APPLICATION GUIDE.

Rayston Proof PU Water Tank System

by Krypton Chemical

Contents

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.

APPLICATION EXECUTION:

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 shall be taken to protect workers in terms of Occupational Risk Prevention, and the appropriate measures shall 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 PU WATER TANK** system. High-performance liquid waterproofing system, applied cold to a concrete tank that will continuously contain drinking water.

The guidelines for cold liquid waterproofing, especially of a closed concrete tank containing drinking water with little movement, will be explained. The objective is to create a continuous, joint-free, roller-applied, elastic, and flexible waterproofing membrane with the ability to bridge cracks that may appear in the tank structure over time. To do this, a two-component, solvent-free polyurethane resin (IMPERMAX AQUA 2K) is applied. The system is designed for waterproofing new tanks and also for rehabilitating tanks in operation with water leaks due to cracks in the concrete. The system is also suitable for closed tanks (or even tanks open to the atmosphere) containing firefighting water, seawater and salt water in general, chlorinated water, wastewater (urban), slightly acidic or basic water, septic tanks, etc.

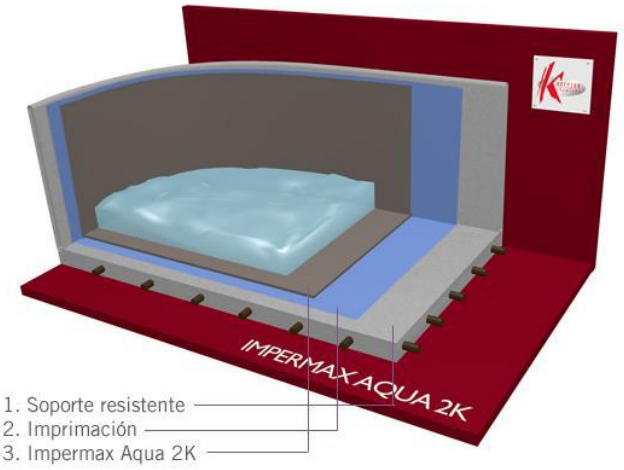
To this end, the preliminary actions to be carried out on the wall must be defined in order to mitigate the risk of future damage. In addition, we will take into account the minimum properties that the substrate must meet in order to mitigate future risks.

3. System steps

The system must follow these steps:

- Primer: Rayston Epoxy 100.
- Main membrane: Impermax Aqua 2K.

FT flashing



4. Substrate requirements and treatment of details and specific points

1 Substrate requirements

The concrete substrate must meet the following properties:

- Compressive strength (minimum 25 N/mm²)
- Minimum cohesion (resistance to tearing/traction) 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).

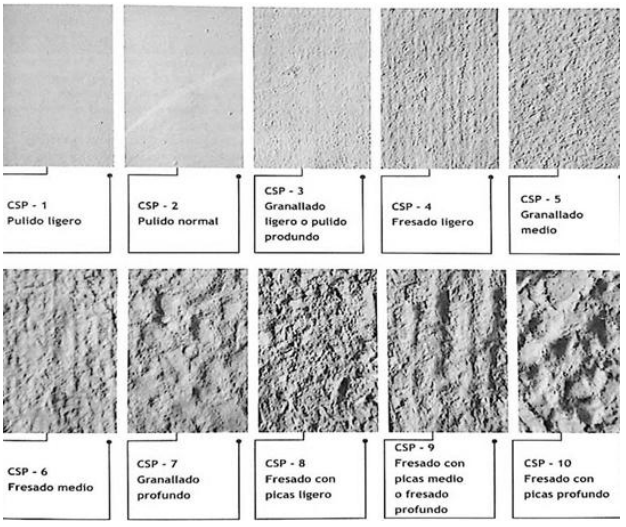
3 Substrate preparation:

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 consistent.
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. Completely 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 water jet 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.

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 Coverings."



