Technical Bulletin

ATS-124
2013-01-14

SPANDREL PANEL GLAZING

Summary

Spandrel panels are the glazed opaque areas in a curtain wall where the glazing material is required to hide insulation, the edges of floor slabs, ceiling details, HVAC equipment, etc. On rare occasions the room side of the panel is visible from the building interior. Spandrel glazing is usually required to resemble the glazed vision area in appearance from the building's exterior. It is seldom possible to get a perfect match because of the different lighting conditions behind the spandrel and the vision glazing but with attention to detail, good uniformity can be achieved.

The use of a durable and stable opacifier on the #4 surface of Heat Treated, Insulating Glass (IG), is generally recommended to allow spandrel panels to most closely match the appearance of adjacent IG vision glazing, and to accommodate the factors described below.

Thermal stress

In order to withstand the thermal stresses created by solar radiation, glass in spandrel panels generally needs to be heat treated; either Heat Strengthened (HS) or Fully Tempered (FT). However it may be possible to use annealed glass if some of the following conditions are met

1. The space behind the spandrel panel is adequately ventilated
2. The spandrel glass is always in complete shade
3. The framing details, such as 4 sided structural silicone glazing, help prevent glass edge to center temperature differences in excess of 28°C (50°F) from occurring
4. The glass cut edge quality is very high. Consider specifying fully polished edges.

If annealed glass is to be considered it is important to perform a detailed thermal stress analysis.

Pilkington North America, Inc.

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 451

Heat treatment

In double glazed spandrels the type of heat treatment required can vary depending on whether the glass is used as an inner or outer lite. HS glass will generally supply adequate resistance to thermal stress in the outer lites of an IG spandrel, even though it is only half as strong as FT glass. HS is usually recommended over FT because of the reduced risk of spontaneous breakage which is occasionally seen in FT glass. HS glass may also show less reflective distortion, though it will probably not have any less quench pattern (visible in polarized light). Note that HS glass is not a "Safety Glass" and, if broken, its pattern resembles that of ordinary annealed glass.

Fully tempered glass may be required for the inner lite of an IG spandrel. This is because the added insulation behind a spandrel panel will mean thatthe inner lite is more severely stressed by solar radiation than the outer lite, plus it will be somewhat weakened by the addition of a ceramic frit opacifier. FT inner lites are generally recommended when a relatively high solar transmitting outer glass is used, with a low emissivity coating on surface #2 or #3. This combination can readily create inner glass temperatures well over 100 °C (212 °F) in still air conditions, even with outside air temperatures at freezing or lower.

Insulation

Spandrel glass panels usually have insulation behind the glass pane. It is recommended that this insulation material not be directly adhered to, or placed in direct contact with, the glass. A gap between the glass and insulation will help reduce moisture condensation issues on the glass even though it will not significantly change the glass temperature in a non-ventilated spandrel.

Opacifiers

Opacifiers are applied to prevent "read-through" of the building details behind the spandrel glass. Even low transmission glasses with less than 10% visible light transmission will sometimes allow contrasting color details behind a spandrel to be visible from the exterior, in some lighting conditions, if no opacifier is used. A number of types of opacifier can be used, some of which are decribed below.

Black plastic film opacifiers, vinyl or polyester (Mylar), can be applied with water based or solvent based adhesives. Some of these materials have shown visible bubbling over time due to the high temperatures experienced in spandrels. Polyester films with solvent based adhesives are reported to be more durable.

Oil based or latex paints may not prove durable enough for opacification when used on the #2 or #4 surface as the sun's Ultra-Violet (UV) radiation can eventually break down the molecules of paint bonding to the glass.

Water based spray silicone materials, in a wide variety of colors, have been successfully used as opacifiers. As with all construction products the material supplier should be asked to supply adequate proof of long term durability.

Opaque ceramic frits are effective at blocking "read-through" even though their coverage may not be 100% complete and some diffuse light will be transmitted. These inorganic materials are usually very durable and typically do not suffer UV damage. Frits are conveniently applied when the glass is being heat treated.

