

IMPROVING BUILDING VALUE THROUGH FACADE WEATHERPROOFING



1.0 – Intro

A - Improving Building Value

Creating a building is one of the most demanding challenges that we as an individual or the company for which we work can undertake, and the major goal of all the players is to create the most valuable building with the available resources, within budget, and on time.

At the same time, buildings are a major part of our lives. We spend most of our lives inside buildings: we work inside of buildings and perform the majority of our non-work related activities inside of buildings. If we aspire to do these activities in comfort, healthily, safely and using the minimum possible resources, we must create comfortable, healthy, safe and sustainable buildings.

How the building performs with regards to all these considerations defines building value.

During the last years a lot has been done with regards to green building, but it is now clear that the market needs to focus and ally sustainability on its different dimensions (environmental, economic, social and cultural) with human health and wellbeing. In this way we may transform our buildings, and as a result our city's, for the benefit not only of the people living within, but for the planet as a whole. Taking a holistic approach to construction can only add value to a project

**“We shape our buildings
and afterwards our buildings shape us” (1)**

B - Buildings – A giant puzzle in our cities

Buildings are comprised of a giant puzzle of different, individual components and materials. We must look at the whole building as an integrated structure. But we must also look deeply into each of building individual components and materials in order to achieve the ideal final solution, and so improving building's value.

C - Facades – The impact on building value

Building envelope, and particularly facades, plays a crucial role on how the building performs during its life time and on how it addresses the above mentioned goals. Facades will greatly influence the value of a building as they determine:

- Aesthetics
- Protection against water and moisture
- Thermal efficiency
- Acoustic performance
- Natural lighting
- Indoor Air Quality
- Wind loads
- Durability

“The façade is the filter between the climate outside and the conditioned space inside, it determines the appearance of the building and its performance” (2)

The goal of this document is to support the market players and stakeholders on understanding how we can improve building value through façade weatherproofing.

Every building project has a unique set of program goals and technical requirements that should determine the façade waterproofing design. At the same time today's market evolves more quickly than ever. It is essential to understand not only which are the state of the art solutions but also on how can these solutions facilitate the fulfilment of project requirements and add value to the final product.

“Technological progress and industrialization of the construction industry means that the role is changing from controlling the design through a profound knowledge of materials and techniques, to a role of orchestration of a multitude of specialists skills, knowledge, and industry intelligence” (3)



Effisus Ecofacade Envelope - Air tightness and water vapor management facade integrated system.

Effisus Ecofacade – Facade waterproofing solution.



(1) [Health, Wellbeing & Productivity in Offices – The next chapter for green building](#)

(2) [Façade Engineering & The Design Teams of the Future](#)

(3) [Façade Engineering & The Design Teams of the Future](#)

IMPROVING BUILDING VALUE THROUGH FACADE WEATHERPROOFING

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1.0 Intro



1.1 Improving building value by sealing façade connections

A - The Building Enclosure - Weatherproofing

In our introduction we have briefly analyzed the importance of a building's façade and its impact on a building's global performance and final value.

A building's façade is the filter between the climate outside and the conditioned space inside and as such it has to address / control multiple loads and functions. Focusing only on climate related loadings, a building, and its enclosure, experience different conditions or microclimates, depending on the project's location, landscape, adjacent buildings, façade and roof configuration, among others. This microclimate has to be taken into consideration when designing a façade solution.

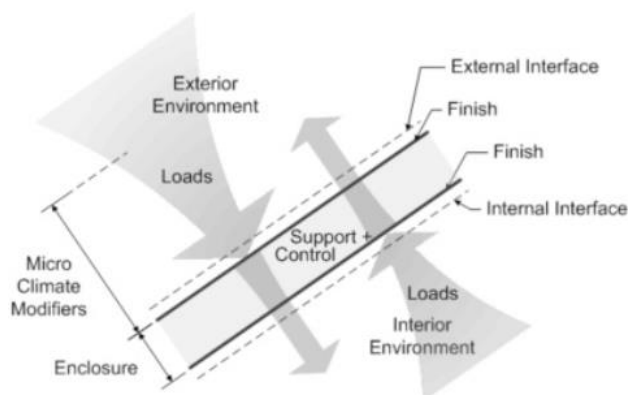


Fig. 1 Building enclosure and its functions (1)

The performance of a façade should be analyzed taking into consideration how it behaves in relation to the different loadings generated by the exterior environment, the interior environment, and the building enclosure itself.

There is a complete list of [climate related loadings](#) (2) that a façade needs to address, such as:

- Solar light
- Heat
- Water
- Air
- Moisture

In this Ebook we will focus on façade weatherproofing but more in particular on the control of water, air and moisture, ensuring watertightness, airtightness and moisture management in facades.

B - Controlling water, vapour and moisture on facades

- Controlling water ensuring watertightness

Protection against water penetration is, since the very beginning, a major function of a building's envelope. However, water leakages remain one of the most common building pathologies, and are definitely, one of those that most deeply affect the performance of our buildings and their value. Water leakages can almost instantaneously cause deterioration of the most common construction materials, uncomfortable indoor environment, and in worst cases, affect a building's structural stability by, for example, causing corrosion on metal structures.

- Controlling air and moisture ensuring airtightness and moisture management

With major efforts made initially in Europe and North America, [airtightness](#) (3) has now globally become a standard requirement for a building's envelope, with major efforts made recently by Australia and Canada, among other countries. It is essential to work towards energy consumption efficiency (energy consumption reductions reached through airtightness can reach up to 40%), maximizing thermal and acoustic insulation, and eliminating the risk of [mold](#) (4) and other building pathologies associated with [moisture](#) (5).

Moisture management is strictly associated with airtightness, and every building airtightness analysis has to consider facade moisture management, assuring that the designed solution eliminates the risk of condensations and allows the evaporation of internal existing or generated moisture.



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(1) http://buildingscience.com/documents/digests/bsd-018-the-building-enclosure_revised
(2) http://buildingscience.com/documents/digests/bsd-018-the-building-enclosure_revised Please check fig. 1, 2 and 3
(3) <http://rdh.com/wp-content/uploads/2014/04/Air-Leakage-Control-in-Multi-Unit-Residential-Buildings.pdf>
(4) <https://www.wbdg.org/resources/moisturedynamics.php>
(5) <https://www.wbdg.org/resources/moisturemanagement.php>

C - Façade connections - The most common leakage paths

The number one rule to ensure a building's enclosure watertightness and airtightness, is to ensure the continuity of the water and air control layer.

However, a building's enclosure and in this case, specifically facades, are a combination of planar components, and each of these components is a three-dimensional, multi-layer ensemble that extends from the inside to the outside.

