TECNO MAGAZINE by TECNOPOL

PRACTICAL GUIDE

MOISTURE IN CONCRETE

- HOW TO KNOW IF THE CONCRETE IS SUFFICIENTLY DRY?
- ADVICE ON AVOIDING DAMP RELATED PROBLEMS

TECNOFOAM G-2060
FOAM DESIGNED FOR INSULATION OF INVERTED ROOFS

CASE STUDIES
THREE EXAMPLES OF WATERPROOFING ROOFS WITH DESMOPOL

CERTIFICATIONS
PRIMER WET OBTAINS TWO NEW CERTIFICATIONS


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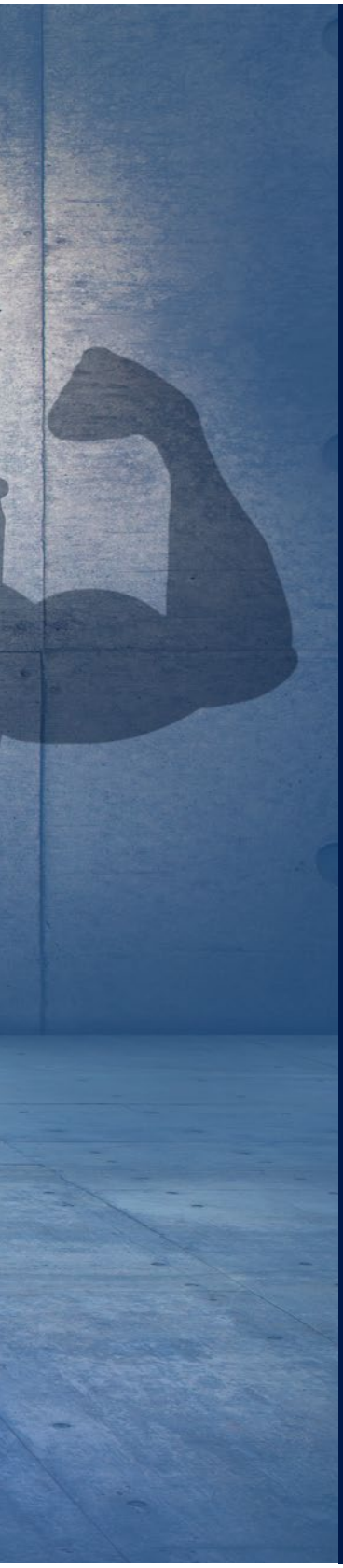

SUMMARY

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WE PRESENT

TECNOFOAM G-2060

FOAM DESIGNED FOR INSULATION OF TRANSITABLE INVERTED ROOFS.

Excellent properties

We have extended our range of polyurethane foams with the inclusion of the new TECNOFOAM G-2060, a foam specifically formulated for the application and formation of high density polyurethane foam (±52~62 kg/m3).

This new foam replaces the previous TECNOFOAM G-2050 which has now been withdrawn from our catalogue. All the tests conducted with the new TECNOFOAM G-2060 have produced even better results than its predecessor, making it ideal for inverted roof systems in combination with TECNOCOAT P-2049 polyurea.

TECNOFOAM G-2060 is a completely closed cell foam, a composition which directly influences its fundamental properties, such as thermal conductivity, absorption and waterproofing, permeability to water vapour, dimensional stability and resistance to compression.

A system suitable for all roof surfaces

Roofs which use a system with a high density and resistance to compression are normally considered transitable. In the TECNOFOAM G-2060 + TECNOCOAT P-2049 system, the high compression resistance of the polyurethane foam, the formation of a regular surface thanks to "closed cell" nature, together with the high resistance of the polyurea, allow the creation of a system which is ideal even for vehicle traffic purposes.

It is also a system widely used in all types of roofs (inclined or otherwise) with insulation and waterproofing requirements: roofs for farms, industrial warehouses, shopping centers, etc.

