WORKING of nidaplast

nidaplast is a polypropylene honeycomb covered on both faces with a soft polyester non-woven fabric. It is available in 2500 x 1200 mm plates ready for direct use: lamination or gluing.

The flexible and light plates enable an easy use in sandwich panels where most usual techniques of cutting, laminating and gluing can be applied. Since it is a thermoplastic product, other additional specific properties make its use even easier.

1 - CUTTING and MACHINING

1.1 - CUTTING

nidaplast is conventionally cut by usual means : saws, webs or thanks to a hot wire as it is thermoplastic

• Saws -
In order not to burst or melt **nidaplast** when cutting, the best toothing is close to :
10 teeth per inch

Circular saws are particularly suitable for long straight parts.
13 mm wide ribbon saws are also suitable for straight parts; 8 mm width rather suits curves.

• Webs -
Cutting with a cutter is possible. A reinforced and bent web is more suitable for complex cuttings (grafting knife).

• Hot wire -
Cutting can be carried out with an approx. 2 mm tensed wire heated at about 350°C.

NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 - Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

1.2 - MACHINING

• At cold temperature -

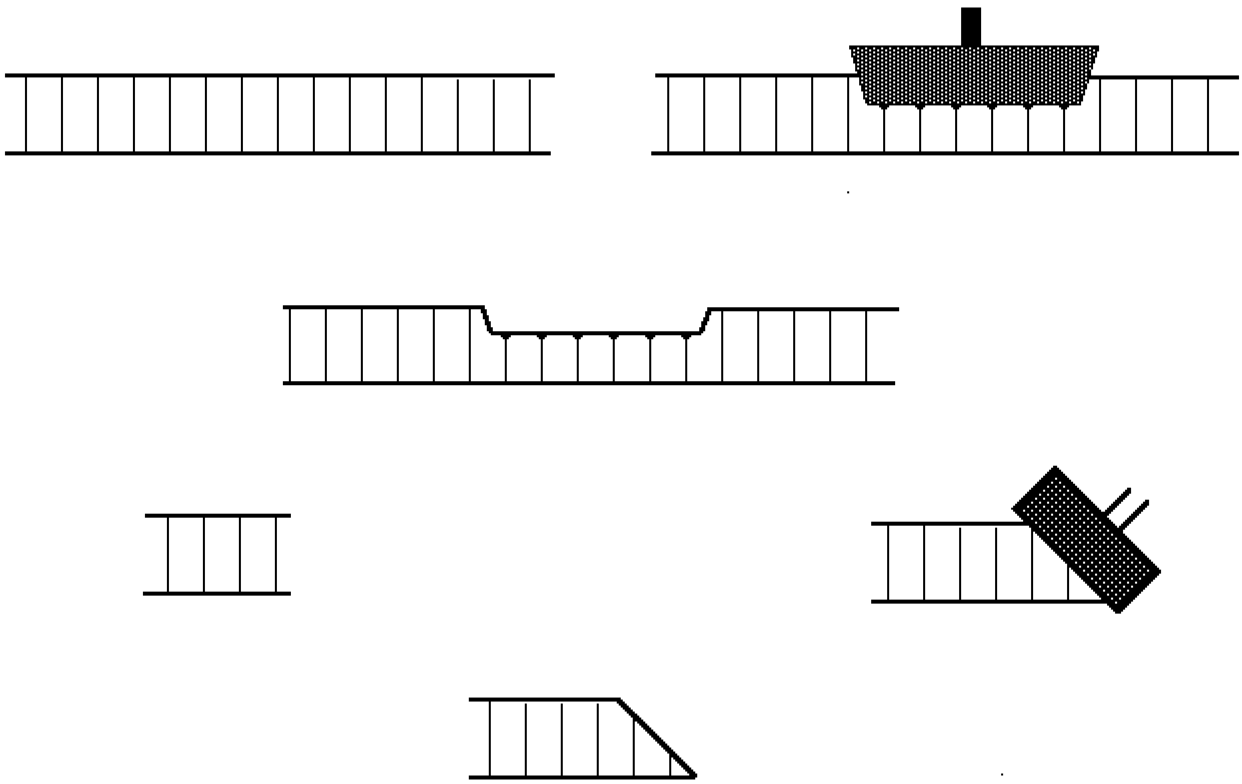
Classical tools for wood (ripper, grinder...) can be used by adapting the number of cutting webs and possibly the speed (too few webs can burst **nidaplast**; too many can melt it).

