NEWTON TECHNICAL PAPER

Basement Drainage Solutions

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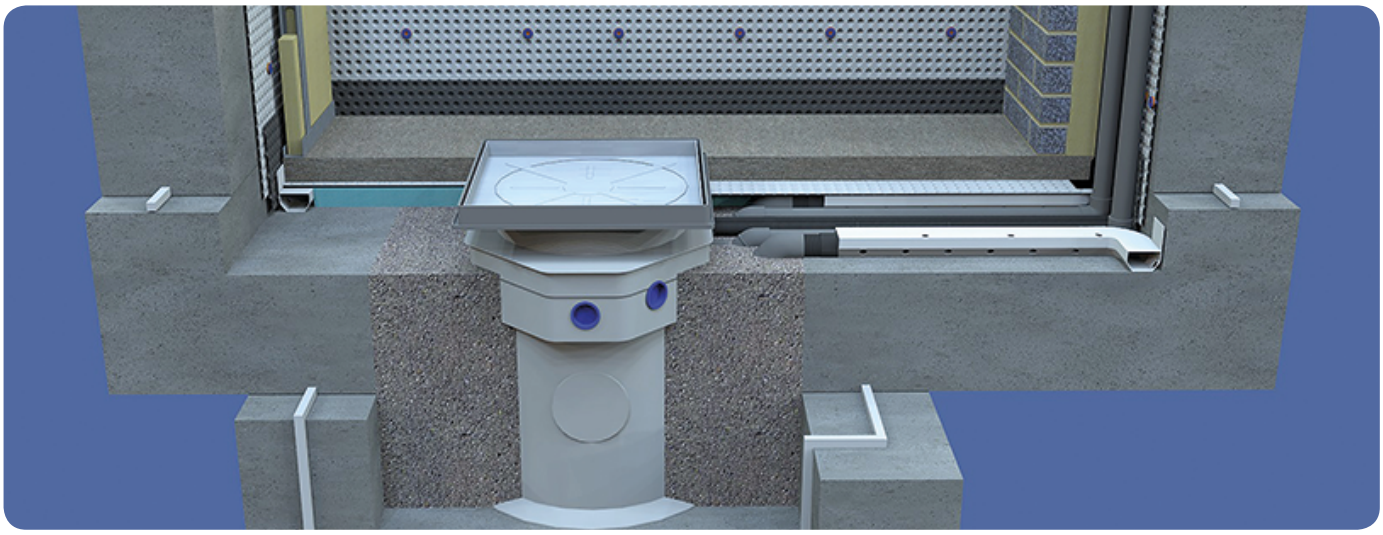
NEWTON
WATERPROOFING

The Practical and Technical Considerations

Basement Drainage Solutions

Practical and Technical Considerations



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1. Introduction

'Basement drainage' is a broad term that can refer to the removal of water either as a part of or in order to assist with the waterproofing of the basement.

Internally, with Type C cavity drain waterproofing systems, drainage is an absolute requirement, whereas externally, when used to prevent water from bearing against the structure, the use of drainage can vary from very helpful, to not so helpful, and in some cases to dangerous.

The following article explains in detail the different forms of basement drainage and when they should and should not be used.

2. Internal Drainage Solutions

2.1. 'Type C' Cavity Drain Waterproofing Systems

The Newton CDM System comprises of cavity drainage membranes, basedrain drainage channels, pumping systems, control panels and battery backup systems, and is the most recommended and most comprehensive solution for effectively waterproofing new and existing basement areas.

