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1. General

Halle Plast AB has been producing transluents for use in building production, agriculture, storage, sun collecting, carports and verandas since the end of the 60s. Our product is sold under the trademark HalleLux.

HalleLux sheets are manufactured from glass fibre reinforced polyester. Four factors are of special importance: surface quality, polyester quality, reinforcement and type of profile. Each factor is explained later in the text. Since HalleLux is made from glass fibre reinforced polyester, the properties are quite different compared to other sheets made from non-reinforced thermoplastics such as PVC, acrylic and polycarbonate. We are using the trade name HalleDur for sheets made from extra chemically resistant polyesters (D and H) and for coloured sheets.

Surface quality – gives the sheets their properties with regard to light transmission, change of colour and aesthetics, especially in the long run. Too little quality gives less customer/client satisfaction in the long run.

Polyester quality – determines the properties of the final product when it comes to fire, consistency and temperature.

Reinforcement – affects the load bearing capacity and stiffness of the sheets.

Profile type – to fit without different kinds of flashings, gives a simple and quick assembly.

Six directives for construction products have been established in the EU, of which each concerns essential areas. All requirements in the directives have requirements on function that should be fulfilled. Each country decides on how it will apply the directives. For a few years now, the Swedish construction rules have been designed according to this way of looking at technical function for construction. The comments below for HalleLux – HalleDur refer to the Swedish construction rules.

Load-bearing, stability and consistency

There are no recommendations for plastics with regard to how dimensioning should be done. It is therefore up to the supplier to recommend how the plastic material should be dimensioned for different kinds of loads. Look at section 6.

Fire-protection

Measures of caution, material demands and construction demands are independent of material. Look at section 8.

Hygiene, health and environment

The standard has a recommendation on access to daylight. The chapter also includes requirements on tightness against humidity/water that is moving towards the wall and roof. This places demands on the supplier to show how the change of material length is handled and to show that the plastic does not split or is, in any other way, untight at fasteners, overlaps etc. Look at sections 2, 7, 10, 14 and 16.

Security when using

Partly concerns risk of slipping and partly risk of injury in the event of a fall. Look at section 9.

Protection against noise

Not very relevant with plastic as the surface material.

Energy conservation and heat insulation

The resistance to heat for the sheets should be shown. Look at section 12.

2. Surface quality

The type of surface quality that is applied in the production has conclusive importance for the lifespan of HalleLux - HalleDur sheets. There are several surface quality options offered on the market. For a good result there has to be a favourable combination between the requirement of lasting properties and price.

Halle Plast AB is offering an extra UV-protected film giving a very competitive combination of price and quality.

Compared to the standard surface film, this extra UV-film gives less yellowing, less erosion and better light-transmission.

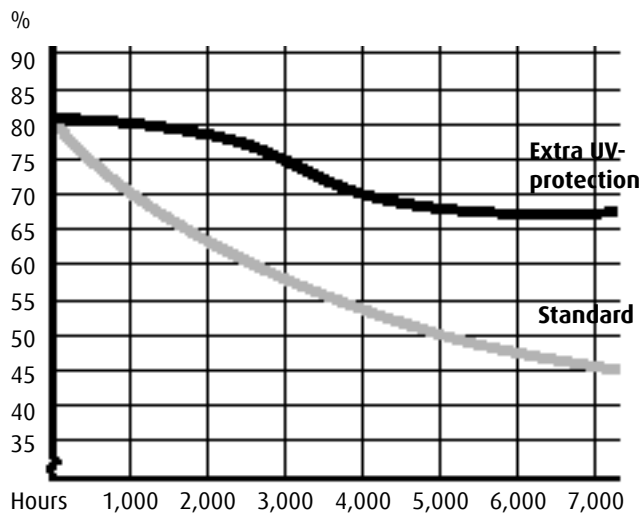
Melinex® (®registered trade mark of Imperial Chemical Industries PLC) films are applied during the production process and the films are hardened to the polyester. Melinex® films have a thickness of 20 microns, that is the same thickness as normal colour coating on profiled steel-sheets.

