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## Rain Screen Clip Design - Technical Bulletin

### *“Buildings a Better Mouse Trap”*

When evaluating rain screen systems and clip options there are a variety of factors which impact clip design and selection. Through firsthand design development of original rainscreen systems and clips in addition to subsequent industry knock offs, we now have a complete understanding of the positive attributes and shortcomings of said systems.

As with all manufactured construction materials, new technologies provide the opportunity to improve on the original art of design.

In Rain Screen applications it is extremely important to recognize that one is dealing with a system of individual components. These components, both on their own and collectively impact the overall performance of the Rain Screen system. Which leads us to a very important question:

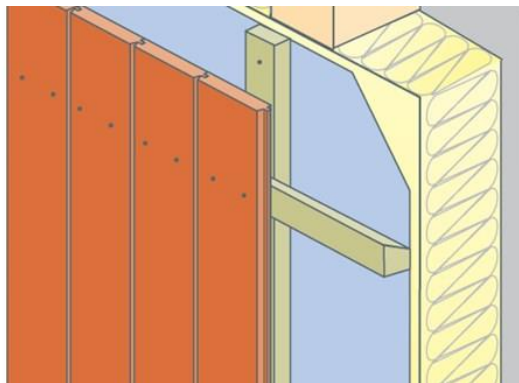
Are these components, and the assembly of them for a complete Rain Screen system, evaluated and certified to withstand the environmental conditions to which they will be exposed?

As an example, Florida represents a combination of some of the harshest environmental conditions. Such as high winds, large amounts of UV exposure and salt spray.

Here is a comprehensive overview of systems are currently in use and finally the one solution to all.

#### **BOARD AND BATTEN / WOOD BATTEN ATTACHMENT**

Traditional Board and Batten Rain Screen systems require the application of battens to the structure. This is followed by attaching the cladding to the battens either by nailing or screwing fasteners through the face of the cladding. The problem with system is with regards to the fastening. What type of fastener is being used? Stainless steel fasteners are the most durable option. More specifically, T316 stainless steel works best in harsh environments such as salt spray and is the only type which will prevent a potential reaction between the tannic acid in the wood and the fastener which can cause black staining to appear at the fastening points. Fastener penetration through the cladding creates points of moisture intrusion, which negatively impacts the long-term performance of both the fastener and the cladding. Additionally, direct attachment of cladding to battens without air space (typically 1/4" is required) creates a moisture trap that reduces long term performance of all components.





### **IMPROVING THE ART**

In an effort to eliminate the issues that arise with traditional Board and Batten applications and to provide a more aesthetically pleasing finish, clip systems were the natural progression. Aluminum clips were developed because aluminum was strong and resistant to deterioration from the elements. Since first generation systems were almost always applied to wood battens, galvanic reaction between clips and natural wood substrates like cedar were not of concern. However, once tropical hardwoods started making it onto the cladding scene because of their higher natural resistance to the elements the market began using pressure treated wood for battens to extend their service life. Treated wood improved service life of battens but it brought with it the corrosive effects of treatment chemicals which contain metals like copper to both aluminum clips and the fasteners. 316 Stainless steel solved the fastener issue but proved too costly for the manufacturing of clips.

This issue was virtually ignored in residential construction applications, but the increased use of rain screen systems on commercial buildings using continuous insulation designs introduced galvanized steel girt and batten systems into the substrate mix. Aluminum presents the same galvanic reaction issue when attaching to galvanized steel as when attaching to treated wood. Aluminum and galvanized steel have a higher galvanic reaction rate than like materials which is further impacted by salt spray.

Applying a barrier in the form of bituminous tape or plastic shims in between the batten and clip or anodizing the clips to prevent galvanic reaction has become the solution to this problem but like stainless steel adds both material and labor costs to the use of clips systems.

### **DOUBLE GROOVED SHIP LAP / WOOD BATTEN ATTACHMENT**

Some clip systems treat rain screen like installing decking with the double groove approach. You see this in both wood and composite systems currently on the market. The use of decking style fasteners which hold the cladding in both a top and bottom groove still requires the use of a batten. The advantage came with no longer having to penetrate the cladding with the fastener. The problem here is the top groove becomes a gutter which over time will collect dirt and debris which in turn will collect moisture, which in turn will serve as a food source for mold, which over time will significantly reduce the service like of the cladding and weaken the system at the attachment points. This system also does not provide a 10mm offset to prevent water bridging between cladding and batten and the cladding design does not provide back ventilation between cladding boards so it should really be classified as a cladding clip and not a rain screen clip.



