## Index

**WHO ARE WE?** ................................................................. 4

1. **Polyurethane in construction** ........................................ 5
   1.1. Thermal insulation ................................................. 6
   1.2. Acoustic insulation ................................................ 7
   1.3. Waterproofness and vapour permeability ...................... 8
   1.4. Reaction to fire .................................................... 9
   1.5. Interior air quality and environment .......................... 10

2. **Building applications** .................................................. 11

3. **Vertical walls, facades and partitions** ........................... 12
   3.1. Ventilated facades ................................................ 12
   3.2. Interior facade insulation ...................................... 13
   3.3. Chamber injection. ................................................ 14
   3.4. Underground walls .............................................. 15

4. **Horizontal walls, roofs, floors and ceilings** .................. 16
   4.1. Flat roofs .......................................................... 16
   4.2. Pitched roofs ..................................................... 17
   4.3. Roof slab insulation ............................................. 18
   4.4. Roof repair ....................................................... 19
   4.5. Ceilings ............................................................. 20
   4.6. Floors ................................................................ 20
   4.7. Waterproofing of roofs, balconies, parking areas and other surfaces ........................................... 21
   4.8. Polyurea applications ............................................ 22
Who are we?

SYNTHESIS INTERNACIONAL SLU is part of the Synthesia group.

The group was founded in 1964 and now encompasses more than 14 companies in the polyurethane industry, focusing in particular on thermal insulation for construction.

The Synthesia group comprises the following companies: Synthesia Internacional, Synthecoat, Synthesia Panamá, Huurre Ibérica, Teczone, Huurre Panamá, Grupo Poliuretanos, Synthelast, Synthesar, Grupo Multiquímica Dominicana, Synthene and Tecnoexport, as well as a network of commercial offices in Europe, Latin America, North Africa and Asia.

The Synthesia group currently has more than 450 employees worldwide (of which Synthesia Internacional has more than 150).

We are part of a large holding company specialising in the manufacture of polymers and polyurethanes, with its headquarters in Spain.

As one of the few independent companies in the sector using its own technology, Synthesia Internacional has always been characterised by a research and development-based strategy, backed up by flexibility and quality.

Synthesia Internacional offers solutions to a range of market sectors through its two business units:

- Polyurethane systems.
- Polyester polyols for polyurethane (under the Hoocker brand).

Synthesia sells a wide range of tailored insulation products, offering a combination of service, availability and knowledge of applications.

SYNTHESIA is a member of AECOR, ANDIMAT, AISLA, IPUR, PU Europe, EUROPUR, C.E.P. and FEDEQUIM.
1. Polyurethane in construction

Polyurethane systems have multiple applications across a wide variety of sectors. One such sector is the construction industry, where thermal insulation, acoustic insulation, waterproofing and coating products are used extensively.

The most widespread formats used in construction are slabs, sandwich panels and systems applied onsite using spraying or injection.

This document covers the use of polyurethane applications applied onsite using spraying and injection.

Polyurethane systems play a crucial role in energy efficiency policies for buildings that are based on using insulation to limit energy demands.

**Polyurethane systems provide the best solutions at the least thickness.**
1.1. Thermal insulation

Polyurethane is one of the most efficient insulators due to its low thermal conductivity and durability.

As well as being highly insulating, sprayed and injected polyurethane systems are applied continuously, without joins. This provides a strong seal that prevents air infiltration and provides a natural solution for places where walls meet and for common thermal bridges in buildings.

There is a whole range of polyurethane systems adapted to building needs based on the applicable regulatory requirements, the environment and the application conditions: facade, roof, floor, interior or exterior, available thickness, new work or renovation, etc.

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*Polyurethane’s low thermal conductivity is not compromised by external agents such as moisture or airborne dust.*
1.2. **Acoustic insulation**

Construction elements used to divide spaces, such as floors and separating walls between dwellings have greater acoustic requirements. Specific polyurethane systems are recommended for use in these situations, either in combination with other systems or employed independently.

The range of polyurethane systems that can be used for acoustic insulation is smaller and is characterised by open-cell internal structures, which give the foam the appropriate absorption coefficient for a variety of applications.

Sprayed polyurethane is applied continuously and adheres to the supporting structure, creating a “sealed effect” that seals the enclosing structure, helping insulate against airborne noise.

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**Features of polyurethane for acoustic insulation**

- Acoustic absorption
- Dynamic stiffness
- Air flow resistance
1.3. **Waterproofness and vapour permeability**

Sprayed polyurethane foam is waterproof, which sets it apart from other insulating materials.

Sprayed polyurethane does not absorb water. Because it is applied continuously and adheres to the supporting structure, it acts as a waterproof barrier on facades, protecting against water infiltration.

Although waterproof, sprayed polyurethane allows vapour to pass through. This should be controlled where necessary using an additional vapour barrier.

