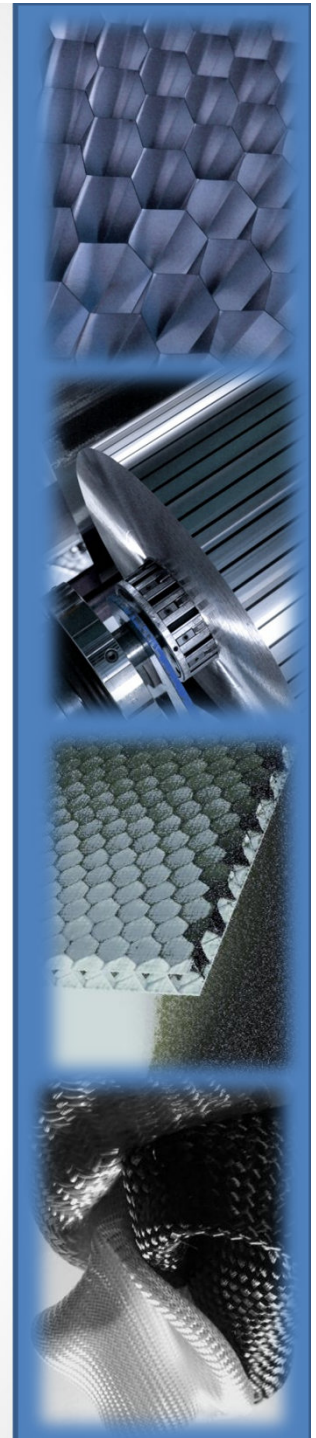
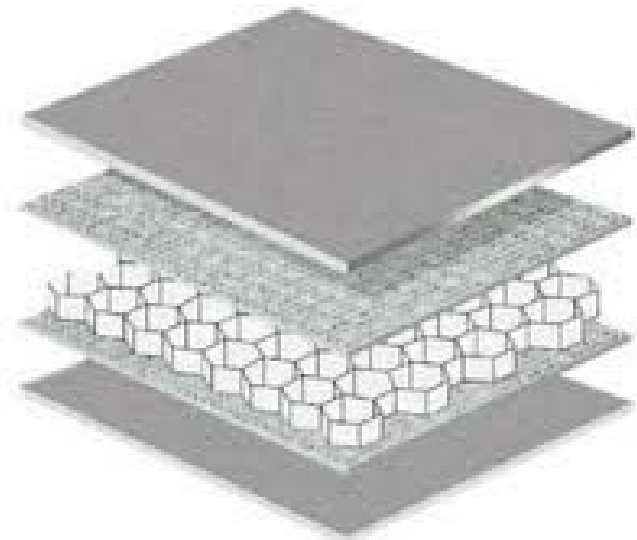




SANDWICH PANEL FABRICATION TECHNOLOGY

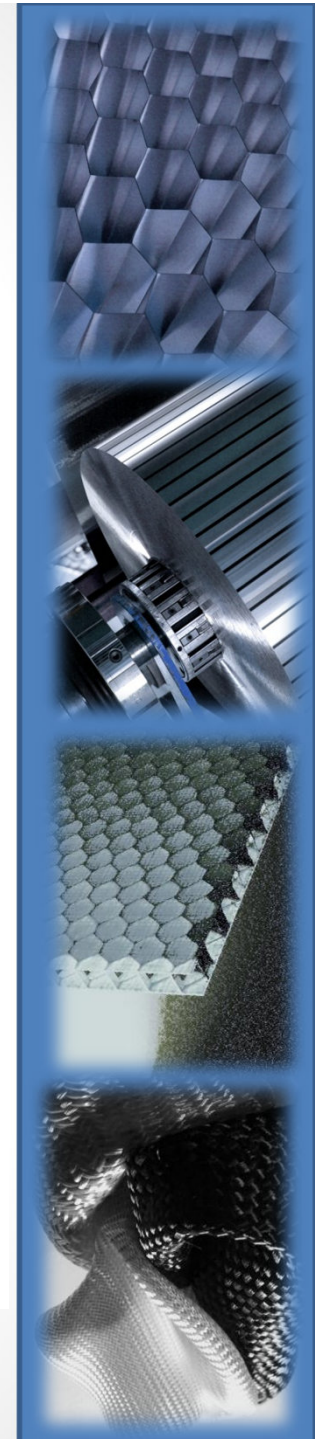


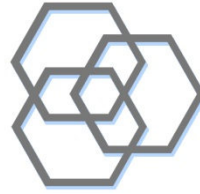
Sandwich Panels Guide

Honeycomb sandwich panels are available in a wide range of configurations. Skin materials range from aluminium alloy, to woven or unidirectional glass or carbon fibre. The honeycomb core can be aluminium or non-metallic (Nomex*) For information on the selection of Honeycomb Selector Guide.