While it may be easier to define the watertight and airtight solutions for these planer components, usually the bigger challenges arise at the connection areas of these planar components, or at points where these planar components need to be perforated or penetrated by the passage, or fixation, of singular construction elements.

**These interfacing areas are the most common façade water and air leakage paths.
Compromising the quality of a sealing solution for these areas means compromising the
façade's complete watertightness and airtightness.**

D - Sealing Façade Connections

Sealing façade interfaces such as the connections between, windows or doors, and the cladding wall, is usually a challenge.

These are areas where the convergence of very different materials, with very different properties and behaviors, happens, such as metal and concrete, or steel and plaster. These are also the areas where the larger facade movements have to be absorbed and where the selected construction materials are under bigger stresses or loads.

Meanwhile, these are areas that are not so expressive, volume wise, on a façade's complete packaging, and many times, properly designing the solution for these connections is not faced as a priority.



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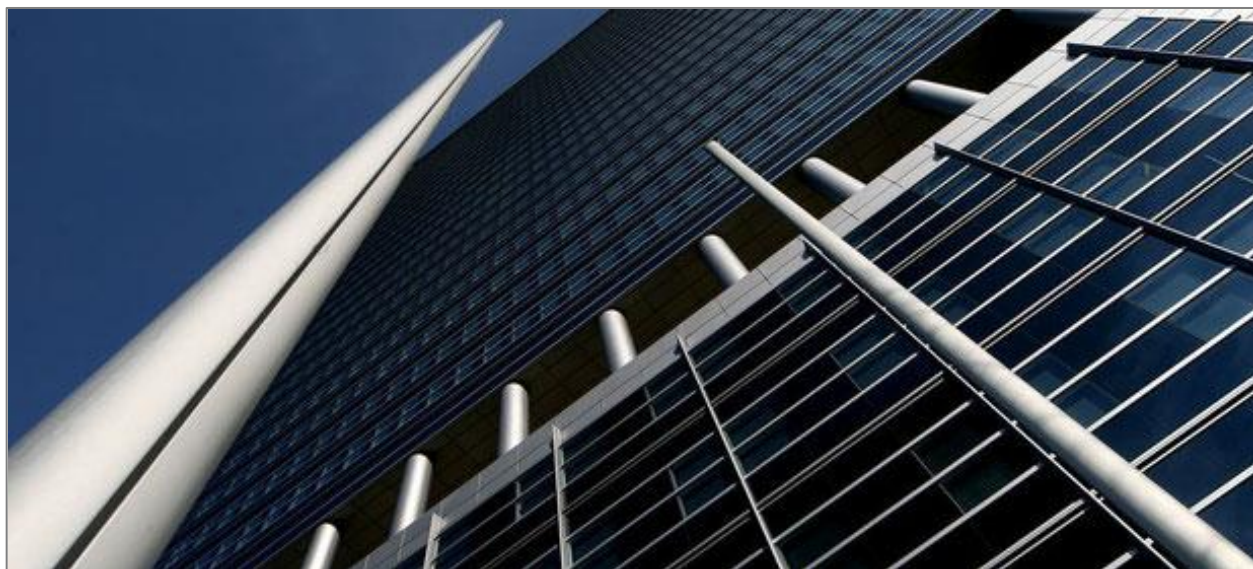


- (1) http://buildingscience.com/documents/digests/bsd-018-the-building-enclosure_revised
- (2) http://buildingscience.com/documents/digests/bsd-018-the-building-enclosure_revised - Please check fig. 1, 2 and 3
- (3) <http://rdh.com/wp-content/uploads/2014/04/Air-Leakage-Control-in-Multi-Unit-Residential-Buildings.pdf>
- (4) <https://www.wbdg.org/resources/moisturedynamics.php>
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1.0 Intro

1.1 Improving building value by sealing façade connections



1.2 – Sealing façade connections – Raising the standards: state-of-the-art solutions

A – Façades - As good as its weakest points

A manufacturer designs its solutions detailing the interfaces between its system components, however the interfaces between different manufacturer's components and on-site constructed elements, such as concrete walls, are under responsibility of the specialized contractor only. Common difficulties arise when the work of two contractors converge.

The materials used on joint sealing are minor components of the building envelope and often contribute with the lowest percentage of a project's overall cost. However it is common sense that a façade will only be as good as its weakest points, which almost always happen to be its interfaces or joints.

Despite the above mentioned, joinery of façade components is, in most cases, not closely analyzed until the later stages of project designing and also not completely discussed until on-site installation comes up. At this point the standard solution will, many times, be fitted to all details. As a result, water leakages and other pathologies will appear as early as 1 or 2 years after the project's conclusion.

It is essential to carefully detail all building's joints and their sealing solutions at an early stage.

"How the façade elements join should be considered early in the design phase" (1)

B – Building joints: Classification (2)

Joints are made to join together elements of the building and may be used for two purposes:

- **Fixed joints**

These occur where materials are joined because maximum panel or unit sizes require the use of more than one element. Joints also occur where different materials or components meet.

At a fixed joint the adjacent components are fastened together to prevent movement between them. The joint then has a constant size and shape and the sealant does not have to move significantly.

- **Movement joints**

These joints are created to allow the building and its cladding to move. Movement occurs because of temperature changes, wind loading and imposed loading, amongst other causes.

Movement joints are made at the natural joints in the building where there would otherwise be fixed joints.

The shape and size of a movement joint will change daily and over longer periods of time. A sealant that can move in the required way is chosen for a movement joint and there is a wide range of performance available.

C - Designing joints and joints' sealing solutions

1 – Identify where joints occur through the façade

Once general façade design is defined and main façade materials are selected, the designer should summary all the materials' interfaces occurring on the façade, as well as consult manufacturers to determine minimum number of expansion joints and their sizes, vertically and horizontally.

2 - Identify the different types of joints

All the identified joints should be grouped up into types of joints. Similar joints, with similar requirements, should be considered as a single type of joint, where an identical joint sealing solution can be used.

This will give an idea of how many different details will be needed to document the different joint designs.

3 – Determine the complete requirements for each joint type

For each type of joint it is necessary to determine the amount of movement that it needs to accommodate (movement joints), as well as all other joint requirements and special conditions.

4 – Select joint sealing material

Considering the requirements identified on stage 3, it is now possible to select the best solution for each joint type, and to develop all necessary design details as well as solution specifications and installation guidelines.

Accepting that there is no such thing as an “ideal sealant”, helps one to accept that it is strictly necessary to take into deep consideration all the joint requirements and particular features, in order to select the best sealing solution for each joint type.

