



## What Can External Waterproofing Membrane Failure Teach Architects about Sustainable Construction?

No matter your experience with waterproofing membrane failure, waterproofing breaches are not so easy to spot. In fact, according to one article in [The Construction Specifier](#), the most minor-looking of leaks could be a sign. Depending on where and how the waterproofing was installed, that can lead to costly excavation work for basements, vaults, tunnels, and water features. It can also lead to full removal or replacement of fixtures and finishes in certain spaces, such as commercial kitchens and lobbies.

Still, that's why envelope engineers or other professionals conduct site visits before construction is completed, right? They make sure the external waterproofing membrane is placed properly and effectively to mitigate the risk and damage of a breach as much as possible.

That can certainly lead to a relatively long-lasting waterproof structure. But it's neither the most risk-free nor the most sustainable solution. But what does that mean for your architectural work? What does the risk and reality of external waterproofing membrane failure mean for you?



## **It's Not Always Better to Stick with Technology You're Comfortable With**

Many architects like yourself are very familiar with external membranes. You know how to inspect and install them. You can physically see and touch them to sort them out before they're covered. In short, there's a sort of reassurance that comes with external membranes. You know they are actually there, and you know exactly what to do if any issues come up.

That comfort can be a detriment at times, however.

## **No Matter Your Comfort with Them, Membranes Are Still High-Risk**

Sure, you can see the external membrane and know the ins and outs of it. But that doesn't mitigate the risk of the membrane failing. If anything, too much confidence in it can stop you from trying out a less liable waterproofing system.

And even if you are able to physically check a membrane that's been applied to the positive side of a structure and felt comfortable with that inspection, that doesn't mean the membrane will stay that way. For instance, the backfilling process can easily tear the membrane. That can fail the whole waterproofing system right there as there is often no opportunity to excavate the membrane to repair it. As a result, builders often turn to [epoxy injections](#) to attempt to fix cracks and leaks that show up in accessible areas of a concrete's surface. That still leaves water outside of those areas to continue passing through the concrete, threatening its structural integrity.

## **Too Much Confidence in Membranes Can Lead to Poor Concrete Construction**

While we have talked about the risk that comes with membranes so far, that doesn't mean they don't have a place in construction. They certainly can be used effectively. But when they're relied on to function perfectly by themselves and project stakeholders haven't weighed the risks of their application realistically, it can negatively impact the quality of concrete construction.

Take the [crack-bridging ability](#) that some membranes have, for instance. Often, stakeholders in a project have full trust in this ability to cover cracks in concrete and prevent water from reaching those cracks. They make the assumption that this ability won't fail. As a result, they feel less worried about having to face the consequences if concrete does crack. That leads them to care less about how concrete placement, curing, and control joints are handled.

Compounding this fact, stakeholders also highly regard the diversity of membranes available on the market. There are enough choices available that membranes seemingly come with an infinite number of different accessories to mitigate risks. But even with those accessories, membrane failure is still a possibility. Once that happens, those accessories aren't going to stop a construction team from a long, costly repair process.

A membrane's accessories might make that last situation seem highly unlikely. But unfortunately, that's just not the case.





## **In Fact, External Waterproofing Membrane Failure Is Incredibly Common**

As the Australian Institute of Waterproofing member Wet-seal notes, waterproofing makes up [almost 80% of complaints](#) during construction in Australia alone. It's an impressive statistic considering waterproofing does not take up a huge chunk of the cost to construct a structure. Waterproofing typically only takes up 1% to 2% of that cost. So why are complaints so high?

A big reason for that is likely how easy it is for external waterproofing membranes to fail. It's a pervasive enough issue that water intrusion is the cause for around [70% of construction lawsuits](#).

So, how does external waterproofing membrane failure get to be that big of a concern? Let's look at the three most common reasons why.

## **One of the Main Culprits for This Is Simply Poor Preparation and Installation**

At least 90% of waterproofing failures come from poor handiwork.

It's not hard to see why either. Despite not being as costly as other parts of construction, waterproofing is no less complex. There are lots of factors to consider for it, and if one aspect isn't considered carefully enough, a failure could be waiting around the corner.



### **POOR PREPARATION IS OFTEN DUE TO A LACK OF TIME**

Builders need to make sure the surface of the substrate they want to apply a membrane to has the following qualities:

- A smooth and clean exterior
- Falls for drainage
- A space absent of formwork distortions, voids, and protrusions

To achieve these qualities, they need to spend time and attention on looking to see if the substrate surface has been spoiled by debris and residue and whether they need to scrape and vacuum it.

