BILDA System – Components and Installation

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Version 2

Foreword

The rainscreen principle is generally defined as the separation of cladding from the building structural wall through an air cavity in an effort to manage moisture and energy transfer in the wall assembly.

There are the following four components of the rainscreen wall assembly:

- **external cladding**, which can be from e.g. wood based panels, plastic, fibre cement, fibre reinforced cement, concrete, metal, laminate panels, stone, ceramic or terra cotta tiles
- **air space** between the cladding elements and the insulation layer
- **subframe/substructure** for attaching the cladding to the main bearing structure
- **insulation** layer.

When fixed in accordance with the following instructions, the **claddings** will withstand wind loads and their self-weight and transfer these loads to the supporting structure but they are not designed to contribute any structural stability to the building. They will increase the durability of the works by providing enhanced protection from the effect of weathering.

Thanks to their separate substructure, rainscreen cladding systems can also be installed on uneven walls or loose layers of render such as are encountered when renovating older buildings, for example. They are also the preferred choice for prestigious buildings, on account of the broad design scope they offer with materials such as natural stone, ceramics, etc.

Rainscreen cladding systems are largely decoupled from the main loadbearing structures by the **substructure**, which is the static connecting link between them. Its function is to transfer loads acting on the cladding (self-weight, wind and seismic loads) the to the main loadbearing structure.

The **substructure** consists of the following components:

- struts
- brackets
- traverses

- yokes
- clips
- fasteners – bolts, self-drilling and self-tapping screws
- ancillary items

The **ventilation airspace** between the insulation layer and the external envelope counteracts overheating in the summer and helps to discharge moisture when physically critical substrates are involved. Rainscreen cladding systems also permit the use of darker colours with lower lightness values.

STOA Ltd. has developed the **BILDA** technology, which provides a complete solution for the construction of varied building applications. **BILDA** is a modular framing system for supporting and fixing the elements of energy-efficient building enclosures with an integrated ventilated cavity. The system is based on standardized components (brackets, traverses, struts, yokes, clips, and interface connectors).

1 Introduction

1.1 Scope and Purpose

The patented **BILDA** technology allows for the complete erection of a vertical platform (loadbearing substructure) that supports the thermal insulation and cladding panels which form the exterior building cladding layer.

The technology has a number of advantages, which make it a universal system not only for the construction of ventilated facades but also for other structures such as photovoltaic panels and temporary structures of various uses.

BILDA technology adopts the integrated systems approach for erecting the exterior building enclosure, which ensures that it is constructed as one system rather than a composition of separate stand-alone systems. Thus, **BILDA** provides a universal fixing solution with possible use of various types of panels and volume shaping of the façade.

BILDA technology is based on two innovations that guarantee the reliable fixing of the components of the subframe: the interlocking and dual clamping method of connecting the system components and the precision slot with its optimized shape and depth, which is easy to process, spares the structural integrity of the panel and ensures a reliable grip of the supporting system components.

The backbone of **BILDA** technology is the modular framing system for supporting and fixing the elements of ventilated exterior facades. The system is based on a kit of standardized components: brackets, struts, traverses, yokes and clips.

The enclosure system is fabricated and installed in functional layers with emphasis placed on the optimal design and proper installation of them.

This guide describes the process and explains in detail the installation of the vertical façade cladding using the universal and integrative **BILDA** technology. The declared performance of this construction product is achieved under the condition the product is correctly installed.

The substructure is a frame system composed by a full set of profiles, supporting and holding elements and interface connectors.

System components have been structurally designed and detailed for achieving an optimal load capacity and aesthetic look of the assembled substructure.

1.2 System Components Overview

1.2.1 Struts

The Struts are the universal linking component of the system, which facilitates design, logistics and installation. Modular sets of the struts can form various substructures - from flat grids to spatial constructions and entire independent structures.

The struts have a box cross-section Q-channelled at its edges, which allow for an easy alignment and quick dovetail coupling of the system components. A range of similar in section struts is used for the construction of mullions and transoms. They are fixed to the wall by means of brackets with or without traverses.

1.2.2 Brackets

The Brackets connect the struts to the main loadbearing structure (RC slabs, beams, columns, exterior walls, etc.) of the building. They transfer the loads applied on the cladding to the building main loadbearing structure. Type and size of the brackets to be used depend on the type of assembly (vertical or horizontal), thickness of the thermal insulation and the depth of the air gap between the insulation and the inner side of the cladding. There are the 4 types of brackets: Y bracket, U bracket, L bracket and horizontal bracket.