D - Selecting a joint sealing solution

Criteria that should be analyzed for selection:

- **Project characteristics**
 - Expected durability (service life time)
 - Expected movement
 - Joint geometry
 - Substrates - Compatibility and adhesion
 - Service environment (temperature, water, UV, acid rain, pollution)
 - Special applications (potable water or food service applications)
- **Performance**
 - Resistance to chemicals (ex: oil, fuel, hydraulic fluids, cleaning chemicals)
 - Resistance to biodegradation
 - Vandalism resistance
 - Loading resistance (pedestrian or wheeled vehicles)
 - Puncture, tear and abrasion resistance
 - Fire resistance
 - Maintenance requirements
- **Installation**
 - Installation environment (space limitations, weather restrictions, etc.)
 - Ease and speed of installation
 - Level of labor specialization
 - Error possibility
 - Waste management
- **Aesthetical concerns**
 - Color and color retention
 - Possibility of painting
- **Environmental concerns**
 - VOC's content
 - % of recycled and recyclable materials
 - Waste

Only when all solution performance requirements, for any identified joint group, are listed, considering the above criteria or others that might be relevant, it is possible to select the best joint sealing solution and develop the necessary project details. The “ideal” solution will completely depend on this analysis.

For small joints, with small movements, liquid sealants may be acceptable, but depending on the façade system, gaskets, rubber membranes or other customized solutions may be more effective. Technical support from manufacturers is key during every stage: joint sealing solution selection, specification and installation.

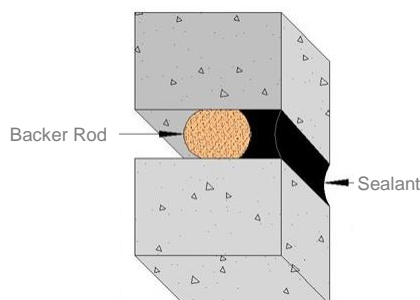


Fig. 1 Standard sealing detail with sealant and backer rod

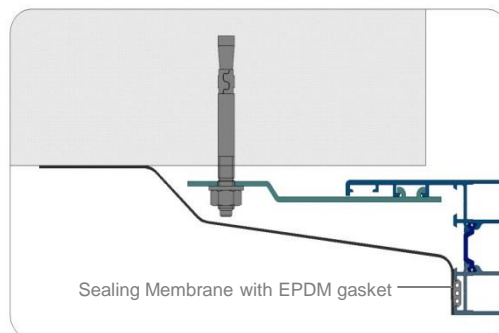


Fig. 2 Sealing membrane with clip-in gasket

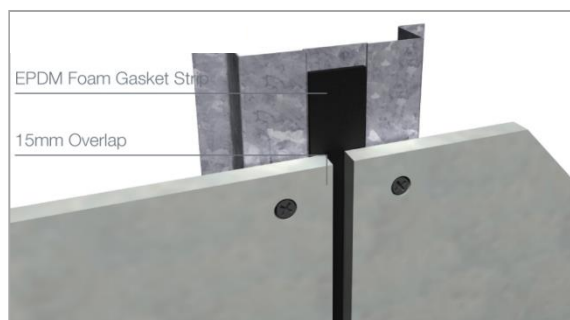
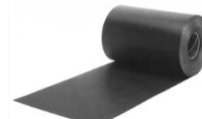


Fig. 3 Sealing detail with foam gasket strip



The Effisus Way – Effisus Ecofacade

- Complete and integrated system
- Continuous technical support
- Unlimited project customization options
- Maximum mechanical resistance
- Freedom of movement



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(1) <http://www.rci-online.org/interface/2010-BES-maing.pdf>

(2) <http://www.cwct.co.uk/construction/installation%20guide/INST-ALL.pdf#page=17>

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1.3 Sealing façade connections – Improving building value with complete, tested and approved systems

A - Complete, tested and approved systems

Façades are traditionally designed to last and to withstand aggressive events such as strong winds or heavy rain. Façade systems can be engineered to offer reasonable degrees of resistance to these effects, and it is only possible to achieve such degrees of durability and resistance, if the different components of the façade can, individually, guarantee these levels of durability and resistance.

The architect, engineer or contractor, has defined, in general terms, the type of solution that is most adequate to each specific sealing detail, and its essential characteristics. Before selecting a specific manufacturer or brand, the architect, engineer, or contractor, should confirm that:

- The solution to specify in detail is a complete and integrated solution, not only an isolated product, without specific accessories to apply it, or to fulfil special project requirements;
- The quality of each one of the solution components is under certification and control;
- The solution is tested and approved as a system (main components + accessories), as well as its application method, considering its typical applications.

▪ Complete systems

A complete system would be a set of main components and accessories, with clearly defined application procedures or routines to perform a specific duty, or solve a problem.

This is completely different from an isolated product. Within a system there will be all the necessary accessories, to completely install the product, in accordance with the defined system installation methodology, within the system scope of application. A system will, most of the times, also have different system options to allow the adaptation of the system to specific project requirements.

For example, a façade connections sealing system, based on EPDM weatherproofing membranes, will be comprised of:

- Main Component - Weatherproofing membranes
- Main component variations – Variations that allow the application of the system on different conditions, or according with different project requirements
- Pre-fabricated pieces – Corners or complete collars
- Cleaner - To proper clean all surfaces before installation
- Primer – To proper prime porous or difficult surfaces prior to installation
- Adhesives – To adhere main components to different surfaces, or to seal main components joints, or other details

Having a complete system, a clear definition of all system components and its application method, will significantly reduce the possibility of error or chemical incompatibilities. It will also make the architect, engineer or contractor job much easier and safer.

Confirming the compatibility of this system with other construction systems with which this will interact is crucial, as well as the support from the supplier / manufacturer to understand the best system option and application method for each specific project and detail – this understanding and specification may significantly reduce human error possibilities during installation or the amount of required labor.

▪ Tested and approved systems – Quality assurance

Quality assurance is a set of planned and systematic actions to ensure that products and services comply with specified requirements. It not only involves checking the final quality of products to avoid defects, as is the case in quality control, but also checking product quality in a planned way in all the production stages. It is the development of work and product design procedures to prevent errors from occurring in the first place, based on planning backed up by quality manuals and tools.

The quality assurance of a system or product production is necessary to increase customer confidence that the product will perform as promoted by the manufacturer and as he is expecting.

Individual product approvals

The first step is always ask for the technical specifications of each product that is part of the system, certified by a third part. This can be achieved for example, through the mandatory CE marking of regulated products.

CE marking signifies that a product complies with relevant safety, health or environmental regulations across the European Economic Area.

