Basement waterproofing

In the past, residential basements were mainly used for purposes that usually entailed the area becoming partially wet during their usage; for example, car parking and plant rooms. Today, they are increasingly used as habitable room spaces, primarily theatre rooms. This is designed to minimise the transmission of audio sounds from the theatre room.

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This type of usage places additional demands on the waterproofing, as it becomes necessary to prevent damage to surface finishes used in these rooms. This, in turn, produces an increase in the cost of the waterproofing. This results in two types of waterproofing, one for what I refer to as 'wet basements', the car parking and plant room type, and the other, which I refer to as 'dry basement', the habitable room type.

Wet basements

Firstly the wet type. Cars always bring water into the parking space. You can observe this when entering an undercover car park in multi car park spaces on a wet day. In commercial car parks the extent of water deposited on the floor can extend well over 100 metres into the car park. Even in a residential basement of a detached dwelling the floor has to cope with the ingress of water.

The walls and ceiling need to handle the build up of humidity within the car park that can lead to condensation forming on these surfaces. Plant rooms are designed with floor drainage to deal with accidental spills, with similar design requirements to car parks in regard to humidity build up.

Figure 1 depicts the type of drainage that is built into floors to cope with water.

This particular car park had been built well below the water table level. To reduce the water pressure on the floor of the car park, core holes were drilled though the floor each side of the drainage grate to release water pressure under the floor, allowing it to drain into the grate – as can been seen in the illustration.

It is common in units with underground car parks that there are lockable cages along some external walls of the car park for storage of items owned by residents. **Figure 2** illustrates how a resident stored the items in the cage on a timber platform placed above the water flow. Water flows in drains along the walls needs to be handled differently than shown in this example. → 64

Figure 1 – Drainage along wall of underground car park

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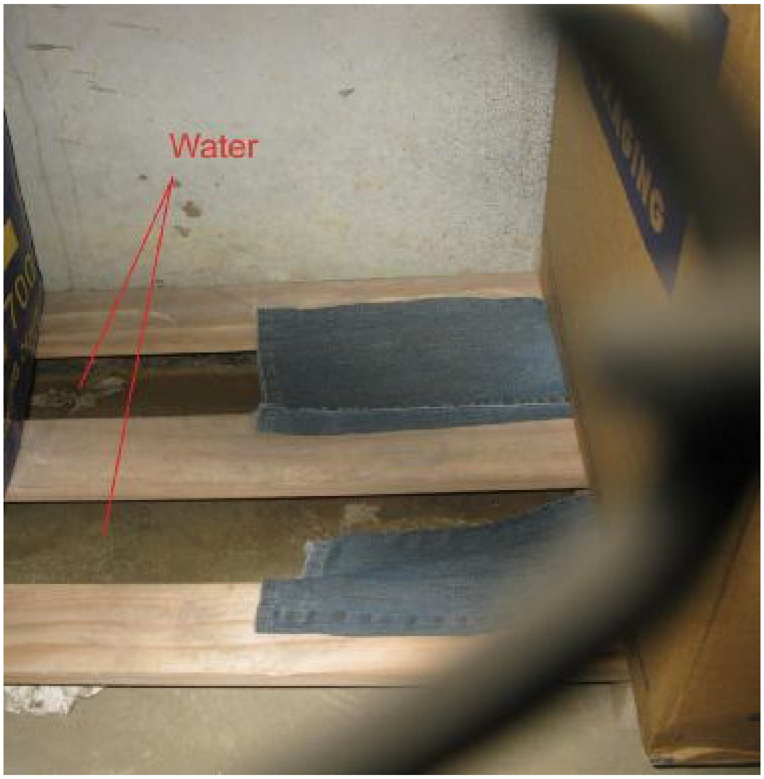

Figure 2 – Items stored above drain

Water entry at the wall/floor junction is common in car parks built below ground level and is where these storage cages are usually built. If storage units are to be constructed along the walls of a car park then a better way of handling the water flow needs to be created at the design stage to avoid potential damage.

Water entry at the wall/floor junction is common in car parks built below ground level and is where these storage cages are usually built. If storage units are to be constructed along the walls of a car park then a better way of handling the water flow needs to be created at the design stage to avoid potential damage. Drainage along the wall/floor junction is the best position for the drain as water inflow is most likely in this location. A removable raised false floor over the drain is a possible solution as it protects the items stored, and allows access to the drain for cleaning. The other solution is to build the storage cages in the middle of the space away from the walls, however this usually results in restricting vehicle access to parking spaces.