• At hot temperature -

Another way is to use the thermoplastic property: softening under heat.

1) nidaplast polypropylene cells melt at 160°C whereas the non-woven polyester which covers the facings melts at 240°C.

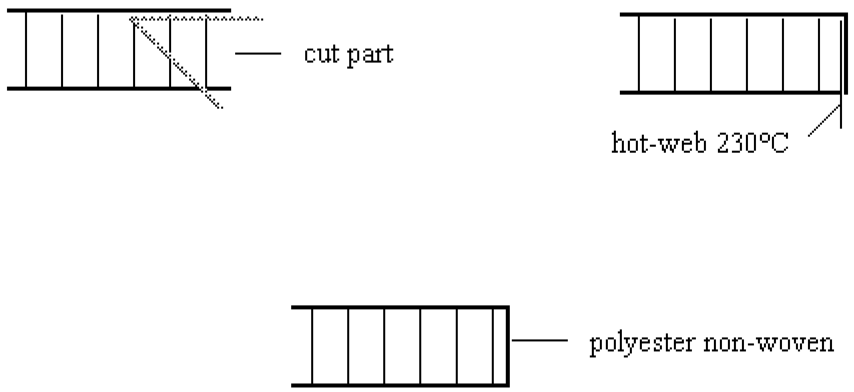
Hence if **nidaplast** is heated at about 200°C, it melts locally to the shape required (hot stamping) without damaging the non-woven facing.



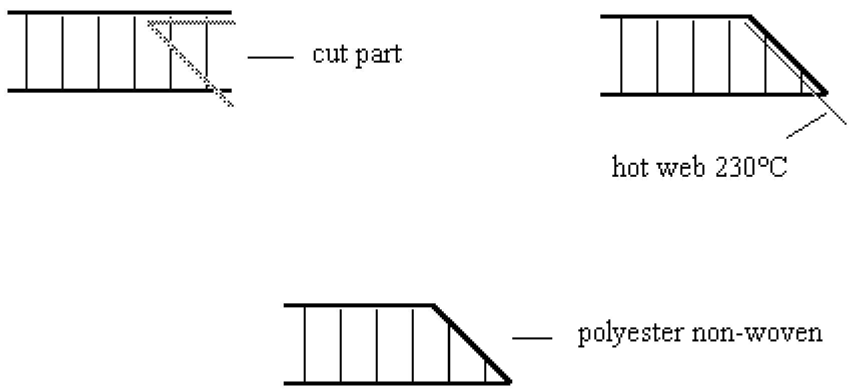
NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 -
Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital
de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

2) A second way is to cut to the required shape and then to re-weld the non-woven polyester. For example, the following edges can be achieved:

- *Straight edges*



- *Chamfered edges*



NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 - Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

2 - FORMING

2.1 - COLD FORMING

The soft polyester non-woven vlies which covers the large faces of **nidaplast** makes its forming easy through a mere pressure:

- *In the case of standard panels*, pressure (e.g. 0.2 to 0.8 bars) should be applied during curing time of polyester or glue. This can be done on a mould with vacuum or a countermould and a press.
- *In the case of marine panels* (pre-cut 5 x 5 cm on one face), a simple mould is sufficient.

2.2 - HOT FORMING and PREFORMING

Again a thermoplastic product is easily thermoformed:

In an oven, in a mould, at less than 100°C, **nidaplast** softens and under a very light pressure it very easily takes the required shape.

nidaplast can also be hot preformed. Two possible processes:

- Pre-heating in an oven between 140 and 150°C, then forming in a cold mould.
- Forming in a mould heated at 130-140°C.