Standard compositions of honeycomb sandwich panels are as follows:

| Panel composition | Key characteristics |
|--|---|
| Aluminium honeycomb core, aluminium skins. | Medium weight and stiffness at low cost. |
| Aluminium honeycomb core, woven glass fibre skins. | Lighter and less stiff than aluminium-skinned panels, at lower cost. |
| Non-metallic Nomex honeycomb core, unidirectional or woven glass fibre skins. | More resilient and higher cost than panels with aluminium honeycomb core. Unidirectional fibres give greater stiffness, at higher cost than woven fibres. |
| Non-metallic Nomex honeycomb core, unidirectional or woven carbon fibre skins. | The lightest and stiffest panels, which is reflected in their cost. |





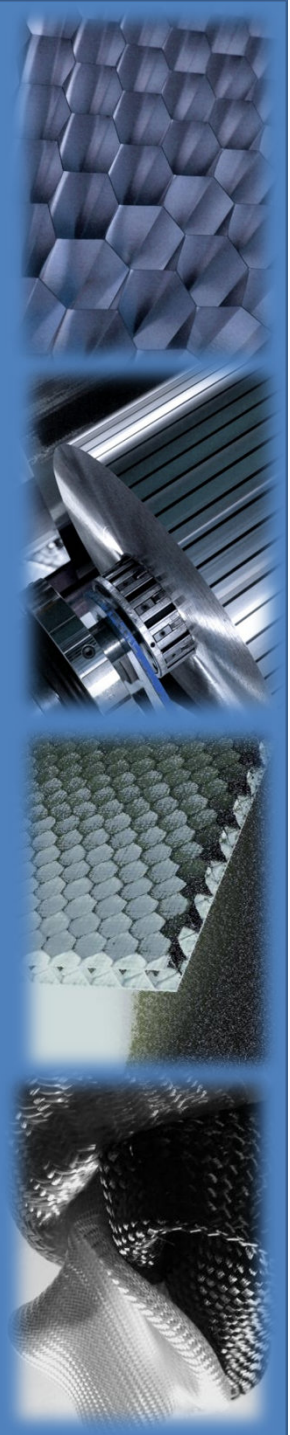
BASIC HONEYCOMB SANDWICH PRODUCTION METHODS

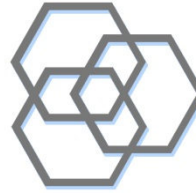
Honeycomb sandwich components may be produced using three alternative well-established methods:-

Heated Press, generally used for the production of flat board or simple preformed panels.

Vacuum Bag Processing, used for curved and complex form panels.

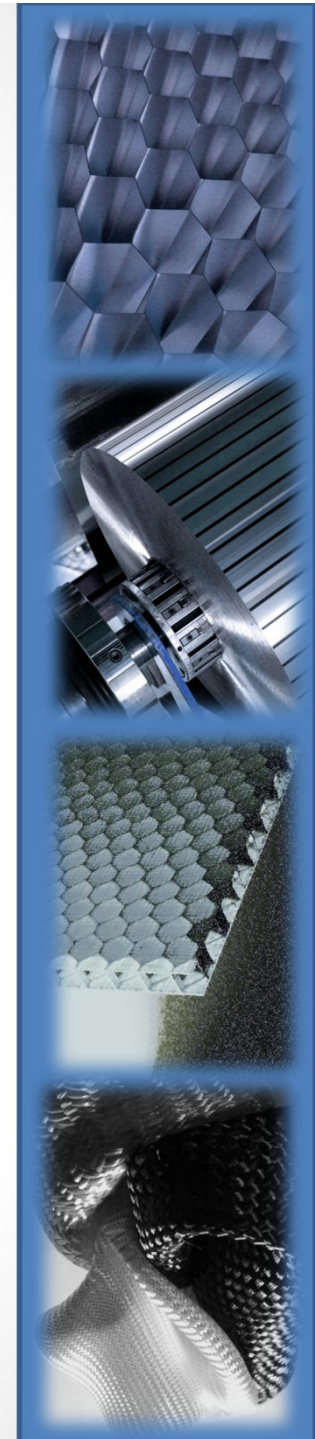
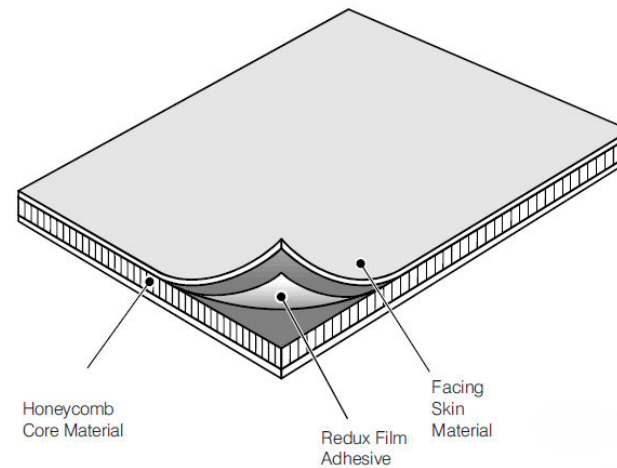
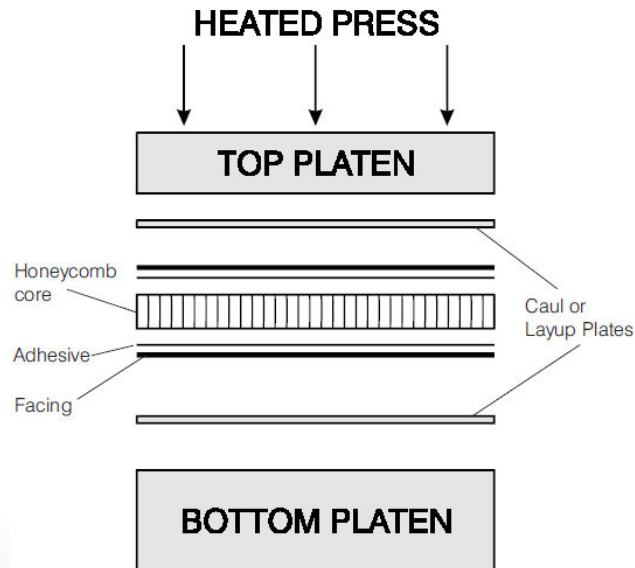
Matched Mould Processing, used generally for batch production of finished panels.

