APPLICATION GUIDE.

Rayston Proof PUA H BRIDGE System

Liquid waterproofing system for bridge decks according to EAD 030675-00-0107 (21/0740) AND ATG (3247)

by Krypton Chemical

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1. General conditions

RECOMMENDATIONS

MANUFACTURER

The manufacturer of the products used in the work described in this specification shall demonstrate in writing that its Quality Assurance system complies with the requirements of Spanish Standard UNE-ISO 9001.

APPLICATOR

For the correct application of the systems specified in this report, it is recommended that the application company has successfully completed a training program on their installation or application and the appropriate methods for preparing the substrate. It must also have the necessary equipment for the correct application of the product.
The application company must have the necessary means and equipment in suitable condition for the correct application of the system.

EXECUTION OF THE APPLICATION:

ENVIRONMENTAL CONDITIONS

Before starting the work described in this specification, check that the environmental conditions, the site, and the substrate are suitable for application.
The final responsibility for any decision regarding the application of the system on site shall lie with the site manager, project manager, and/or builder, and in no case with the product supplier.

PREPARATION

Proper preparation of the substrate is vital for the correct application of the products. Therefore, the technical instructions recommended by the manufacturer must be followed.

APPLICATION

It is recommended that the products described in this report be applied or installed in accordance with the manufacturer's instructions and in compliance with current regulations.

PROTECTION SYSTEMS

Before starting the application work, the necessary measures must be taken to protect workers in terms of Occupational Risk Prevention, and the appropriate measures must be taken to ensure that personnel not involved in the work are not affected by the application.

2. Proposed solution

This document is intended to assist you and the applicator during the application of the **RAYSTON PROOF PUA H BRIDGE** system**.** High-performance liquid waterproofing system, applied by hot spraying machine on concrete for bridge decks.

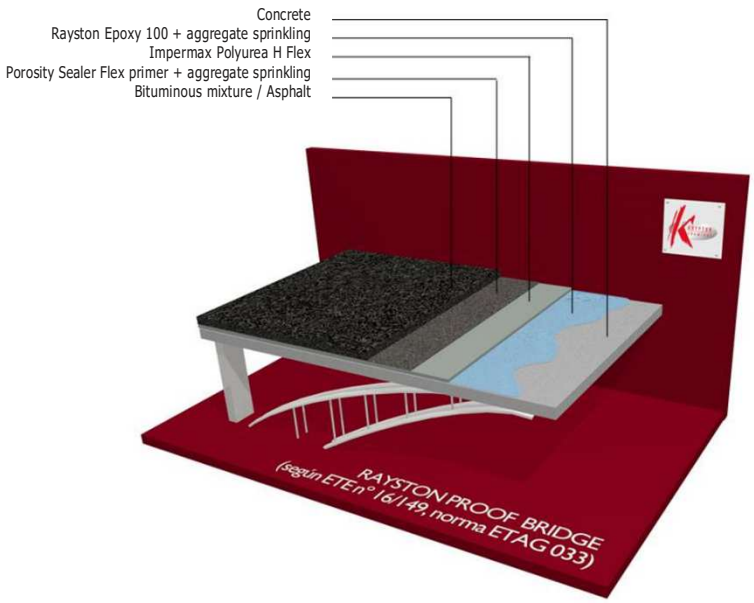
Concrete bridge decks can be easily affected by water seepage from the roadway, causing damage to the structure of the construction: rust, cracks, spalling, and ultimately disintegration of the material. To avoid these problems, it is always necessary to waterproof the bridge deck with an effective and long-lasting system.

To do this, the preliminary actions to be carried out on the surface must be defined in order to mitigate the risk of future damage. In addition, we will take into account the minimum properties that the substrate must meet in order to mitigate future risks.

3. System steps

The system must follow these steps:

- Primer: Rayston Epoxy 100 + aggregate sprinkling
- Sprayed membrane: Impermax Polyurea H Flex
- Protective layer: Porosity Sealer Flex Primer + aggregates until saturation.
- Top coat: Bituminous mixture/Asphalt



4. Substrate requirements and treatment of details and specific points

1 Substrate requirements

The cementitious mortar substrate must meet the following properties:

- Compressive strength (minimum 25 N/mm²)
- Minimum cohesion (tear/tensile strength) of 1.5 N/mm².

- HR <4%
- No cracks
- Cohesive
- Uncontaminated
- Level

(Otherwise, the coating will highlight any existing irregularities)

2 Moisture content, ambient temperatures, and substrate.

It is important to monitor ambient temperatures and humidity throughout the application cycle to prevent accelerated reactions.