In both cases **nidaplast** will keep its shape at cold temperature.

In all cases, temperatures, pressures and timings should be set up according to the shape of the part and to the thickness of **nidaplast**.

3 - WORKING UP

Sandwich panels with a **nidaplast** core can be achieved either by direct lamination or by gluing a rigid skin.

3.1 - LAMINATION

The non-woven polyester applied on **nidaplast** is an ideal surface for direct lamination of thermo hardening resins of polyester type (or other). However, considering their huge variety, resin formulations and working up techniques should be checked against their compatibility with **nidaplast**.

Most traditional techniques (hand lay up, spraying, vacuum, pressing, low pressure injection) which are function of existing tooling and depend upon the parts to be achieved, can be applied and need only slight adjustments to **nidaplast** specificities.

Within the range **nidaplast**, **nidaplast® 8** is especially suitable for lamination. Indeed, **nidaplast® 8** has, as an underface of the non-woven polyester, a plastic film which restricts resin passing through into the cells.
The operating principle of sandwich panels is to have a perfect adherence between the core and the rigid skins. Therefore when working up a panel, it is necessary to check:
- the good impregnation by resin to the core and skins,
- the good contact, e.g. through pressure, between the core and the skins.

• Manufacturing process of a laminated sandwich panel with a nidaplast core:

a) Traditionally make the first skin of the sandwich panel (gelcoat on the mould then the required layers of glass-resin).

b) Before the first skin has hardened, apply **nidaplast** interposing an extra ca 400 g/m² quantity of resin, either applied on the skin or on **nidaplast**, when hand lay up laminating.

If necessary, in the manufacturing process or in case of a thin laminate and if a very high quality surface finishing is required, it is possible to let the gel coat and one or several layers of glass-resin polymerize. As soon as polymerization is over, a last layer of glass-resin is spread in order to glue **nidaplast** as explained earlier. It is also possible to glue with shrinkless polyester glue.

c) On **nidaplast**, traditionally apply the required layers of glass-resin of the second skin, providing for and extra ca 400 g/m² quantity of resin to impregnate **nidaplast** and to ensure gluing with the laminate.

If necessary or if a gel coat finishing is planned on both faces of the sandwich, either a mould or a countermould are used, or the first layers of the laminate are made first and then they are glued to **nidaplast** as explained before.

Pouring resin in heaps on **nidaplast** without spreading it immediately should be avoided in order to prevent it from going through into the cells by gravity.

As **nidaplast** is a heat insulator, using a resin with too much exothermic should be avoided since it could damage the laminate or cause air bubbles.

A glass mat should be preferred to a fabric for direct contact with **nidaplast**.

d) Once the part is achieved, it is advised to apply the most evenly distributed pressure on the whole (vacuum, press, weight...).

Hand lay up working is possible but a good **nidaplast**-laminate bonding (on the mould side) should be ensured by a former impregnation of **nidaplast** then by a hand pressure on **nidaplast** when fitting it. It is the same on lamination by simultaneous glass-resin spraying. Bonding of the other side is easier to check as it is visible; additionally it is naturally made on the pressure unbubbling of the glass-resin layers.

• **RTM**

nidaplast® 8R is used fot RTM techniques. Working up depends on the technique used, injection pressure, temperature, fluidity; therefore it is preferable to consult us.

3.2 - GLUING

There again, non-woven polyester is used as a gluing surface to a lot of rigid skins such as wood, melamine laminates, marble, fibrocement or metal.

The glue to be used essentially depends upon the skin to be glued and on the physical and mechanical strains applied to the finished sandwich panel. Numerous glues were already satisfactorily tested on **nidaplast**: polyurethane, epoxy, neoprene, vinyl, polyester, ureaformol...

However, in all cases using glue, tests should ensure compatibility of the different materials and the mechanical properties of the sandwich panel made. Polyurethane or epoxy bicomponent glues are the most often used thanks to their good mechanical characteristics and their adherence on most materials.