The distinct advantages of the extra UV-protected film are:

- Better colour stability due to less yellowing.
- Erosion of the surface is reduced, that is the gloss is much improved.
- A good surface means that glass fibre threads will not be at the surface and therefore prevents dirt from accumulating.

The diagram is from accelerated tests. The importance of extra UV-protection is clearly seen. Also, the standard surface film is much better than sheets without any surface protection.

The light transmission for HalleLux sheets is approx. 80% at the time of delivery. This is valid for visible wavelengths. The light transmission is always improved when cleaning the translucents. Use a mild synthetic detergent, soft brush and lots of water.



The diagram shows light transmission against time in an accelerated test. 1,000 hours in testing are, very roughly, 2 years of exposure in Scandinavia.

3. Polyester

By using different types of polyester, slightly different properties can be obtained for the manufactured sheets. The differences are particularly apparent when it comes to fire, temperature and consistency, see appropriate items. (8, 10 and 16)

We have fixed specifications for all our translucent sheets, insuring an even quality. For the J quality, we have a quality inspection by a certified external body. Polyester is given as position 2 in our article numbers.

Our quality markings are as follows:

HalleLux:	N	General purpose polyester. No threadmarking.
	J	Fire-retardant polyester. Marking with a black thread.
HalleDur:	H	A chemical resistant ISO polyester. Can also be delivered with fire-properties as for quality J.
	D	A chemical resistant polyester. DERAKANE®. Marking with a yellow thread.

HalleDur is also our trade name for coloured sheets with polyester qualities N and J. To be able to see afterwards what combination of surface film and polyester quality a sheet consists of, different combinations of threads are used in the material to gain a reliable identification.

4. Reinforcement

All our HalleLux and HalleDur products are manufactured with reinforcements in the form of glass fibre mats. Through the use of glass fibre mats we can always guarantee an even thickness of our products. The glass fibre mats are produced according to ISO 3374.

Several other producers of translucents use glass fibre that is cut during the production of the translucents. This can result in an uneven reinforcement and weak spots. These translucents can also give an uneven appearance.

The reinforcement can be delivered in different weights. Halle Plast AB is currently delivering sheets with reinforcement of 375 g/m² (approx. 0.85 mm), 450 g/m² (approx. 1 mm), 600 g/m² (approx. 1.3 mm), 900 g/m² (approx. 2 mm), 1,200 g/m² (approx. 2.6 mm) and 1,350 g/m² (approx. 3 mm). Reinforcement is given as position 5 in our article numbers.

5. Profiles

HalleLux sheets are manufactured in the same geometrical form as steel, aluminium or fibre cement profiles. Halle has tools for almost all Nordic profiles and for several other steel and aluminium sheets. New tools can be produced in a cheap and efficient way.

One of the main advantages of HalleLux translucents is that they can overlap the steel profiles at the ends and sides. No demands for cost flashings. Ask for current list of profiles. The type of profile can be checked in position 3 and 4 in our article numbers.

6. Load-bearing

One of the most important issues when using translucents is the load-bearing capacity. An extensive test series has been performed to determine possible moment and moment of inertia. Several profiles of heights 20-45 mm have been tested, also with different reinforcements (375, 450, 600, 900 g/m²).

Observe that the tests have been performed with Melinex® films and glass fibre mats. The values below have been calculated according to the method used for profiled steel sheeting.











Span is the distance between purlin centres. S-factor is the safety factor – 1.5 or 2.5.

The spans, giving a deflection of L/45 for different loads, are also stated. For a good function, the riveting of side laps is recommended, c/c max. 500 mm. Safety factor 2.5 is recommended for roofs and safety factor 1.5 for wall claddings. The span tables can be used for both snow and wind loads.

When HalleLux sheets are supported on all four sides, the side laps are riveted. The spans according to the span tables can be increased by 10%, this is valid for 1 and 2 spans. The permissible canopy action from the last support is 20% of the actual span. The canopy distance is between the free edge of the HalleLux sheet and the middle of the outer purlin.




