Environmentally Friendly Building Façade Systems.

The growing concerns regarding the sustainability of our environment has created an ever increasing awareness of the need to reduce energy consumption in buildings. One effective method that can be used to achieve this is the use of Brise Soleil Systems incorporated into the building façade construction. However whilst the energy efficiency of such systems is becoming better understood it is also very important to understand the various engineering issues that can arise when designing these systems as part of the overall building curtain wall.

An effective solar shading system should prevent excessive solar gain which in turn can significantly reduce the demands on cooling and air conditioning systems in buildings. This obviously has major benefits to the building owners and managers by reducing building running costs and extending the service life of cooling plant and machinery.

Natural daylight should be utilised to the maximum effect, brise soleil louvres are used for this purpose by blocking direct summer sun but allowing diffused light between the louvre fins. These fins may be arranged to specifically redirect light to the ceiling of the internal space behind the façade. This effectively acts as a light shelf increasing daylight levels further into the depth of the building while still reducing glare and discomfort for occupants.

Horizontally Projecting Unbraced Installations

A common form of brise soleil installation, in which a brise soleil panel of typical projection in the range from 800mm to 1200mm is supported by brackets at 1500mm to 3000mm centres. Although it is seen as perhaps the simplest of installations to a curtain wall façade with the minimum amount of bracketry, this form of installation creates the most significant loading to the curtain wall mullion in the form of a simple moment as a result of wind loading and other loads.

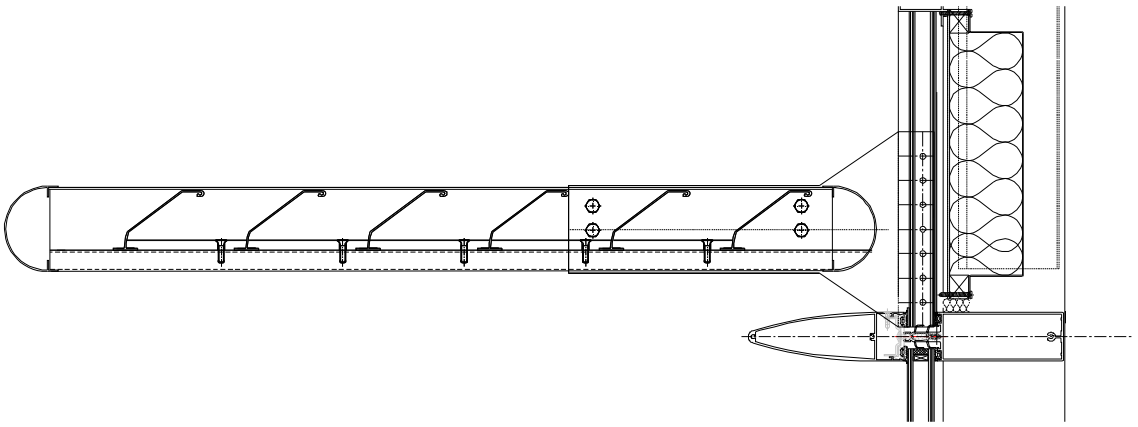

Figure 1 Typical Horizontal Brise Soleil Installation

In order to reduce the bracket loading for this type of installation either the projection may be reduced, also reducing the shading effect or the bracket centres may be reduced requiring a corresponding reduction in the curtain wall mullion centres.

Horizontally Projecting Braced Installations

Where loadings exceed those viable with a simple cantilever style bracket, as figure 1, a brace may be utilised to significantly reduce the effective loadings. If a similar bracket design is used for the cantilever installation as figure 1 and then also used for the braced version as figure 2, the reactions developed at the pins will be reduced by an approximate factor of 20 for a 45° brace bar. The brace may be used above or below, however, the brace must be capable of resisting both tensile and compression loadings as wind loads may act in a both an upward or downward direction.

