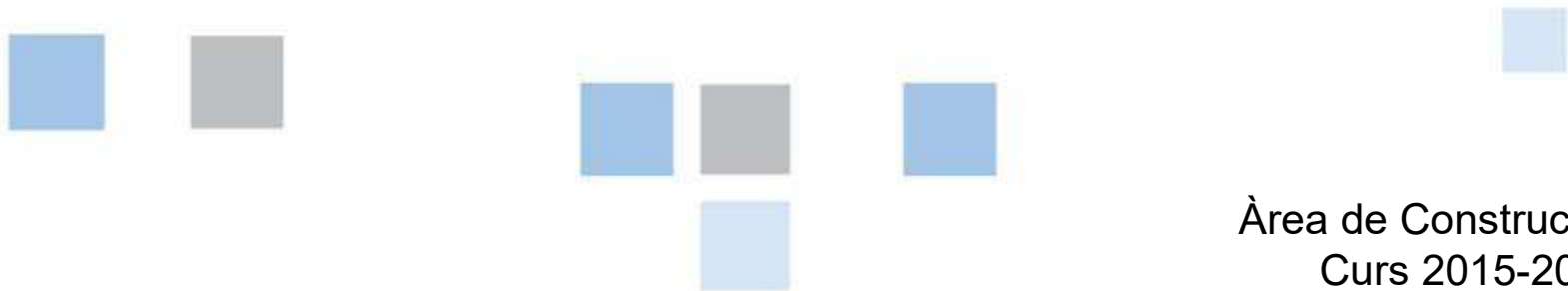




# WATERPROOF MATERIALS

## CONFORT

Construcció II. Construcció mineral. 2n curs



**Water comfort****WATERPROOFING. Continuous sheet**

	APLICATION	FORMAT	resistant against UV		PRODUCT
Àrea de Construcció Pàg. 2/21	<b>INORGANIC</b>	ON-SITE FORMATION	POWDER & WATER: AMORPHOUS CLAY MASS	YES	<b>CLAY</b>
			MORTAR / WITH ADDITIVES / WITH MESH	YES	<b>WATERPROOF MORTARS</b>
	<b>ORGANIC</b>		RESIN PAINT / WITH MESH	YES	<b>EPOXY RESIN (EPOXI)</b>
	Synthetic		EMULSION / WITH MESH	YES	<b>RUBBER</b>
			RESIN PAINT / WITH MESH	YES	<b>LATEX</b>
			SPRAYED LIQUID MEMBRANE	YES-NO	<b>POLYUREA</b>
			SPRAYED LIQUID MEMBRANE	YES-NO	<b>POLYURETHANE</b>
		SHEETS	ADHESIVE OR AIR WELDED ROLLS	YES-NO	<b>PVC (POLYVINYL CHLORIDE)</b>
			AIR WELDED ROLLS	YES	<b>TPO: ETHYLENE AND PROPYLENE OLEFINA</b>
			VULCANIZED WELDED ROLLS	YES	<b>EPDM (SYNTHETIC RUBBER)</b>
		BLANKETS-TRAYS	FORMED AND WELDED AT FACTORY	YES	<b>EPDM (SYNTHETIC RUBBER)</b>
	Bitumen	ON-SITE FORMATION	PASTE EMULSION	NO	<b>ASPAHLT PAINT</b>
		SHEETS	FABRIC ROLLS, BLOWTORCH WELDING	NO	<b>LO OXIASPHALT</b>
			FABRIC ROLLS, BLOWTORCH WELDING	NO	<b>LOM MODIFIED OXIASPHALT</b>
			FABRIC ROLLS, BLOWTORCH WELDING	NO	<b>LAM MODIFIED TAR</b>
			FABRIC ROLLS, BLOWTORCH WELDING	NO	<b>LBM MODIFIED BITUMEN</b>
			FABRIC ROLLS, BLOWTORCH WELDING	NO	<b>LBME EXTRUDED MODIFIED BITUMEN</b>
	SHEETS WITH MULTIPLE LAYERS	FABRIC ROLLS, BLOWTORCH WELDING	YES	<b>SELF-PROTECTED USING METALS</b>	
		FABRIC ROLLS, BLOWTORCH WELDING	YES	<b>SELF-PROTECTED USING SLATE</b>	

## Water comfort

### WATERPROOFING. Continuous sheet

#### Material's requirements and installation

**Waterproofing system for a continuous sheet:** or it has no joints from manufacture or continuity has to be done at a site.