Assessment will need to be CE marked and accompanied by a [Declaration of Performance \(DoP\)](#). This is intended to ensure that reliable technical information is provided about the performance of construction products in a common technical language and tested using consistent assessment methods. This consistency should also enable designers and specifiers to compare the performance of products more easily.

The DoP of a product suitable to seal façade connections usually provides information of:

- Reaction to fire
- Resistance to water passage
- Water vapour properties
- Resistance to air passage
- Tensile strength
- Elongation
- Tear resistance
- Dimension stability
- Foldability at low temperature
- Weathering by combined - continuous stress trough UV exposure and high temperature
- Resistance to water passage

The CE marking will also confirm that product is under periodical control and that products are tested periodically.

System approvals

However the type of certification described previously guarantees only the product essential characteristics, and its production control. It says nothing about how this will perform with any accessory used to apply it, or about how this material will perform together with other building components. It does not harmonize the product with building regulations or recommend the suitability of products appropriate for a project, responsibility for which remains with designers, specifiers or contractors.

Façade connection sealing systems can also have a certification from a third part, specially when these are innovative solutions.

There are several certification bodies that have certification methods defined to test and approve such systems and its application methods. Some examples:

- [Cahier de Charges - Socotec](#)
- [Avis Technique – CSTB](#)
- [IAB - Irish Agrément Board](#)
- [BBA – The British Board of Agreement](#)

These type of approvals are usually a mark of quality, safety and reliability. They will provide reassurance of the product's fitness-for-purpose. These usually provide the following information, which is most valuable to designers and contractors:

- Purpose of the solution and scope of the certification
- Product overview and product characteristics (including system accessories)
- Field of application
- Application guidelines (main directives, different supports, repairs, compatibility, etc.)
- Test results and final certification

B - The purchase department – Demanding quality

The characteristics/standards of the construction materials need to be put down in specifications and purchase orders in unambiguous items. The technical terms should uniquely be understood by the supplier. The testing and inspection methods/procedures, the type of tests that are required to be conducted; all need to be specified accurately.

The purchase department can achieve required quality of incoming construction material by:

- Conveying correct specifications;
- Assessing quality capability of supplier before placement of purchase order;
- Insisting on proper certification of dispatched material from the supplier's facility;
- Proper packaging and transportation to avoid deterioration, damage, breakage during transition;
- Testing and inspection at the receiving end. Insisting on approved quantity and quality certificate;
- Proper storage in the warehouse/store so as to avoid deterioration or damage during storage;
- Revising and conveying the quality specification as and when needed well in advance so as to avoid stockpiling and or getting mixed up of 'old' quality items with 'new' quality items;

All these steps, used appropriately, help in insuring the right quality of the incoming construction materials; which ultimately reflects in the final product of the company.

The Effisus Way – Effisus Ecofacade

Membrane options:

- Effisus Ecofacade Membrane – Standard weatherproofing membrane
- Effisus Ecofacade SA-Edge Membrane – Weatherproofing membrane with one or more embedded self-adhesive bands for application without the need for additional adhesives.
- Effisus Ecofacade P-Fix Membrane – Weatherproofing membrane with a quick-connection profile for fastening to the frame or facade without the need for additional accessories.
- Effisus Ecofacade SA-Edge + P-Fix Membrane – Weatherproofing membrane with self-adhesive band and quick-connection profile for applications without the need for accessories.



System accessories:

- Effisus Bonding KF Adhesive – Paste adhesive
- Effisus Bonding KF+ Adhesive – Paste adhesive with no solvents
- Effisus Coat NP Primer – Primer for porous substrates
- Effisus Setup PR – Cleaner for smooth surfaces
- Pre-fabricated corners – For quick installation without error
- Pre-fabricated collars or other pieces – Fully project customization

Cahier des Charges SOCOTEC – Ce procédé a fait l'objet d'une enquête technique n° DTM-B/13/535FV/FD valable jusqu'au 01/04/2016 dont les conclusions sont reconnues par l'ensemble des collaborateurs de SOCOTEC France.

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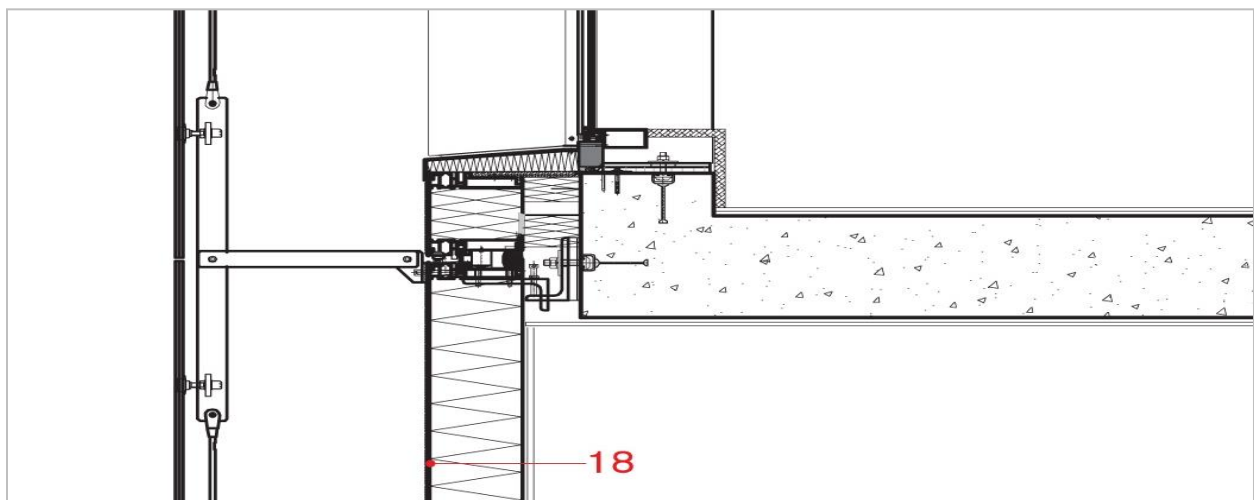
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1.4 Sealing façade connections – Making each project a success with bespoke solutions

A - Imagination Has No Limits

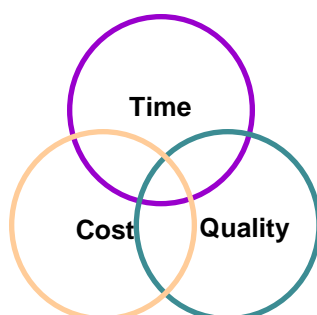
During last decades we witnessed a rise of façade engineering challenges. Buildings are now expected to continually push boundaries, inspire, amaze, relax, reassure, make our lives easier and more rewarding. Buildings' facades are curved, warped, twisted and transparent with an increased demand for daylighting. They now have a clearly identifiable "landmark" status. These challenges are increased by environmental regulations and continuous economic pressures.