### **SINGLE GROOVE SHIP LAP / WOOD BATTEN ATTACHMENT**

Some systems use a clip that does not require the use of a top groove but again still require the use of a batten. This system is an improvement in theory, but due to the clip size, two clips are required at butt joints, and the clip does not provide a 10mm (3/8") standoff from the batten. This inherently opens up the potential for water bridging between the cladding and the batten, which now affects the long-term service life of the other components. What of the galvanic reaction between clip and fastener? Paint or coatings which are less expensive than anodization can be applied to the clip and fastener to mitigate this, but inevitably the coatings will break down over time due to friction that occurs with wind pressure.



### **SINGLE GROOVE SHIP LAP / DIRECT SHEATHING ATTACHMENT**

The development of a wider aluminum clip that does not require a groove at the top of the cladding was a great improvement. This generation of clip also met the required 10mm (3/8") stand off to prevent water bridging. In fact this clip design uses a 3/4" air gap, mainly because battens are historically 3/4" thick and not for any particular technical reason. This generation of clip also brought about the ability to eliminate the use of battens and the direct attachment to wood substrates with it's double fastener design and the use of specialized screws. The elimination of the need for battens provides both vertical and horizontal air flow which improves wind pressure equalization. The problem comes when installers are left to their own devices and substitute screws to lower cost. This clip design also did not predict the increased application of clips to galvanized girts and battens as discussed earlier. The two hole design is wood sheathing specific limiting the clips applications. The starter rail concept fails in that drainage is dependant on weep holes which will clog over time and create a gutter effect holding water promoting rot.





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### **SINGE GROOVE SHIP LAP / DIRECT SHEATHING, BATTEN OR GIRT ATTACHMENT / HIGH AND LOW PROFILE CLIPS**

The next generation clip brought two clip options, high-profile  $\frac{3}{4}$ " air gap, and a low profile  $\frac{1}{4}$ " air gap to address demand for a lower profile clip. This was before international building codes began calling out 10mm as the minimum air space to prevent water bridging. The low-profile clip did bring the benefit of a solid design eliminating any potential hollow space that might collect water or ice. This manufacturer introduced specific screw designs for any potential application... cladding to wood batten, cladding to galvanized batten or Z girt, cladding direct to wood sheathing. Screw material specifications address the potential of galvanic reaction however, screw diameters address structural requirements, screw pullout under pressure and long-term serviceability equal to both the clips and the cladding. Both clips provide a wide platform allowing the cladding to share a clip at the butt joints and the three-hole configuration solves both direct to cladding or direct to batten attachment options. These clips eliminate the need for cladding penetration and the guttering effect of top grooved cladding. Its individual components are engineered to function as an integrated engineered and certified system, not only providing superior performance, but eliminating potential liabilities by eliminating the integration of any non-specified components into the system.

What most of the systems also never took into account were the tabbed designs, which when over torquing the screws during installation cause the clip to pitch making it more difficult to slide the next row of cladding in as illustrated below. Sharp edges risk cutting into and penetrating applied moisture barrier materials.

Unfortunately like all aluminum clips, whether attached to treated wood or galvanized steel, some type of barrier has to be applied between the clip and any metal or treated wood substrate.

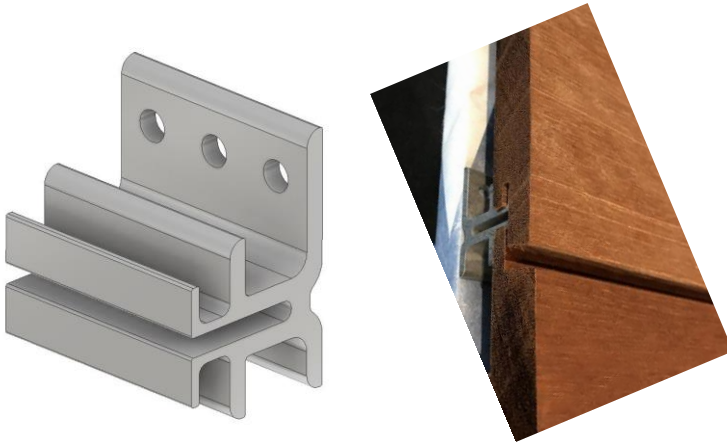




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**SINGE GROOVE SHIP LAP / DIRECT SHEATHING, BATTEN OR GIRT ATTACHMENT/SPRING LOADED HIGH PROFILE CLIP**