#### 1. Physical characteristics:

- Waterproof or water tightness properties of the membrane
- Capacity in order to get the joint's water tightness when the sheet is not continuous
- Resistances against heat and sudden temperature changes
- Dimensional stability

#### 2. Movements:

- Ability to strengthen or shrink without breaking or altering the sheet (elasticity) in order to absorb movements with a thermal origin.

#### •3. Mechanical resistance:

- Tensile strength (in order to absorb the building's movements without breaking)
- Strength against punching (or protection against punching)
- Strength against abrasion (or protection against weathering)
- The sheet can incorporate meshes and fabrics

#### 4. Chemical compatibilities

- UV stability (or protection against UV)
- Chemical compatibility between the different components: See chart on the following link:

<http://www.salleurl.edu/tecnologia/eng/teoria.html>

#### •5. Formable material

- Ability to bend and adapt to complex geometries

## Water comfort

### WATERPROOFING. **Waterproof membranes materials**

#### **BITUMINOUS :**

**Asphalt** : Sticky, solid or pasty material (depending on the temperature) black or dark-brown coloured.

**Tar** : Obtained by carbonization of mineral coal, or by distillation of **wood coal**

**Bitumen** : Obtained from residues of the oil distillation

**Natural bitumen** : come from the oil distillation. Natural hydrocarbons (solids or semi-solids)

#### **ELASTOMERIC :**

**Elastomers** : Polymeric materials that can be extremely elongated at room temperature, at least twice the original length, and recover the original size when stress is released.

**Rubber**: Natural polyisoprene (Latex) from a tree (*Hevea brasiliensis*)

**Butyl rubber**: Isobutylene Isoprene Butyl, synthetic rubber

**Epdm** : Ethylene Propylene Diene monomer, synthetic rubber some more resistant to UV than butyl

**PVC** : polyvinyl chloride, is a synthetic resin obtained by polymerization of vinyl chloride

**Polyurethane/Polyester/Polyethylene** : synthetic polymeric resins

## Water comfort

### WATERPROOFING. What do we need to know?

#### Formats

We need to know which type of application it has  
We need to know if we can combine it with other materials  
We do not need to know its dimensions or thickness: we look it up in a catalogue

#### Characteristics

We need to know the characteristics which qualify the element, especially if it is affected by UV and outdoor.  
We need to know its chemical compatibility (If you are not sure, you must know where to find this exact information)  
We do not need to know its exact economic price, nor its exact ecological footprint value: these are values we can consult in a catalogue.  
We need to have an idea of its composition and its process of installation (these two predetermine the above values)

#### Applications:

We need to know the most common. (this will be explained in further classes)

