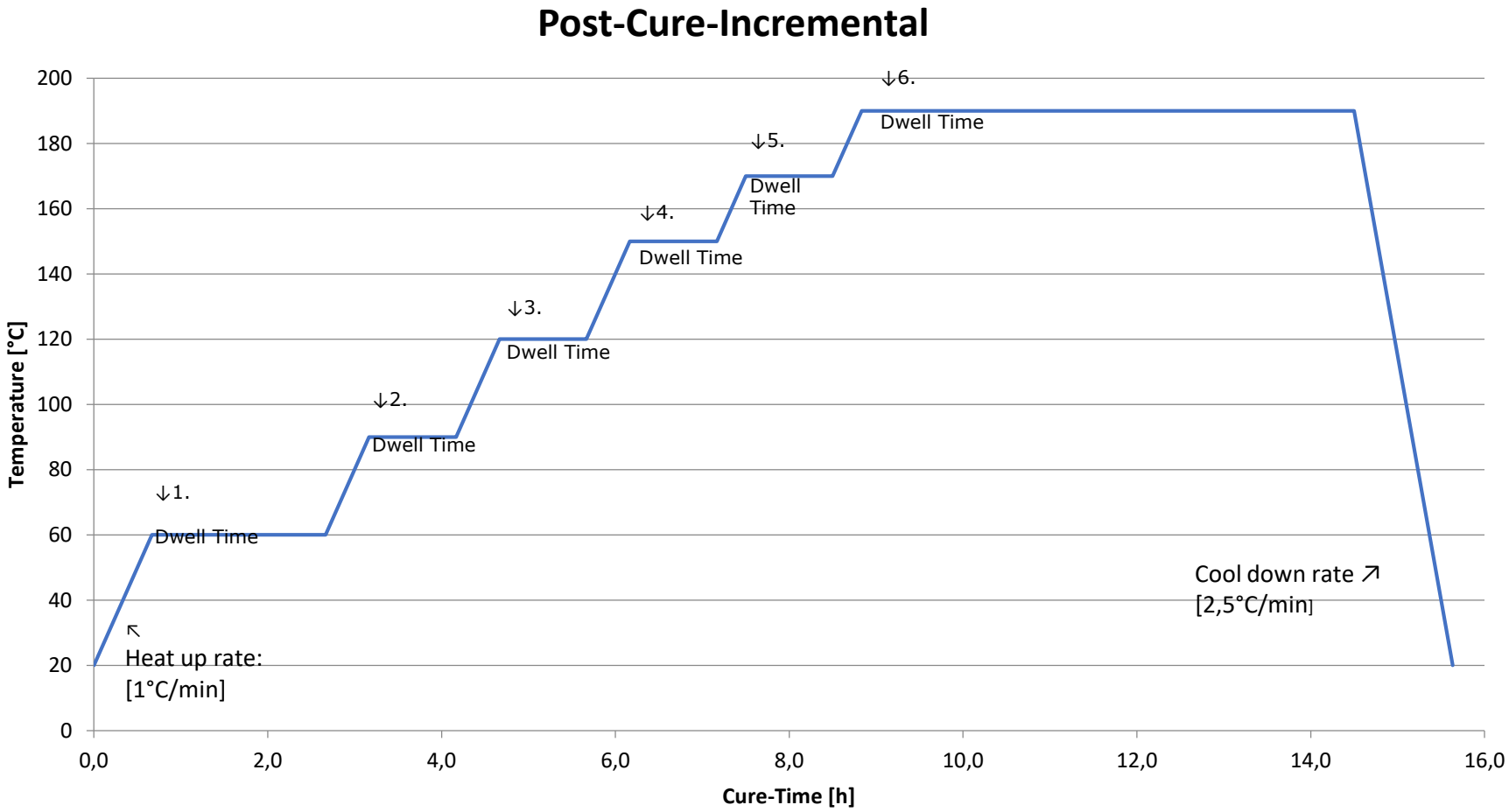
Post - Cure



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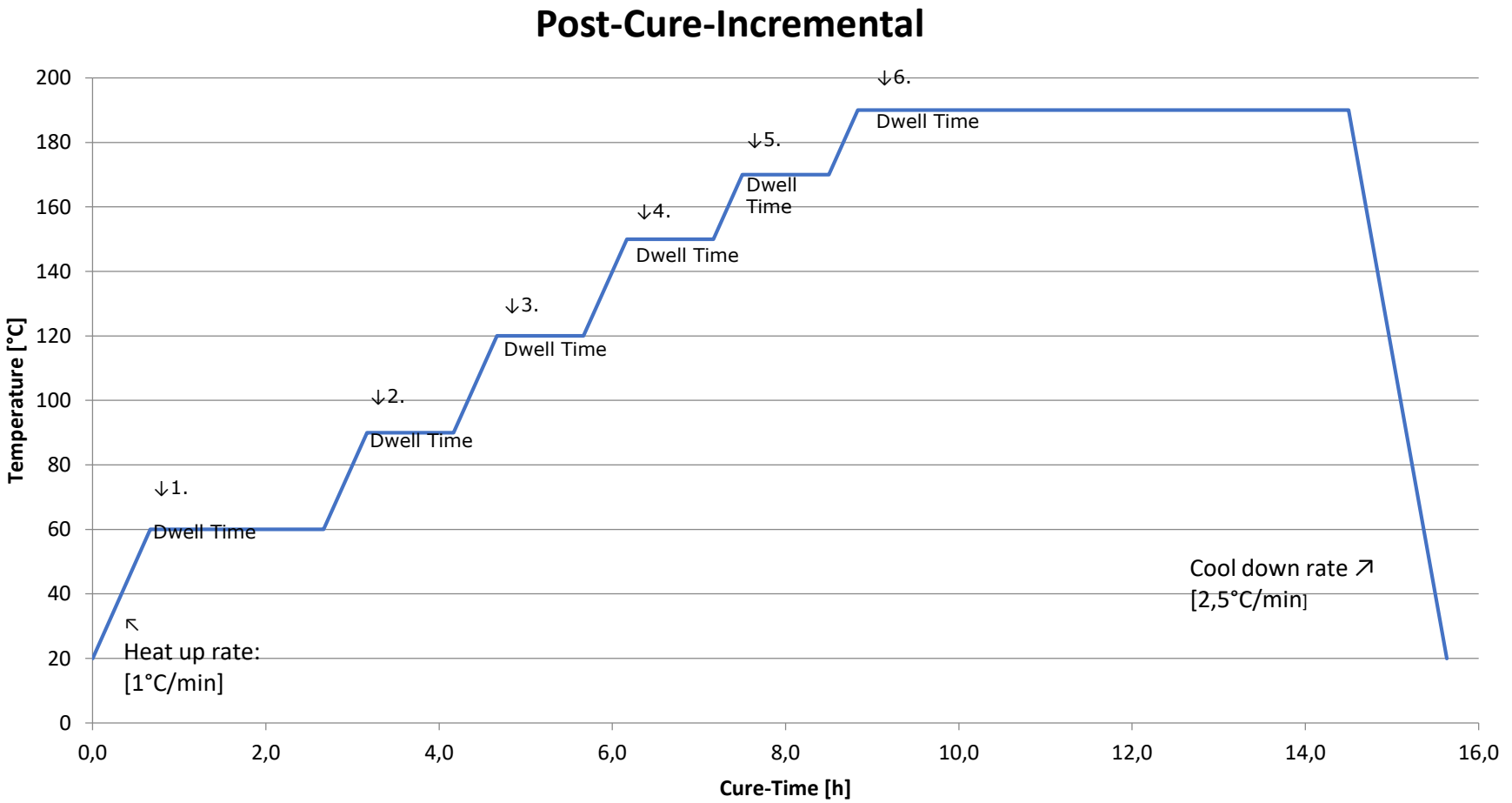
Post - Cure



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Preperation of the Mould

- Wash surface thoroughly with clean water and allow to dry
- Clean surface with Mould Cleaner use copious amounts and continue until it can be felt to be ‘squeaky clean’
- Alternatively test on an “off part” area with a non-silicone adhesive tape
- Allow 30 minutes at ambient to thoroughly dry

Please note following points

- Avoid any aggressive abrasion on the surface, i.e. when removing components from mould.
- Avoid cutting into mould surface during lamination.
- Do not use excessive force when releasing from mould.
- Different release agents and different pre-pregs can have a wide variation in effects on the surface of the mould.