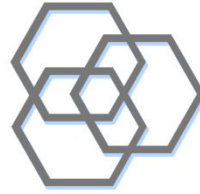




HEATED PRESS

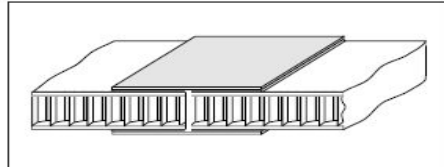
Ideally the panels should be assembled ready for curing as a single shot process. This method is suitable for metallic and prepreg (pre-impregnated) facing skins. Alternatively prepreg facing skin materials may be pre-cured by using a press, and subsequently bonding with a film adhesive layer. Integrally bonded items such as extruded bar sections and inserts may be included and located by the honeycomb core or with simple tooling.



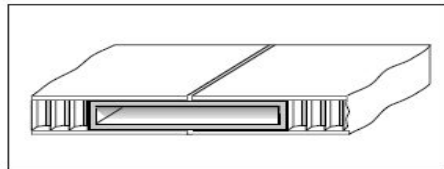


TYPICAL SANDWICH PANEL – JOINTING CONNECTION METHODS

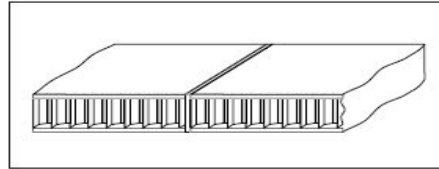
Typical Flat Joining Methods



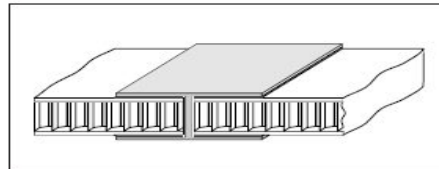
- Bonded face supported butt joint.



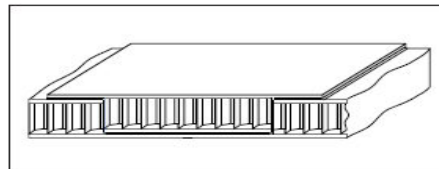
- Flush faced bonded joint, supported by a special internal extrusion (or wood block) - for volume production.



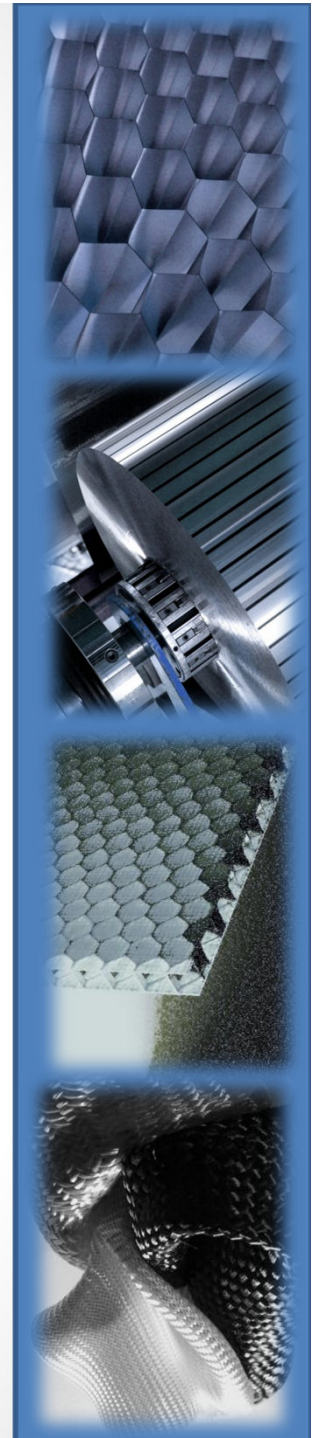
- Flush faced all bonded butt joint - for non-structural applications. Care must be taken to ensure flatness across the joint.

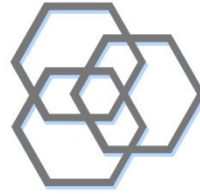


- Bonded butt joint using 'H' section extrusion for volume production.



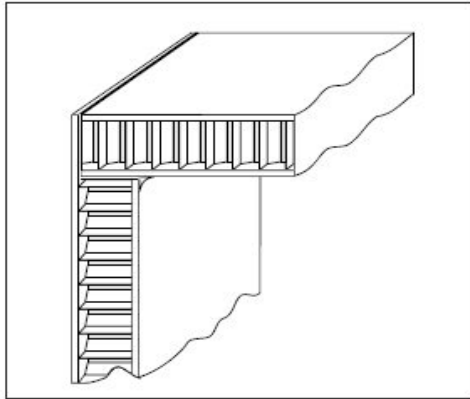
- Panel section insertion method, using same panel material.