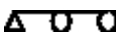
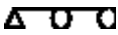

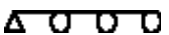
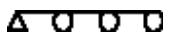
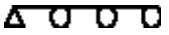
20-PROFILES (height 20 mm)

Recommended spans between purlins. The loads are stated at the top of the table.
The permissible spans are given in metres for 1 and 2 spans and for 3 or more spans.

Reinforce- ments g/m ²	S-factor	Evenly distributed load										Numb. of spans 
		0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0	
450	1.5	1.63	1.41	1.26	1.15	1.07	1.00	0.94	0.89	0.85	0.81	1 span 
	2.5	1.26	1.10	0.98	0.89	0.83	0.77	0.73	0.69	0.66	0.63	
	L/45	1.09	0.99	0.92	0.87	0.82	0.79	0.76	0.73	0.71	0.69	
600	1.5	2.12	1.84	1.64	1.50	1.39	1.30	1.22	1.16	1.11	1.06	1 span 
	2.5	1.64	1.42	1.27	1.16	1.08	1.01	0.95	0.90	0.86	0.82	
	L/45	1.22	1.10	1.03	0.97	0.92	0.88	0.84	0.81	0.79	0.77	
900	1.5	2.84	2.47	2.21	2.01	1.86	1.74	1.64	1.56	1.49	1.42	1 span 
	2.5	2.23	1.94	1.73	1.58	1.47	1.37	1.29	1.23	1.17	1.12	
	L/45	1.34	1.21	1.13	1.06	1.01	0.96	0.93	0.89	0.87	0.84	
450	1.5	1.63	1.41	1.26	1.15	1.07	1.00	0.94	0.89	0.85	0.81	2 spans 
	2.5	1.26	1.10	0.98	0.89	0.83	0.77	0.73	0.69	0.66	0.63	
	L/45	1.46	1.33	1.23	1.16	1.10	1.05	1.01	0.98	0.95	0.92	
600	1.5	2.12	1.84	1.64	1.50	1.39	1.30	1.22	1.16	1.11	1.06	2 spans 
	2.5	1.64	1.42	1.27	1.16	1.08	1.01	0.95	0.90	0.86	0.82	
	L/45	2.62	1.48	1.37	1.29	1.23	1.18	1.13	1.09	1.06	1.03	
900	1.5	2.84	2.47	2.21	2.01	1.86	1.74	1.64	1.56	1.49	1.42	2 spans 
	2.5	2.23	1.94	1.73	1.58	1.47	1.37	1.29	1.23	1.17	1.12	
	L/45	1.79	1.63	1.51	1.42	1.35	1.29	1.24	1.20	1.16	1.13	
450	1.5	1.75	1.52	1.36	1.24	1.15	1.07	1.01	0.96	0.91	0.88	3 or more spans 
	2.5	1.37	1.18	1.06	0.97	0.90	0.84	0.79	0.75	0.71	0.68	
	L/45	1.34	1.22	1.14	1.07	1.02	0.97	0.93	0.90	0.87	0.85	
600	1.5	2.29	1.99	1.78	1.62	1.50	1.40	1.32	1.26	1.20	1.15	3 or more spans 
	2.5	1.78	1.54	1.36	1.26	1.16	1.09	1.03	0.97	0.93	0.89	
	L/45	1.50	1.37	1.27	1.19	1.13	1.08	1.04	1.01	0.97	0.95	
900	1.5	3.08	2.67	2.38	2.18	2.01	1.88	1.78	1.69	1.61	1.54	3 or more spans 
	2.5	2.42	2.10	1.87	1.71	1.58	1.48	1.40	1.33	1.26	1.21	
	L/45	1.65	1.50	1.39	1.31	1.25	1.19	1.15	1.11	1.07	1.04	

45-PROFILES (height 45 mm)

Recommended spans between purlins. The loads are stated at the top of the table.
The permissible spans are given in metres for 1 and 2 spans and for 3 or more spans.