The introduction of the spring-loaded clip theoretically allows for expansion and contraction of wood cladding. It mimics the wider three hole design and 3/4" off-set of previous aluminum designs which all ignore the galvanic reaction issues. In Addition this clip provides no engineering to support its use and dependant on arrow straight cladding materials as the gap can be collapsed when applying downward pressure during cladding installation which makes the system very unforgiving as the majority of cladding materials are natural wood species which will likely present with some minimum amount of bow that must be removed during installation. Furthermore the collective weight of the cladding application on a tall wall may create the potential for the clips to collapse creating irregular reveals. Of greater concern is the space created by the spring loaded design which creates a water bridge between the top and bottom wings of the clip. This is of great concern in climates where water freezing is an issue, as frozen water will have the potential to expand this gap creating irregular reveals or worse, fracturing the wings of this clip. The manufacturer now shows a nylon version which addresses issues related to galvanic reaction but does not address the other issues. An interesting marketing concept but technically adds some new concerns while not eliminating the old ones. Sharp edges and corners still present risk of cutting moisture barriers.



Fortunately for architects a new generation state of the art clip has been designed which resolves all of the issues facing the previous generation of clips.

**Developed By Tropical Forest Products – The Black Label™ Clad Clip™**



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## SINGE GROOVE SHIP LAP / DIRECT SHEATHING, BATTEN OR GIRT ATTACHMENT / GLASS FILLED NYLON

- **Clip Design** – Eliminates Water Penetration Risk Associated with Fastener Penetration of Cladding Materials
- **Clip Design** – Provides 1/16 Air Space Between Cladding Boards for Back Ventilation
- **Clip Design** – Provides Both Horizontal and Vertical Air Flow Improving Ventilation and Pressure Equalization
- **Clip Design** – No Sharp edges to cut moisture barrier materials.
- **VO Rated Glass Filled Nylon Polymer** – Fire Resistant and Heat Dissipating
- **Glass Filled Nylon Polymer** – The Strength of Aluminum
- **Glass Filled Nylon Polymer** – Eliminates Galvanic Reaction Between Clip and Steel or Treated Wood Substrate
- **Glass Filled Nylon Polymer** – Eliminates Material and Labor Cost Associated with the Application of Barrier Materials Between Clip and Substrate.
- **10mm (3/8") Offset** - International Building Code Compliant
- **10mm (3/8") Offset** – Eliminates Potential for Water Bridging
- **Solid Cavity Free Design** – Eliminates Risk of Water and Ice Buildup Inside the Clip
- **Black Color** – Virtually Eliminates Visibility of Clips from View
- **Single Material Design** – Eliminates the Risk of Coating Failure and Shiny Aluminum Read. One Clip/No Cladding Penetration
- **Three Hole Design** - 100% Reversible, Mount on any Substrate Material... Wood Sheathing, Treated Wood, Galvanized Steel, Aluminum or Concrete
- **Tab Free Design** - Eliminates the Risk of Deformation from Over Torque
- **Specialized Fasteners** - T316 Stainless Steel Course Thread for Application to Wood or Aluminum Substrate, Zinc Coated for Attachment to Galvanized Steel, Tapcon for Attachment to Concrete
- **Engineered** - Comprehensive Component and System Engineering for Wind Loads

This new generation state of the art clip represents a significant improvement to the art of rain screen clip design which extends service life, and engineered performance in one simple solution. However these clips were not designed exclusively for exterior use. Matched with any exterior or interior wood species milled to standard and custom cladding profiles and the design options are only limited by a designer's imagination.



**Black Label™ Clad Clip™.**