TECNOFOAM G-2060 allows the application of a polyurea membrane over its exterior coat in a continuous form without the risk of "pinholes" or bubbles forming.

GENERAL FEATURES

1. TECNOFOAM G-2060 is a product with high insulating capacity, easy to apply covering all surfaces.

2. The application and formation of the foam are carried out means a spray equipment.

3. It is specially designed to be coated with TECNOCOAT P-2049, without the appearance of bubbles, "pinholes" or other pathologies.

4. It does not emit any substance to the environment once installed.

5. The properties of this polyurethane foam system allow it to adhere to any surface such as concrete, ceramic, metal, polyurethane foam, wood, acrylic paints (checking the situation of areas recommended).

6. The application of TECNOFOAM G-2060 is completely continuous, instead of the classic non-continuous thermal insulation material , saving any kind of union between applications, and providing a optimum thermal insulation surface with high thermal insulation parameters

7. TECNOFOAM G-2060, is under european norme EN 14315-1:2013, thermal insulation products for buildings, in situ formed sprayed rigid polyurethane (PUR)

8. It has CE mark on the basis of a declaration of performance DoP prepared in accordance with EU regulation 305/2011. www.tecnopol.es or statement available on demand.

TECHNICAL PROPERTIES OF TECNOFOAM G-2060

Applied density	±52~62 Kg/m³
Thermal conductivity	0,023± 0,001 W/M•K
Stirring time	2 ~ 5 Seconds
Cream time	3 ~ 5 Seconds
Tact free time	9 ~ 12 Seconds
Fire reaction	Euroclasse E
Mixture ratio (Volume)	100/100
Application method	Spray equipment

PRACTICAL

MOISTURE IN CONCRETE AND COATINGS SENSITIVE TO DAMP.

Slabs of concrete are the system most used in the construction of all types of buildings and the use of concrete walls is ever more common. Sometimes the concrete surface may be left as a decorative feature in itself, while on other occasions it may be decided to cover it with coatings and finishes.

For the correct application of coatings sensitive to damp (including adhesives) an understanding is required of the source of the moisture within the concrete, the variations in damp during drying time, the factors which affect drying and the drying point after which coatings sensitive to damp may be applied.

We will go on to present a brief summary of how to determine the moisture content in concrete and how to interpret the information in order to obtain a realistic indication of whether the concrete drying point is suitable for applying the finishes.

The total degree of moisture within the concrete, whether water or water vapour, is known as the "moisture content" and is generally expressed as a percentage of the mass of the concrete.

Moisture may exist in the form of water (when the concrete is damp and the pores are saturated) or as water vapour. The amount of water vapour, and thereby the relative moisture within the concrete, varies significantly with time, depending on the degree of water vapour which entering or escaping from the concrete.

It is important to bear in mind that due to the miniscule capillaries of concrete, it may be almost saturated with water and yet have a moisture content of just 5%. This has implications for what is considered a "sufficiently dry" concrete surface.

SOURCES OF MOISTURE

The initial source of moisture in concrete is the water necessary for the internal chemical reaction involved at the time of mixing. Once the concrete has been poured there are many other sources of moisture; we will look at the most significant:

Moist curing

Moist curing is generally considered to be the most effective way of curing concrete to ensure a process of continual hydration. When it is required that the concrete dries in the shortest possible time, other curing methods should be considered which do not introduce more water.

Exposure to bad weather

If the concrete drying time is critical, it should be protected against re-moisturization. Rain falling on the concrete slabs and getting between the joins and wetting the under layer or ground will prolong the drying period.

Damp ground

For work involving concrete slabs on ground, vapour barriers or anti-damp membranes should be installed which comply with the requirements necessary to separate the concrete from possible sources of moisture. If they are installed correctly and are not damaged, they will reduce the transmission of moisture to a level which will not cause problems for the coatings sensitive to damp and the associated adhesives.

For concrete walls close to ground level, the damp under layers may be isolated from the structure using appropriate methods around the edge of the slap and damp testing coats.