1.2.3 Clips (cladding interface components)

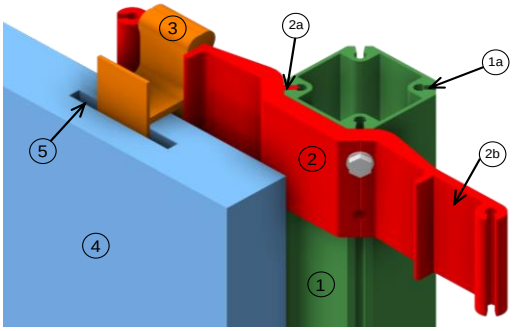
The Clips are connected to the struts either directly or through yokes. They provide vertical and horizontal support to the cladding panels. Type and size of the clips to be used depend on the way they are connected to the struts, their positions (bottom, middle or top), panel thickness and weight of and loads applied on the cladding.

1.2.4 Traverses and Yokes (massive layer interface components)

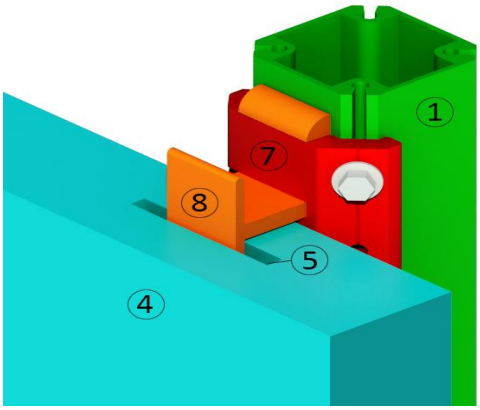
The Traverses are attached to the brackets and their function is to hold the struts In case of sliding type supports, the traverses allow struts vertical / horizontal movements at those places.

The Yokes are attached to the struts in a vertical assembly and their function is to carry the clips and transfer loads from them onto the struts.

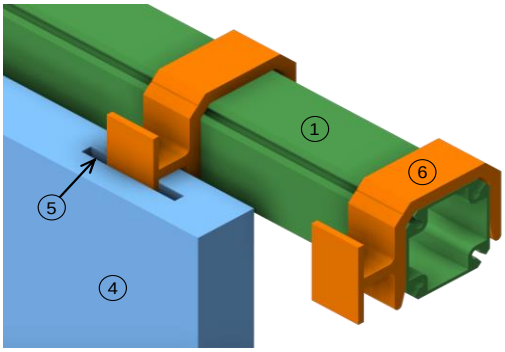
Components of BILDA system



Vertical Strut Assembly
(for landscape orientation of the panels – yoke and clips fixing)



Vertical Strut Assembly
(for landscape orientation of the panels – clip combo fixing)



Horizontal Strut Assembly
(for portrait orientation of the panels)

Legend:

1 Strut (vertical, horizontal)

2 Yoke

3 Yoke clip

4 Cladding panel (wedge-in-slot hooking)

5 Precision mortise slot to accommodate the clip blade/tenon

6 Strut clip

7 Clip combo

1a) Q-channel to accommodate the yoke

2a) Tongue fitting into the Q-channel of the strut

2b) Elongation to accommodate the yoke clip

Detailed information about system components can be found in BILDA catalogue.

BILDA cladding kit does not include the fasteners (screws/anchors, nails, rivets, bolts) used to secure the kit elements to the external wall or to the framework.

2 Installation process

2.1 Preparation Stage

To ensure that the installation process goes as smoothly and quickly as possible it is essential to have supporting documentation (shop drawings) as well as proper on-site work preparation.

The assembly of the system always starts with an analysis of the plans and the framework layout of the building and on-site checking of the substrate.

2.1.1 Shop drawings

Substructure shop drawings are produced on the basis of panel sizes, hole locations, hard reference points such as windows, doors, and corners. They are co-ordinated with relevant architectural and structural drawings, building installations drawings, etc. The shop drawings contain complete information of substructure geometry, locations and types of supports, components data (types, materials, sizes, locations, etc.)

2.1.2 Laying-out

The gridlines shown in the shop drawings shall be appropriately marked in the area where the cladding is to be installed (on the external walls in general and/or on other building parts). The positions of the gridlines shall be linked to those of the building main gridlines and levels.