This is the case for roofs where waterproofing is applied over the sprayed polyurethane. An asphalt emulsion applied to the supporting structure prior to the polyurethane provides the vapour barrier.

- **Degrees of waterproofness**
  - Polyurethane foams have different degrees of waterproofness depending on the closed-cell percentage of their microscopic structure.
  - There are two types of polyurethane foam, closed-cell (CC) and open-cell (OC).
1.4. Reaction to fire

Polyurethane is an organic material and, like most construction materials, has a certain degree of combustibility.

Unlike other plastics, polyurethane is a thermostable product. It does not melt and chars without producing flaming droplets.

The European classification system allows for and requires both the classification of products individually and in their end role as part of a construction system, where their actual reaction to fire performance can be established.

**Polyurethane system classifications**
- C-s3,d0
- D-s3,d0
- E

**End use classifications**
- B-s1,d0
- B-s2,d0
- B-s3,d0
1.5. **Interior air quality and environment**

Polyurethane is harmless to human health, as demonstrated by many of its applications. Once installed, it remains inert throughout its useful life and does not generate harmful emissions.

The polyurethane spraying process produces a reaction between the two components that make up polyurethane (polyol and isocyanate), which is why professional appliers use the appropriate protection equipment.

After it has been sprayed, polyurethane foam remains inert.

The main environmental benefit of polyurethane is the energy efficiency provided by maximum insulation at the minimum thickness.

This resource efficiency is manifested in two phases:

- Energy savings in the building use phase.
- In the construction phase. Polyurethane enables lighter structures with fewer material requirements than other, denser insulation solutions that require greater thickness to provide the same insulation levels.

In terms of waste management, sprayed and injected polyurethane is characterised by minimal waste generation during application, no offcuts and optimum thicknesses.

Polyurethane waste can be handled in various ways:

- Reused in other applications.
- Chemically recycled back to a raw material.
- Incinerated to generate energy.

Other benefits of polyurethane:

- It is not a breeding ground for mould or bacteria.
- It cannot be eaten by insects.
- It does not contain fibres that are harmful to the respiratory system.
- It does not absorb moisture.
- It does not absorb dust or dirt.
2. Building applications

The versatility of polyurethane systems and installation technologies give rise to many building insulation applications.

Polyurethane insulation foam forms part of the complex construction elements that comply with current regulations.

In all cases, polyurethane insulation foam forms a continuous layer over the surface to which it is applied, with no joins or thermal bridges.
3. Vertical walls, facades and partitions

3.1. Ventilated facades

A ventilated facade is an exterior enclosure construction system comprising an inner sheet, a ventilated air chamber with an insulating layer and a discontinuous, unsealed outer sheet.

Polyurethane spray offers numerous benefits for ventilated facades:

- Exterior insulation prevents thermal bridges.
- The waterproof nature of polyurethane protects the facade from water infiltration.
- Polyurethane is the thinnest way of providing maximum insulation.
- The sealed effect of the interior sheet provides improved acoustic insulation.
- Polyurethane enables the passage of water vapour, limiting the risk of condensation.
- Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.
- Its adherence to the interior wall without the need for fixing elements enables the sealing of cracks and prevents air infiltration, which is a cause for energy loss and less comfort for the user.
- It is resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without coming loose or deteriorating in other ways.
- This application complies with current fire safety regulations covering external wall systems.
3.2. Interior facade insulation

This facade construction solution comprises a primary exterior sheet, polyurethane sprayed into the air chamber and internal plasterboard.

The internal plasterboard can be dry or wet.

Polyurethane spray offers numerous benefits for internally insulated facades:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray technology enables easy treatment of thermal bridges.</td>
<td></td>
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<tr>
<td>The waterproof nature of polyurethane protects the facade from water infiltration.</td>
<td></td>
</tr>
<tr>
<td>Polyurethane is the thinnest way of providing maximum insulation.</td>
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</tr>
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<td>The sealed effect of the interior sheet provides improved acoustic insulation.</td>
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<tr>
<td>This application complies with current fire safety regulations covering interior wall systems.</td>
<td></td>
</tr>
</tbody>
</table>

Source: ATEPA

Features of polyurethane for acoustic insulation of internal partitions

- Acoustic absorption
- Dynamic stiffness
- Air flow resistance
3.3. Chamber injection

This construction solution is commonly used when renovating facades that have an accessible air chamber.

The wall comprises the existing primary exterior sheet, the new layer of injected polyurethane and the existing internal plasterboard.