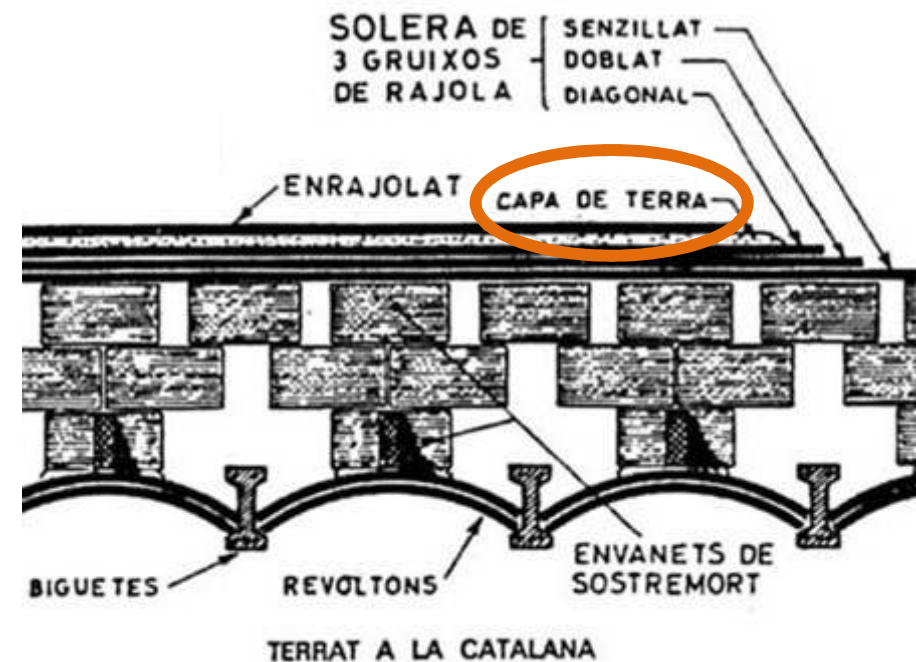
#### Identification:

We need to visually identify the most common products (without doubt)

## Water comfort

### WATERPROOFING. clay

- Formats** Amorphous, kneading and applied by hand. Special clay, not all are valid
- Features:** Very little footprint if extracted from sources close to the work  
Very little water resistance to abrasion and dissolution.
- Applications:** Valid only in little rainy climates or as complementary waterproofing inbetween layers that protect it (Catalan roofing)



Font: Benavent de Barberà. *Com he de construir*. Ed. Bosch

## Water comfort

### WATERPROOFING. mortars

#### Formats

Cement based mortars and minerals or organic additives that improve the water tightness.

Can have mesh reinforcement

Variable thickness depending on product, not less than 1 cm. each coat layer

#### Features:

Vary greatly from one product to another. There are many very specific products for each requirement. Consult always catalogs

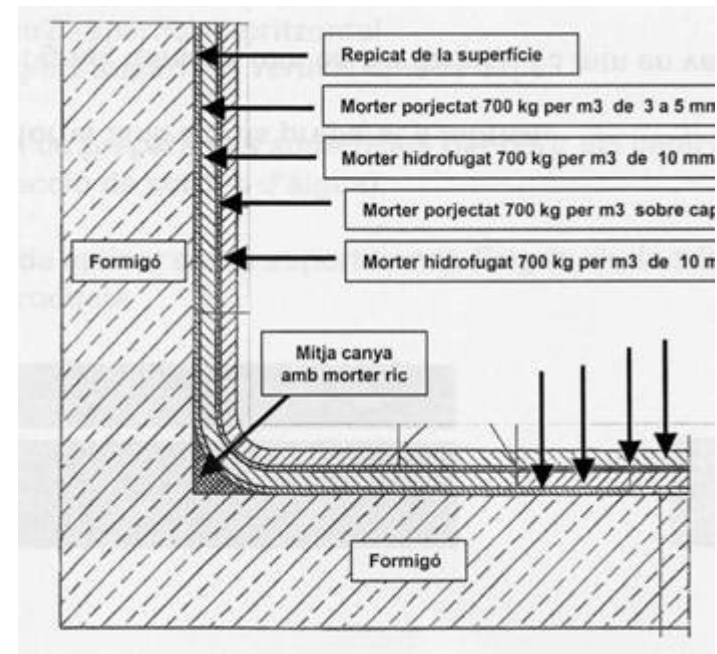
Chemically complex

They are usually able to set and adhere to support in presence of water

#### Applications:

Waterproofing of interior spaces and reparations

Adherence of small roof elements



Mercat de Santa Caterina. Barcelona, 1997-2005. EMBT

## Water comfort

### WATERPROOFING. Emulsion of acrylic rubber

#### Formats

Emulsion can have reinforcement or not  
Application of several consecutives and crossed layers.  
Approximated thickness of 0.5 cm for each layer