Traditional construction and standard solutions are quite rare nowadays, and most of the times, each building is a bespoke solution. This level of complexity and interaction starts to hint at the true definition of modern facades and [façade engineering](#).

B - Modern Façade – Aspects worth identifying

1. A modern façade must, by definition, cover all sections of the enclosure system.
2. The individual materials and components tend to take on less significance. It is the overall performance of the system which is most important.
3. The performance of a façade system can be totally undermined by the “weakest link”.

The most common connection sealing details, on modern facades, are not standard details and a bespoke solution is, most of times, the best solution. The perfect solution is the one that will offer the perfect balance between the **key criteria below**.



A bespoke solution is many times the only type of solution that will allow the stakeholders to achieve their goals, on time, within budget and according to the defined quality standards.

In order to design and develop this bespoke solution, it is required that the **façade engineer** works closely with the manufacturers during solution prescription. A good supplier – partner - will ask, listen and present a solution with added value. Most of the time, it will be necessary to define and redefine the solution, develop a prototype, test it and finally approve it.

First of all, it is crucial to identify the key goals or requirements of the project, as well as any special constraints, such as:

- Environmental concerns such as LEED certification requirements
- Very strict construction schedules
- Lack of on-site specialized labor
- Restrictions for use of dangerous materials on-site
- Difficulties off access for installation on the job site
- Difficult maintenance conditions after construction

For example, in a project with very strict construction schedules, it is of the highest importance that the selected solution is quick and easy to install. This may justify to not choosing the cheapest solution according to the initial investment, but one that will guarantee that the project's goals are fulfilled. This usually means better performance at a lower global cost.

On a project where it is clearly identified that there will be a lack of specialized labor, a solution that guarantees minimum possibilities of human error, during on-site installation, is key.

The solution should be customized in order to fulfill functional requirements and never the opposite.

C – Sealing Façade Connections - Bespoke solutions

Bespoke sealing solutions might be the answer to projects' major challenges:

Improve productivity:

- Reduction of installation timetables
- Reduction of labor
- Facilitating work in restricted spaces
- Allowing installation under adverse outdoor conditions (heavy rain, wind or snow)

Quality control:

- Reduction of error possibility
- Overcoming the lack of specialized labor on the job site
- Resistance to very high or low temperatures
- Eliminating compatibility issues

Environmental and health concerns:

- Energy efficiency requirements
- Less waste material on-site
- Less noise, dust and local disruption
- Less dangerous materials on-site

Sealing profiles

Sealing profiles are not available only in standard materials or shapes. It is possible to fully customize solutions to specific project needs. There is a large range of available compounds in the market that allow the selection of the best material, for the highest compatibility or durability requests, and molding possibilities are quite large.



For example, reducing the number and complexity of on-site adhered connections might be crucial to warranty the quality parameters of the final solution. Molded parts, or fully vulcanized frames, are usually a way to assure quality control.

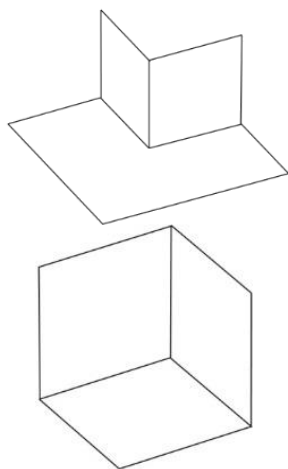
The fixing of this type of profiles is a very common problem, but again, manufacturers can offer solutions with fully customized installation methods:

- clip-in solutions for mechanical fixing
- incorporated self-adhesive strips - only for positioning or for long-lasting connections
- Incorporated reinforcements to avoid stretching during installation

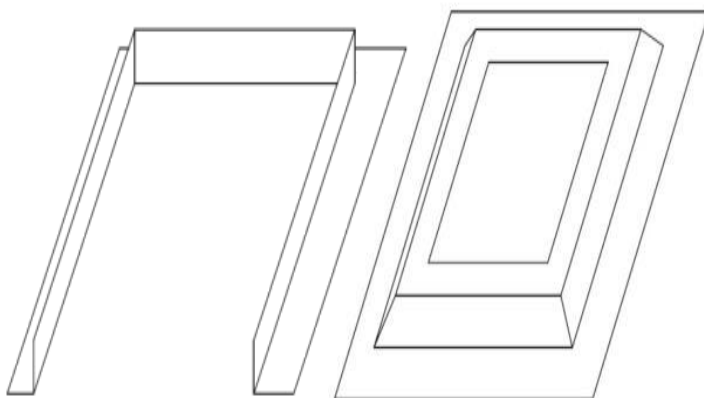
The analysis of a project's requirements, and a full understanding of these requirements, by the manufacturer, will allow the development of a fully customized solution that will significantly contribute to the project's success.

Sealing solutions with EPDM foils

When sealing window or façade perimeters, replacing solutions that are largely dependent on the quality of labor on the job site, for pre-fabricated solutions with pre-fabricated corners or in factory vulcanized collars, will significantly reduce installation times and increase quality of the final solution.



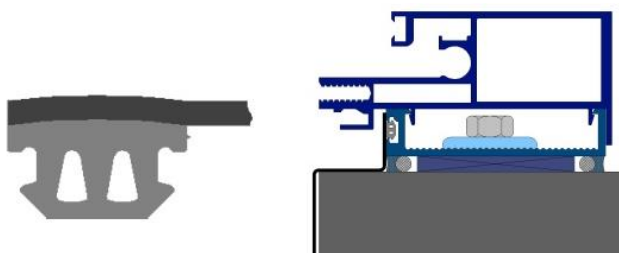
Pre-fabricated EPDM corners



Pre-fabricated EPDM collars

The use of pre-fabricated corners or in factory vulcanized T sections might seem like a small detail, but these are usually the points where more labor is required, and where most installation errors occur.

Membranes or full collars can also be supplied with self-adhesive strips or clip-in EPDM profiles to allow more expedite installation methods, as well as to reduce the amount of waste and dangerous materials on the job site. The location of self-adhesive strips can be fully customized in order to facilitate positioning or final fixing.



EPDM membrane with gasket to clip in the windows' or façades' frames



EPDM membrane with self-adhesive edges

The choice of the type of adhesives, sealants or other accessories to be used in combination with this type of solutions might also influence significantly project success: if very low temperatures or humidity are expected, specific accessories should be used in order to permit installation under those conditions or, for example, if the work will occur in spaces with limited ventilation, accessories with low VOC content should be selected. For last, this choice is also important in order to avoid incompatibility issues with difficult materials, such as, bitumen membranes.