• **Gluing process of a sandwich panel with a nidaplast core:**

According to he manufacturer's directions, evenly apply the required quantity of glue on the rigid skin or on **nidaplast** or both at the same time, if so required by the glue.
For polyurethane glue the quantity should be around 400 g/m².

In the same way apply glue on the second skin or on the second face of **nidaplast**.

On the panel made apply the pressure specified for the glue, a minimum of 0.2 bars and maximum of 1 bar is enough with regard to **nidaplast**. Let the glue set under the indicated conditions before handling or applying efforts on the panel.

Characteristics of the sandwich panels are mainly due to the good adherence between the core and the skins, therefore a special care should be brought to gluing and the results obtained should be well checked.

Note: *Cells may show through the glued skin if the latter is too thin or not rigid enough. Showing through is made worse by an excessive gluing pressure and/or the glue shrinkage when drying.*

NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 -
Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital
de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

3.3 - WORKING UP PREPREGS

The high melting temperature of polypropylene makes it possible to use prepregs which polymerize at temperatures up to 125°C (at 100°C **nidaplast** still resist to 1 daN/cm² compression)

Position the prepreg on **nidaplast**, apply pressure at the required temperature and let the whole polymerize. According to the temperature and to the polymerization time, check that there is no risk of collapse of **nidaplast** due to the flow. Under a press, a possible solution consists in positioning shims very slightly less thick than **nidaplast** in order to avoid this flow.

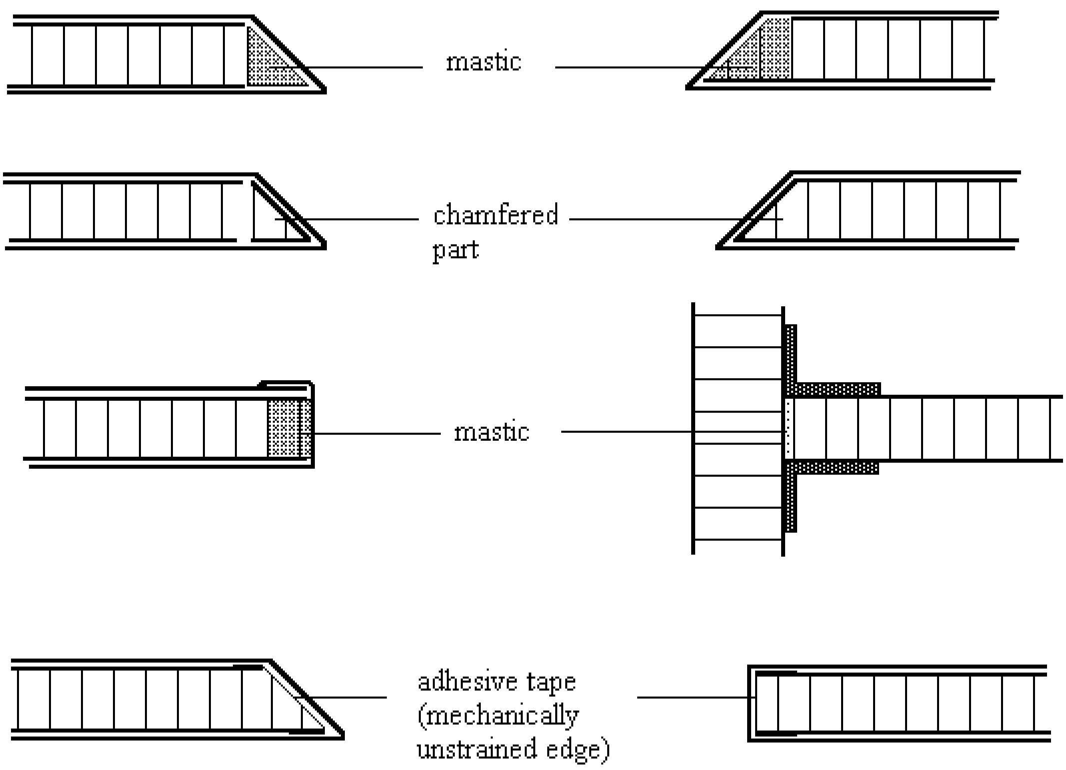
Unmolding should not be carried out too hot to avoid any risk of distorting the panel or of delaminating **nidaplast**.