#### Features:

Continuous layer  
Manual application with roller. Easy to install.  
Can be the finishing of the roof.  
Several color finish. It can also be transparent  
Low cost because there is no need of more applications. (if faced)  
Outdoor resistance limited.  
Compatible with other waterproofing materials

#### Applications:

Usually applied for repairs, but also for new construction





## Water comfort

### WATERPROOFING. Latex, polyurethane and / or poly-urea

- Formats** Liquid membrane can incorporate reinforcement or not  
Application with several consecutive layers  
Approximately 0.4 cm thick
- Features:** Continuous layer  
Large elastic capacity, not need of joints  
Requires regular support and smooth but perfectly suited to complex geometries.  
Good adherence to the support  
Sprayed manual application (some products are applied with rolls)  
Quick placement  
Can be the finishing of the roof  
Several colors of finishing, usually white  
High cost of material
- Applications:** Usually applied in new construction of large dimensions



## Water comfort

### WATERPROOFING. Epoxy resins

#### Formats

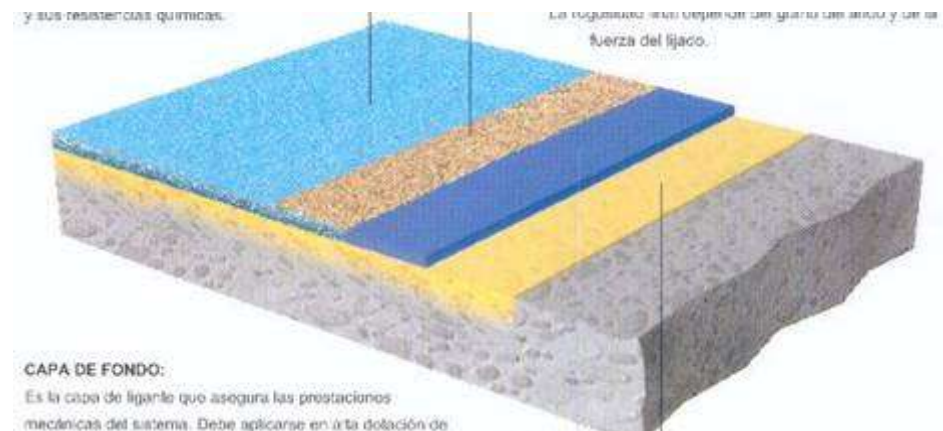
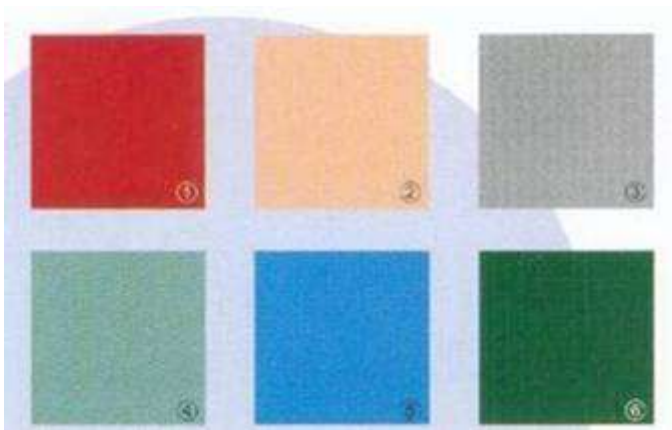
Two-component paste. It can wear reinforcement or not  
Application of a single coat + primer + finishing  
Approximately 0.3 cm of thickness

#### Features:

Continuous layer  
Requires regular support, but it can suite to complex geometries.  
Very good adherence to the support  
Manual application  
High mechanical resistance capacity  
High resistance to all kinds of chemicals  
Can be as finishing. Multiple colors for finishing  
High cost material

#### Applications:

Waterproofing of industries, overflows and hidden showers plates  
They are usually not installed for roofs (due to the high cost), but are used as an a adhesion primer on continuous roofs



## Water comfort

### WATERPROOFING. PVC polyvinyl chloride

Flexible **PVC** sheets which are obtained by **calendaring** or by extrusion. These sheets are manufactured from virgin resins which guarantee constant characteristics and an optimum durability.

