TECHNICAL BULLETIN

Rain Screen Clip Design Evolution

When evaluating rain screen systems and clip options, there are a variety of factors that impact clip design and selection. Through firsthand design development of original rain screen systems and clips, in addition to evaluating subsequent industry knockoffs, we now understand 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 vital 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. This leads us to a very important question:

Are these components and their assembly to make a complete rain screen system evaluated and certified to withstand the environmental conditions they will be exposed to?

For 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 currently in use and, finally, the one solution to all.

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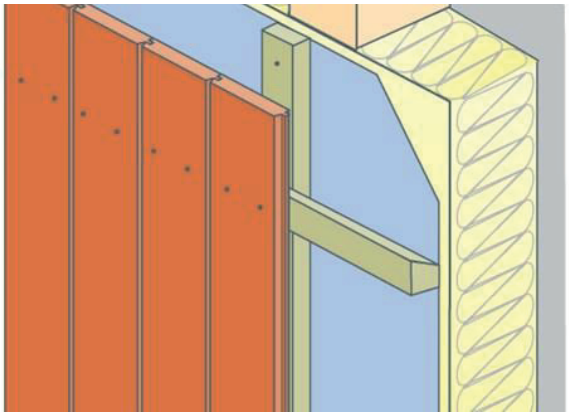
BOARD AND BATTEN / WOOD BATTEN ATTACHMENT

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 systems is with regard to 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 where salt spray occurs and is the only type that 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, the direct attachment of cladding to battens without sufficient air space (typically ¼" is required) creates a moisture trap that reduces the long-term performance of all components.



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IMPROVING THE ART

Clip systems were the natural progression to eliminate issues with traditional board and batten applications and provide a more aesthetically pleasing finish. 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, a galvanic reaction between clips and natural wood substrates like cedar was not of concern. However, once tropical hardwoods started making their way 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 the service life of battens; however, 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 to manufacture 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 are 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 solved this problem. However, like stainless steel, it adds material and labor costs to using clip systems.

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DOUBLE GROOVED SHIPLAP / WOOD BATTEN ATTACHMENT

Some clip systems treat installing rain screens like installing decking with the double groove approach. You see this in the 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 that 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 life 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 the cladding and batten. The cladding design does not provide back ventilation between cladding boards, so it should be classified as a cladding clip, not a rain screen clip.

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SINGLE GROOVE SHIPLAP / DIRECT SHEATHING ATTACHMENT

Some systems use a clip that does not require the use of a top groove but still requires 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 increases 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? To mitigate this, paint or coatings, which are less expensive than anodization, can be applied to the clip and fastener. Still, inevitably the coatings will break down over time due to friction that occurs with wind pressure.

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SINGLE GROOVE SHIP LAP / DIRECT SHEATHING ATTACHMENT

Developing a wider aluminum clip that does not require a groove at the top of the cladding was a significant improvement. This generation of clips also met the required 10mm (3/8") standoff to prevent water bridging. In fact, this clip design uses a ¾" air gap, mainly because battens are historically ¾" thick and not for any particular technical reason. This generation of clips also brought about the ability to eliminate the use of battens and the direct attachment to wood substrates with their double fastener design and specialized screws. Eliminating the need for battens provides vertical and horizontal air flow, improving wind pressure equalization. The problem comes when installers are left to their own devices and substitute screws to lower costs.

As discussed earlier, this clip design also did not predict the increased application of clips to galvanized girts and battens. The two-hole design is wood sheathing specific, limiting the clip's applications. The starter rail concept fails because drainage depends on weep holes, which clog over time and create a gutter effect, holding water and promoting rot.

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SINGLE GROOVE SHIPLAP / DIRECT SHEATHING, BATTEN OR GIRT ATTACHMENT / HIGH- AND LOW-PROFILE CLIPS

The next generation clip brought two clip options, a high-profile ¾" air gap and a low-profile ¼" air gap, to address the 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 benefited from 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, and cladding direct to wood sheeting. 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 to provide superior performance but to eliminate potential liabilities by eliminating the integration of any non-specified components into the system.

Most of the systems also never considered 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 must be applied between the clip and any metal or treated wood substrate.

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SINGLE GROOVE SHIPLAP / 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 ¾" offset of previous aluminum designs, which all ignore the galvanic reaction issues. In addition, this clip provides no engineering to support its use and is dependent 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 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. The space created by the spring-loaded design is of greater concern, 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 offers a plastic version that addresses issues related to galvanic reaction and may lower the clip cost but does not address the other issues. This is an exciting marketing concept but technically adds some new concerns while not eliminating the old ones. Sharp edges and corners still present a risk of cutting moisture barriers.

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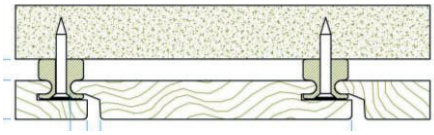
Fortunately for architects, a new generation of state-of-the-art clips has been designed, which resolves all the issues facing the previous generation of clips.

TFP PROCLAD Clad Clip™



This new generation state-of-the-art clip represents a significant improvement to the art of rain screen, cladding, and soffit clip design, which extends service life and better-engineered performance in a straightforward solution. Clad Clips were not designed exclusively for exterior use. When combined with any external or interior wood species milled to standard or custom cladding profiles, the design possibilities are only limited by the designer's imagination. When backed with Rock Wool®, the system absorbs noise in interior and exterior applications.

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SINGLE GROOVE SHIPLAP / DIRECT SHEATHING, BATTEN OR GIRT ATTACHMENT / GLASS-FILLED NYLON

- **TFP PROCLAD Clad Clip Design** – Eliminates Water Penetration Risk Associated with Fastener Penetration of Cladding Materials
- **TFP PROCLAD Clad Clip Design** – Provides 1/16 Air Space Between Cladding Boards for Back Ventilation
- **TFP PROCLAD Clad Clip Design** – Provides Both Horizontal and Vertical Air Flow, Improving Ventilation and Pressure Equalization
- **TFP PROCLAD Clad 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

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- **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 410 Stainless Steel for Attachment to Galvanized Steel, Tapcon® for Attachment to Concrete

- **Engineered** - Comprehensive Component and System Engineering for Wind Loads

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