Polyurethane injected into the air chambers of existing facades provides numerous benefits:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⬤</td>
<td>Polyurethane provides the best insulation for the width of the chamber.</td>
</tr>
<tr>
<td>🎧</td>
<td>The sealed effect provides improved acoustic insulation.</td>
</tr>
<tr>
<td>🌸</td>
<td>Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.</td>
</tr>
<tr>
<td>🏷</td>
<td>Its adherence to the supporting element enables the sealing of cracks and prevents air infiltration, which is a cause for energy loss and less comfort for the user.</td>
</tr>
<tr>
<td>☀️</td>
<td>It is resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without coming loose or deteriorating in other ways.</td>
</tr>
<tr>
<td>🔥</td>
<td>This application complies with current fire safety regulations covering interior wall systems.</td>
</tr>
</tbody>
</table>

Certain conditions must be met for this application:

- Polyurethane foam is injected through drill holes spaced no more than 1 m apart.
- Injection should commence through holes situated at the bottom of the structure, slowly filling the chamber from the bottom up, as the material should saturate the volume of the chamber without creating excessive tension or cracking the plasterboard. The narrower the chamber, the more care must be taken.
- Preliminary inspection is required so that filling of the chamber is not hindered by foreign objects inside.
3.4. Insulation and waterproofing of underground walls

This application takes advantage of two of polyurethane’s main features – the thermal insulation of polyurethane foam and its waterproof qualities.

Polyurethane spray offers numerous benefits for underground walls:

- Exterior insulation prevents thermal bridges.
- The waterproof nature of polyurethane protects the underground wall from water infiltration.
- The watertightness of sprayed polyurethane foam allows it to be used as an anti-radon membrane.
- Polyurethane is the thinnest way of providing maximum insulation.
- Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.

Certain conditions must be met for this application:

- The density of the polyurethane foam used should be at least 45 kg/m³, ensuring a compressive strength greater than 200 kPa.
- Although dependent on thermal requirements, it should always be at least 4 cm thick.
- If it cannot be guaranteed that the surface of the polyurethane foam will not degrade during run-off from the ground, an anti-punching layer should be placed between both materials.

Anti-radon protection

- Underground walls and floor slabs in contact with the ground are the construction elements closest to the soil, considered the main source of radon gas contamination.
- Radon gas is toxic and harmful to the quality of air inside buildings.
- Polyurethane foam can act as an anti-radon membrane in some cases.
4. Horizontal walls, roofs, floors and ceilings

4.1. Flat roofs

Flat roofs consist of a strong supporting element, an insulation layer, waterproofing and finishing.

Such roofs are conventional or inverted, depending on the order in which the insulation and the waterproofing are applied. Whether they can be walked on depends on the type of finishing used.

Polyurethane spray offers numerous benefits for flat roofs:

- **Spraying technology** provides a perfectly adhered, continuous insulation layer, without joins, offcuts or overlaps.
- **Polyurethane’s impermeability** helps waterproof the roof.
- **For inverted roofs**, the impermeability, continuity and adhesion of sprayed polyurethane prevent water from flowing between the insulation and the waterproofing.
- **Polyurethane** is the thinnest way of providing maximum insulation.
- **Polyurethane enables** the passage of water vapour, limiting the risk of condensation.
- **Polyurethane is harmless to humans and environmentally friendly** due to its efficiency and durability.
- **It is mechanically resistant** while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without shrinkage or deterioration.
- **This application complies with current fire safety regulations covering external wall systems.**

Vapour barrier

- **Conventional roof.** When the waterproofing is placed over the thermal insulation, a vapour barrier should be placed on the warm face, between the support and the insulation.
- **Inverted roof.** When the waterproofing is placed beneath the thermal insulation, the waterproofing itself forms a vapour barrier on the warm face.
4.2. Pitched roofs

Pitched roofs consist of a strong supporting element, an insulation layer and finishing.

The most common finishes are tiles, slate or a waterproof membrane. All types require an attachment system using battens or adhesive strips.

Polyurethane spray offers numerous benefits for pitched roofs:

- Spraying technology provides a perfectly adhered, continuous insulation layer, without joins, offcuts or overlaps.
- Polyurethane’s impermeability helps waterproof the roof.
- Polyurethane is the thinnest way of providing maximum insulation.
- Polyurethane enables the passage of water vapour, limiting the risk of condensation.
- Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.
- It is mechanically resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without shrinkage or deterioration.
- This application complies with current fire safety regulations covering external wall systems.

Vapour barrier

- If a waterproof membrane finish is laid on the polyurethane foam layer, a vapour barrier should be placed between the strong supporting element and the insulation.
- When the finish is based on tiles or slate (or any discontinuous elements), a vapour barrier is not necessary because the vapour permeability of the enclosure is guaranteed.

Source: ATEPA
4.3. Roof slab insulation

On this type of pitched roof, the insulation is placed on the horizontal roof slab, between the boards that form the slope of the pitched roof.