Applications: reservoirs, lakes, dams, channels, waters, roofs

These sheets have a lot of stability against UV  
(different variations depending if they are placed outside or hidden)

Guarantee a 10 year durability

Can be placed without protection with thickness of 1,2 mm.

Resist swelling and leveling.

Have a great deformability and a high resistance to its welds.

High resistance against **punching**

Resistance against roots

Does not resist against asphalts, oils, nor **tars**.



## Water comfort

### WATERPROOFING. PVC polyvinyl chloride

- Formats** Membrane can have reinforcement, but not usually  
Application of only one layer, in rolls of 1.5 m wide (usually)  
Approximately 0.2 cm of thickness
- Features:** Discontinuous layer  
Hot air welding or chemical welding (tetrahydrofuran)  
High physical resistance  
It can be the finishing of the roof it is prepared to withstand UV  
Limited ability to be folded. Requires special pieces for complex geometries  
Not compatible with other membrane waterproofing materials
- Applications:** Usually applied on large areas of simple geometries



Soldadura química

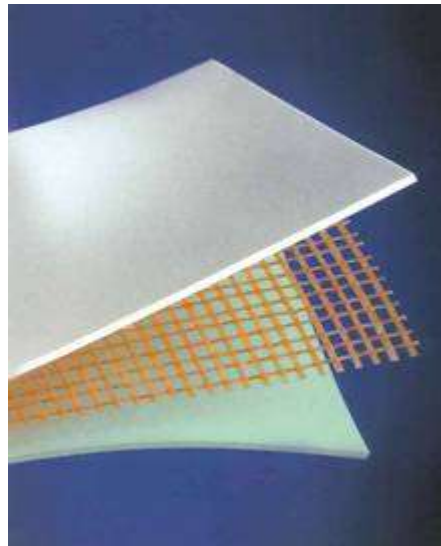


Soldadura per aire calent

## Water comfort

### WATERPROOFING. TPO polyolefin ethylene and propylene

<b>Formats</b>	Reinforced membrane Application of only one layer, rolls of 1.94 m wide Thickness 0.114 and 0.152 cm
<b>Features:</b>	Discontinuous layer composed of two materials Hot air welding High physical and chemical resistance Lightweight Can support the finishing of the roof, UV resistant Limited ability to be folded. Requires special pieces for complex geometries Compatible with other membrane waterproofing materials
<b>Applications:</b>	Usually applied on large areas of simple geometries



Soldadura tèrmica

## Water comfort

### WATERPROOFING. EPDM rubber in roll

- Formats** Membrane  
Application of only one layer, rolls of 1.5 m wide (usually)  
Common thicknesses from 0.1 to 0.2 cm
- Features:** Discontinuous layer  
Welding with chemical adhesive or with auto-adhesive band for vulcanization  
High physical resistance  
High dimensional stability  
Can be the finishing of the roof, withstands UV rays  
Very flexible  
Limited ability to be folded. Requires special pieces for any geometry  
Difficulty getting flatness if not adhered to support  
High cost  
Various colors of finish, usually black
- Applications:** Usually applied to large surfaces with high demands and that require reliability



## Water comfort

### WATERPROOFING. EPDM in blanket

<b>Formats</b>	Blanket, which can be three-dimensional Application of only one piece for each roof slope. Up to 1000 m <sup>2</sup> of roof surface Usual thickness 0.2 cm
<b>Features:</b>	Continuous layer Welding in factory by vulcanization of several pieces High physical resistance High dimensional stability Can be the finishing of the roof, supports UV rays Very flexible Very difficult to achieve flatness if it is not adhered to the support High cost
<b>Applications:</b>	Usually applied to large surfaces with high demands and that require reliability. Flooded roofs