Condensation

The presence of warm and damp air against a cooler wall or floor may result in moisture condensation which can be absorbed by the concrete itself. Moisture may also condense within the material.

Moisture from the adhesives and coatings

When these products are water based, some part may be absorbed by the concrete after application. The main problem is not the drying of this moisture, but the effect on the pH levels as alkalis dissolve close to the surface, which may in turn affect the adhesives or coatings applied. To avoid this adequate priming of the surface is recommended.

Cleaning the surface before applying finishes.

Cleaning with acid, detergent or high pressure water is often used to clean the concrete surface before applying the subsequent treatments and these processes may add a considerable amount of water to the concrete. Provided there is sufficient drying time, the possibility of employing other cleaning methods such as sandblasting should be considered.

Spillages, humid environments and surface cleaning.

During construction, activities involving the use of water should be kept away from drying concrete.

HOW TO KNOW IF THE CONCRETE IS SUFFICIENTLY DRY?

The major problem with damp in concrete is not knowing how much water there is in the concrete - but whether if it is moving towards or from the surface.

There are various methods for estimating the drying time required or determining when the concrete is sufficiently dry for the application of finishes or coatings sensitive to damp. These range from a general rule to quantitative tests:

General Rule.

This method simply establishes a drying time of one month for each 25 mm of concrete thickness from the end of curing or from the final re-moistening. As such, for each 100mm of thickness, four months will be required. The same thickness in a suspended slab or a wall which dries on both sides will only require half this time.

However, although these times are a reasonable approximation up to 100 mm of thickness, it has been discovered that the rate of drying is not linear and varies according to the thickness of the slab. For thicker elements and in particular if re-moistening occurs (damp dries at a lower rhythm in older concrete), the general rule is not a good method for estimating the drying time.

Water-cement ratio

For water-cement ratios of up to 0.5, the research indicates that period of approximately three months should provide sufficient drying time for a concrete slab of 100 mm thickness which dries from one side. Six months are suggested for a slab of 150 mm thickness and 12 months for a slab of 200 mm thickness. If the slab can dry from both sides, these periods may be reduced to half the time.

Swedish concrete association method

A method has been presented by which the standard drying time is adjusted taking into account the water-cement ratio, the thickness of the slab, drying on one or both sides, the temperature, the ambient humidity and the curing conditions. Through this method it is calculated that for a 100 mm slab, with 4 weeks curing, drying at 85% relative humidity on one side, in ambient conditions of 18ºC and 60% relative humidity, the drying period would be 116 days. If the slab dries on both sides, the drying time is reduced to 50 days.

All the methods mentioned so far only produce estimates for drying times, we will go on to describe other methods with objective measurements.

Vapour emission rate

This is a method developed after years of research. It is recommended that floor coatings sensitive to damp are not positioned until the vapour emission rate is below 25 g/m2/24 h. In contrast to the measurement of surface moisture, the vapour emission rate is an indication of the moisture remaining within the concrete.

Moisture content and/or relative humidity

Using this method it has been determined that coatings should not be applied until the moisture content is below 5.5% or the level of relative humidity does not exceed 70%.

The problem is that generally only the surface moisture is measured and, as mentioned above, the concrete may be totally saturated and continue to have a moisture content of lower than 5.5%.

If the manufacturer's recommendations are stricter than the 5.5% permitted under the rule, the period specified by the manufacturer should be used.

Gravimetric test for moisture content

Method which involves taking a core sample by making a dry cut in the slab and then drying the sample in an oven until it reaches a constant weight, and determining the moisture content via the difference in its initial and final weight. This is a very reliable method given that the moisture content measured represents the total weight of the concrete and not just the surface layer.

Rubber sheet test

A 500 mm x 500 mm square is positioned on the slab, away from windows and doors, and left for 24 hours before checking if signs of moisture appear on the underside, or if the concrete becomes darker in colour, indicating the presence of excess moisture.

Glass sheet test

Test similar to the above, but instead of removing the sheet, it is possible to inspect for signs of damp (darkening colour) through the glass.