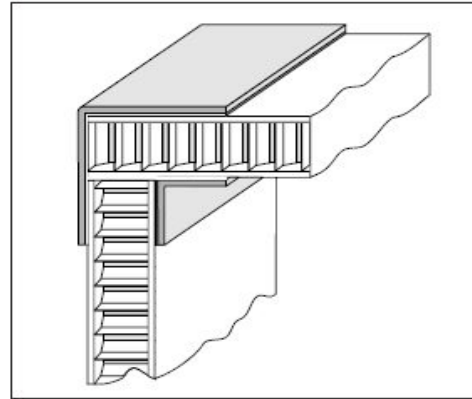


TYPICAL SANDWICH PANEL – JOINTING CONNECTION METHODS

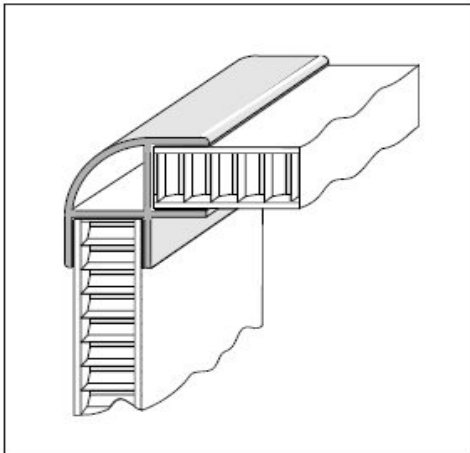
Typical Corner Joints



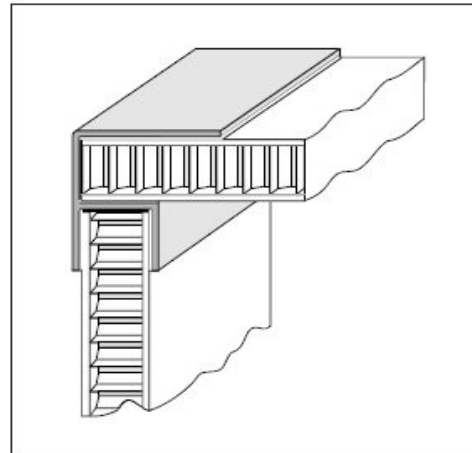
■ Rebated and bonded. Low strength, and can be difficult to make square.



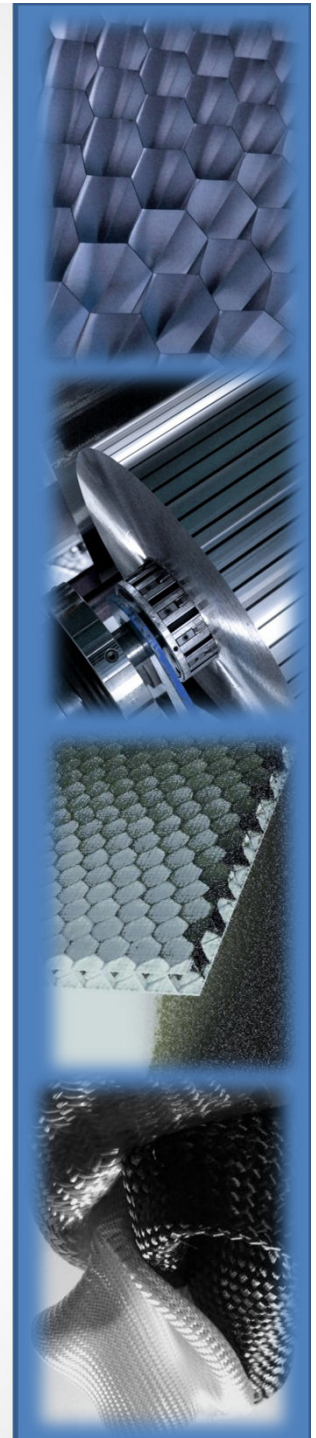
■ Supported by bonded L-section extrusions.

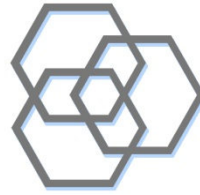


■ Use of special extrusion, for volume production of rounded corners.



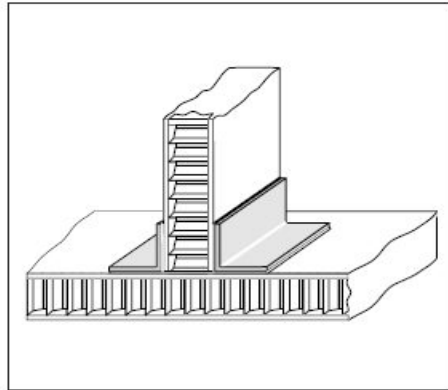
■ Use of special extrusion, for volume production of square corners.



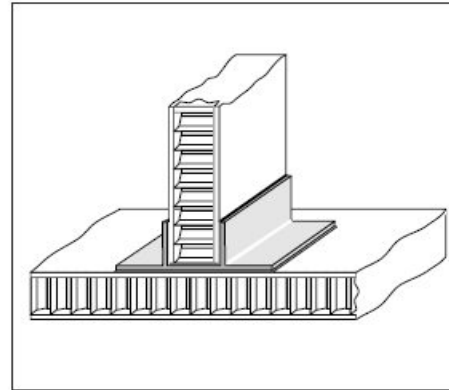


TYPICAL SANDWICH PANEL – JOINTING CONNECTION METHODS

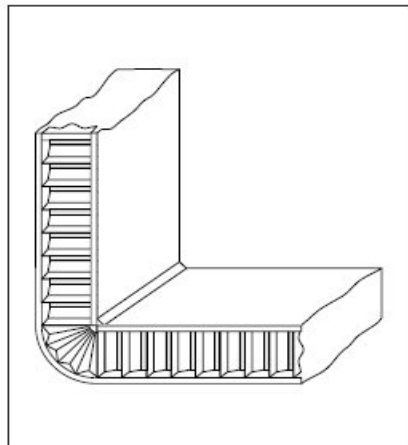
T Joints



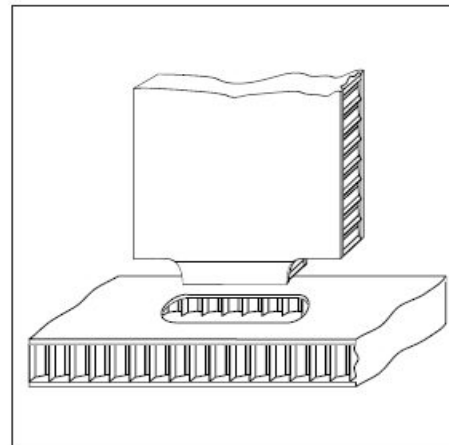
■ Joint supported by bonded L-sections.



