Permastop Annexure

February 2023

An effective and economical waterproofing solution for Portland Cement Structures. Concrete is one of the most widely used building materials, used on everything from residential basements and foundations to tunnels, water containing structures, bridges and water treatment plants. Although hard and dense, it is a porous material which makes it highly susceptible to damage and deterioration from moisture and chemical penetration. That is why nearly all residential and commercial projects specify some sort of waterproofing. Traditionally, contractors apply a spray-applied coating, brush applied coating, a peel-and-stick sheet membrane or torch on system, normally acrylic or bitumen based, to keep moisture in or out of a concrete structure depending on the end use of that structure. However, these type of coatings and membranes can be torn or damaged during backfill, could delaminate, decompose or deteriorate over time. Like information technology changed the world, crystalline waterproofing is set to be the latest paradigm in rendering concrete impervious to moisture penetration. Crystalline waterproofing relies on chemical reactions to fill or block pores and cavities within a cement matrix. Certain types of crystalline waterproofing products will even self-heal minor cracking within such a matrix.

Advantages

Crystalline waterproofing offers a number of advantages over conventional coatings and membrane based overlays.
These are:

- Can't be torn or damaged during backfill.
- Is UV stable and will not delaminate, decompose or wear out.
- Decrease maintenance costs for the entire life of the concrete structure.
- Because it offers such long lasting protection, it is especially useful in highly corrosive environments such as bridges constructed over bodies of salt water and high consequence projects, where this is not normally an option.
- No off-gassing VOC's and is considered "green".
- User friendly.
- There are few temperature restrictions; if temperatures are adequate for pouring normal concrete, crystalline waterproofing can be used within the same temperature ranges.
- Their biggest advantages are their self-healing ability and lower long-term maintenance costs.

Price of Protection

Crystalline waterproofing is generally more cost effective over a period of time. The real savings come in the form of work turnaround and compounded future maintenance. It specifically good for structures that are subjected to significant hydrostatic pressure and harsh marine environment. Crystalline waterproofing replaces the traditionally specified membrane systems because of its ability to withstand the hydrostatic pressure and protect the reinforcing against corrosion.

Crystalline Waterproofing Systems

In the presence of water, the ingredients of these products react with calcium hydroxide and other by-products of cement hydration to form non-soluble crystals which fill and plug the pores and micro cracks in concrete – even years after the concrete was poured. Many crystalline waterproofers (such as Cemcrete's **Permastop**) are self-healing throughout the life of the concrete structure to automatically seal cracks up to 1/2mm wide. It is durable and is sought after in projects where the concrete will be subjected to hydrostatic pressure.

Permastop: The crystalline waterproofing solution to common moisture ingress challenges

Waterproofing is a complex process, so you will need further technical advice and expertise on your specific project. The most common areas of contention within the African/South African context occurs in concrete and Portland Cement structures built on this continent and typically occur in:

- Reservoirs with or without water
- Sewage and water treatment plants
- Underground vaults and wine cellars
- Secondary water containing structures i.e. pools/ponds

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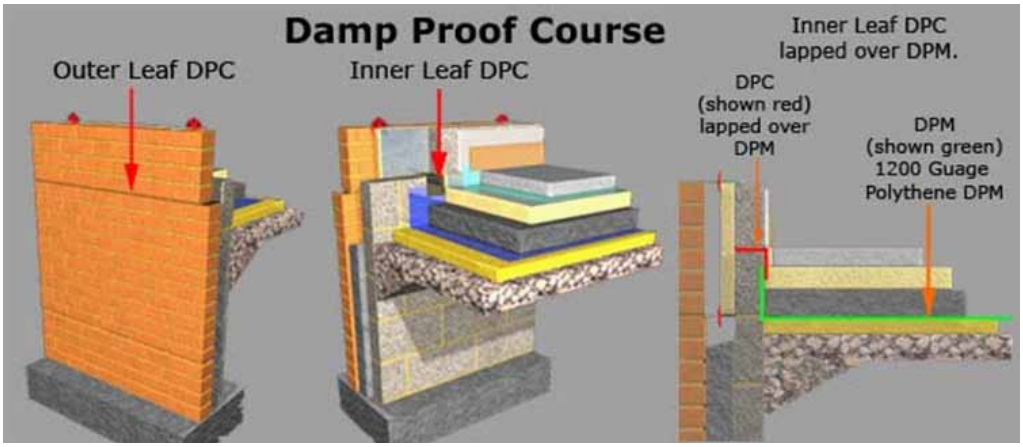
- Foundations
- Parking structures
- Concrete slabs (floor/roof/balcony etc.)
- Walls with failed DPC

Cemcrete's rule of thumb – build it right the first time – comes into play here. This may include using DPC (damp proof course), typically between your foundation and walls.