## Water comfort

### WATERPROOFING. Asphalt paint

#### Formats

Paint, emulsion  
Application of one or more layers  
Common thicknesses from 0.1 to 0.2 cm

#### Features:

Continuous layer  
Application with brush or roller  
Very little physical resistance  
Does not withstand UV rays  
Needs a very clean and not very smooth surface to adhere well to the support  
Low cost

#### Applications:

Usually applied to vertical surfaces that are not going to be faced but protected: retaining walls, sills, railings and balconies, sealing of joints

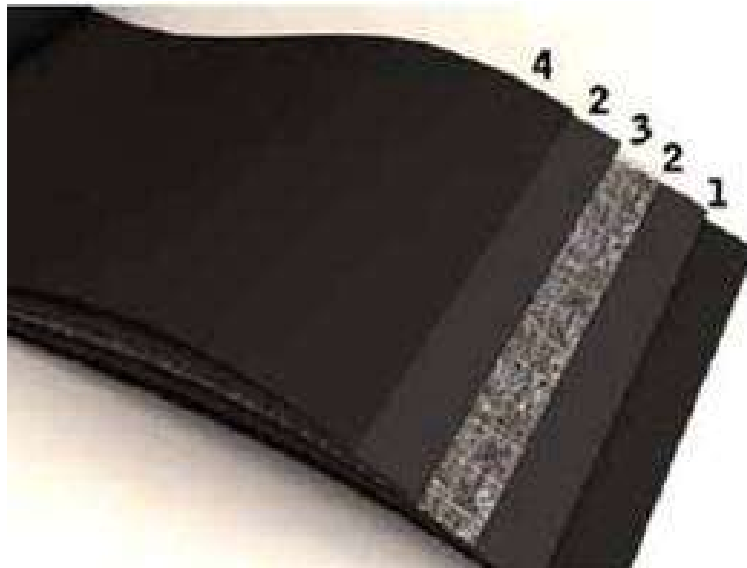




## Water comfort

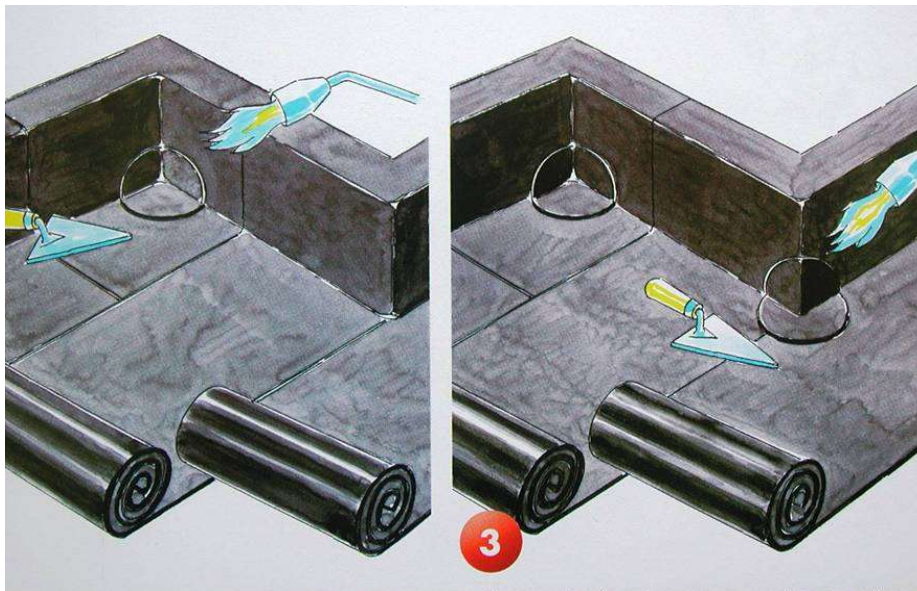
### WATERPROOFING. Asphalt membrane

- Formats** Oxidized asphalt membrane (oxiasphalt), bitumen, modified bitumen and modified tar  
Application in one or varies layers, in rolls of 1m wide  
Common thicknesses from 0.2 to 0.3 cm (identified by the weight / m2)
- Features:** Discontinuous layer  
Blowtorch welding  
Low physical resistance  
Average flexibility. Lost with the pass of time (10 year warranty)  
No withstanding of UV rays  
Needs a clean surface to adhere to the support  
High ability to be folded, adapts by warming to complex and irregular surfaces  
Average cost
- Applications:** Usually applied to small and medium-sized roofs