D – Bespoke solutions – Key criteria

- **Optimized technical characteristics** - vapor permeability, thermal conductivity, mechanical resistance, chemical compatibility and UV resistance, among others, optimized for the application.
- **Cut or molded to fit perfectly** - dimension and shape suitable for immediate application, with minimum cuts or joints to be done on-site.
- **Optimized installation method** - considering expected environmental conditions, time, access or space constraints - with self-adhesive strips or clip-in profiles, with minimum requirements of additional accessories or accessories with added value for the application (such as accessories with low VOC content).

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Membrane options:

- Effisus Ecofacade Membrane – Standard weatherproofing membrane
- Effisus Ecofacade SA-Edge Membrane – Weatherproofing membrane with one or more embedded self-adhesive bands for application without the need for additional adhesives.
- Effisus Ecofacade P-Fix Membrane – Weatherproofing membrane with a quick-connection profile for fastening to the frame or facade without the need for additional accessories.
- Effisus Ecofacade SA-Edge + P-Fix Membrane – Weatherproofing membrane with self-adhesive band and quick-connection profile for applications without the need for accessories.

System accessories:

- Effisus Bonding KF Adhesive – Paste adhesive
- Effisus Bonding KF+P Adhesive – Paste adhesive with no solvents
- Effisus Coat NP Primer – Primer for porous substrates
- Effisus Setup PR – Cleaner for smooth surfaces
- Pre-fabricated corners – For quick installation without error
- Pre-fabricated collars or other pieces – Fully project customization



IMPROVING BUILDING VALUE THROUGH FAÇADE WEATHERPROOFING

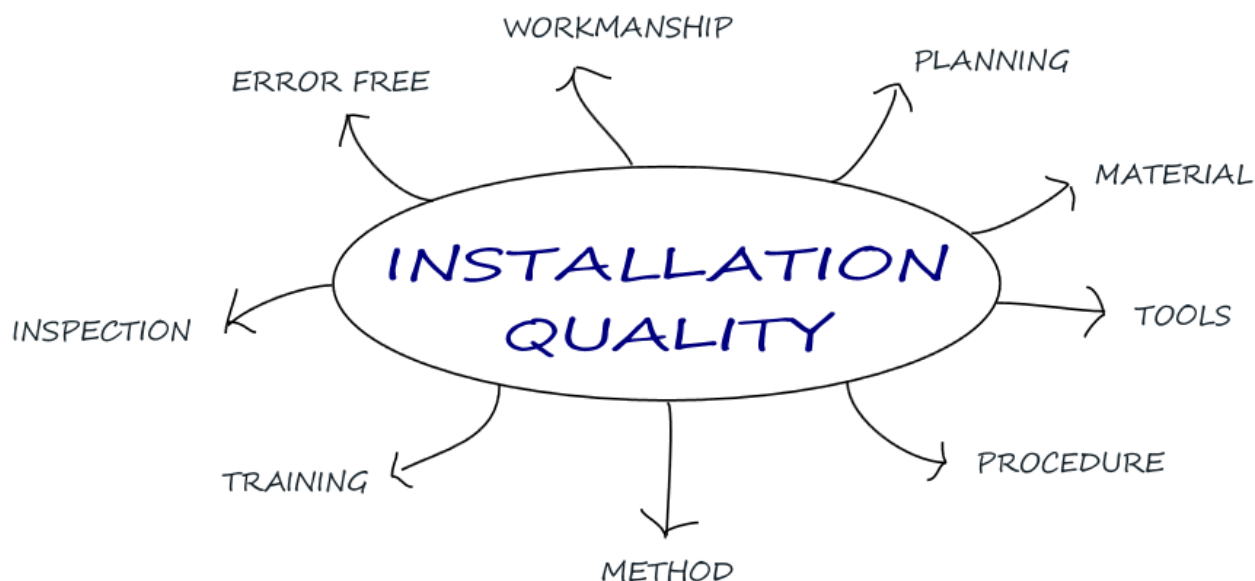
1.0 Intro

1.1 Improving building value by sealing façade connections

1.2 Sealing façade connections – Raising the standards: state-of-the-art solutions

1.3 Sealing façade connections – Improving building value with complete, tested and approved systems

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1.5 Sealing façade connections - Assuring flawless installation

Quality of a system installation is becoming an increasingly important concern for project managers. Defects or failures during installation represent increased costs and delays, as well as reduced quality of the final product. Even with minor defects, re-construction may be required and facility operations impaired.

Tender specifications, codes of practice and work instructions, sampling and testing procedures, inspection procedures, requirements for storage of raw materials and assuring proper training to the workforce are examples of areas that have to be taken into consideration in order to assure quality of the installation of any solution for sealing façade connections.

On this Ebook chapter we will discuss some of the these dimensions.

A – Initial design and specification

Successful project managers try to ensure that the job is done right the first time and that no major errors may occur during installation of any construction system. In order to assure that installation is perfect, the most important decisions, as we have seen on previous chapters, are made during the design and planning stages rather than during construction. It is during these preliminary stages that component configurations, material specifications, installation methods and functional performance are decided. Quality control during installation consists largely of insuring conformance to these original design and planning decisions.

Design details and specifications should be made clear to all parties in the project, with clear language and without possibilities of misunderstanding.

Quality requirements should also be clearly defined at this stage and should be easily verifiable. Defining monitoring and inspection procedures, and creating a schedule for these tasks, is necessary, in order to guarantee that work is done according to the project's requirements. While the multitude of participants involved in the construction process require the services of inspectors, it cannot be emphasized too strongly that inspectors are only a formal check on quality control. Quality control should be a primary concern for all the members of a project's team.

B – Testing, samples and mock-ups

Samples and mock-ups have become more common requirements on construction projects and specially on sealing solutions as the number and complexity of goods and materials that are available and that are required for a single project has increased.

These are specially useful to understand if specifications are correctly done, to confirm the solution adequacy to the project, to allow review of appearance and for testing to be carried out, in order to confirm if the solution works properly under certain actions. Samples and mock-ups might also be important so that one can verify the supplier's ability to produce a product that is aligned with the required specifications. Material suppliers should also be present at the development of solution mock-ups because their contribute will improve possibilities of success at all levels.

The benefits of requiring samples or mock-ups include:

- Knowledge obtained from failures discovered through the tests that are performed.
- Potential issues and causes of failures can be taken into consideration and mitigated against.
- The process of testing and approval can improve the durability and longevity of the finished building.
- They can help test the way installed materials interact.
- They provide assurance that the specified materials will function as required under a variety of conditions.
- They can help understand the boundaries between trades.
- They can help improve installation techniques prior to actual work beginning.
- They can be useful to obtain approval from stakeholders who may find it difficult to understand drawings and specifications.