To achieve these roughness requirements, mechanical pre-treatment (e.g., sanding with a diamond machine), the application of a self-leveling cementitious mortar, or even both may be necessary.

Previously applied coatings that have lost their adhesion must be completely removed.

4 Treatment of imperfections and dents:

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

5 Treatment of details and specific points:

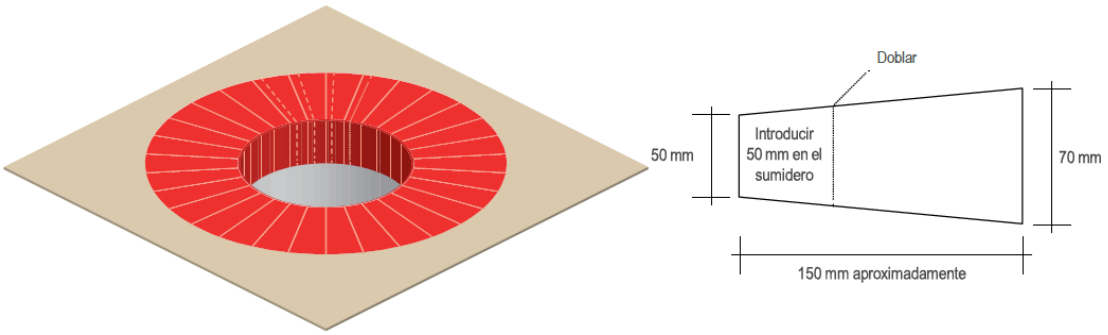
Right angles should be avoided at horizontal-vertical joints, corners, and other parts of the structure; in other words, it is advisable to round off these areas of the surface with mortar **(half-rounds)**.

Areas where significant **relative movement** between two surfaces is expected (metal pipes that expand with temperature changes differently than concrete, cracks at risk of opening, etc.) should be treated with duct tape on the previously primed concrete surface so that the membrane can move freely at these points.

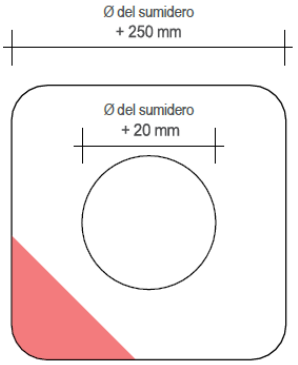
To prevent **delamination** of the polyurethane membrane, it should end halfway up the top edge of the wall, completely away from the water. At this point, a groove should be cut with the help of a radial saw. The edge of the membrane will end inside this groove. This edge of the membrane must then be protected with a Rayston Flex-type polyurethane mastic. Finally, a fixing profile will be applied to achieve an aesthetic and functional appearance.

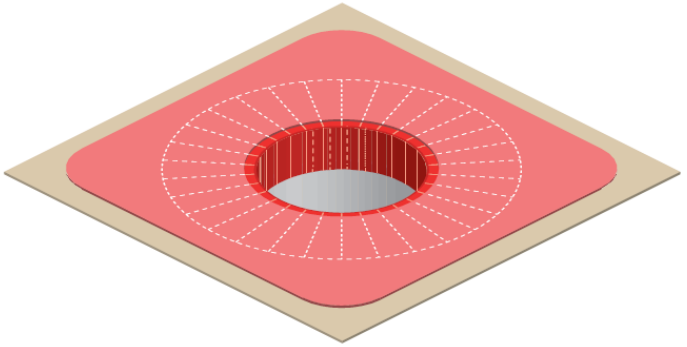
The following steps must be followed for **drains**:

1. Cut enough wedge-shaped reinforcement strips to cover the drain in overlapping layers.
2. Dip the individual strips in waterproofing resin, ensuring that each one is saturated.
3. Apply waterproofing resin to the top and inside of the drain, making sure that no resin drips down the drain.