Plastic sheet test

A square plastic sheet measuring 460 mm x 460, 0.1 mm thickness, is positioned on the concrete and sealed around the edges with adhesive tape. The sheet is removed after 16 hours and the area inspected for signs of damp.

Test panel

For large projects, a sample area will be coated and then assessed during an appropriate period of time. If the results are satisfactory the full application may proceed.

Test areas should be evenly distributed in areas where the existence of damp is suspected, avoiding areas exposed to direct sunlight and other sources of heat.

ADVICE ON AVOIDING CONCRETE DAMP RELATED PROBLEMS

Coatings sensitive to moisture may cause problems if the sufficient drying time is not respected. Faults such as "pinholes" or lack of adherence tend to occur when the appropriate drying time has not been followed and the application made onto a surface that was too damp. These problems may emerge even months after the application if the surface drying time has not been respected.

The following tips will help us avoid any inconvenient incidents related to damp surfaces:

1. Respect concrete drying time
2. Check the vapour emission rate or levels of relative humidity are acceptable.
3. Make sure there is a vapour barrier below the concrete slab.
4. Use breathable coatings, with a rate greater than 10g/m2/24h.
5. Avoid the use of heaters and/or fans to allow faster appliance of coatings, as these only dry the surface and not the core of the concrete.
6. Always use products which establish a solid join between the concrete and the surface. The Tecnopol range of primers comply with this requirement.
7. Apply the product at suitable temperatures avoiding extreme conditions.
8. In bi-component products, ensure appropriate doses and mixing of the components.
9. Correctly prepare the surface. All grouting, efflorescence, chemical or organic contaminants and dirt should be fully removed.
10. Check that all the curing components, release agents, formwork oils, etc. have been eliminated.
11. If it is not possible to allow sufficient surface drying time, never clean the concrete with water or acid based products before applying the coating. Dry abrasive blasting or other mechanical processes are recommended for preparing the surface.
12. Repair all surface imperfections in sufficient time to allow the material used to dry adequately.

coverage

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CASE STUDY

TWO EXAMPLES OF INTEGRATION INTO THE SURROUNDING ENVIRONMENT: CASA PANGAL AND THE RESTAURANTE CASA BOSQUE

Within the world of architecture and construction, we are growing ever more conscious of the importance of harmonious integration of buildings into their surroundings.

Within the rural surroundings of the project the use of natural materials and colours is of vital importance in contributing towards this integration. For this purpose a waterproofing system with Desmopol polyurethane membrane was used, which allows perfect adaptation to the peculiar form of the roof, and was finished off with a near saturated dusting with a matte red aggregate. This type of aggregate was selected for both its natural origin and tone, producing results in perfect harmony with the surroundings.

Casa Pangal is a sustainable construction, designed by the architect Sergio Andrade and located in el Fundo Cascada de las Animas, San José de Maipo (Santiago de Chile). It is a private residence, built on a foundation of tyres and employing reusable materials wherever possible, for example in the thermal insulation created with drinks cans, plastic bottles and cardboard. .

Restaurante Casa Bosque, also located in San José de Maipo and the work of the same architect, is a restaurant and events center which had inadequate waterproofing, performed with an asphalt membrane which needed to be repaired in the fastest possible time without affecting the business activity of the restaurant.

Both buildings, with their important aesthetic requirements and construction process, required optimum waterproofing, which was adaptable to the particular geometry of the roof, 100% safe and which would allow a completely natural appearance.

With the solution proposed for these two roofs by the APV company, the distributor and retail outlet for Tecnopol products in Chile, the functional properties of the Desmopol continuous waterproofing system with its liquid polyurethane membrane was successfully employed, while also achieving the desired aesthetic effect and integrating the building within its surroundings.