2.1.3 Access facilities

The access facilities, e.g. scaffolding, mast climbing platforms, etc. serving the cladding area in a proper way (allowing access required for installation works) are to be provided and installed. The initial tying of the scaffolding, masts etc. to the building main bearing structure shell not conflict with the erection of BILDA substructure, e.g. to give the necessary space for attaching the brackets and further assembling the other system components. In the process of installing the cladding panels, the initial tying is to be replaced with BILDA scaffolding kit (set of a bracket, scaffolding bracket extension and scaffolding scissors) installed within panels horizontal joints. The scaffolding kit allows the tying of the access facilities be effectuated without necessity of "boxing" the cladding at places of the facilities anchors to the main bearing structure and "patching" those places after dismantling the facilities

2.1.4 Cladding panels

The cladding panels delivered to the site should have sizes and slots, holes, etc. according to the dimensions and positions shown in the shop drawings and within allowable tolerances. **Neither cutting slots nor drilling holes are allowed to be done on the site.**

2.1.5 Struts and accessories

The struts have to be cut to correct size in a workshop or on the site with appropriate aluminium profiles cutting machines and tools. Before installation the profiles and accessories need to be inventoried and inspected for damage. In case some struts shall be further trimmed during installation, this shall be only done using appropriate aluminium profiles cutting machines and tools.

2.1.6 Connecting devices

All connecting devices necessary for the system assembly should also be available - both the set used to fasten the substructure to the main loadbearing structure of the building and the set for fixings within the substructure.

Manufacturer's instructions for the correct fasteners shall be strictly considered as they may vary depending on the type of the main loadbearing structure elements to which the substructure is to be connected and loads. Anchors by established manufacturers such as Hilti, Wurth, Fischer, etc. are to be used. For

all connections in the Q-channels of the profile **self-tapping screws** ø 4.8 mm and 5.5 mm, material A2 are used.

2.1.7 Construction Sequence

After completing the main loadbearing structure (entirely or partially at places where the cladding is to be) it is recommended that the installation of BILDA system be done before mounting the curtain wall, windows, etc.

2.2 Vertical Strut Assembly

2.2.1 Brackets installation

The exact positions where the brackets will be fixed / anchored to the main loadbearing structure shall be determined on the basis of the shop drawings and the grid lines set out and their spots appropriately marked.

Then, the centers of the anchor bolts are marked, holes are drilled and cleaned as per requirements and the anchor bolts inserted. Thermal break pads (if such are required as per the shop drawings) are placed on the anchor bolts. Then, the brackets are mounted on the anchor bolts in their correct positions through appropriate horizontal adjustment allowed by existing slotted holes. Washers or serrated plates (if required) are slipped on the anchor bolts. Finally nuts are placed and tightened as per torque values given in the shop drawings.

2.2.2 Struts installation

The struts shall be fastened (directly or by traverses) to the brackets as per details shown in the shop drawings. In connections where the traverses are used, they are pre-assembled to the struts. In case of fix type supports, the traverses are permanently fixed to the struts by fasteners as per details given in the drawings. In case of sliding type supports, the traverses are temporarily stuck to the struts in order to facilitate the assemblage. The struts shall be fixed to the brackets in a way that they are lying in one plane parallel to and at a required distance from the cladding panels plane.

The struts lying on the same vertical line are interconnected by splicers each of them fixed only to the respective bottom strut in order to provide a sliding connection between the struts.

2.2.3 Insulation installation

The insulation is fixed independently using appropriate installation anchors.

2.2.4 Yokes, Clips and Panels installations

2.2.4.1 Yoke and Clips Fixing

The yokes positions on the struts shall be determined as per the shop drawings. Marks lying on a horizontal line at a level of, say, yokes upper edges shall be drawn on each of the struts.

Using the marks on the struts, the yokes are positioned on the latters by inserting their tongues into the Q channels and fixing their opposite edges to the struts by means of self-tapping screws. Yokes necessary for installing several layers of panels can be initially fixed on the struts.

The panel rows are installed from the bottom to the top. The first row shall be leveled what ensures the correct installation of the rows above.

Firstly, the clips bottom supporting the panels of the first row are hooked over the yokes already installed.

Secondly, the panels of the first row are mounted starting, say, from the left to the right in the following sequence. The first panel is laid onto the respective two clips bottom by slipping its bottom side slots on the clips blades and its top left corner is tied with a clip middle simultaneously penetrating the slot and hooking over the yoke already installed at that place. Then the panel top right corner is tied by inserting a clip middle blade into the panel slot and hooking this clip on the yoke installed at that place. The installation of the second panel and the subsequent ones repeats the same order of actions.