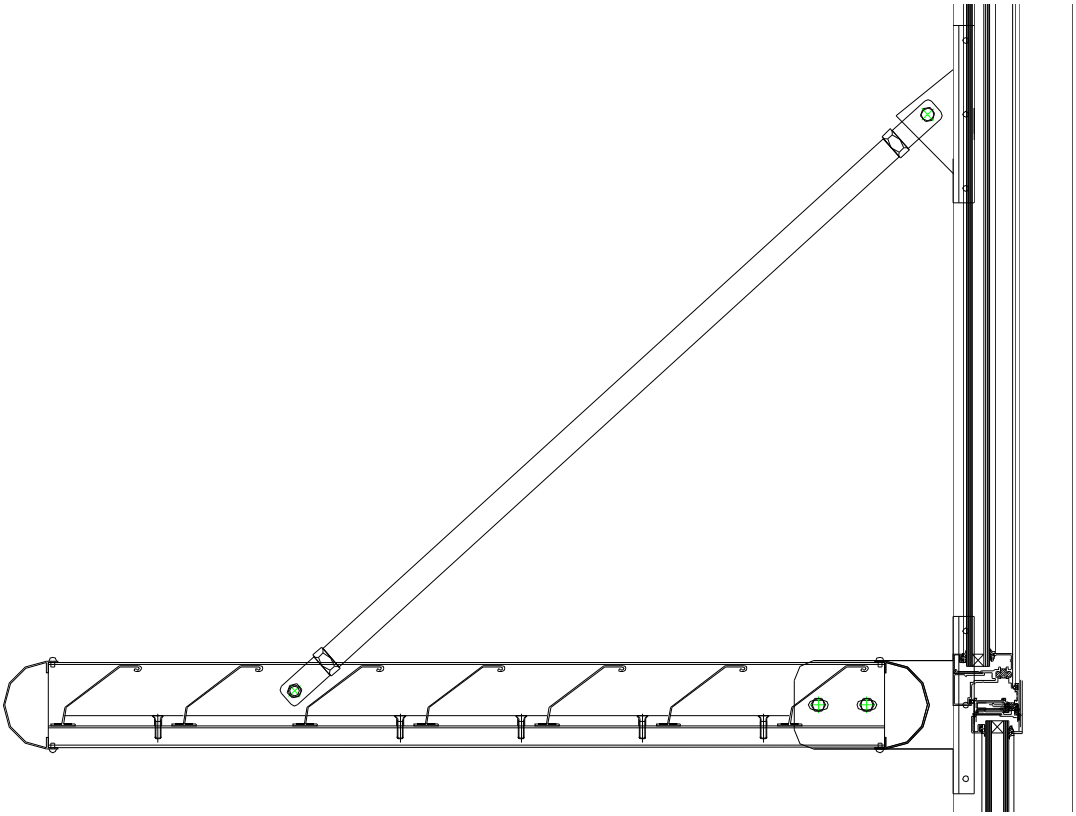

Figure 2 Typical Horizontal Braced Brise Soleil Installation

Although the additional bracket to locate the end of the support strut to the system mullion acts to reduce individual bracket loads, these additional brackets cause an increase in penetrations to the façade that will effectively double the available path for heat flow across the façade. This form of installation is typically used within the projection range of 1200mm to 1500mm, beyond this projection either an external support frame is utilised or a cable support system.

Horizontally Projecting Cable Braced Installations

For large projecting installations and walkway systems a cable support system is utilised to support the outer edge of the brise soleil panel. Stainless steel cables are typically used and must be tied into the structure at both the upper and lower levels. This is essential so that the cable is only operating under tension, the cable will not be able to resist any significant load in compression and wind loads may act both upwards and downwards.