At **Casa Pangal 350m²** of roofing was waterproofed, while at the **Restaurante Casa Bosque**, the area of waterproofed roof surfaces amounted to around **1,400m²**

The same system was employed on both projects:

1. Preparation of the surface
2. Application of EPw 1070 PRIMER
3. Application of DESMOPOL polyurethane membrane in a brick red colour.
4. Application of PU 1000 PRIME as an adhesive for the aggregate
5. Sprinkling of matte red aggregate to saturation point
6. Application of TECNOTOP 2C Neutral protection as a final sealant coat.

Casa Bosque

Casa Pangal

WATERPROOFING WORK
CARRIED OUT WITH DESMOPOL
BY APV
www.apv.cl

CASE STUDY

WATERPROOFING SYSTEM FOR CONCRETE ROOF AT THE BASÍLICA SAGRADA FAMILIA

Among other building work at the Basílica de la Sagrada Familia waterproofing is currently underway on various roofs and exposed areas. In this article we will describe some of these procedures.

In the case which concerns us swift waterproofing was required to ensure the watertightness of one of the basilica's concrete roofs. It was decide to employ a solution using a continuous membrane of DESMOPOL polyurethane.

As we always recommend for this type of application, correct surface preparation is essential to guarantee optimum adherence to the surface membrane. On this occasion a mechanical blasting was employed in order to obtain a regular and smooth surface which would allow the correct attachment of the waterproofing system to the surface.

All the individual points were then sealed: joins, corners, folds etc., using PRIMER EP-1020 epoxy resin mortar, and MASTIC PU polyurethane putty, reinforcing these seals with TECNOBAND 100 self-adhesive geotextiles strips.

The entire surface was then primed by the application of a mineral bonding layer consisting of PRIMER EPw-1070 epoxy resin, which was followed by a DESMOPOL polyurethane continuous membrane, with added DESMOPLUS to increase resistance to breakage and reduce curing time.

Lastly, two layers of TECNOTOP 2C aliphatic polyurethane will be applied with a sprinkling of aggregate, to obtain a surface resistant to UV rays, and at the same time rugged with anti-slip properties.

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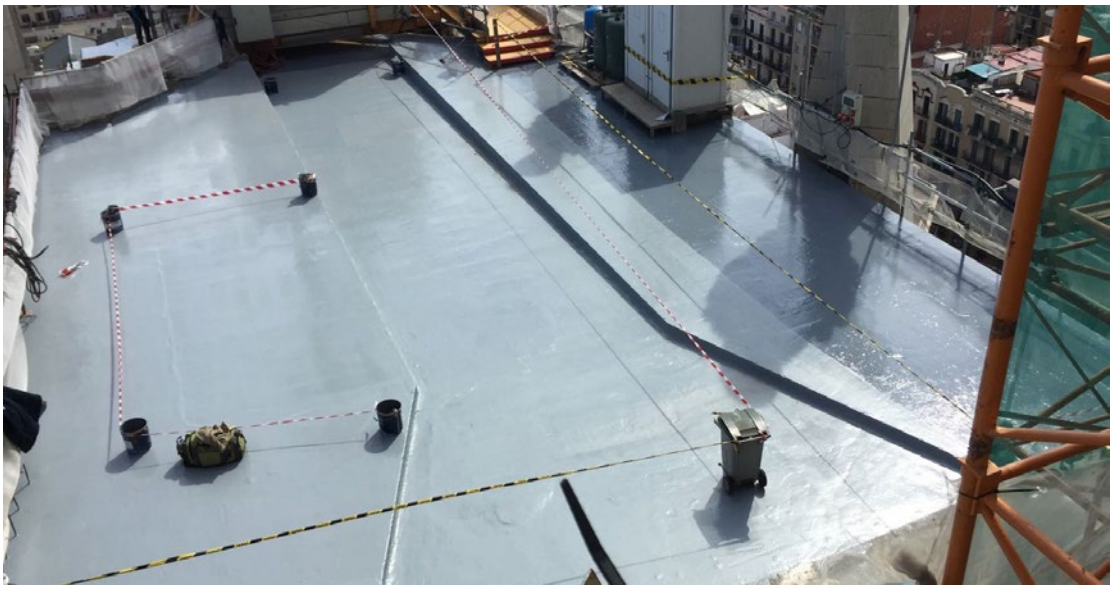