4. Remove any excess resin from the strips and place them in an overlapping pattern until the entire outlet is covered.
5. Remove any air bubbles or wrinkles and apply additional resin to the reinforcement (if necessary), taking care to peel back the overlapping edges.
6. Cut a square piece of reinforcement with rounded corners, cut a circular hole in the middle of the piece with a diameter = drain diameter + 20mm, and saturate it with waterproofing resin, then squeeze out the excess resin and place it over the drain, making sure the hole in the piece is directly over the drain.
7. Use a brush or roller to remove any air bubbles or wrinkles and to ensure that the square reinforcement piece is completely saturated and pressed down firmly.





With regard to the **expansion joints** in the structure, if they have a movement greater than 50% of the size of the joint, mechanical joints must be installed (for example, a joint with a minimum width of 10 cm must be opened a maximum of 15 cm). To ensure the watertightness of the system, these mechanical joints must be installed following the manufacturer's specific recommendations.

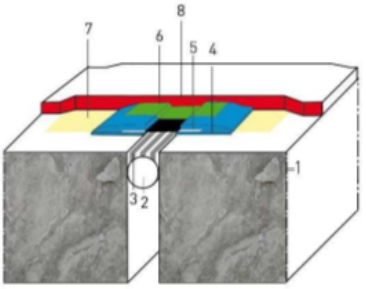
If the movement is smaller, it can be treated with Rayston Joint Geo high elasticity tape, after filling it appropriately (polyethylene foam cylinder and Rayston Flex type polyurethane putty). Rayston Joint Geo adheres to the primed substrate thanks to an adhesive (PU 2K Adhesive) or an epoxy resin such as Rayston Epoxy 100 applied to the geotextile attached to the tape. Polyurea membranes do not adhere well to Rayston Flex Joint Geo tape, so if the joint moves, this movement will not be transferred to the polyurea membrane, or in any case the movement will be attenuated when it reaches the polyurea membrane, reducing the risk of cracking.

Rayston Joint Geo can be supplied in different widths; it is advisable to always use a strip of the appropriate width.

For small jobs, Rayston Flex 3040 single-component polyurethane mastic should be applied manually. For greater productivity, the highly elastic polyurea-based mastic (two-component, cures in a few seconds) Rayston Flex 70 can be applied as an alternative using the portable Rayston Spray Gun machine. If a large number of linear meters of joint need to be filled, application will be more efficient with the Rayston G-1 machine.

A similar treatment should be carried out on cracks larger than 2 mm or even smaller if there is a suspicion that they are moving and/or continuing to open over time (unstabilized cracks or fissures).

1. REGULAR, DRY AND FULLY CURED CONCRETE SURFACE.
2. JOINT BOTTOM: POLYURETHANE FOAM CYLINDER (PE).
3. RAYSTON FLEX 3040 / RAYSTON FLEX 70
4. PU 2K ADHESIVE OR RAYSTON EPOXY 100
5. RAYSTON FLEX JOINT GEO
6. SEPARATION STRIP (PE) - RAYSTON FLEX JOINT (OPTIONAL)
7. PRIMER
8. WATERPROOFING MEMBRANE APPLIED IN LIQUID FORM



Important: Treatment carried out in winter (at the lowest possible temperatures) will always be more effective than treatment carried out in summer. In winter, at low temperatures, the materials will be contracted and the edges of the joint will be further apart. In summer, with high temperatures, the materials will be expanded and the edges of the joints will be closer together. If the treatment is carried out in summer, without leaving any slack in the membrane, when winter arrives and the temperature drops, the edges of the joints will separate and the membrane will become tense, with the risk of cracking.

5. Steps and application of the system

5.1 Primer

Use **Rayston Epoxy 100** if the surface is new concrete, is completely dry and fully cured (moisture content below 4%). Apply approximately 0.4-0.5 kg/m² of Rayston Epoxy 100 in order to completely seal the porosity of the surface. Apply two coats on vertical surfaces and one coat on horizontal surfaces.