Mock-ups can be built and tested either on site, as part of the building itself, at the manufacturer's premises, or in a third-party testing facility such as a laboratory.

It is most important to use information obtained with these samples / mock-ups in order to complete or redefine all specifications / solution details and its installation methods.

C – Design review and final specification

After mock-ups and samples have been approved it is most important to review the final design and complete final specifications. All information obtained with any performed mock-up should be used in order to ensure that installation is flawless.

D – Planning

As well as for all other project activities, the installation of solutions for sealing façade connections should be carefully planned. The following aspects, among others, are key in order to assure quality of the installation:

- Definition of activity schedule / timetable
- Definition of strategy for achieving defined objectives
- Assure availability of the necessary amount of resources (labor and materials)
- Clear definition of specification requirements
- Availability of detailed installation manuals on the job site – made available to all project players, at all times
- Availability of material product data sheets and material safety datasheets, at all times
- Definition of inspections plans, responsibilities and schedules – all necessary documents should be defined (ex: inspection reports)
- Definition of acceptance procedures
- Identification of the difficulties that might arise during the installation – for example weather constraints - and definition of a backup plan in these scenarios (e.g. Keep in stock a primer that allows the installation to continue in very low ambient temperatures, with high moisture levels on substrates and in other unexpected situations)
- Definition of repair procedures

E – Material stock management

As previously mentioned it is crucial to ensure the availability of materials in accordance with timetable requirements. This will allow the installation work to occur without constraints due to lack of materials on the job site.

All materials should be kept in a warehouse that assure that materials are stored according to their storage requirements (e.g. temperature, humidity rate, protection from UV light). Many times a sealant or adhesive that is not stored at proper temperatures might not work properly.

Installation manuals should always be available together with all materials, permitting the workforce's access at all times.

F – Training

Finding qualified workers with the right skill sets is an increasingly challenging. Currently minimal quantities of specialized labor are available at the job site. This forces designers to have to focus their attention on detailing and specification writing, guided by numerous national standards, regulations and procedures for certification.

It is equally important is that project managers take responsibility for improving qualifications of the workforce. Employee participation in the control of installation quality should be sought and rewarded, including the introduction of new ideas. By suggesting new work methods, by avoiding rework, and by avoiding long term problems, good quality control can pay for itself.

Proper training of the final installer is essential in order to assure quality of the installation. The installer has to understand in detail the installation method, materials characteristics, including its limitations, as well as understanding the importance of the work that is being done and the impact of installation defects.

Training should be provided by project managers in collaboration with solution suppliers. It is important that specifications and technical details are fully understood by the installer.

Training is not only important for the installer, but also for all project players. Inspectors, for example, need to have all this knowledge about the specified solution and preconized installation method, otherwise their capacity to perform a capable inspection will be very restricted.

G – Monitoring / Work inspection

Controlling quality of the installation work of any solution for sealing facade connections should always include inspection or verification of finished installation. These allow one to filter any defects before they reach the client, so that work that is non-compliant with the project's requirements can be discarded or repaired.

This control is usually carried out by people who were not involved in the production activities – independent inspectors.

Regular inspection is a crucial part of ensuring that the works progress as intended, both in terms of quality and compliance. However, the solo dependence on independent inspections might only mean higher risks, as defects will be identified at later stages of a project, as these inspections don't happen every day.

Project manager should define an internal inspection plan in order to avoid these risks. Nominating a team member to inspect work done at the end of each working day is a good step. All defects should be clearly identified in order to be properly rectified during the next working day. This will allow defects to be identified at an early stage when their correction is much simpler and with lower costs.

A clear inspection template should be defined identifying all key points that should be inspected, such as:

- Minimum bonding surfaces
- Quantity of applied sealants / adhesives
- Bonding quality
- Proper use of system accessories (ex: use of primers when necessary)
- Corners
- Penetrations / connections / interfaces
- Materials under stress
- Cuts / perforation

H – Work revisions

Work revisions should be made according with previously defined repair procedures. If any non-standard repair has to be made the solution supplier should be consulted before any work is done.

I – Maintenance plan

After installation is concluded it is very important that a maintenance plan is made available.

J – The role of solution suppliers

The contribute of solution suppliers for installation success is crucial. Project managers should work closely with project managers in order to identify and preconize ways of promoting installation quality. Bellow there's a summary of the contributes that solution suppliers might bring to the project:

- Simplification of installation procedures or development of more logical installation methodologies
- Development of pre-fabricated solutions for details where installation will be more complex and more dependent on the installer's skills (corners, perforations, overlaps, etc.)
- Customized solutions with increased efficiency with regards to specific project requirements and lower error possibilities
- Solutions that do not require difficult to use accessories or complex tools
- Detailing of interfacing with other façade systems
- Compatibility tests
- Support on the developments of samples and mock-ups
- Continuous training, including training on site
- Development of supporting material such as project customized installation manuals
- On site inspections
- Maintenance plans
- Continuous technical support at all project phases

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System options:

- Easy to use accessories and no special tools required
- Customized dimensions and configurations – pre-fabricated pieces such as corners or collars
- Self-adhesive strips or clip-in profiles

Continuous technical support:

- Training on site
- Inspections on site
- Maintenance plans
- Supporting material such as project customized installation manuals

Consulting services:

- Solutions specification
- Customization of solutions to specific project requirements
- Support on mock-ups development
- Compatibility tests

Effisus Ecofacade Envelope - Air tightness and water vapor management facade integrated system.

Effisus Ecofacade – Facade waterproofing solution.



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1.6 Sealing façade connections - Cost-benefit analysis

A project completed on time, within budget, but that does not achieve the specified quality or performance criteria, will be considered to be a disappointment or even an outright failure. Such failures may be prohibitively expensive to rectify and can damage reputations overnight.

“Quality is remembered long after the price is forgotten” Sir Henry Royce ⁽¹⁾

The notion of “quality” is multidimensional, complex, and includes aspects that are not easily evaluated or quantified, such as: appearance, function, durability and maintenance. The opposite happens when considering the issue of initial cost – through a quick analysis it might look easy to quantify and evaluate.

The issue of cost is always on the mind of project owners, design teams, constructors and, of course, quantity surveyors. This is the a primary concern for the vast majority of project owners. Questions such as “what is the cost?” or “can it be any cheaper? we do it any cheaper?”, are the most common among construction clients. Should decisions be based only on this quick analysis? Certainly not.

Value for Money

Achieving value for money may be seen as being a balance between satisfying clients’ needs and expectations, and the resources required to achieve them.