Fig A. Cross section of the plinth area, vertical substrate/s (wall) and horizontal substrate/s (floor slab and overlays) depicting the required waterproofing provisions for concrete, brick and mortar structures.



These are waterproof materials like Polyethylene (PE) sheets, PVC 'water bars', or bituminous membranes. Including this in your plan ensures your building is watertight. Concrete or brick walls could also be repaired – usually first from the exterior, then the interior – using a crystalline product like Cemcrete's **Permastop**.

This module focusses on addressing the following categories of waterproofing challenges within concrete, brick and mortar structures as mentioned above:

1. Internal vertical substrates (wall areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks.

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2. External vertical substrates (wall areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks.

3. Internal/external horizontal substrates (floor areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks.

4. Gushing leaks within common dwellings, commercial structures, water containing structures and subterranean structures.

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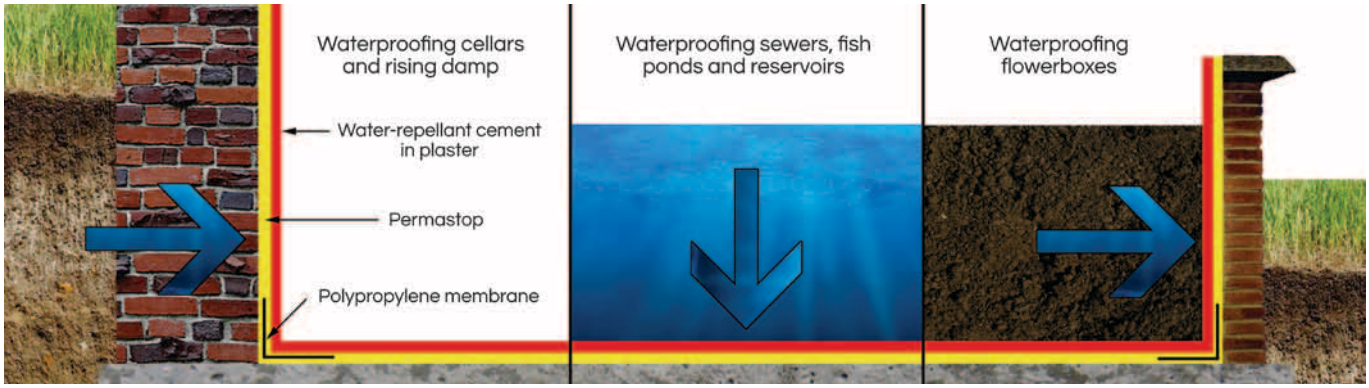
Permastop - How and where one can use it.

Fig B: The typical household waterproofing applications.



Did you know? Not all waterproofing systems are permanent. **Permastop** is and becomes an integral part of the substrate matrix. Even after the concrete has cured, **Permastop** remains dormant in the concrete and will reactivate in the presence of moisture to seal capillary tracts and hairline cracks.

Now let's look at the common substrates that make up the composition of typical dwellings and structures with the view to providing basic specifications for each for both internal and external applications.

Walls (vertical substrate) could be damaged by water ingress or damp pressure from the water table. Are the walls fully above the ground or is a portion below the ground? Is it an internal wall or external wall?

NOTE:
These step-by-step guides are to assist you in the application of **Permastop** to repair rising damp. However, it should not be relied upon for the successful completion of your application. Please make use of Cemcrete's technical and sales team for further assistance. Product demonstrations are available at our head office. Remember, preparation is vital to a successful project.