Once the primer has cured, it should have a glossy appearance. If it has a matte appearance, this means that the surface porosity is not properly sealed and an additional coat of resin is necessary.

The curing time of Rayston Epoxy 100 can be reduced with Epoxy Accelerator when working at low temperatures. On vertical surfaces, Thickening Additive (powder) can be added to prevent sagging if applied in a thick coat (1%).

A good alternative to Rayston Epoxy 100 (dry substrates), especially on vertical surfaces, is **Rayston Epoxy 100 Gel** (0.4-0.5 kg/m^2, high viscosity gel consistency and thixotropic), applied with a trowel, which allows you to level a concrete substrate as well as prime it, all in a single operation.

Another option would be **Primer H** (0.4-0.5 kg/m²), a two-component, water-based epoxy resin with no mineral fillers and a high resin content, which can be applied to a surface with traces of moisture. When the resin is applied, it has a milky appearance that fades as it dries and the water evaporates. A perfectly cured Humidity Primer should be completely transparent and colorless. White spots are the result of the water in the resin not being able to evaporate completely, usually due to excess coating (product accumulation) in some areas of the application. It should only be applied to water tanks (non-potable) that are open to the outside. Not recommended for application in closed water tanks, due to the difficulty of evaporating the water from the resin under these conditions.

If the surface belongs to a closed tank that has contained water in the past and therefore there are traces of moisture on the surface (up to 8% moisture), apply approximately 0.4-0.5 kg/m² of **Primer GC** primer in order to completely seal the porosity of the surface. Apply two coats on vertical surfaces and one coat on horizontal surfaces.

Application tools Rayston Epoxy 100, Rayston Epoxy 100 Gel, Humidity Primer and Primer GC:

Note: If the water tank is below ground level and there is a risk of negative hydrostatic pressure, apply a first coat of **Tecnocem** (minimum 2 kg/m²).

Tecnocem is a three-component epoxy-cement system designed to be applied to porous substrates with high moisture content or to surfaces exposed to negative hydrostatic pressures. It can also be used as a self-leveling mortar to level surfaces. A layer of 2 kg/m², 1 mm thick, can withstand negative pressure of up to 10 bar.

If the moisture content of the concrete is much higher than 6-8% and it is not possible to reduce it, a first coat of Tecnocem will also be essential.

As Tecnocem is a coating that is applied in high thickness, it can also be used to level the surface.

The thickening additive will help prevent Tecnocem from sagging on vertical surfaces (approximately 2% thickening additive on vertical surfaces).

Once Tecnocem has cured, apply a coat of Primer H (open tanks) at a rate of approximately 0.3-0.4 kg/m² or Primer GC 0.3–0.4 kg/m² (the latter in the case of closed tanks or in conditions unfavorable for the drying of a water-based resin, i.e., high ambient humidity or low temperatures).

In an enclosed space, a forced ventilation system will be necessary so that the water contained in Tecnocem can evaporate completely.

Important: In open tanks, whose walls are exposed to direct sunlight, never apply the primer at the end of the morning, when the surfaces are gradually heating up and there is rising air. This air could cause pores in the primer, which could then reproduce in the Rayston Polyurea membrane.

5.2 Main membrane

Impermax Aqua 2K is a two-component polyurethane resin, completely free of organic solvents (therefore it can be applied in an enclosed space) and is supplied colored. Impermax Aqua 2K is UV resistant but its color is not (yellowing).

As it has low thixotropy, when applied to vertical or steeply sloping surfaces, it must be used in conjunction with the Thickening Additive (powder).

Its curing time depends on the ambient temperature. To reduce it, especially at low temperatures (below 15°C), the Accelerator for PU 2K can be used.

Always apply the system first to vertical surfaces and then to horizontal surfaces. To prevent the resins from running on vertical surfaces, the Thickening Additive (powder) can be used. Impermax Aqua 2K is applied with a roller.