Reinforce- ments g/m ²	S-factor	Evenly distributed load													Number of spans
		0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0	3.5	4.0	4.5	
450	1.5	2.14	1.85	1.66	1.51	1.40	1.31	1.24	1.17	1.12	1.07	0.95	0.90	0.85	1 span 
	2.5	1.66	1.44	1.28	1.17	1.09	1.02	0.96	0.91	0.87	0.83	0.75	0.70	0.65	
	L/45	1.82	1.65	1.53	1.44	1.37	1.31	1.26	1.22	1.18	1.14				
600	1.5	2.83	2.46	2.20	2.00	1.86	1.74	1.64	1.55	1.48	1.42	1.30	1.20	1.12	1 span 
	2.5	2.20	1.90	1.70	1.55	1.44	1.35	1.27	1.20	1.15	1.10	1.00	0.95	0.85	
	L/45	1.99	1.81	1.68	1.58	1.50	1.43	1.38	1.33	1.29	1.25				
900	1.5	3.65	3.16	2.83	2.58	2.39	2.24	2.11	2.00	1.91	1.83	1.65	1.55	1.45	1 span 
	2.5	2.92	2.53	2.26	2.07	1.91	1.79	1.69	1.60	1.53	1.46	1.30	1.25	1.15	
	L/45	2.17	1.97	1.83	1.72	1.64	1.57	1.50	1.45	1.41	1.37				
450	1.5	2.14	1.85	1.66	1.51	1.40	1.31	1.24	1.17	1.12	1.07	0.95	0.90	0.85	2 spans 
	2.5	1.66	1.44	1.28	1.17	1.09	1.02	0.96	0.91	0.87	0.83	0.75	0.70	0.65	
	L/45	2.43	2.21	2.05	1.93	1.83	1.76	1.69	1.63	1.58	1.53				
600	1.5	2.83	2.46	2.20	2.00	1.86	1.74	1.64	1.55	1.48	1.42	1.30	1.20	1.12	2 spans 
	2.5	2.20	1.90	1.70	1.55	1.44	1.35	1.27	1.20	1.15	1.10	1.00	0.95	0.85	
	L/45	2.66	2.42	2.25	2.11	2.01	1.92	1.85	1.78	1.73	1.68				
900	1.5	3.65	3.16	2.83	2.58	2.39	2.24	2.11	2.00	1.91	1.83	1.65	1.55	1.45	2 spans 
	2.5	2.92	2.53	2.26	2.07	1.91	1.79	1.69	1.60	1.53	1.46	1.30	1.25	1.15	
	L/45	2.91	2.64	2.46	2.31	2.19	2.10	2.02	1.95	1.89	1.83				
450	1.5	2.31	2.00	1.79	1.64	1.52	1.42	1.34	1.27	1.21	1.16	1.05	0.95	0.90	3 or more spans 
	2.5	1.79	1.55	1.39	1.27	1.17	1.10	1.04	0.98	0.94	0.90	0.80	0.75	0.70	
	L/45	2.24	2.04	1.89	1.78	1.69	1.62	1.56	1.50	1.46	1.41				
600	1.5	3.07	2.66	2.38	2.17	2.01	1.88	1.77	1.68	1.60	1.53	1.40	1.30	1.25	3 or more spans 
	2.5	2.28	2.06	1.84	1.68	1.56	1.45	1.37	1.30	1.24	1.19	1.05	1.00	0.95	
	L/45	2.46	2.23	2.07	1.95	1.85	1.77	1.70	1.64	1.59	1.55				
900	1.5	3.95	3.42	3.06	2.79	2.58	2.42	2.28	2.16	2.06	1.97	1.80	1.70	1.60	3 or more spans 
	2.5	3.16	2.73	2.45	2.23	2.07	1.93	1.82	1.73	1.65	1.58	1.45	1.30	1.25	
	L/45	2.68	2.44	2.26	2.13	2.02	1.94	1.86	1.80	1.74	1.69				

Physical type values:

- Tensile strength 100 N/mm²
- Compressive strength 200 N/mm²
- Modulus of elasticity 7,000 N/mm²

7. Fastening

Halle fasteners are recommended for use together with HalleLux and HalleDur translucents/sheets. When HalleLux translucents are being used together with metal sheeting, fasteners recommended by the metal sheet producer are normally used.