## Water comfort

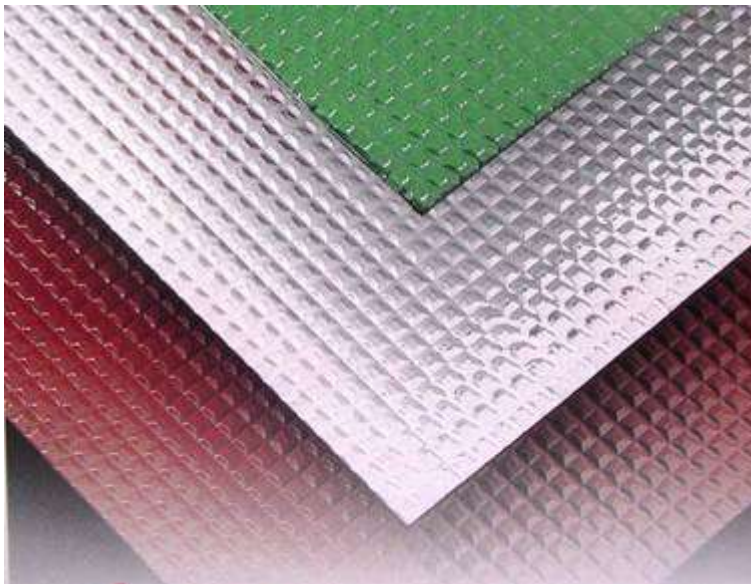
### WATERPROOFING. Asphalt membrane



## Water comfort

### WATERPROOFING. Self-protected asphalt membrane

- Formats** Oxidized asphalt (oxiasphalt) and modified bitumen membranes with a metallic face  
Application of one layer and in rolls of 1 m wide  
Common thicknesses from 0.2 to 0.3 cm (identified by the weight / m<sup>2</sup>)
- Features:** Discontinuous layer composed of two waffled materials  
Blowtorch welding  
Low physical resistance  
Average flexibility. Lost over time  
Withstands UV rays  
High ability to be folded, adapts by warming to complex and irregular surfaces  
Average cost
- Applications:** Usually applied to small and medium-sized roofs as a finish or as reinforcement of sealing.



Arena de Picasso. Marne la Vallée, França, 1983-84. Manolo Núñez.

## Water comfort

### WATERPROOFING. Self-protected asphalt membrane

- Formats** Modified bitumen sheet of slate on one side  
Apply a layer rolls 1 m wide  
Common thicknesses from 0.2 to 0.3 cm (identified by the weight / m<sup>2</sup>)
- Features:** Discontinuous layer composed of two materials attached  
Welding flame  
Endurance rating  
Flexibility half. The lost over time  
It supports UV  
High ability to be folded, adapted to warm, complex and irregular surfaces  
Cost half
- Applications:** Usually applied to small and medium-sized covered as a finish or as reinforcement sealing.



## Water comfort

### WATERPROOFING. Polyethylene sheets

- Formats** High density polyethylene sheet  
Application of a layer of rolls with a width of 5m  
Common thickness from 0,2 – 0,3 cm (are identified by their weight/m2)
- Characteristics** Excellent thermal and chemical resistance  
Very good resistances against impacts  
Flexible, even in low temperatures  
Tenacious  
It has a very lightweight. Its density is equal to or smaller than 0.952 g/cm<sup>3</sup>.  
Can be placed outside  
Recyclable product  
Average economic cost
- Applications:** Usually applied to roofs with big dimensions and to public works.

