

**To be used in conjunction with the Advanced Composites Group**

**Autoclave Cured LTM<sup>®</sup> Prepreg Mould Tools**



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## 1. General Introduction

- 1.1 The successful performance of any composite mould tool relies on the correct application of the release agent, regular checks to the mould tool surface and operation within defined processing limits. The instructions contained in this manual have been compiled from many years of experience both within the component manufacturing division of the Advanced Composites Group and also from their customers world-wide.

These recommended procedures have been specifically tailored to deal with LTM prepreg mould tools manufactured by the Advanced Composites Group.

## 2. Scope

- 2.1 This specification details the various aspects related to the priming, release, component manufacture, component release and refurbishment of LTM prepreg mould tools manufactured by the Advanced Composites Group.

Note: Throughout this procedure, Frekote44-NC is identified as the 'release agent'. The Advanced Composites Group accepts the use of any similar release agent that is known to the Advanced Composites Group and agreed in writing. The use of non-agreed or non-specified materials or procedures may invalidate any warranty supplied by the Advanced Composites Group.

## 3. Equipment

- 3.1 Curing Oven: The curing oven must be of air circulating type and be capable of raising the temperature at the mould tool face to 80°C (176°F) at a rate of between 1-3°C (1.8-5.5°F)/minute.

## 4. Materials Required for Maintenance of LTM® Mould Tools

### Material

- 4.1 1200 grade wet and dry
- 4.2 Farécla Cutting compound
- 4.3 Frekote™ B15 primer
- 4.4 Ensolve or equivalent
- 4.5 Chemically resistant rubber gloves
- 4.6 Protective goggles
- 4.7 Lint free cotton cloth (Rymple cloth)
- 4.8 Frekote 44-NC release agent
- 4.9 Sprayfon PTFE release agent

Note: Ensure all materials are within the limit of any defined shelf life.

## 5. Environmental Conditions

- 5.1 Release agent must be applied in a separate, designated area. Initial polishing of the mould tool can be performed in a normal workshop environment. The application of the Frekote B15 primer should be carried out in a well-ventilated area.

## 6. Frekote 44-NC Release Agent Application

- 6.1 Please refer to Loctite Frekote 44-NC release agent product data sheet.
- 6.2 Mould tools supplied from the Advanced Composites Group are pre-coated with Frekote B15 primer. Release agent or similar pre-agreed release agent must be applied to its surface prior to the mould tool being used to manufacture the first component.  
  
**Note:** Before application, the release agent must be inspected to ensure it is uncontaminated and that the resin in the release agent has not started to precipitate.
- 6.3 The release agent must be applied onto clean surfaces in a separate designated area to avoid contaminating components. One coat must be applied using a clean uncontaminated piece of Rymple or similar lint and contaminate free cloth, leaving a wet but unreticulated surface.
- 6.4 The release agent must then be oven cured at 10°C (50°F) above the planned maximum mould tool use temperature for 15 minutes.
- 6.5 Pre-treat all dowels and all metallic fittings by spraying with Sprayfon +3 or equivalent PTFE. Bake or dry using a hot-air gun to 80°C and repeat as necessary.
- 6.6 Care must be taken that the surface is then kept clean and uncontaminated until use. If there is any significant delay between releasing and use, the tool surface must be covered.
- 6.7 The batch and serial numbers of the release agent and primer used should be recorded. Do not progress to the next stage until all previous operations have been checked and validated.

## 7. Laminating Components onto LTM Prepreg Mould Tooling

- 7.1 The mould tool surface should be released, checked and signed off prior to the start of the prepreg lay-up as in 6.1 to 6.5.

Ensure that the surface is uncontaminated and that no solvents have been spilt on the surface as this could cause poor release/sticking of the component. Such contamination could also affect the finish of the component and the cure of the component resin system, thus adversely affecting the surface strength of the cured component and/or the adhesion of any subsequent painting.

- 7.2 Any loose tooling should be checked both as above (7.1) and to ensure correct parts and fit. The loose tooling should fit together without undue force. If it will not fit easily it is probable that it is an incorrect part or there is contamination in the form of component resin in the location points.

- 7.3 **Do not under any circumstances** cut materials against the mould tool surface, or against previously laid up plies or use sharp instruments (e.g. metal rule) to push prepreg into corners.

Such practices will eventually result in significant damage to the mould tool. This can lead to the component sticking, further damaging the mould tool and probably the component as well.

Where design of the component demands trimming against features such as joggles, a thin metal shim should be positioned between the laminate and the mould tool surface. Care must be exercised when positioning to avoid scratching the mould tool face.

Prior to use, shims should be examined for burrs/sharp edges that could cause this damage.

- 7.4 After the component has been cured/cooled and is ready for removal from the mould tool, strip and dispose of all consumables.
- 7.5 All dowels, bolts and loose tooling should be removed without undue force. **Do not use sharp or hard instruments** such as screwdrivers since they will damage the mould tool surface or component. When removing the component avoid excess pressure in localised areas by working systematically around the periphery applying a low even pressure. Take care handling the edge of the component as it is likely to have razor sharp resin flash around it.