Halle screws are always placed in the profile valley. HalleLux sheets are being produced with elastic polyester, making it possible to use screws in the valley even with sinusoidal profiles (max. 14 mm washer for sinusoidal profiles).

The most reliable tightness is achieved when using screws, because nails always have a tendency to rise when wooden purlins dry out. HalleLux screws are compressed, making the rubber of the washer extend 1 to 2 mm outside the metal washer.

A certain minimum number of fasteners should be used in order to give a proper appearance. That is, no bird mounting, giving less tightness and unexpected deformations.

Minimum attachment:

- At the end of the profiles, one fastener is required per corrugation, however, no closer than 150 mm is necessary.
- On mid-purlins, one fastener is required per every second corrugation, however, no closer than 300 mm is necessary.

To gain better stability, it is possible to change valley for the fastener at each purlin, that is the fasteners are not placed in the same profile valley from eaves to ridge.

The number of fasteners is normally calculated for each project. To do this, the following possible fastener loads can be used. These loads are tested and evaluated according to SIS 271115 (Swedish standard).

The tests have been done as short term tests. Safety factor 2.0 has been used. A higher safety factor should be used for permanent loads.

Possible fastener loads kN/fastener			
Type of fastener	Reinforcement g/m ²		
	450	600	900
Halle screw with 14 mm washer	0.26	0.36	0.41
Halle screw with 19 mm washer	0.29	0.36	0.65

Fasteners close to ends of sheets are not capable of taking full loads, which is why the fasteners should not be positioned closer to the end than 100 mm. If the load is so large that the permitted fastener load is too small, you can manufacture a metal sheet that covers the entire bottom of the profile and follows the webs of the profile. The screw is then pulled through the metal sheet and the HalleLux sheet down into the purlin. Another way is to have a hot rolled angle profile over the HalleLux sheet and place a screw that squeezes the sheet between the hot rolled angle profile and support.

For the possible riveting of side laps, use a pressure tight rivet.

Screws for side laps do not work together with HalleLux or HalleDur sheets. The reason for this is that a side lap screw requires a thread-form to occur in the material, which does not occur in plastic.

8. Fire quality

In order to fulfil different standards, Halle delivers sheets with several different fire-classified polyesters. The different polyesters are marked with coloured threads incorporated in the side of the sheets. Halle is the only company on the Nordic market that delivers fire-retardant polyester to meet the demands of the authorities. The testing results of different Halle Lux qualities can be seen below.

N – quality A general purpose polyester. No thread.
 Class 4 according to BS 476 P7.
 Class B 3 according to DIN 4102.

J – quality A fire retardant polyester. Marked with a black thread.
 Class 3 according to BS 476 P7.
 B2 according to DIN 4102. Self-extinguishing according to ASTM D 635.

Also, ISO-polyester can be delivered in fire-classifications according to the above qualities N and J.

For Scandinavian classifications, see the special leaflet.

9. Walkability/Personal safety

Walkability is defined in a Swedish standard, SIS 271113, as a property for withstanding the cautious walking of a person weighing 100 kg, without giving permanent deformation.

Walkability: Spans for walkability (2 or more spans)

Span	Valid for
1.25 metres	20-profile, reinforcement 900 g/m ²
2,25 metres	45-profile, reinforcement 900 g/m ²

The sheets should not normally be walked upon. Fastening is done from the side or from a ladder or load-dispersing board. Walking should only be done in exceptional cases and then over purlins when the sheets have been fastened.

Personal safety

In some countries, there is a requirement that the sheets must withstand the weight of a person falling onto the sheets. Test methods according to labour safety regulations. HalleLux translucents have been tested according to the Swedish method with the following result, with a reinforcement of 900 g/m².

Profile	Reinforcement	Supports (2 or more)
20-profiles	900 g/m ²	Up to 1.25 metres
45-profiles	900 g/m ²	Up to 2,00 metres

Our general recommendation is that HalleLux translucents should not be walked upon.