Clients always expect to have their projects completed on time, within budget, and in accordance with the preconized quality standards. However, quality is always constrained by cost and time. A balance needs to be achieved, and for this ,it is necessary to prioritize objectives.

A costumer needs to understand that compromising, or changing any of these dimensions, will certainly affect the remaining ones. Achieving a time frame reduction will certainly increase costs, and special measures have to be taken into consideration, in order to avoid quality deterioration.

Most of the times, the main challenge, at the beginning of any project, is to find the right balance between the following three dimensions: time, cost and quality.

The same balance has to be found when choosing has to be applied when choosing any specific construction solution. Most of the times, it is most advisable to do a careful and complete cost-benefit analysis, comparing different options in order to select the solution that has the perfect balance in accordance with the project goals.

The analysis of costs and benefits

The analysis of costs and benefits is not an easy task. Some of the criteria that must be evaluated in an analysis of this type cannot be directly expressed in economic terms. But even though something can’t be expressed numerically, this doesn’t mean that it is less important or that its effect on a project’s success will be lower. In this Ebook chapter we will review some of the criteria that should be evaluated when selecting a façade’s sealing connection solution.

The cost of building leaks

Before starting to review the above mentioned criteria, it is never too much to reflect once more on the cost of building leaks.

Expectations on buildings’ comfort are continuously increasing. We expect temperatures to be optimal, ideal lighting, air quality, and minimal noise. Tolerance for nuisances is minimal, and uncontrolled water penetration is on the top list of building pathologies that adversely affect building quality and indoor comfort. Building leaks affect the integrity of a building’s structure, through corrosion and rot, reducing thermal and acoustic efficiency, damaging interior finishings and largely contributing towards the deterioration of all building materials. Last but not least, leaks affect the health of buildings occupants through mould growth and its associated health risks.

It is also important to point out that building leaks are the number one cause for post-sale claims, and repairs associated with such claims usually have very high costs, and can ruin a company’s reputation.

Cost-benefit Analysis – Key Criteria

We have made a summary of the key criteria that we believe should be considered in any cost-benefit analysis, when selecting a solution for sealing façade connections. We have divided these into in 3 groups: dimensions related to the material itself or (to the) supplier, dimensions related to the general product performance when related to the intended use, and finally, dimensions related to the installation set-up.

A - Material / supplier

- Initial cost

The initial cost should always be clearly quantified with as much detail as possible. All accessories necessary for installation should also be identified and quantified in this cost analysis. Many times, the cost of the main product is identified, but the cost of the accessories, or complementary products, is not. As a result, the cost of the final solution will be a lot higher than the one that was initially considered.

- Availability / delivery time

It is essential to know the availability of the material and its expected delivery times, in order to determine if these are acceptable according with project scheduling, or if they will impede the selection of a specific solution.

It is also important to know if, in case of additional material is being required during installation, in a short period of time, due to unexpected motifs such as material robbery or misuse, this will be quickly obtained or not. If not, this might mean that selecting this solution might bring unacceptable delay risks to the project.

- Transport to site

Information regarding transport options and transport costs should be clearly identified. Most offers are ex-works and transport costs may cause substantial variations to the predicted solution final cost.

- Group materials / complete systems

It is a clear advantage if it is possible to group different solutions on a single supplier. Administrative costs will be lower and order management will be easier. Most of the times, when grouping orders, it can be possible for one to obtain price reductions due to higher final order values.

Studding interfacing bewails between different solutions will also be easier and safer. Technical support, during project development and installation, will also be easier and more accurate.

B – Performance

- Health and safety during the life of the building

Health and safety concerns during installation and over a building's entire service life, must be taken into consideration. In some projects such concerns can be reflected or assured by standards requirements, but many times this doesn't happen. It is the responsibility of the project manager to do this evaluation and choose the safer and healthier solutions, whenever this is possible.

- Structural capability / Durability

When selecting any solution, it is important to have information regarding the expected durability of that specific solution. If a project owner requires a 20 year warranty from the contractor, the contractor needs to make sure that the durability of any selected solution is in accordance with such requirements. The existence of a material warranty for one solution and the inexistence of such warranty for another, may dictate the choice of final solution.

In the scenario were the project manager chooses a solution with reduced warranty, it is important to have this fact present, in order to evaluate the risks of a material failure and take them into consideration.

- Technical characteristics

As we have previously seen, technical characteristics must be aligned with project requirements. Mechanical resistance, UV or moisture resistance, etc., must be clearly assured in accordance with project requirements.

- Maintenance requirements

Identification of maintenance requirements has to be clearly done. A solution with a low initial cost but with high maintenance requirements might not be the ideal solution for a specific project (most of the time it isn't).

C – Installation

- Installation time

Labour is usually the highest cost item in any construction project. A cheap solution with high installation time will not be the cheaper solution, and this must be taken into consideration at a global analysis.

At the same time, and not focusing only on initial investments, any time-saving solution, which saves time that can be used for other project needs, has a big advantage. Solutions that will contribute to save time, time this that can be used for other project necessities, will certainly have advantages that should be taken into consideration.

“Time is money” Benjamin Franklin

- Labour requirements / Ease of installation

Analysing the level of labour specialization that is required for the installation of a specific solution is important, in order to understand if the project manager will need to contract special resources, or if the expected teams are adequate to execute the installation with the expected quality parameters. In many projects it might be extremely difficult and expensive to contract specialized labour.

A solution with higher initial cost but with no need for specialized labour, with a much simpler installation method and lower error possibilities, is most of the time, a solution that will globally contribute to reduce global project costs.

- Health and safety issues on installation

For example, waterproofing solutions that require using open flames, call for safety procedures that have a cost. Also, they bring several risks to the project that need to be evaluate and taken into consideration. If installation will be done in places with low ventilation, the use of solvents may be problematic. An alternative without solvents or other hazardous substances might bring added value to the project.

- Site constraints

Project sites may have constraints, such as reduced spacing, which might prohibit the use of special tools or machines that are usually required for the installation of a specific solution.

- Climate constraints

If a project is located in an area where heavy rainfall or extremely low temperatures are expected, it is important to take this information into consideration, especially when doing a cost-benefit analysis. For example, a solution that needs its application surface to be 100% dry before installation, or that requires ambient temperature to be above 5°C, might make its application difficult during the winter, which might once again introduce significant project delays.



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Effisus Ecofacade Envelope - Air tightness and water vapor management facade integrated system.

Effisus Ecofacade – Facade waterproofing solution.



(1) <http://arrow.dti.ie/cgi/viewcontent.cgi?article=1028&context=beschreoth>