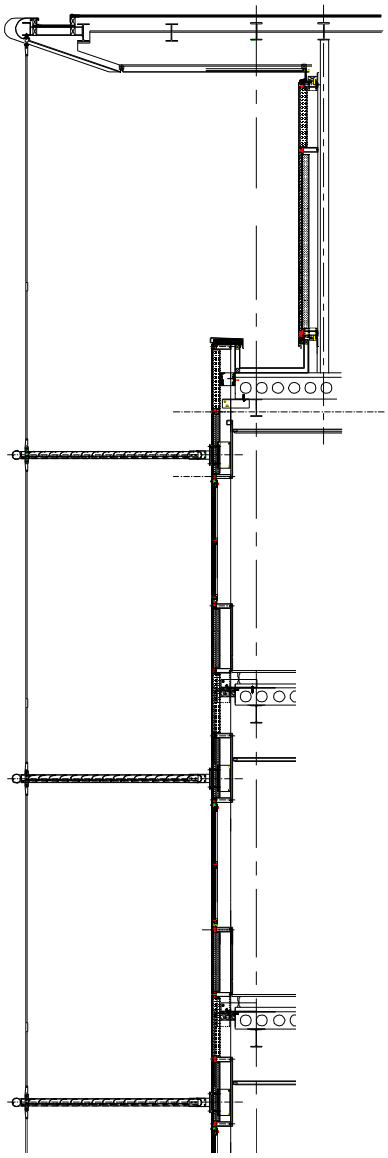

Figure 3 Horizontal Projecting Cable Braced Brise Soleil Installation

Vertical Screen Installations

These are probably the most effective systems for buildings in the Gulf environment where sun angles remain relatively high for most of the year.
Vertical brise soleil screens are often formed using elliptical extruded aluminium sections and are well suited to covering large expanses of façade. Typically a series of horizontal fins are carried by two outer vertical sections, these vertical sections are then in turn connected to projecting brise soleil brackets, normally with a minimum of each vertical connected at both the top and bottom such that a brise soleil panel assembly would be supported at all four corners.

As the vertical panel must be held off the façade at least by the depth of the louvre fins a moment is developed in the bracket connection to the curtain wall mullion. This moment is dependant on the width of the panel being supported and the number of brackets used along the vertical support. Loadings are again developed by wind load, however, due to the larger and heavier nature of the extrusion's dead load may be a more significant factor to be considered.

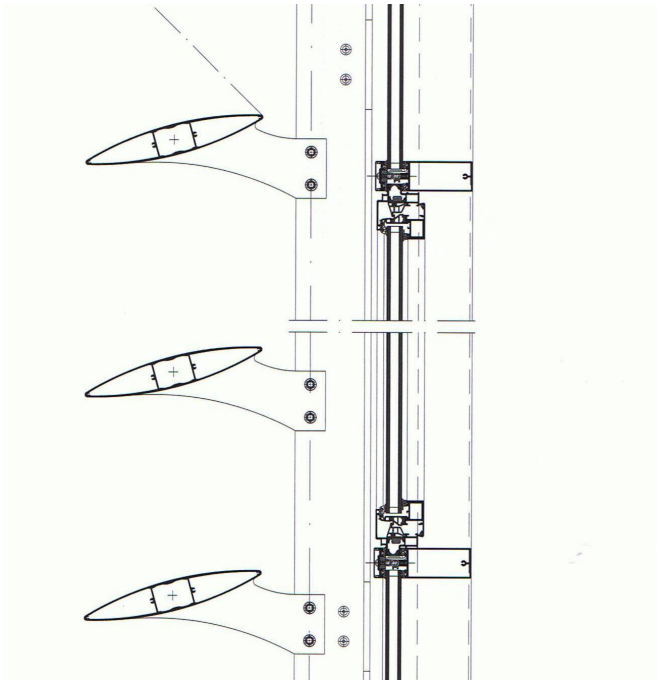

Figure 4 Typical Vertical Brise Soleil Installation

Individual bracket loadings may simply be reduced by using more support brackets.

The wind load is normally the largest force acting on a brise soleil louvre if there are no access loadings, self weight and wind load are then the primary load factors.