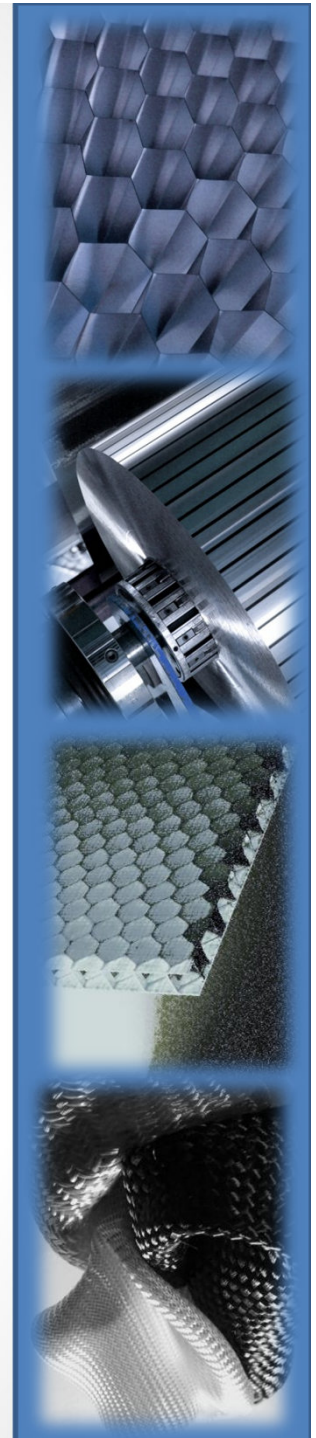
■ Joint supported by special bonded extrusion - for volume production.



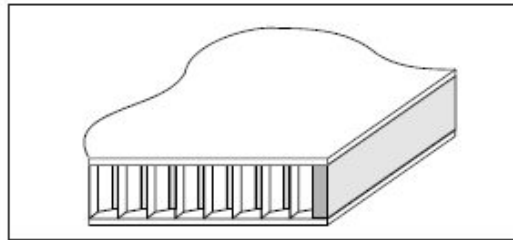
■ Cut, folded and bonded corner joint for clean radius edges.



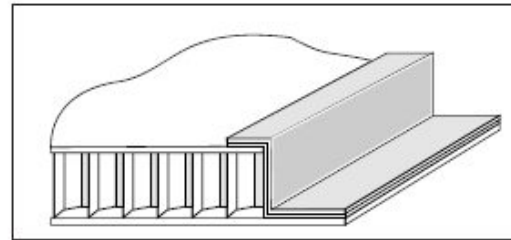
■ Self jigging "tongue and groove" method joint.