The substrate must be as dry as possible.

Recommended ambient temperature conditions: Min. +10°C, Max. +30°C.

Always apply (each layer of the treatment) to a substrate whose temperature is 3°C above the dew point (to prevent condensation of ambient humidity on the substrate).

3 Substrate preparation:

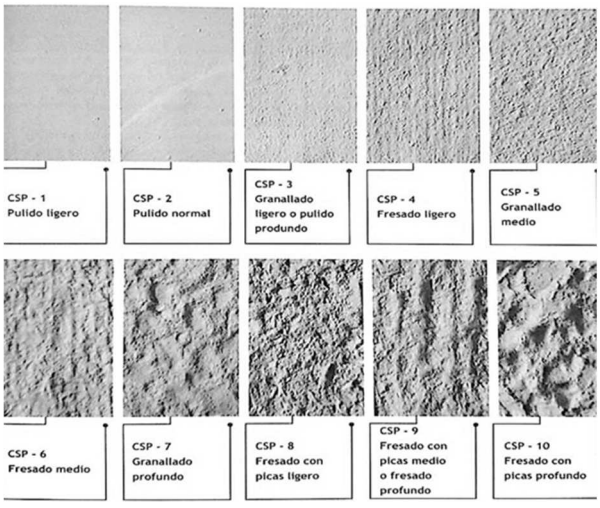
To ensure good compatibility of the system with the existing substrate and to obtain good adhesion, it is very important that the substrate meets the minimum conditions and has the following properties:

1. Cohesive.
2. Regular and homogeneous.
3. Completely continuous.
4. Free of cracks, fissures, and cavities (which must be treated beforehand).
5. Clean and free of dust, grease, fluids, and any other type of chemical contaminant.
6. Fully cured.
7. Free of particles and other materials not completely adhered to the substrate.
8. As dry as possible (without risk of negative pressure).

The substrate must be washed with a high-pressure hot water machine to remove dirt (degreasing) and impurities. It is important that no material residues remain, as these can affect the adhesion of the membrane to the substrate.

One way to ensure the complete removal of these greases, oils, or other contaminating fluids is, for example, to remove the contaminated concrete layer by mechanical means (milling if a thick layer of substrate needs to be removed or sanding with a diamond machine if the thickness to be removed is less).

The degree of roughness in the concrete must be CSP1-CSP3 according to Technical Guide No. 03732 of the ICRI (International Concrete Repair Institute) "Selection and Specification of Concrete Surface Preparation for Polymeric Coatings, Sealants, and Overlays."



To achieve these roughness requirements, it may be necessary to treat the surface mechanically (milling or sanding with a diamond machine) and then apply a fast-curing mortar to all or only some areas of the surface. In some cases, it may also be necessary to apply a self-leveling cementitious mortar or even both to the entire surface.

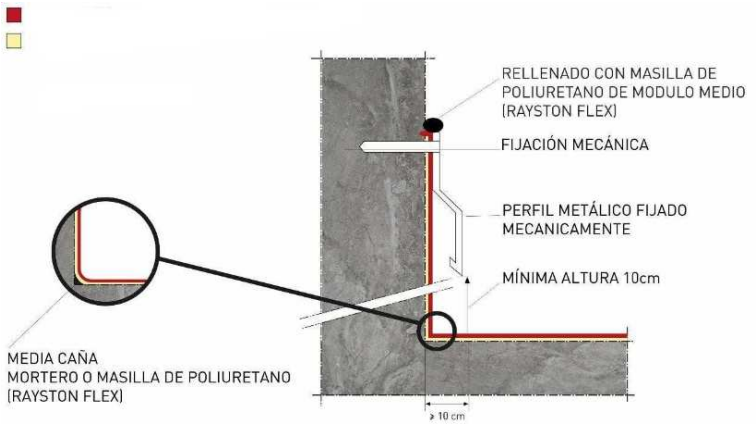
4 Treatment of damage and dents:

Before proceeding with the primer on the surface, local treatments will be carried out with dry mortar based on Rayston Epoxy 100 resin, with aggregate of 0.4 to 0.9 mm grain size, or with R4 type cementitious repair mortar, ensuring complete aesthetic homogeneity with the existing treatment. Any cracks or small cavities will be filled with Rayston Flex polyurethane filler.