- 7.6 Ensure all dowels, bolts and loose tooling are positioned in a safe place, not on the floor or mould tool face. Check that all dowel holes, bolts and vacuum integral fittings are clean. All dowels should be sprayed with PTFE release agent prior to repositioning the loose tooling (refer to Section 6 for further details).
- 7.7 Resin flash should be cleaned from the mould tool face using a soft plastic scraper and vacuum cleaner. Goggles must be worn during this operation.
- 7.8 After making the first moulding, a further coating of release agent should be applied as per Section 6.
- 7.9 When any release difficulties are experienced, the area in question can be touched-up or the entire mould can be recoated.

**Caution (Applies to tooling manufactured using ACG's LTF318B Surface Ply):**

High tack vacuum bag sealant tape has the potential to cause damage to mould tool flange areas during its removal. Therefore, customers are advised to check the adhesion characteristics of their sealant tape prior to use and determine if removal of the tape is likely to lead to delamination. Where the potential for damage exists, a less aggressive, lower tack sealant tape should be sourced or steps taken, such as using a mould sealer or applying a flash breaker tape, to minimise the risk of damage.

## **8. Refurbishment Sequence**

### **8.1 Frequency of Refurbishment Sequence:**

- 8.1.1 After a certain number of moulding cycles, it will be necessary to carry out the sequence of operations detailed below in order to remove any resin or release agent build-up on the mould tool surface and ensure the release coat system performs consistently. The frequency of this refurbishment operation is dependent on many factors and cannot be specified by the Advanced Composites Group. The condition of the tool face and the user's requirements will determine the refurbishment frequency.

### **8.2 Removal of Excessive Deposits and Polishing:**

- 8.2.1 If absolutely necessary, deposits may be gently abraded from the surface of the mould tool, using 1200 grade wet and dry paper and/or Scotchbrite, until all traces of component resin and other build-up on the mould tool surface have been removed. All traces of abrasive should be removed with warm soapy water.
- 8.2.2 Polish the mould tool surface with cutting paste using a lint-free cotton cloth until a shiny surface is obtained.

8.2.3 All traces of polish should be removed with warm soapy water and the surface dried thoroughly.

### 8.3 Frekote B15 Primer Application:

8.3.1 The surface of the mould tool must be cleaned thoroughly with Ensolve or equivalent solvent/cleaner and wiped dry using a clean, lint-free cotton cloth. Repeat until all signs of contamination have been removed (a minimum of 3 applications), and then dry by heating to 80°C (176°F) for 15 minutes.

8.3.2 The can of Frekote B15 primer should be shaken vigorously before use and checked for contamination by moisture. This is indicated by the presence of a white precipitate in the normally clear solution. Contaminated B15 should be discarded.

8.3.3 Apply Frekote B15 primer at room temperature in a clean, well-ventilated area. Apply using a clean, lint-free cotton cloth. The primer should be wiped to form a smooth continuous wet film over the entire mould surface.

8.3.4 The Frekote B15 primer dries rapidly and care should be taken not to wipe over areas previously coated.

**Note:** Applications which are too thick and not dried/cured at elevated temperature can lead to release and surface finish problems.

8.3.5 Having completed the application of Frekote™ B15 primer, the mould tool should be heated in an oven at 80°C (176°F) for 15 minutes to dry and cure.

8.3.6 Time and temperature should be recorded on oven cure sheet.

8.3.7 Operations 8.4.3 – 8.4.6 should be repeated until a minimum of 2 coats have been applied.

8.3.8 Before using the mould, 1 coat of release agent should be applied and baked at the planned component cure temperature plus 10°C (50°F) for 15 minutes (see Section 6).

## 9. Check List

- 9.1 Throughout this process of Frekote B15 primer application, all batch numbers and serial numbers must be recorded. Do not progress to next operation until all previous operations have been checked and validated.

## 10. Major Refurbishment

- 10.1.1 If any major damage occurs to the mould tool face, i.e. delaminations, impact damage etc, the tool should be taken out of service and the problem referred to the Advanced Composites Group for advice prior to defining a repair scheme.

## 11. Cure Cycles

- 11.1 LTM prepreg mould tools must not be used above their maximum recommended temperatures if a satisfactory life is to be expected. Tool life will be related inversely to the maximum use temperature and will also be highly dependent on the level of care with which tools are used and maintained. Maximum recommended use temperature for different resin systems are as follows:

Resin Series	Maximum Use Temperature °C (°F)
LTM10	200 (392)
LTM210	200 (392)
LTM317	150 (302)
LTM318	180 (356)
HTM515	250 (482)

Tools manufactured by the Advanced Composites Group are supplied fitted with a maximum temperature recording thermometer. This should be checked after each thermal cycle.

Ensure that all cure cycles are carefully monitored, to avoid exothermic reaction or excessively high air temperatures.

## 12. Storage

- 12.1 Composite mould tools should have the tool surface covered and protected from impact damage and contamination when not in use. All loose tooling should be attached in position and all vacuum ports covered to prevent the ingress of dirt that could affect the correct operation of valves. Care must be taken when using fork lift trucks to lift and move the mould tools.
- 12.2 During storage the resin in the tool is likely to absorb moisture, which can lead to a poor surface finish and porosity being achieved on the first components to be made from the tool after a period of storage. It is recommended that tools removed from storage are put through one or more normal cure cycles to remove the absorbed water before components are made on them. A test patch may be moulded during the drying cure cycles to check whether the resulting laminate quality is satisfactory.

**If in doubt regarding any aspect in the use of these composite mould tools, contact the Advanced Composites Group.**

Frekote is a registered trade name of the Loctite Corporation.