Brise soleil louvre systems are designed as standard without any provision or structural capacity for access along the upper surface. The brise soleil system itself, particularly in multi level horizontal installations restricts access to the façade by traditional access equipment such as cradles and abseiling. Where external access is required for routine cleaning and maintenance operations specific walk on brise soleil systems may be provided, typically with a serrated ‘tread’ section extruded into the upper surface such as fig 5.

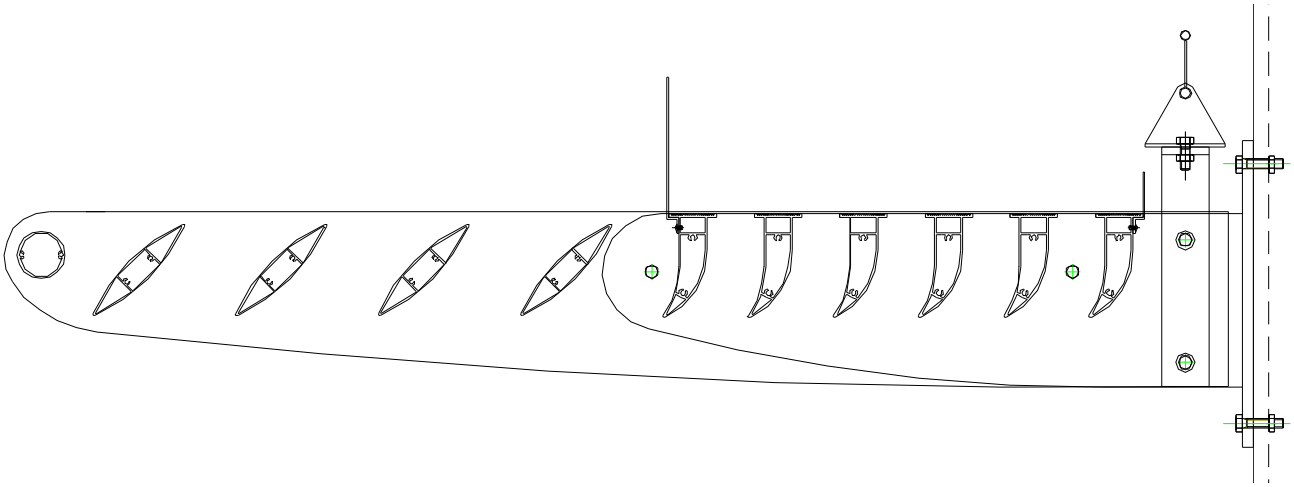

Figure 5 Typical Brise Soleil Incorporating a walkway section

Loadings typically are for maintenance personnel and the weight of any materials and tools required for example in the replacement of glazing units. Loadings for such maintenance work should be reviewed on a project specific basis dependent upon the function and duty of the walkway section in question. Normally high wind load would not be considered in conjunction with the access load, as in these extreme weather conditions it would not be considered safe to use the platform.

In addition to the walkway system if a safety barrier is not provided then the walkway system should be used in conjunction with a fall arrest system, if the fall arrest system is fitted to the brise soleil brackets then a considerable additional loading can be applied of up to 10kN per attachment point. This load is dependent on whether the system is a full fall arrest system or, if the suspension point may be mounted high enough, is a fall restraint system for which the loading will be considerably less.

Brise soleil systems can be designed to augment both a project's aesthetic appeal and assist in reducing the thermal cooling load. However, care must be taken that adequate consideration is given to both the purpose and potential benefits that brise soleil systems may bring to a project and that sound engineering underpins their design.

Brital do not believe that Brise Soleil systems can be a standard part of an aluminium systems product range as the performance, engineering and aesthetic requirements vary on each project, although several of the components can be commonly utilised in various different projects Therefore it is Brital's policy to review each project requirement individually and propose a system that meets the performance criteria of the building specifications specific to each project. Brital designers and engineers are able to utilise their knowledge and experience of Brise Soleil systems to ensure building owners continue to enjoy the benefits of such systems throughout the building life cycle.