Otherwise, without a pristine substrate surface, it is likely that a waterproofing application [will not be successful](#).



## **POOR INSTALLATION IS NO DIFFERENT**

Builders have multiple items to install to ensure that a structure has an effective and thorough waterproofing system. Depending on the structure, that might mean knowing the correct installation procedure and executing it for the following products:

- Waterstop angles
- Perimeter flashings
- Vertical flashing angles
- Pressure strip flashings
- Chased drop flashings
- Control joints
- Drainage flanges
- Cavity flashing downturns

- Reinforcing at junctions
- Overflow devices
- Linear strip drains
- Slip joints

Not having the time to properly install even just one of these items can weaken the overall waterproofing system they're a part of, making it more vulnerable to leaks.

In short, standing in the way of both proper waterproofing preparation and installation is time. Construction projects tend to run on tight schedules, so it can be tempting to skimp on the smaller details. Whether that's quickly getting through backfilling and tearing a membrane unintentionally in the process or limiting quality assurance processes for faster work, it's all done to help save what little time a project has. And while it might speed up a project in the short-term, the following repairs that result from this work will add up in the long-term to the project's expenses.

## **The Second Culprit Is a Failure to Prime Areas Effectively**

Waterproofing membranes, even self-adhering ones, require a primer during their application process. After all, builders want to ensure that their membranes remain bonded to a substrate for the life of the structure they're waterproofing. And using a primer to prepare the surface of a substrate helps to enhance the adhesiveness of a membrane. It does so by reducing the porosity, dusting, air entrapment, and high-residual moisture of a substrate.

But it will only impart those qualities if builders prime the substrate surface effectively.

This is also an area that runs into issues with timing.

When constructing homes, for example, a builder may not always accurately estimate how long it will take to prime the surface. As a result, they might schedule in tiling to be done in a bathroom and expect that the priming will only take a day or so. However, priming could take longer depending on the membrane, temperature, and weather conditions.

If the schedule is too tight, that could lead to a substrate surface with no priming, insufficient priming, or the wrong primer entirely. All of which [can cause the membrane to debond](#). That creates gaps in the membrane system, leaving room for moisture to penetrate the substrate and weaken its structural integrity.

## **The Last Is a Lack of Insight into the Substrate's Residual Moisture**

Unsurprisingly, out of the top three common causes of external waterproofing membrane failure, moisture remains one of the bigger obstacles. All it takes is poor preparation, installation, or priming for moisture to enter the structure and wreak havoc.

But what if moisture was already surrounding the structure but had gone unnoticed? As you might have guessed by now, that's a pretty common situation. And it likely stems from a lack of awareness at how much moisture content a substrate has.

Without an accurate estimate of moisture content using a tool like a moisture meter, there is a high chance that the substrate still has residual moisture. When left alone, that moisture can interfere with a membrane's ability to bond to a substrate, causing structural weakness to occur.





## **That Puts Membranes in an Awkward Spot When It Comes to Sustainability**

Because it is so easy to damage membranes through application alone and because that damage can have severe consequences for a structure, membranes should not be considered the ideal sustainable solution. After all, you can't call something sustainable if it can't be upheld safely in an environment for a long time.

Though, it *is* true that not all membranes are going to fail immediately during application or afterwards. What about those then? Would we call the ones that can last without wear and don't hurt their environment sustainable? It's debatable, but in this instance, the answer would still likely be no. And that's because many membranes come with a short life span of around one to 10 years before they deteriorate.

After that, they need to be replaced. If they aren't, then water damage is a more likely possibility. And if they are, then the building's maintenance team needs to use up monetary and construction resources to get the same waterproofing protection.

All in all, it's a very short-term version of sustainability that is draining resources at regular periods unnecessarily as there are long-term forms of waterproofing out there.



## **Even Worse, Acquiring External Membranes Is Also Not That Sustainable**

Even if you still want to stick with specifying and using external membranes, you may find it increasingly difficult to do so.

## **For One, There Is a Global Materials Shortage That May Hinder That**

Between the ongoing pandemic, the past Suez Canal blockage, delayed and pricier shipping, and the mass blackouts in Texas that led to chemical plant shutdowns, [there is a significant materials shortage going on](#).

And waterproofing membranes have not gone unscathed. Often made with plastics and other materials that typically require crude oil, membranes have been hit in both areas.

Plastics are hard enough to get that companies like Acer and Dell are starting to create products with recycled plastic instead. Meanwhile, crude oil is in a different sticky situation. Instead of a shortage of the product itself, there's a shortage of tanker truck drivers in the United States of America. At least [50,000 more drivers are needed](#). With the two materials harder to supply, that is going to make waterproofing membranes also harder to supply and will likely increase their costs as demand goes up for that shorter supply.