10. Temperature

The coefficient of linear expansion for HalleLux sheets is $20-25 \times 10^{-6}$. This is equal to approx. 1 mm per metre of sheet, when calculating with a temperature difference of 40° C. It is also the same elongation as for aluminium sheeting and about double compared to steel sheeting.

Other plastics such as PVC and polycarbonate will give 3 - 4 times the elongation.

The highest temperature without load is + 130°C. The lowest recommended temperature is -40°C. HalleLux sheets will not be brittle at low temperatures, contrary to some non-reinforced plastics such as PVC. Testing shows that HalleLux will work as a load-bearing element even at the high temperatures that can be reached in the overlapping of translucents and steel sheeting (+80°C). The temperature for keeping the polyester a constant shape is approximately 75°C. These values are valid for orto- and isopolyester resins. Vinyl ester such as e.g. Derakane® polyester can handle higher temperatures.

Due to the temperature movements, the length of the sheets should not exceed 8 metres. If the sheets are of a longer length, the roof length should be divided and moveable end lapping used. The maximum sheet length for the production is 12 metres, which can cause transportation problems.

11. Curved sheets

HalleLux sheets have been used as curved sheets for different purposes for many years. The HalleLux sheets are being delivered as normal profiled sheets and are bent, to the required radius, over the purlins at the building site.

The spans between supports may be 75% relative to the spans for normally supported sheets with 3 supports. Always use at least 3 supports for curved sheets. This is valid for sheets with 450 g/m² of reinforcement and a profile height of 20 mm (minimum radius 5 metres) and a profile height of 45 mm (minimum radius 10 metres).

To achieve a good tightness in side laps, we recommend profiles giving a side lap of both top and bottom flanges. Symmetrical profiles are recommended, that is top and bottom flanges with the same widths. When calculating the number of fasteners, it is important to consider that the bending will give an extra fastener load of $F=E \times I / (R \times L)$ R = Radius in metres. L = Distances between supports. E × I value is given in the table below.

E × I in kN m ² /m, Reinforcement 450 g/m ²	E × I
Profile height 20 mm:	0,57
Profile height 45 mm:	2.63

In end laps HalleLux/HalleLux, the force will be $2 \times F$ (one F for each sheet). If overlapping HalleLux/metal sheeting, use the E × I value for metal sheeting for one of the two F-values.

We recommend the use of valley fixing with screws. Ask for further information concerning other profiles and amounts of reinforcement.

12. Insulation/Condensation

Insulation:

Heat can be transported in three ways:

- radiation
- conduction
- convection (air movements)

The insulation effect from radiation, for single and double sheeting of HalleLux, is minimal. Radiation does have an important role when it comes to the “greenhouse” effect. Short-wave radiation from the sun is transformed into long-wave radiation in the greenhouse, which is not transmitted, thus giving an increase in temperature.

The insulation effect is therefore mostly dependent on conduction and convection.

Heat resistance due to conduction:

R (conduction) = thickness/coefficient of con. = $0.001/0.15 = 0.007 \text{ m}^2 \times \text{°K/W}$

Heat resistance due to convection: R (convection) = $0.2 \text{ m}^2 \times \text{°K/W}$

Which gives an insulation value of $U=1/(R \text{ cond.} + R \text{ conv.})=1/(0.007 + 0.2) = 4.83 \text{ W/m}^2 \times \text{°K}$ (°K = degree Kelvin)

If the effect from conduction is disregarded, the U - value will be $5.0 \text{ W/m}^2 \times \text{K}$. From this, we can see that the insulation effect comes from convection. This means that the insulation effect for a profiled sheet is at least as good as for a flat sheet.

For double skin constructions, there will be an extra effect of the distance between the two sheets, giving an insulation value of approx. $2.8 \text{ W/m}^2 \times \text{°K}$.

Values for calculation: Single skin $5.5 \text{ W/m}^2 \times \text{°K}$
 Double skin $2.8 \text{ W/m}^2 \times \text{°K}$

Condensation:

NB! HalleLux sheets can now be supplied with the same anti-condensation treatment as metal sheeting.

Condensation is water in gas form being transformed into water in liquid form.