1. Internal vertical substrates (wall areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks.

1.1 Existing Internal Walls

Where one has existing previously painted walls which now appear aesthetically displeasing due to moisture ingress the following can be done to remedy the situation:

- Shoot a chalk line approximately 1.1m above the finished floor level and then using an angle grinder cut back to brick or shuttered concrete.
- Previous plaster to be totally removed back to concrete or brick below this ruled joint.
- Always wear gloves when applying **Permastop**.
- To the dampened and dust free brick/concrete surface brush on a liberal coat of **Permastop** using a large distemper/block brush mixed in accordance with the datasheet instructions.
- For the corners and where the floor meets the walls a polypropylene membrane strip should be dipped into the **Permastop** slush and placed in such a way that it overlaps both the wall and floor surfaces by at least 100mm. Making use of a paint brush/ iron out all air bubbles.
- A second coat should be applied after the first coat has set for ± 30 minutes but no later than 90 minutes after the first coat.
- We recommend that a scratch plaster be applied approximately 45 minutes after the application of the second coat of **Permastop**. Ensure that this is flush jointed to the existing surrounding plaster.
- Once this new plaster is properly hydrated and cured you may proceed with decorative coatings.

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N.B. Scratch plaster mix to be:
- 1 volume Cemcrete Water-repellent Cement
- 3 volumes clean plaster sand
- 1 volume clean river sand

1.2 Existing unpainted internal walls
- Pre-dampen the entire wall ensuring that the substrate is saturated with water.
- Brush on an HCL/water solution made up of 1 volume HCL and 3 volumes clean water and allow this to fizz before wire brushing the entire surface. Please ensure that the surface is free of contaminants and organic growth before proceeding.
- Rinse off with clean water.
- Brush on a sodium bicarbonate/water solution made up of 1 cup sodium bicarbonate to 5 litres of water in order to neutralize the substrate and then rinse off with clean water.
- Allow the excess moisture to disappear.
- To the dampened brick surface brush on a liberal coat of **Permastop** using a large distemper/block brush mixed in accordance with the datasheet instructions.
- A second coat should be applied after the first coat has set for ± 30 minutes but no later than 90 minutes after the first coat. Ensure that the differential crack where the floor meets with the wall is coated with **Permastop**.
- Allow the **Permastop** slurry to hydrate for the next three weeks following the day of application and then do a light acid wash using a solution made up of 1 volume HCL and 10 volumes clean water.
- Brush down with a stiff nylon brush and then rinse off with clean water.
- Allow to dry and only coat/paint the surface when the moisture levels subside to the level recommended by the relevant manufacturer of the desired coating.

2. External vertical substrates (wall areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks.

External walls including boundary walls:
- Shoot a chalk-line approximately 1.1m above the finished ground level as this will ensure a straight line to finish against.
- Always wear gloves when applying **Permastop**.
- Cut back to brick using an angle grinder with a diamond blade. Remove all plaster down to brick level.
- Clean thoroughly to ensure that no dust remains.
- Drill 2 holes two-thirds into each brick immediately above the faulty damp proof-course.
- Using a funnel, inject SiliconSeal into the holes until it bleeds back through the face of the substrate/brick.
- Mix 2 volumes **Permastop** and 1 volume water to a paintable consistency.
- Damp down the surface and apply a liberal coat of the **Permastop** slurry.
- A second coat should be applied after the first coat has set for ± 30 minutes but no later than 90 minutes after the first coat.
- We recommend that a scratch plaster be applied approximately 45 minutes after the application of the second coat of **Permastop**. Ensure that this is flush jointed to the existing surrounding plaster.
- Once this new plaster is properly hydrated and cured you may proceed with decorative coatings.

N.B. Scratch plaster mix to be:
- 1 volume Cemcrete Water-repellent Cement
- 3 volumes clean plaster sand
- 1 volume clean river sand

3. Internal/external horizontal substrates (floor areas) within common dwellings, commercial structures, water containing structures and subterranean structures experiencing rising damp or light to medium moisture ingress but free of gushing leaks e.g. balconies and flat roofs etc.

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Expansion Joints

Application over moving joints or cracks can result in cracking and delaminating. All construction, cold joints, structural joints and/or structural cracks which may be dynamic before and/or after the screed / topping application must be extended through to the surface of the new screed / topping application in the form of voided joints. All voided joints including saw cuts should be filled with suitable joint filler.