The general perception is that this might get better sometime in 2022 or a little later. But does that mean you should wait it out?

### **Even Without a Shortage, Membranes Will Still Be Non-Eco-Friendly**

While only some membranes use plastic, almost all require crude oil in their manufacturing. And that doesn't bode well for the environment. According to the University of Calgary's [energy education team](#), whether drilling for oil, transporting it, refining it, or using it otherwise, there is always an environmental impact. Extracting it, for example, destroys the land around it. And other oil industry activities can end up producing chemicals that contribute to smog or creating greenhouse gases that increase the effects of global warming. Moreover, if during any part of that process, the oil spills, it can impact the plants, soil, and well-being of animals, making the environment wholly toxic.

All of which is definitely not a way to maintain human well-being either, making membranes even less ideal for sustainability.



## **Nowadays, There Are Better Alternatives Out There**

And they come in the form of crystalline waterproofing admixtures.

To apply these products, builders have one step and that's it. There's no detailed handiwork or long time period required. All builders have to do is add your specified admixture into the concrete mix. From there, the mix will have the waterproofing properties it needs. It's a short and sweet process that should permanently waterproof a concrete structure without the risk of application error.

The only real challenge you'll come across is finding which crystalline admixture is right for you.



## **Just Look Up Your Options for Concrete Waterproofing Admixtures**

The American Concrete Institute has classified these products [under two categories](#): permeability-reducing admixtures for non-hydrostatic conditions (PRAN) and permeability-reducing admixtures for hydrostatic conditions (PRAH).

The first of the two we recommend for low-risk use. PRANs, as their name implies, are not meant to handle heavy water pressure. Instead, they are more designed to repel water. To that end, they often use water-repellent chemicals. These might involve soaps, vegetable oils, or even petroleum. Such materials work to leave a layer alongside concrete pores that repels water while still leaving the pores themselves open. However, PRANs can also make use of chemically active or inert fillers, which act as densifiers to limit how much water gets into concrete pores. In either case, you don't get watertight waterproofing with them.

What you do get is a solid dampproofing solution. So you could use PRANs for projects that will encounter a little moisture ingress. That might involve using them to repel rain off a structure or to minimize the structure's dampness.

So, what about PRAHs?

Now, these are what you should really keep an eye out for. These are recommended for long-term waterproofing against heavy water pressure. They tend to use a hydrophilic polymer plug or crystal technology. And that creates waterproofing that is impervious to damage or deterioration and capable of bridging cracks in concrete.

It makes PRAHs a perfect option for watertight waterproofing in any concrete structure.

(For even more details on these waterproofing admixtures and more, [get our free e-book](#) on the topic!)

## **We Recommend Krystol Internal Membrane™ (KIM®) for Thorough, Sustainable PRAH Waterproofing**

If you want a specific PRAH recommendation, we suggest [KIM](#).

When you specify it, KIM gets added to the concrete mix where it disperses Krystol® technology throughout the entire mix. That way, once the concrete cures, the technology will rest dormant throughout the slab until it encounters water. Once that happens, the technology will activate and react to the water and nearby unhydrated cement particles to create interlocking crystals (which you can visibly see react in a sample via time-lapse [here](#)!). These crystals go on to fill up capillary pores and micro-cracks in the concrete. That blocks the water from passing through.

And it does that for the entire life of the concrete as KIM remains within concrete permanently.

So you get lifetime waterproofing for the simple act of adding KIM to a mix. There's less labor involved and no installation risks, which will save your construction team time and money, expediting their work in the process. There are no shortage issues. And even better, KIM comes with [several sustainable advantages](#):

- Reducing site disturbance by eliminating the need for excavation
- Eliminating any possible waste it has by coming in custom-size pulpable bags
- Containing no volatile organic compounds
- Having NSF certification for safe use with potable water
- Ensuring KIM-treated concrete can be recycled post-demolition

So when you use KIM, you can earn LEED points while also benefitting from less labor-intensive and time-consuming permanent, tear-free waterproofing.



## Waterproofing Membrane Failure Is a Sign to Revolutionize Your Design

When you think about external waterproofing membrane failure and how common it is, consider what the alternatives are. There are many concrete waterproofing admixtures out there that could better solve the issues that come with membranes. And if you want one that gives you an edge in the LEED sustainability framework, you don't have to look farther than KIM. It will revolutionize your architectural design and help it become the green watertight structure you're looking for.

Ensure Your **Concrete  
Waterproofing Method**  
Is Ready for 2022

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