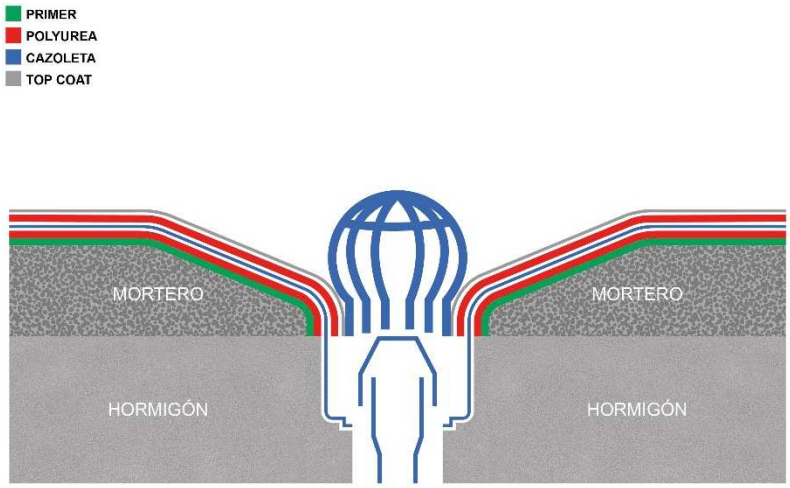
5 Treatment of details and specific points:

Right angles should be avoided at horizontal-vertical joints, corners, and other parts of the structure; in other words, it is advisable to round off these areas of the surface with mortar **(half-rounds)**.

To **prevent delamination** of the polyurea membrane at the edges of the treatment, it should end about 15-20 cm from the floor, on the vertical part. At this point, a groove will be cut with the help of a radial saw. The edge of the membrane will end inside this groove. This edge of the membrane must then be protected with a Rayston Flex-type polyurethane mastic. The installation of an aluminum protective profile will prevent possible detachment of the edge of the membrane in the medium and long term.

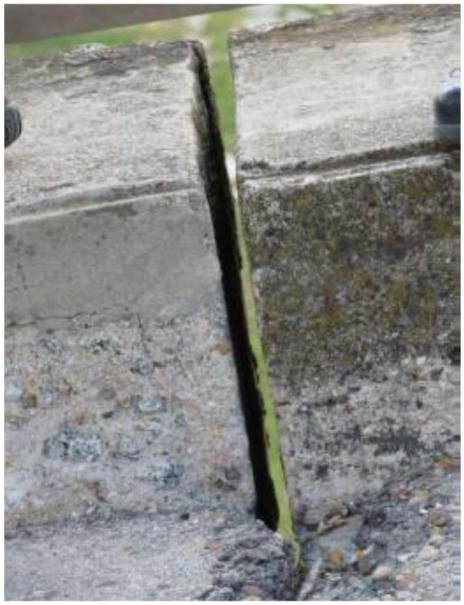


In **drains**: Remove the cover or gravel, clean with pressurized water, and once dry, apply the primer as a bonding bridge. Allow to cure, and spray the membrane, completely covering the edge of the drain and facilitating its entry into the water collection basin.



It is highly important to pay attention to the **support plates (vehicle restraint systems)** that plates, since they must be previously installed and in perfect condition before applying the waterproofing membrane. The purpose of liquid waterproofing is to create a continuous membrane that can cover the entire surface, which is why the plates will also remain below the polyurea as shown in the next image.

Expansion joints in a bridge deck work must be treated using mechanical joints. Currently there are various types and technologies. To ensure a tight seal and proper installation of the mechanical joint, follow the manufacturer's instructions.



5. Steps and application of the system

5.1 Primer with aggregates sprinkling

RAYSTON EPOXY 100 is a high-viscosity, high-solids epoxy system consisting of two pre-measured components.

Apply 0.4–0.5 kg/m² of Rayston Epoxy 100 in a single coat.

Then, while still fresh, apply a sprinkling of quartz sand (0.3–0.8 mm) with a total of 0.7 kg/m².

For application, spread the material evenly, avoiding accumulations, and work within the product's pot life (see FT).

Important: The primer is applied to seal the porosity of a surface and should never be applied when there is rising air, i.e., when there is direct sunlight on a porous exterior surface that is gradually heating up. The recommended product in this system, RAYSTON EPOXY 100, can only be used if the substrate moisture content is less than 4%. (If it is higher, ask the technical office for a list of primers).