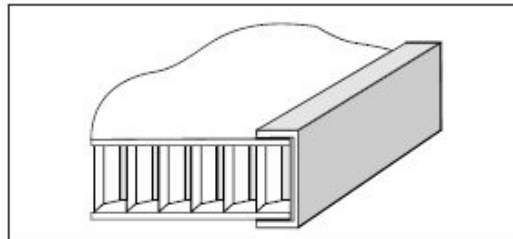
TYPICAL SANDWICH PANEL EDGE CLOSURE PANELS



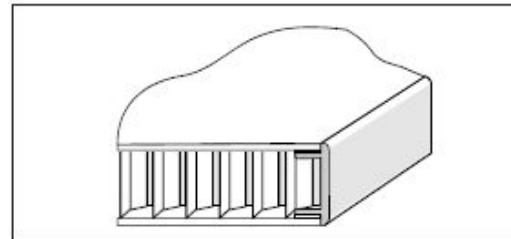
■ Edge filler



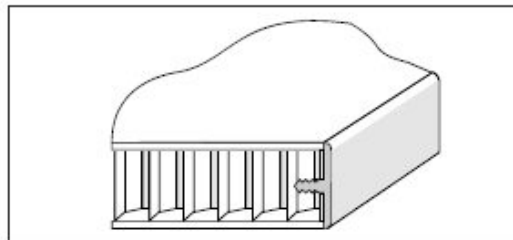
■ Bonded Z' section



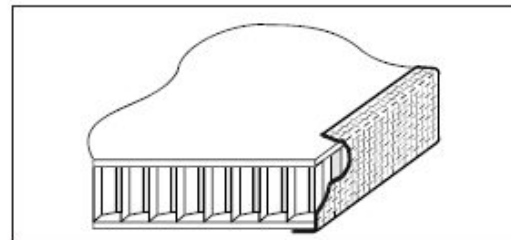
■ Bonded U' section



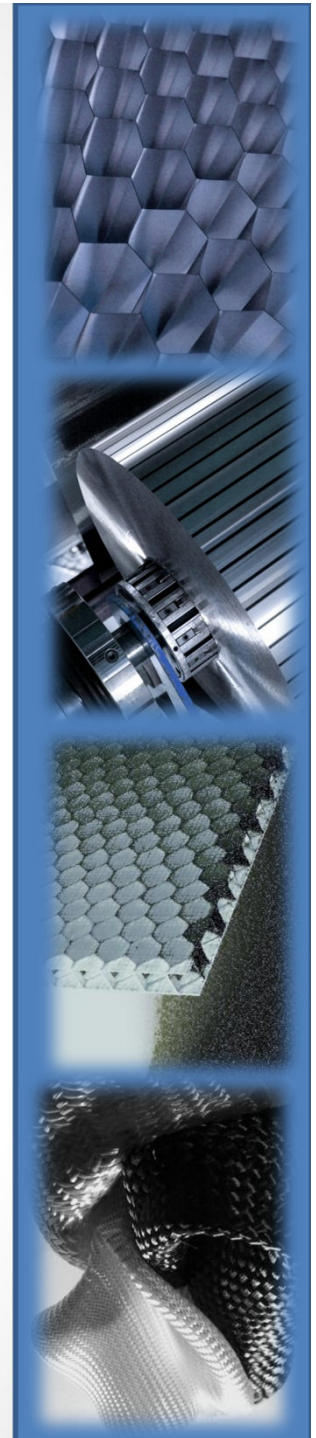
■ Bonded edge closure section suitable for thicker panels



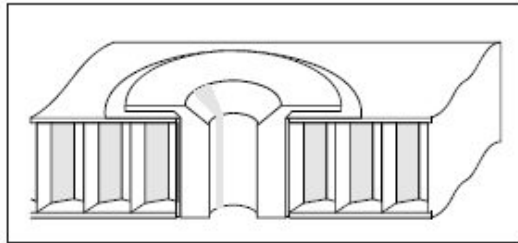
■ Press fit edge closure section, suitable for thinner panels