4 - FINISHING of the SANWICH PANEL

4.1 - FINISHING of EDGES

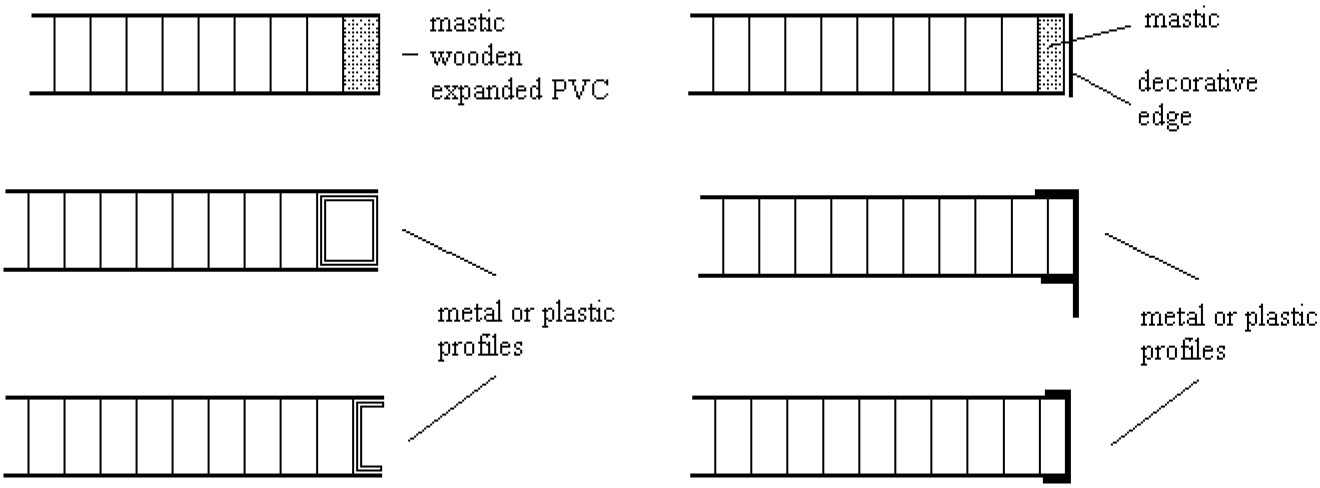
4.1.1 - Laminated panels -

Several types of finishing are possible in case of laminated panels. Moulding of polyester skins makes it easier to work out edges as shown in the following examples :

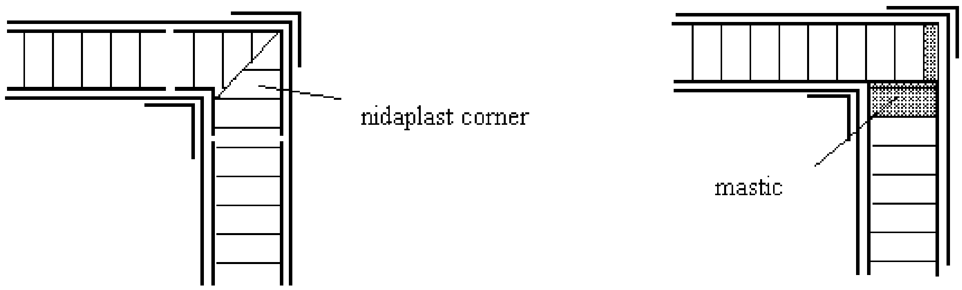


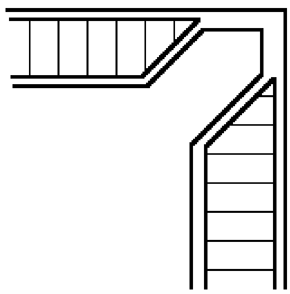
Most frequently, finishing is carried out through a frame or a finishing profile. Its material will be chosen according to the physico-chemical strains of manufacture and use. Wood is interesting by its very wide flexibility of use but it may require trimming and is sensitive to damp. Plastic or metal enable a direct finishing but need a very exact size.
Setting the frames or profiles can be carried out, as shown by the following examples, either before or after the panel is made:

<u>During manufacturing</u> **<u>After manufacturing</u>**



4.1.2 - Connection of two panels -

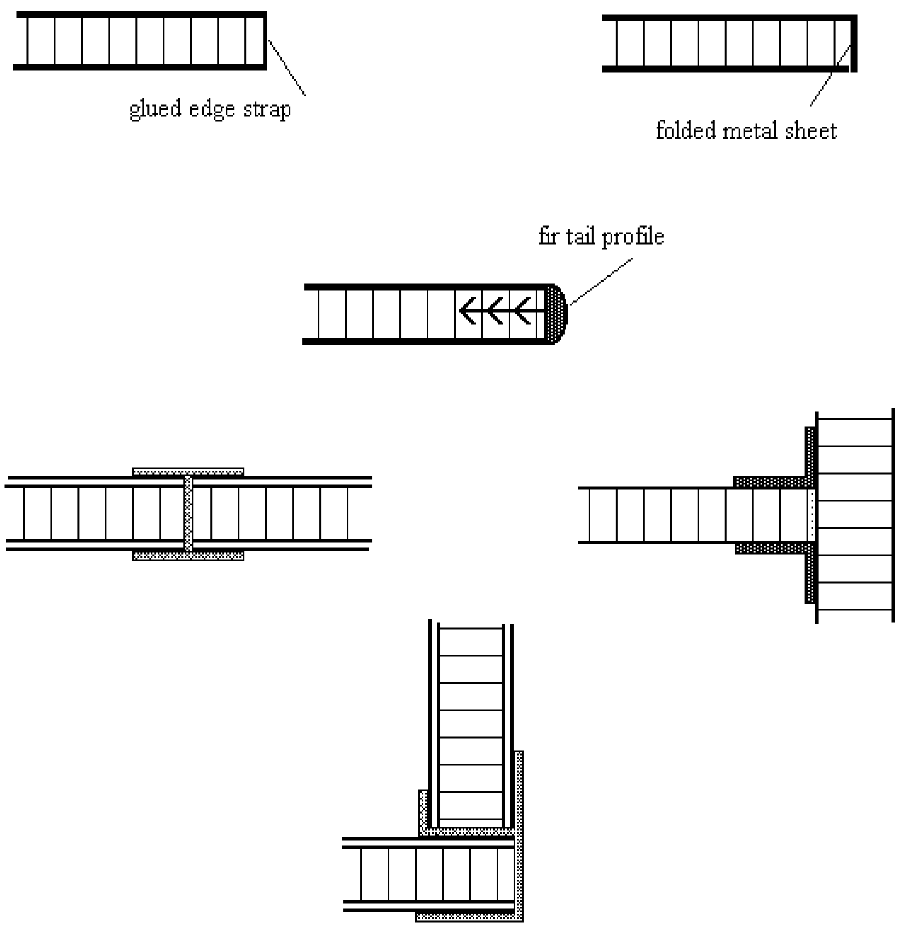




4.1.3 - Glued panels -

Several types of finishings are possible according to the skins, the panel use and the mechanical strains applied.

Unstrained decorative edges can be merely glued on both rigid skins. In case of a metal sheet, a mere fold can hide the edge.