Polyurethane sprayed onto the roof slab beneath a pitched roof (between the supporting boards) offers numerous benefits:

- Spraying technology provides a perfectly adhered, continuous insulation layer, without joins, offcuts or overlaps.
- Polyurethane is the thinnest way of providing maximum insulation.
- Polyurethane enables the passage of water vapour, limiting the risk of condensation.
- Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.
- It is mechanically resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without shrinkage or deterioration.
- This application complies with current fire safety regulations covering external wall systems.

Vapour barrier

- If the air chamber beneath the roof is ventilated, there will be no risk of condensation.
- If the chamber is not ventilated and the roof has a waterproof membrane finish, a vapour barrier between the strong supporting element and the insulation is recommended.
- If the chamber is not ventilated and the roof finish is based on tiles or slate (or any discontinuous elements), a vapour barrier is not necessary because the vapour permeability of the enclosure is guaranteed.

Source: ATEPA
4.4. Roof repair

Sprayed polyurethane foam insulation is the most effective solution for repairing all types of roofs due to the versatility that its application technology offers.

It can be applied internally or from the exterior onto a range of roof types: fibre cement, metal or tiled.

The use of polyurethane spray for roof repair offers numerous benefits:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Bridge</td>
<td>Spraying technology provides a perfectly adhered, continuous insulation layer, without joins, offcuts or overlaps.</td>
</tr>
<tr>
<td>Umbrella</td>
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</tr>
<tr>
<td>Triangle</td>
<td>Polyurethane is the thinnest way of providing maximum insulation.</td>
</tr>
<tr>
<td>Waterfall</td>
<td>Polyurethane enables the passage of water vapour, limiting the risk of condensation.</td>
</tr>
<tr>
<td>Flower</td>
<td>Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.</td>
</tr>
<tr>
<td>Fire</td>
<td>It is mechanically resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without shrinkage or deterioration.</td>
</tr>
<tr>
<td></td>
<td>This application complies with current fire safety regulations covering external wall systems.</td>
</tr>
</tbody>
</table>
4.5. Ceilings

In this construction solution, the polyurethane foam is sprayed under the roof slab before the ceiling is installed.

Polyurethane spray offers numerous benefits for ceilings:

- Spraying technology provides a perfectly adhered, continuous insulation layer, without joins, offcuts or overlaps.
- Polyurethane is the thinnest way of providing maximum insulation.
- Polyurethane enables the passage of water vapour, limiting the risk of condensation.
- Polyurethane is harmless to humans and environmentally friendly due to its efficiency and durability.
- It is mechanically resistant while being light and stable. It is not affected by dirt, dust or moisture. It maintains its shape without shrinkage or deterioration.
- This application complies with current fire safety regulations covering external wall systems.

4.6. Floors

In this construction solution, polyurethane foam is sprayed onto the floor slab before the floor is installed.

Polyurethane spray offers numerous benefits for floors (see table above):
4.7 Waterproofing of roofs, balconies, parking areas and other surfaces.

This construction solution is based on a pure polyurea elastomer system formed by the reaction of two fast-drying liquid components applied by mechanical spraying. Once applied, it creates a continuous, high-strength, waterproof coating.

Polyurea waterproof membranes offer numerous benefits:

- The main feature of this waterproofing system is that it uses no joins or unions. Its uniform finish creates an easy-to-maintain surface.

- The versatility of pure polyurea means it is adaptable to any surface or supporting element. This makes it the ideal product to be applied in irregularly shaped areas, whether curved or squared.

- Polyurea adheres to any surface, such as cement, concrete, polyurethane, wood, metal, etc.

- It is very tough and resistant to wear.

- The fast-reacting pure polyurea provides excellent stability after installation. It is waterproof and can be walked on in less than three hours, although it takes 24 hours before reaching optimum condition.

- Once applied it is highly durable, unaffected by temperature changes and retains its properties without breaking or deforming. Nor is it affected by fuels, fertilisers or animal excrement.
4.8. Polyurea applications

Polyurea can be used on a wide variety of surfaces, including concrete, polyurethane foam, wood, ceramics, metal, etc.

- **Piping.** Offering a protective coating against external and internal agents, it is ideal for use as a pipe coating.
- **Pools.** Pool lining.
- **Gardens.** Waterproofing of gardens and roof gardens.
- **Terraces.** Waterproofing of all types of foot traffic surfaces exposed to the elements or corrosive environments.
- **Fibre cement coating.**
- **Parking areas.** Trafficable surfaces that need to be resistant, waterproof and anti-static.
- **Tanks.** Protective coating against leaks from tanks, including those holding chemicals.
- **Cold rooms.** For agri-food industries in need of a bacteria-free environment, resistant to wear and corrosion.
- **Electrical cabinets.** For its anti-static properties; especially useful for preventing static build-up in explosives warehouses, lifts, operating theatres and other places that need to be free of this type of charge.
- **Aquatic facilities.** Provides safe, durable waterproofing for aquariums and fish farms.
CATALOGUE of APPLICATIONS