



THERMAL EXPANSION

Materials will expand and contract according to variations in temperature.

All the materials used in construction and sign making will expand when exposed to high temperatures and shrink when the temperature falls. Each material has its own thermal expansion rate. In the metric system it is measured in mm/m/100DC and shows how many millimetres one metre of material will expand when the temperature changes by 100 degrees Celsius.

For example, for steel and concrete this rate is around 1.2 mm and for PVC it is 5.2 mm. When different materials are fixed together it is always necessary to take into account their expansion rates and exposure of those materials to different temperatures.

TLG MATERIALS ACM consists of 2 Aluminum layers bonded to a polyethylene core. Thermal expansion of ACM is determined by the properties of its Aluminium skins. Thermal deflection of Aluminium is 2.4 mm/m/100o C. So a 96" long panel with a 100 C temperature fluctuation will expand 5.86 mm and its length will become 2445.86 mm under new temperature conditions. At the same time, if 2 edges of the panel are fixed, the tension in Aluminum skins will lead to panel bowing. Bowing deflection in this case will be 73.2 mm. It is very important to make sure that when installation is carried out in the conditions where essential temperature fluctuations are expected, fixings shall be designed to allow free thermal expansion of the panels.

Sometimes it may happen that a substrate on which ACM is designed to be installed is rigidly fixed without taking thermal expansion into consideration. In this case this substrate can bow and deform causing subsequent bowing of the ACM which is fixed to this substrate. To prevent this, substrates on which ACM is going to be installed should be carefully examined.

When installed outdoors under direct sunlight, ACM surface temperature can achieve up to 75°C for dark colors. Minimum winter value in Northern countries should be taken as -35°C. Before any installation it is very important to calculate possible thermal movements and choose the right solution to compensate taking into account materials of the subframe, temperature during installation, minimum and maximum temperatures in the installation area. Compensation of thermal expansion means that ACM fixing should be done to allow some freedom in fixing points so that the panel can independently slide along the subframe when shrinking or expansion of the panel differs from that of the subframe. It allows for the prevention of tension which can lead to panel bending or damage to the fixings. Channel systems and clipping systems allow free movement of the panel alongside the profile. A fixing gap should always be left between the panel edge and channel end to allow the panel to expand perpendicularly to the profile.



Problems with thermal movements often happen when a panel is fixed to the subframe with rivets or screws; to prevent this, special tools should be used during such installation. When ACM is fixed by rivets, an adjusted step drill and riveting gun with special nozzle should be used. A step drill cuts a 5,2 mm diameter hole in the subframe profile while an 8,5 mm or bigger hole is cut in the panel. A special nozzle for riveting guns is used to prevent jamming of the rivet head into the panel surface. It fixes the rivet so that a small gap is left between the panel surface and the rivet head to allow free panel movement. Rivets with bigger heads should also be used - normally, rivets with 14 or 16 mm heads are used. When screws are used to fix ACM it is possible to use a step drill with the first drill radius at least 1 mm smaller than the shaft of the screw. Another option is to cut holes for the screws in ACM prior to installation. The radius of such holes should be calculated depending on the project to allow free panel movement. Normally at least 8,5 mm holes should be made for 5 mm screws. Screws should be carefully centred in the holes during installation. Screws should not be fixed tightly and should not jam into the ACM. It is recommended to turn the screw 180° to make sure it is not tight. Screws with countersunk heads should not be used.