4.2. - <u>LOCAL STRENGTHENING PARTS, FIXING INSERTS for ELEMENTS or OBJECTS</u>

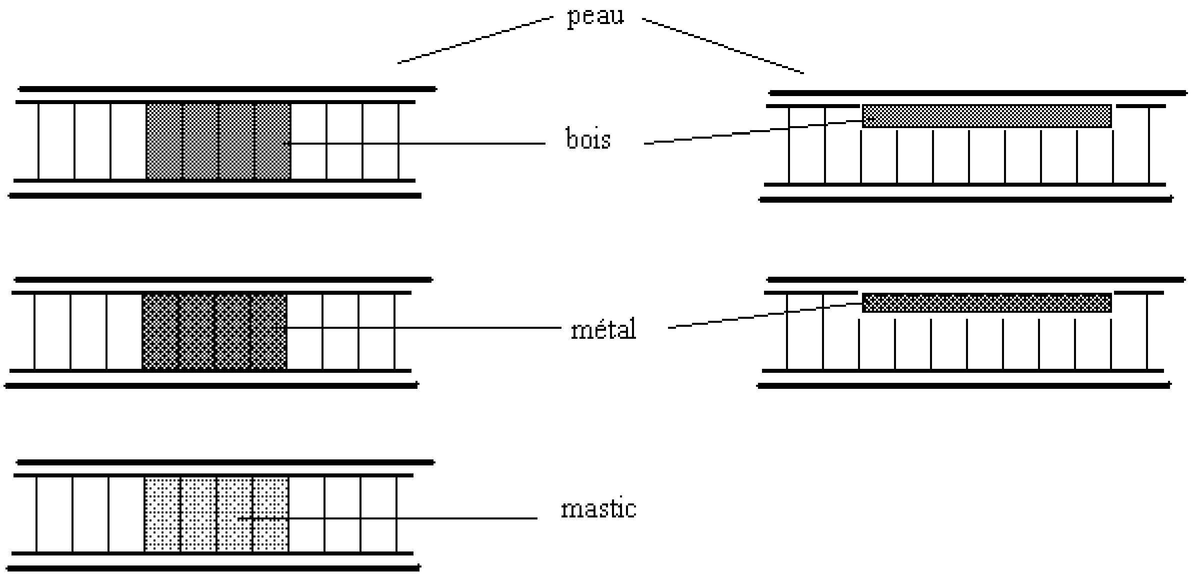
Fixing elements on a sandwich panel may require local strengthening parts or inserts.

Choosing the adequate solution essentially depends on the strains transmitted by the fixing to the skins or to the core.
Fixings can be traversing or not.

4.2.1 - Non-traversing fixings -

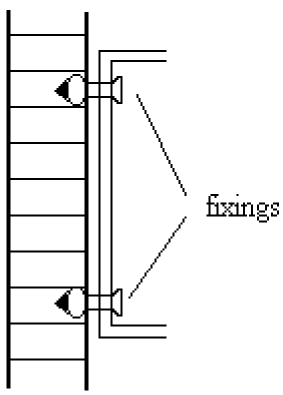
4.2.1.1 - *Light loads* -

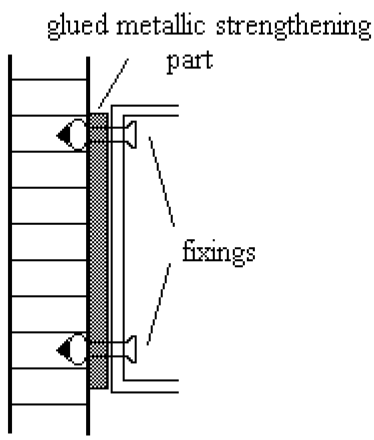
Considering the good cohesion of **nidaplast** and the good adherence of skins if they were worked up properly, fixing can be carried out in a classical way : rivets, bolts, selftapping screws ..., on only one skin. If the load makes it necessary or if the skin is insufficiently resistant, a glued metallic strengthening part can be added and will distribute the strains



4.2.1.2 - *Heavy concentrated loads* -

• In case of non-traversing fixings, the most frequent solution consists, before gluing the skins of the sandwich panel, in placing inserts which locally build up a solid panel into which fixing is carried out in a classical way.
The most frequently used insert is wood, but metal or resin inserts are also suitable.
The insert can take the full or only part of the thickness of the panel.





an Etex GROUP company

NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 - Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

• For a greater flexibility of use, it is also possible to make resin inserts on finished panels.