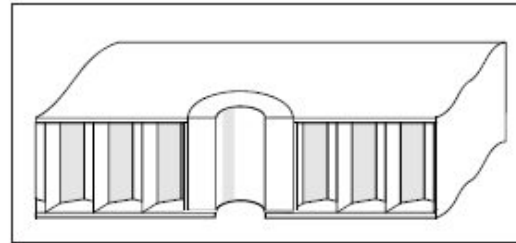
■ Durable self adhesive tape



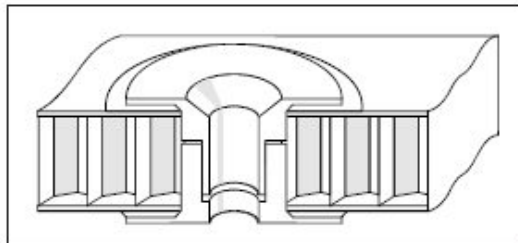
TYPICAL SANDWICH PANEL FIXINGS



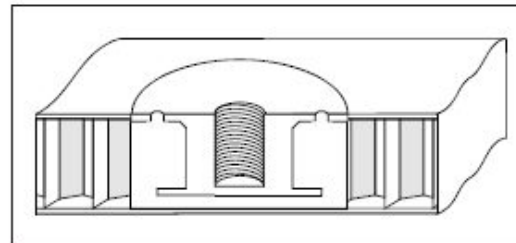
■ Single part ferrule



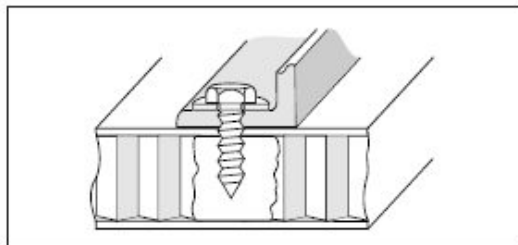
■ Distance tube



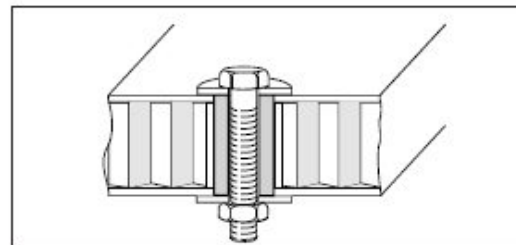
■ Two part ferrule



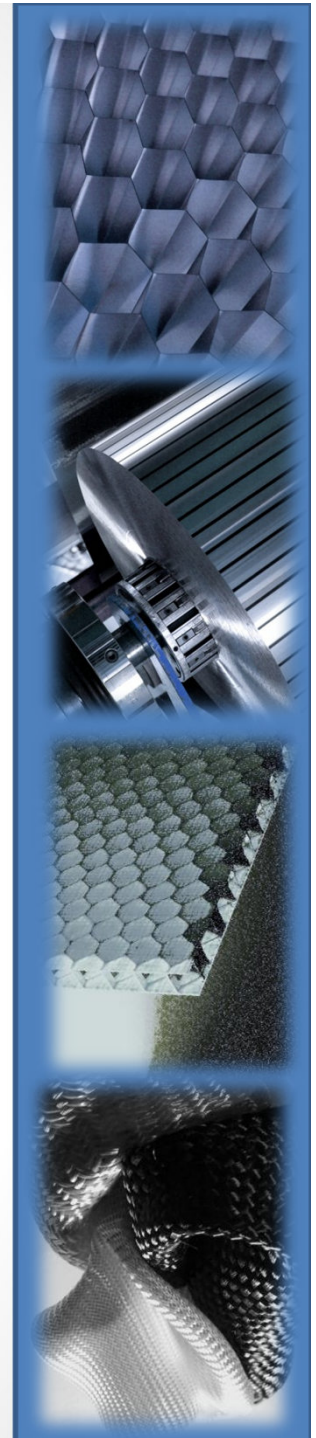
■ Threaded insert

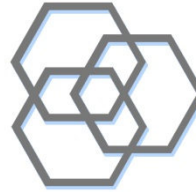


■ Resin potted area



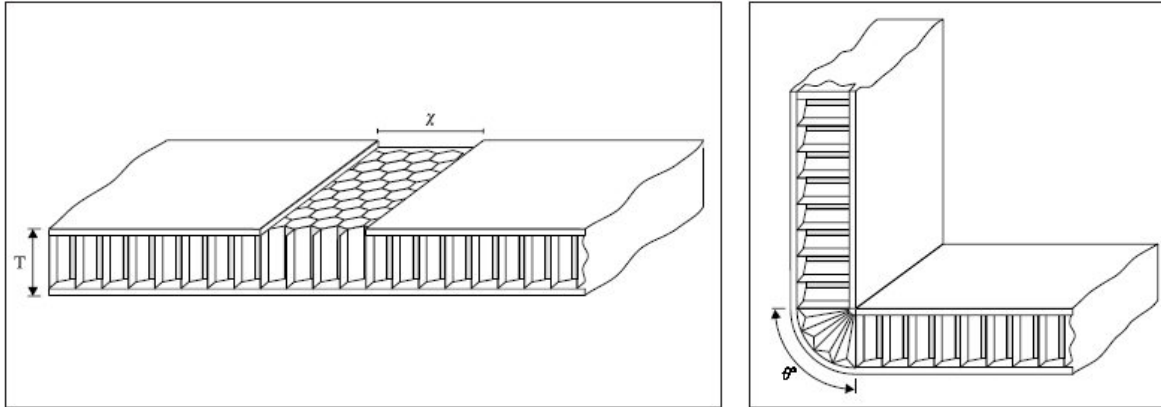
■ Through panel distance tube using penny washer



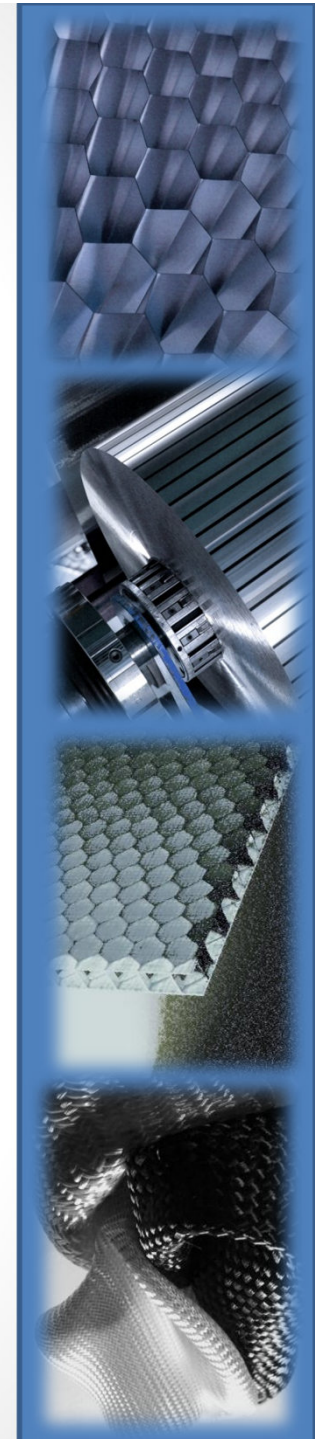
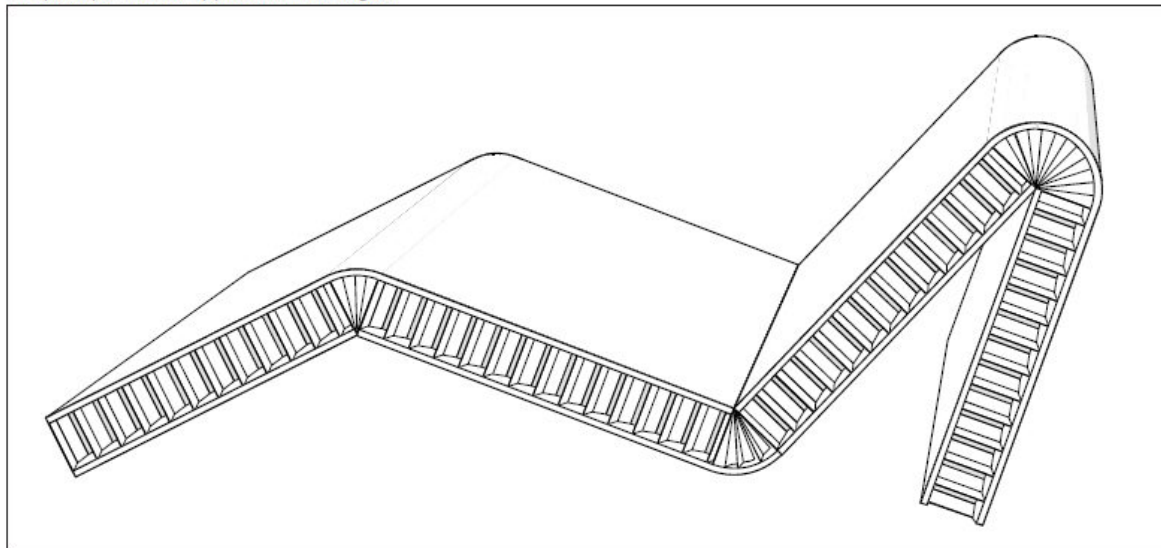