Application tools Rayston Epoxy 100:

5.2 Main membrane

Impermax Polyurea H Flex is a fast-curing, two-component aromatic polyurea resin-based system for the application of elastic membranes with crack bridging. For application on bridges, a layer of resin should be applied at a rate of 2 kg/m².

The application will be carried out using a spray machine. The parameters of the dosing machine (temperatures, pressures, etc.) are specified in the resin's technical data sheet.

5.3 Protective/adhesion layer

As a protective layer, use **Porosity Sealer Flex** at a rate of 0.5 kg/m² with a roller + sprinkle arids (in fresh) with a grain size of 0.3-0.8 mm until saturated (approximately 2-3 kg/m²).

Note: For optimum adhesion between layers, apply as soon as possible after the previous stage, always on the same day. Remove excess aggregate by vacuuming when the resin is completely dry. Allow a few days for the resin to cure completely.

5.4 Considerations to take into account

Apply an asphalt primer compatible with the prescribed asphalt agglomerate. The asphalt agglomerate (final wearing course) will be applied the following day. It is recommended that the asphalt paver be wheeled (rather than tracked). This machine should be prevented from turning or maneuvering abruptly on the applied waterproofing system (it is better to make turns where the waterproofing system has not been applied).

Overlaps: When applying a new layer of IMPERMAX POLYUREA H FLEX over an old layer of IMPERMAX POLYUREA H FLEX that is more than 20 hours old (overlaps, for example), proceed as follows to ensure good adhesion between the new and old layers: a) Lightly sand the surface. b) Clean, degrease, and activate the surface, normally by wiping with a cloth impregnated with solvent, for example, RAYSTON SOLVENT.

Shortly afterwards, when the solvent has completely evaporated, apply the non-film-forming primer for non-porous surfaces, PU PRIMER (0.1 kg/m²), with a roller. When the solvent in this product has completely evaporated (after a maximum of 4 hours), apply IMPERMAX POLYUREA H FLEX.

6. Certificates

IMPERMAX POLYUREA H FLEX certificates

ETE (European Technical Assessment) number 16/149 issued by the Torroja Institute, the leading laboratory for construction materials in Spain.

- Broof(t2) external fire performance certificate. The Broof (t2) external fire performance certificate is much more demanding than the minimum requirement of Broof (t1).
- Reaction to fire, B2 according to German standard DIN-4102-1998.
- Hail resistance certificate according to European standard EN – 13583:2012.
- Crack bridging capacity, static, tested according to standard EN-1062-7, at -10ºC. (Class A5, the highest possible, according to standard EN-1504-2).
- Resistance to accelerated aging by heat, according to EOTA TR11 standard.

7. Quality control

For proper inspection and testing, it is important to complete daily application logs.

Daily application logs will clearly identify the work area to which they relate, record the lot numbers of the coating product, the application equipment used and the equipment settings, the substrate preparation and finished profile, and periodic environmental readings related to ambient temperature, dew point, and substrate temperature.

Daily application logs are required for Krypton to provide technical assistance and advice.

The average coating thickness can be determined using the consumption records related to the grid references in the daily application logs or by samples taken during the spraying process or by destructive testing, such as the pull-off test used to determine the level of adhesion.

Spray samples can be taken on site by placing a concrete paving slab on the substrate. The spray applicator continues to spray the designated area in its usual pattern and, as part of its spray pattern, covers the concrete sample which can then be removed to verify the thickness.

To test for proper curing of the coating, a hardness test can be performed and compared to the hardness specifications contained in the Krypton Chemical Technical Data Sheet for the specified product.

Please note that some variations in hardness are normal due to variations in machines, settings, gun configurations, etc.

The adhesion strength between the Krypton Chemical coating system and the substrate can be determined by performing a "pull-off test" with a hydraulic pull-off testing device that complies with DIN EN ISO 24624.

8. Conclusions

Krypton Chemical, SL. proposes an innovative solution for waterproofing bridge decks, based on polyurea applied in liquid form with the aid of a hot spray machine: The **Rayston Proof PUA H Bridge** system.

This solution offers the following advantages:

- Waterproofing membrane with high mechanical, chemical, and high-temperature resistance.

Elastic, continuous, and jointless waterproofing membrane capable of withstanding substrate movements (ability to bridge cracks in the concrete base).

- Total long-term watertightness of the system.

- Quick installation.

- Application using an automated system ensures complete quality control of the work.

- System certified according to European ETA standards (ETAG 033 and EAD 030675-00-0107).

- References from projects carried out worldwide.

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