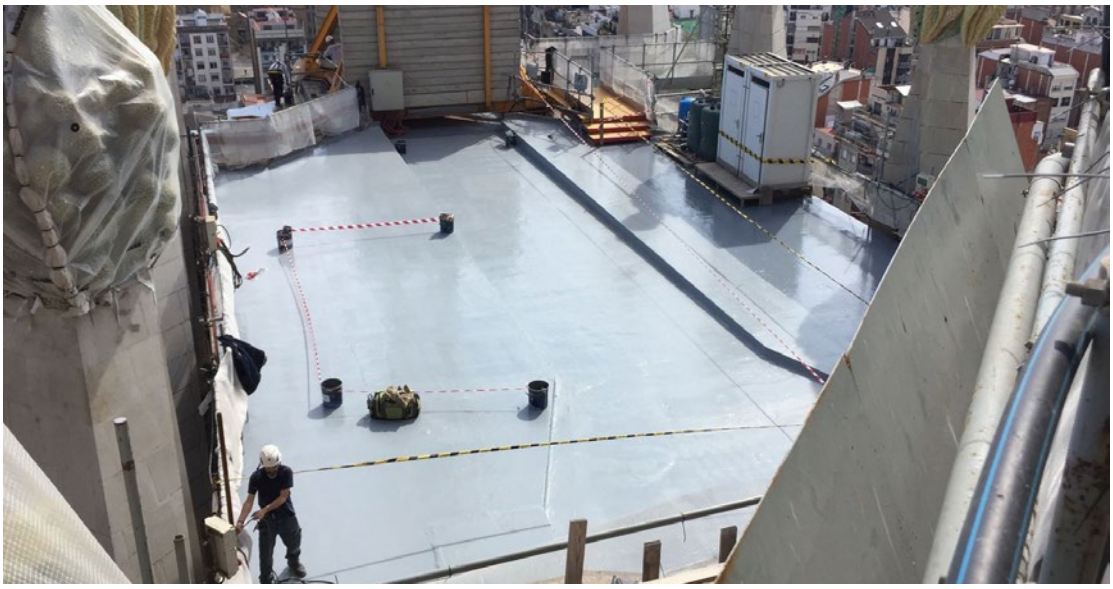

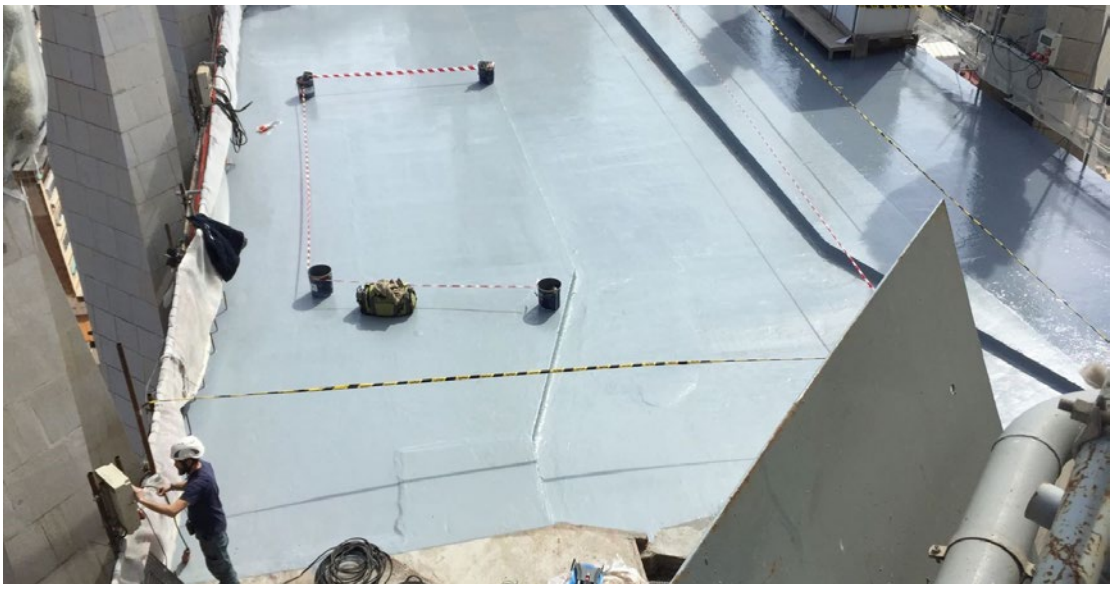

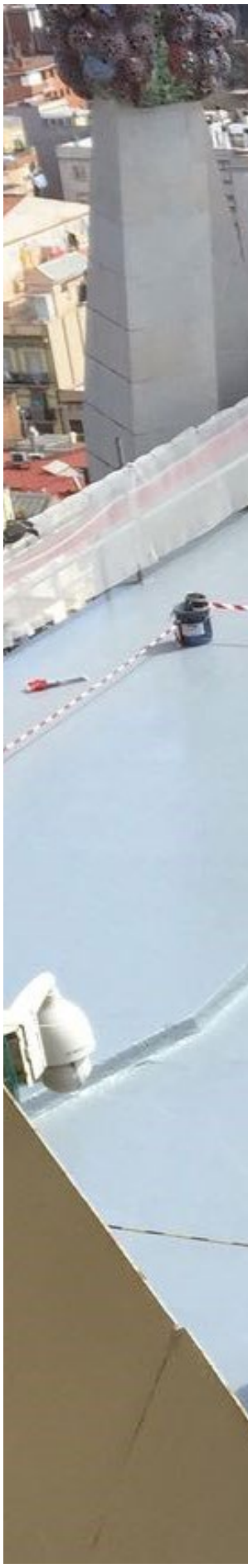

WATERPROOFING WORK CARRIED OUT WITH DESMOPOL BY NEOPROOF

www.neoproof.net

CERTIFICATIONS

PRIMER WET

UNE-EN 1504-2:2005

UNE-EN ISO 7783-1:2000

PRIMER WET

OBTAINS THE UNE-EN 1504-2:2005 CERTIFICATION (PRINCIPLE 1.2 PROTECTION AGAINST PENETRATION) AS A PRODUCT SUITABLE FOR USE ON CONCRETE STRUCTURES

The UNE-EN 1504.2 standard entitled "Products and systems for the protection and repair of concrete structure" is the European approval certificate which defines the identification, performance (including durability aspects), safety and assessment of conformity for products and systems designed for concrete surface protection, with the purpose of increasing the durability of concrete and reinforced concrete structures, in both new concrete constructions and maintenance and repair work.

Recently our 100% solid resin for very damp surfaces PRIMER WET has successfully passed all the tests conducted by the TECNALIA laboratories, obtaining the EN 1504-2:2005 (principle 1.2 protection against penetration). The results of these tests and a copy of the certification are available on request from our technical department.

PRIMER WET is an epoxy resin without solvents, of low viscosity, applicable in one coat. It is especially designed to increase the adherence of our waterproofing systems based on continuous membranes, TECNOCOAT P-2049, pure polyurea membrane, and DESMOPOL, polyurethane membrane, on concrete or mortar surfaces with high residual moisture of up to 98%.

PRIMER WET

OBTAINS THE UNE-EN ISO 7783-1:2000 STANDARD

In conjunction with the above certification, the tests and trials required under the UNE-EN ISO 7783-1:2000 standard were performed by the TECNALIA laboratories, under the title "Determination of the water vapour transmission rate according to the dish method for small films.", obtaining the highest results (45.57 SD(m) ± 2,74) for a Class II certification, very close to Class III, impermeable to water vapour.

www.wedevelopvalue.com

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