The panels of the second row are laid onto the respective clips middle already in place as a result of the installation of the first row panels and their tops furthermore fixed as those of the first row panels.

The installation of the last row panels is identical to that of the panels below only with a difference that the panels top edges are fixed to the struts by the clips top.

2.2.4.2 Clip Combo Fixing

The clips positions on the struts shall be determined as per the shop drawings. Marks lying on a horizontal line at a level of, say, clips upper edges shall be drawn on each of the struts.

Using the marks on the struts, the clips will be positioned on the latters by inserting their tongues into the Q channels and fixing their opposite edges to the struts by means of self-tapping screws.

The panel rows are installed from the bottom to the top. The first row shall be leveled what ensures the correct installation of the rows above.

Firstly, the clips bottom supporting the panels of the first row are fixed to the struts at respective marks by means of self-tapping screws

Secondly, the panels of the first row are mounted starting, say, from the left to the right in the following sequence. The first panel is laid onto the respective two clips bottom by slipping its bottom side slots on clips blades and its top left and right corners are tied with clips middle simultaneously penetrating the panel slots and fixed to the strut considering the marks on it with self-tapping screws.. The installation of the second panel and the subsequent ones repeats the same order of actions.

The panels of the second row are laid onto the respective clips middle already in place as a result of the first row panels installation and their tops furthermore fixed as those of the first row panels.

The installation of the last row panels is identical to that of the panels below with the following peculiarity: parts of the clips top are fixed to the struts considering the marks on them with self-tapping screws. Then, the panels top edges are fixed to the struts by inserting clips top blades into the panels slots and hooking those clips on the parts already fixed to the struts at that places.

2.3 Horizontal Strut Assembly

2.3.1 Brackets installation

The exact positions where the brackets will be fixed / anchored to the main loadbearing structure shall be determined on the basis of the shop drawings and the grid lines set out and their spots appropriately marked.

Then, the centers of the anchor bolts are marked, holes are drilled and cleaned as per requirements and the anchor bolts inserted. Thermal break pads (if such are required as per the shop drawings) are placed on the anchor bolts in order to minimize thermal bridging. Then, the brackets are mounted on the anchor bolts in their correct positions through appropriate vertical adjustment allowed by

existing slotted holes. Serrated plates are slipped on the anchor bolts. Finally nuts are placed and tightened as per torque values given in the shop drawings.

2.3.2 Struts installation

The struts shall be fastened (directly or by traverses) to the brackets as per details shown in the drawings. In connections where the traverses are used, they are pre-assembled to the struts. The struts shall be fixed to the brackets in a way that they are lying in one plane parallel to and at a required distance from the cladding panels plane.

The struts lying on the same horizontal line are interconnected by splicers each of them fixed only to the one of the struts in order to provide a sliding connection.

2.3.3 Insulation installation

The insulation is fixed independently using appropriate installation anchors.

2.3.4 Clips and panels installation

The panels rows are installed from the bottom to the top. The first row shall be leveled what ensures the correct installation of the rows above.

Firstly, the clips bottom are connected to the struts by means of self-tapping screws at positions given on the shop drawings.

Secondly, the panels of the first row are installed starting, say, from the left to the right in the following sequence. The first panel is laid onto the respective two clips bottom by slipping its bottom side slots on the clips blades and its top left corner is tied with a clip middle penetrating the slot, hooking over the strut above and fixed to it with self-tapping screw(s). The panel top right corner is tied to the strut by a clip middle being used for tying the top left corner of the second pane. The installation of the second panel and the subsequent ones repeats the same order of actions.

The panels of the second row are laid onto the respective clips middle already in place as a result of the first row panel installation and their tops furthermore fixed as those of the first row panels.

The installation of the last row panels is identical to that of the panels below only with the difference that the top edges of the panels are fixed to the struts by the clips top.

3 Appendices

[Appendices are optional, and are used to provide additional detailed information that may help the end user manage the overall application. Examples could include references to standards (such as W3C standards), technical specifications required for regulatory compliance, checklists, or other information of a technical nature.]

4 Index

[Depending on the size or complexity of the final document, consider pulling together an index to assist the using in location specific information. Index entries correspond to tags or categories, and are useful in navigating long books.]