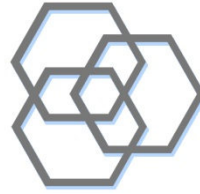
CUT AND FOLD FABRICATION

The process starts with the removal of a strip .x. from one facing skin. The width is determined by the fold angle required. This is calculated as $x = (2\pi \times T \times \phi^\circ) / 360$



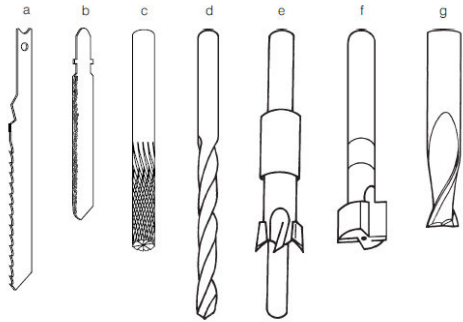
The principle can be applied to most angles.



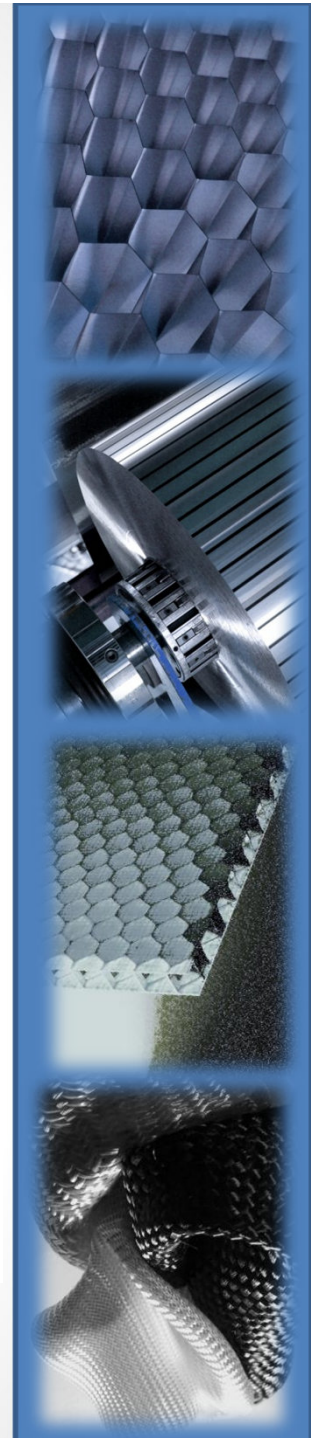
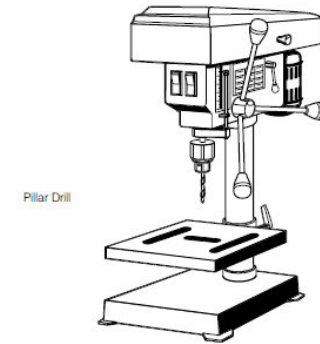
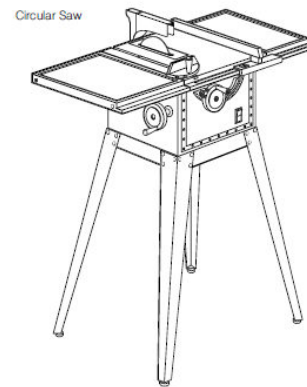
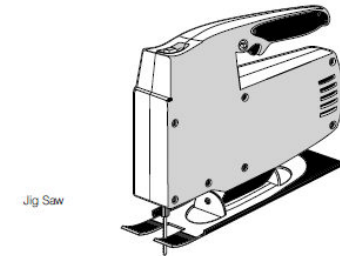
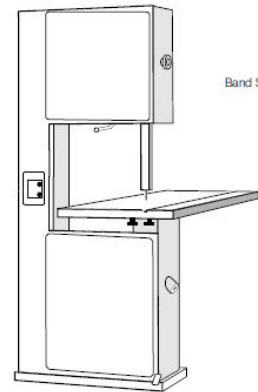
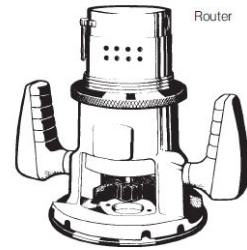


TOOL REQUIREMENTS FOR SANDWICH PANEL FABRICATION

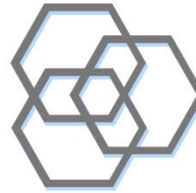
Some of the tools and equipment used in the fabrication of honeycomb sandwich panel components



- a Standard jig saw blade
- b Grit edged jig saw blade
- c Diamond cut pattern tungsten carbide router cutter - burr end
- d High speed twist drill
- e Piloted counter bore cutter
- f Edge rebating router cutter
- g 2 flute tungsten carbide router cutter



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SAFETY

Handling Precautions:

When fabricating from honeycomb sandwich board materials it is advisable to wear disposable clean cotton gloves throughout the entire operation.

This helps to keep the panel clean, and affords protection for the operator's hands.

Glass fibre dust is an irritant. Avoid breathing the dust generated by cutting operations, and do not rub the eyes with hands which may be contaminated with the dust.

The usual precautions should be observed while working with synthetic resins.