Base Concrete

The concrete on which the screed is to be laid should be hard, free from loose material, mould oil or grease and have a characteristic strength of minimum 20MPa. It should comply with the acceptance levels as prescribed by the C&CI. The following is recommended:

- Apply **Permastop** slurry as per Cemcrete's attached datasheet (to be done +- 20min ahead of screed).
- A screed mix sufficient for a depth of 20mm should be dumped on the base concrete (freshly grouted with **Permastop**) and spread somewhat thicker than the final required thickness. It should then be compacted using a screed stamper (proper design). Extra compaction is recommended on edges of panels.
- Apply **Permastop** slurry onto this green screed and embed CemForce woven membrane into this slurry with overlaps of 50mm. Where the floor meets the wall, the CemForce should be embedded into the same slurry coated at least 50mm up the wall. Apply a second liberal coat of **Permastop** slurry thus saturating the CemForce properly.
- The second level of 20mm screed (with Cemcrete Water-repellent Cement incorporated in the mix design) to be laid over the first (now with a covering of **Permastop** and CemForce) compacted and finished off as per normal.

Water Channels (not screeded)

Where these are finished with vibrated concrete or precast concrete they would naturally be sufficiently dense to resist water penetration. However, **Permastop** can be slush coated onto this surface in order to ensure that it is properly waterproofed. Where the base meets the wall **Permastop** and polypropylene membrane should be used to take care of the fine hairline cracks that occur as a result of expansion coefficient differences between the substrates in accordance with the **Permastop** datasheet.

4. Gushing leaks within common dwellings, commercial structures, water containing structures and subterranean structures.

4.1 Gushing Leaks:

Open concrete at place were water is pouring out to a cavity of about 40mm³. Grout in place a piece of old hose pipe using "Joint Filling Mix" mixed with **Permastop** Accelerator instead of only water. Once water has been led away from surface of concrete, continue to clean out joints/cracks from the point of lowest hydrostatic pressure to the point of highest hydrostatic pressure which is normally where the old hose pipe has been grouted in. Apply one coat neat slurry mix into these opened clean joints/cracks, and then within 90 minutes fill with "Joint Filling Mix" as described below.

Joint Filling Mix: Mix one volume **Permastop** with one volume clean plaster sand and bring to a thick plaster consistency with **Permastop** Accelerator.

4.2 Membrane:

Lay polypropylene membrane dipped into and impregnated with a **Permastop** slurry and apply this over the joint filled area to be covered using a paint brush to 'iron out', smoothen and flatten the membrane.

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4.3 Permastop slush coat:
Allow the joint filled area now covered with polypropylene membrane and impregnated with **Permastop** to stiffen for about 30 minutes (not later than 90 minutes). Mix 2 volumes **Permastop** and 1 volume water to a paintable consistency. Then damp down the rest of the concrete and apply a liberal coat of the **Permastop** slurry to this substrate. A second coat should be applied after the first coat has set for ± 30 minutes but no later than 90 minutes after the first coat.

Having completed the schedule of work to this point one has one of two choices:

1. A scratch plaster (incorporating Cemcrete Water-repellent Cement) can be applied approximately 45 minutes after the application of the second coat of **Permastop**. Ensure that this is flush jointed to the existing surrounding plaster. Once this new plaster is properly hydrated and cured you may proceed with decorative coatings.

2. Allow the **Permastop** slurry to hydrate for the next three weeks following the day of application and then wet the surface before doing a light acid wash using a solution made up of 1 volume HCL and 10 volumes clean water (prevents capillary action drawing acid into the substrate). Brush down with a stiff nylon brush and the rinse off with clean water. Allow to dry and only coat/paint the surface when the moisture levels subside to the level recommended by the relevant manufacturer of the desired coating. Cemcrete's CemWash is ideal for this type of application.

NOTE:
Permastop crystal formation is water/lime activated so if water penetrates a decorative finish it can trigger crystal growth in the paint or sealer interface and can cause delamination of the film or discolouration of cement based decorative coatings. It is important to deactivate the **Permastop** surface before applying cement based coatings or film forming paints.

The crystal growth into new cement coatings or render forms a strong bond between new and old cementitious compounds. If this is desired the new cement coating/render should be applied to a wet (or very green) **Permastop** layer so that the chemicals can migrate into both the old and new cement compounds.