On vertical surfaces: The thickening additive (1-3%) must be added to IMPERMAX AQUA 2K to prevent the resin from sagging. Apply two coats of approximately 1 kg/m² per coat.

On horizontal surfaces: Apply a minimum of 2 kg/m² in a single coat. Then roll with a spiked roller.

Notes:

- In tanks containing continuously moving water, even with solid particles, the abrasion of the waterproofing membrane will be higher and a greater amount of product will need to be considered to compensate for the loss of thickness due to wear (a total of 3-4 kg/m² applied in a single coat horizontally, in several coats of 1 kg/m² vertically).

- In the case of wastewater tanks, septic tanks, tanks with slightly acidic water, etc., the amount used should be at least 3-4 kg/m², and even more if the water is in motion and contains solid particles that could wear down the membrane.

- The entire interior surface of a closed tank must be coated and protected with the resin, both the parts that will be in contact with water and those that will not, including the roof of the tank.

- The water level in an open tank should never be above the end of the treatment with the Impermax Aqua 2K system.

- It is recommended to allow the product to dry for at least ten days before washing and filling the tank with water and putting it into service.

- Wash the tank with water and a neutral detergent and then rinse before filling the tank with drinking water.

5.3 Top Coat

In this type of project, we cannot recommend an aliphatic finish for the system.
This is to reduce risks such as delamination.

Therefore, we recommend applying a RAL to the polyurethane with low yellowing (RAL 7011, for example).

6. Certificates

IMPERMAX AQUA 2K

The Impermax Aqua 2K product has been exhaustively tested by the Applus Laboratory and the Eduardo Torroja Institute, which carried out the following tests:

- Determination of resistance to cracking, UNE-EN 1062-7 Static Method.
- Continuous contact with drinking water 98/83EC, RD 140/2003 in Spain and DM 174 of 6/04/2004 in Italy.
- CE marking according to EN -1504-2 for surface protection of concrete.
- Determination of direct and indirect water penetration under pressure according to the basic criteria of UNE-EN 12390-8. Watertightness under the pressure of a 50-meter water column.

7. Maintenance

It is advisable to maintain the installations and carry out periodic cleaning, removing surface debris and dirt before cleaning.

A minimum frequency of two visual inspections per year is recommended, one at the beginning of spring and the other at the beginning of autumn.

In addition, the tank should always be inspected after other professionals have carried out work such as construction, installation of new equipment, or repair of existing equipment.

8. Conclusions

The **RAYSTON PROOF PU WATER TANK** system proposed by Krypton Chemical has been used in a large number of construction and roof renovation projects in Spain and other countries. It has a long track record of success.

This system is completely continuous (without joints), remains adhered to the treated surface, and offers great resistance over time. In addition, it is a system that easily and effectively solves all the unique issues that can be found in an installation of this type.

There are several advantages to liquid waterproofing with polyurethane resin compared to traditional thick cement-acrylic systems, even though both systems are easily applied in liquid form, cold, and when cured form a continuous and relatively thick coating. The big difference is that IMPERMAX AQUA 2K resin forms a highly flexible and elastic membrane with high tensile strength, and therefore a great ability to bridge cracks that appear in the substrate. In contrast, an acrylic-cement system has little flexibility and is not elastic at all, with very low tensile strength. Therefore, it will be able to adapt to very small movements in the structure, but it will not be able to bridge cracks in the concrete surface. The result will be the appearance of small water leaks, even shortly after the tank is put into service, especially if it is a new construction that is still settling into the ground.

This system, applied on site by a company approved by Krypton Chemical, has the CE mark, based on tests carried out by the APPLUS laboratory.

law.
The obligations enforceable against Krypton shall be solely those that can be claimed from a product supplier. Under no circumstances, through this or any other document, does Krypton assume the responsibilities and obligations corresponding to the project manager, the construction manager, or the builder.

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