Reasons for this are:

- air temperature decreases
- humid air comes into contact with a cold surface
- inadequate ventilation

Normal cases of condensation are:

- during periods of snow melting with snow on the roof
- during spring and autumn, grey weather
- clear nights

The location and design of the building will strongly affect the risk of condensation. Water in the vicinity and inadequate ventilation will increase the risk of condensation

In general, condensation will occur less frequently on translucents than on steel sheets, due to the fact that the temperature drop is less with translucents than with steel sheets. With decreased ventilation, the risk of condensation will increase. For normal carports and verandas, the condensation will rapidly vanish when the weather conditions change.

13. Cutting - Handling - Storing

Note that HalleLux sheets are of a lightweight material and that the risk of them blowing away must be considered. Heavy blows to the translucents must be avoided. If not, white blisters will appear on the surface.

The transportation of long sheets at the building site can be made when sheets have been rolled into a bundle.

Storing should be made in tilted bundles, max. height 1 m, with protection from rain and sun.

When stored for a period of time, water between the sheets can cause the discolouring and delamination of the protective film. Store in a dry place and make sure that the ventilation between the sheets is good.

The cutting and drilling of HalleLux translucents can be made with normal carpenter tools. Cutting is made with small teeth saws. Hold the saw at a shallow angle towards the sheet.

14. Side and end lapping

Side laps for roofs are normally 1 wave (top and bottom). Special side laps (most sheet manufacturers have their own) or profile top and half a profile bottom are also common. Note that the last type of side lap should be sealed irrespective of roof pitch.

For wall cladding, the side laps are normally overlapped with profile top or profile bottom.

Normal rivets are recommended for sheets with a reinforcement of 450 g/m². Special rivets are recommended for sheets with 600 and 900 g/m². When sealants are used, the rivets should be spaced with intervals of 300 mm. With no sealants – 500 mm distance. In general, riveting is seldom done when the spans are less than 1,000 mm.

The coefficient of thermal expansion for HalleLux and aluminium sheets is approximately the same. The coefficient for steel sheeting is about half relative to aluminium. To avoid thermal stress, it is recommended to only use riveting in the central 5 m of the side lap HalleLux metal sheeting.

Fixed end lappings between sheets can be performed by fasteners through both sheets. This type of end lap can be used with a total sheet length of up to 8 metres.

A moveable end lap must be used with roof slopes longer than 8 metres. This can be done with a fastener approx. 20 mm above the end of the sheet on the underside (the bottom sheet can slide under the top sheet – necessary with wide purlin) or with a slot formed hole in the bottom sheet. Moveable end laps should be sealed with 2 strings of sealants (silicone is recommended).

Fixed end laps, as well as side laps, are normally sealed if the roof slope is under 14 degrees. Hard sealing might be necessary even with higher slopes. 2 strings of sealants can be used when tough conditions might be present.

End lappings for roofs – minimum 200 mm, and for walls – minimum 100 mm. To reduce the number of end laps, thus reducing the risk of leakage, it is recommended, if possible, to use HalleLux translucents in full lengths from ridge to eaves.

Silicon is recommended as the sealant (not containing acids).

For certain profiles, it might be necessary to place the fasteners closer than that mentioned in section 7.

15. Tolerances

The length variations for HalleLux sheets are -5/+25 mm. The profile geometry according to the profile sketches is approximate due to some variations when the plastic is matured. Note that small groves, especially with 900 g/m² materials, cannot be made as distinctive as for metal sheeting. In some cases, it is recommended to use a profiled translucent in the same profile, but without groves.

16. Consistency

Chemical consistency:

Polyesters have significant consistency against acids and sour environments. Polyester has a large consistency even for base environments. Isopolyester has a slightly better consistency than ortopolyester.

Different kinds of vinyl ester, e.g. Derakane®, have the largest consistency.

To exactly explain the consistency in a special environment, it takes information about the substances, concentrations of substances, gas or fluid phase and temperature for existing substances. Ask Halle in special cases.

HalleLux translucents are not affected by microorganisms, they do not rot or corrode. GRP is especially suited to acid environments. For immediate attention, do not hesitate to contact Halle.

HALLE

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