Dry basements

Now for habitable room basements. With habitable rooms not only do you need to prevent water entry, the water vapour transmission through the walls and floor also needs to be lower than any finish applied to them.

As the floor of the basement will often be below the water table level at some stage during the life of the building, the floor needs to be waterproofed as well as having a low water vapour transmission rate.

The water vapour barriers used for concrete slabs on ground construction will not achieve this requirement. Due to their thin nature the water vapour barriers frequently have small pin holes made in them and this creates difficulty in making water tight seals between sheets.

Pin holes and joins between sheets are not a problem with water vapour transmission as the rate of bleed of water vapour is a function of the total surface area. So a few pin holes or gaps in joins do not greatly alter the total amount of water vapour transmission through the whole surface of the floor. However, even a small pin hole will be a problem in regard to water entry, which must be avoided in habitable room spaces.

In this type of construction, it is possible that some of its life will be spent below the water table level. Therefore, a waterproofing membrane with a low water vapour transmission rate is required below the floor. A low water vapour transmission rate is one that is 0.1 gram or less per square metre in a 24 hour period. This low rate requires the use of sheet waterproofing membranes or hydro carbon liquid ones. Any that are water based or require water to activate will not provide the required low rate of water vapour transmission.

As the floors are usually concrete, two separate layers of concrete in the floor construction are required to apply the membrane. What is commonly referred to as a wear slab is initially installed, then the membrane is applied. The conventional floor slab is then placed over the membrane as shown in Figure 3. The wear slab is extended out past the floor slab, so that the wall membrane can be joined onto the membrane after the walls are in place. This extension allows a waterproof junction between the wall and the floor membrane. → 66

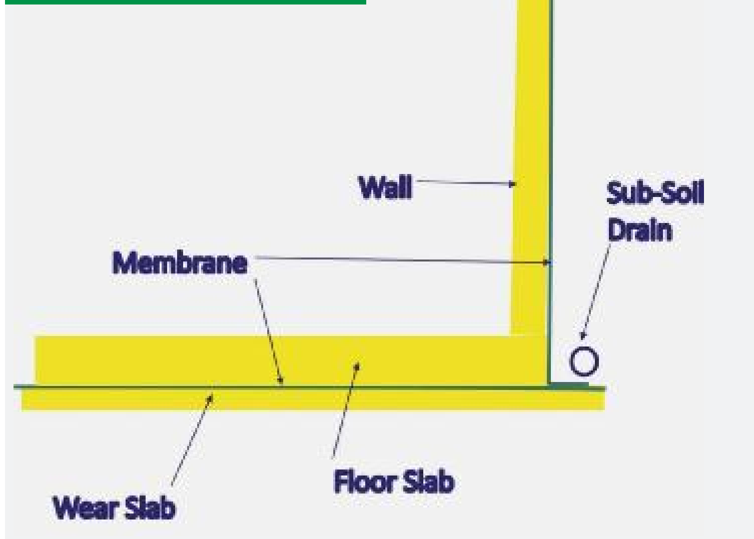

Figure 3 – Details for a floor slab with wear slab

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To limit the long-term water pressure on the wall there must be a sub-soil drain installed below the top of the floor slab as shown in **Figure 3.**

If this detail is not followed then coverings of the floor slab need to be limited to those that will have a high water vapour transmission rate. Otherwise there is the risk of dampness building up under them due to the water vapour transmission through the floor slab.

With walls it is worth considering the use of a vented cavity between the wall finish cladding and the structural wall behind it. This would be advisable, as the waterproofing membrane on the wall is frequently damaged during the backfilling operation, even if protection boards are used.

An example of the damage that can occur due to water vapour transmission through a wall in a habitable basement is shown in **Figure 4.**

From the examples discussed in this article it is clear that greater performance requirements are required for waterproofing of habitable room spaces in basements than are deemed necessary for car parks and plant rooms. Unfortunately these extra performance requirements are often overlooked in the specifications used in the waterproofing of habitable room spaces. This frequently results in the need to undertake extensive repairs and/or alterations once the building is occupied to provide the required performance. ■

Figure 4 – Internal damage to a wall from water vapour transmission