If the spandrel glass can be seen from inside the building it is very important that the opacification material provides adequate uniformity when the glass is in direct sunlight.

Pilkington **Eclipse Advantage™** reflective low-e glass can have fluorine free frits applied to the glass side surface, or the reflective coated surface, as an opacifier. The Pilkington **Eclipse Advantage™** coating is compatible with most frits. The glass temperature should not be allowed to exceed 640 ºC (1184 ºF) when frits are applied to either surface.

Pilkington **Eclipse Advantage™** glass should be carefully examined for uniformity in diffuse reflected light, before installation, to ensure the application has been successful.

The opacifier color should be carefully selected to give optimum blending appearance with the vision glass. Generally a medium to dark grey color has been found to be the most effective.

Scrim backing

Scrim materials can be combined with opacifiers, or applied on top of them, to prevent fall-out of broken spandrel glass under light loads (4 psf as in ASTM C-1048). The need for scrim backing originated with the rare occurrences of spontaneous breakage in tempered glass. The use of HS spandrel glass lessens the need for scrim.

Shadow box spandrels

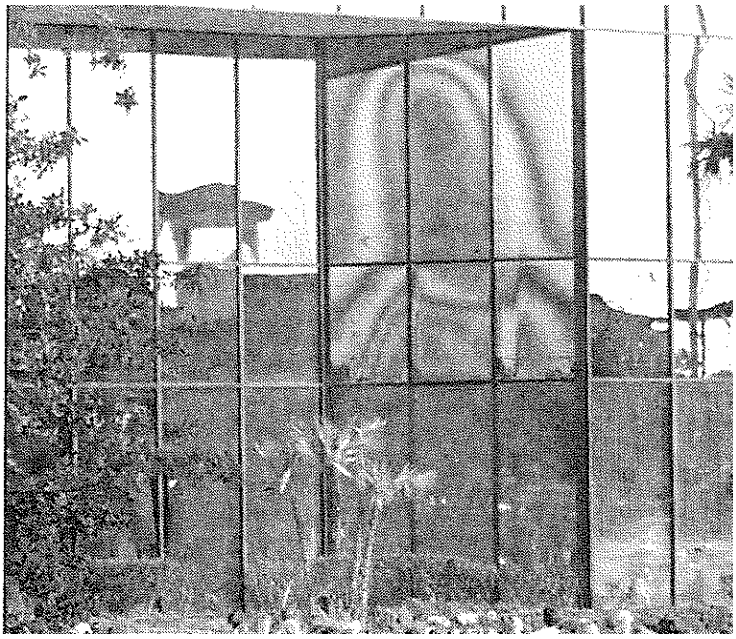
If the glass is not opacified then a "shadow box" construction can be considered. The space behind the glass must be uniformly dark, made of materials which will be stable under UV light and high temperatures - over 100 °C (212 °F), with a moisture barrier or sealed metal spandrel pan. The space between the glass and the insulation must be adequately vented to the exterior to prevent condensation of moisture on the cool glass surface (#2) at night or when not exposed to sunlight. If the materials are not stable, volatiles can easily out-gas. These will condense on the cooler glass and make stains which could be visible from the exterior, because an effective opacifier has not been used. These construction requirements are difficult to satisfy in practice.

Condensation of volatiles is suspected to be the cause of the visible deposits on the #2 surface of single glazed spandrel shadow boxes in the central area of the photo below of a Clearwater, FL building.

Pilkington North America, Inc.

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 4517



Deposits on glazing probably due to condensation of volatile materials

Insulating glass shadow boxes

The optimum general solution is to glaze the spandrel area with Heat Treated Insulating Glass, which acts as a stable shadow box, using a medium or dark grey color opacifier on the #4 surface. The IG seal system needs to be of high quality to withstand the very high temperatures encountered. A silicone and butyl dual seal construction, certified to IGCC level A, is the minimum level of performance needed. This design is easy to fabricate, reliable, and can give a very good appearance match with the vision glass.

Pilkington North America, Inc.

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 4517