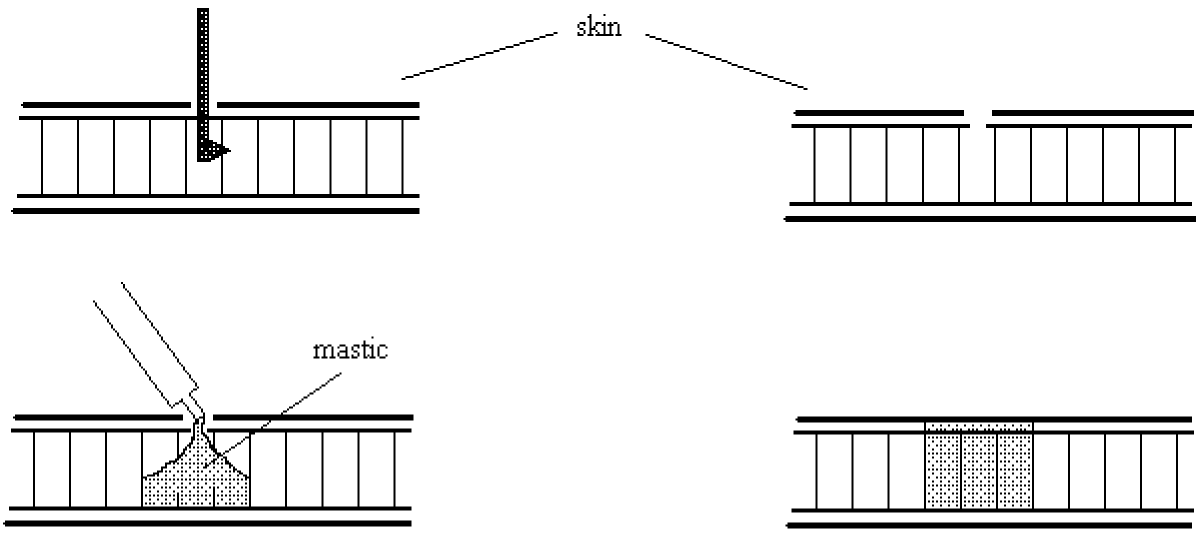
Considering the fixings to be made, inserts can be large or small:

a) *Large inserts*

The upper skin is removed from the surface concerned by the insert. A mastic is applied with a spatula into the cells of **nidaplast**. Once the mastic is dry, its sandpapering leaves a clean and hard surface on which a new lamination allows a solid fixing.

b) *Small inserts -*

The upper skin is perforated at the spot planned for the insert. Thanks to a cutting tool, a few cells are sheared around the hole then filled up with resin. Fixing can then be carried out into the resin.



4.2.2. TRAVERSING FIXINGS

Traversing fixing can be carried out:

- into inserts as described above,
- thanks to a metal or pultruded plastic brace,
- thanks to specially adapted fixings.

NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 - Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z

4.3 - THERMOWELDED INSERTS

Because of its polypropylene composition, **nidaplast** can very easily receive polypropylene inserts by friction welding.

The 15 mm thick insert whose diameter can vary according to the resistance wished, is positioned on **nidaplast** at the required spot.

Thanks to a rotating tool at 1500 revolutions a minute, a light pressure is applied on the insert.

Rotation and pressure create the heating which enables a perfect welding between the insert and **nidaplast**.

The panel thus prepared can receive the final skins. On the insert, solid fixing is carried out with specially adapted screws.

NOTA : The indicated directions can serve as a guide to use the product but cannot be considered as a guarantee of a good working up. Additionally application, utilization and/or transformation of the products escape our control possibilities. As a consequence, they exclusively remain the responsibility of the user and/or transformer.

NIDAPLAST - Rue Paul Vaillant Couturier - F - 59224 THIANT - France - Tél. : +33 (0)3 27 44 72 00 - Fax : +33 (0)3 27 44 88 05 e-mail : composites@nidaplast.com - site : www.nidaplast.com S.A.S. au capital de 1 061 998 € - R.C. VALENCIENNES 971 204 474 - SIRET 971 204 474 00060 - TVA : FR 87 971 204 474 - NAF : 2223 Z