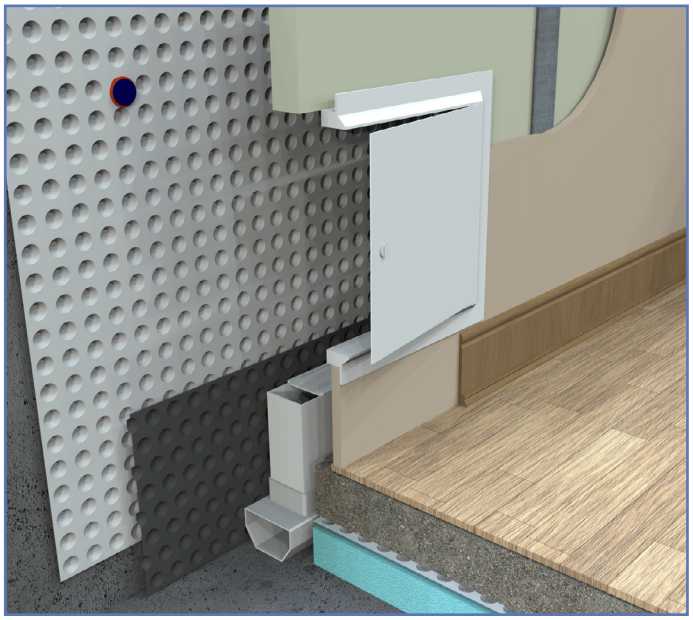

Figure 1: The Newton Basedrain channel captures water from the drainage membranes, and includes inspection ports for maintainability

Figure 1 shows how the Newton Basedrain drainage channels form an integral part within the Newton CDM System. If the pumping system that discharges captured water from the property can be considered as the heart of the system, then the drainage channels are the veins, delivering the water to the pumps.

Newton Basedrain consists of a range of drainage channels that receive water entering the property at the weakness within the structure, such as at joints or where the structure is porous, which is often the case at the kicker joint.

Water that has passed through the structure is first depressurised by the air cavities that are created by the cavity drain membranes and the Basedrain channels, and then safely removed from the property either via the Newton Pumping System or by safe gravity drainage to a point that is downhill of the basement slab.

If the water is removed by pumping, then the Basedrain Drainage System is connected directly to the Newton Titan-Pro packaged sump system. With its simple and easy-to-install connections, the Titan-Pro is designed specifically for use with the Newton CDM System, and is compatible with a large number of Newton pumps.

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3. External Drainage Solutions

3.1. Drainage Membranes

The Newton HydroBond® System provides an external waterproofing solution for basements by creating a continuous waterproof envelope around the structure.

Newton 410 GeoDrain is a key component of the HydroBond System that protects the wall membranes against damage when the compacted ground is replaced. In some cases it can also be used to manage ground water in order to ensure that it does not bear against the primary form of waterproofing, which in most cases is a self-healing physical or liquid-applied membrane.

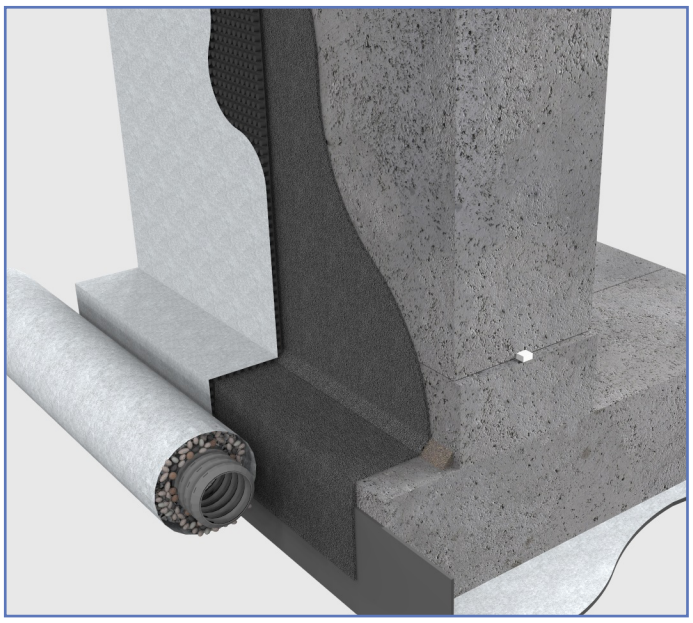

Figure 2: Newton 410 GeoDrain used externally to protect the waterproofing membrane as part of the Newton HydroBond System

In order to perform such a role, the Newton 410 GeoDrain membrane needs to be extremely strong, and is therefore formed from a composite of a durable, cuspated HDPE core, coupled with a fine gauge geotextile membrane in order to create a high-volume drainage void.

3.2. The Safe Use of External Drainage

3.2.1. Basements Built Within Sloping Ground

Basements built into slopes will break into existing watercourses and act as a dam, intercepting water that would otherwise have flowed down the hill within the soil. By using a drainage membrane, such as Newton 410 GeoDrain and a land-drain/perforated pipe, together with a permeable back-fill such as clean graded stone, water that would otherwise be intercepted by the structure can be diverted downhill and away from the property, mimicking what happened naturally prior to the basement build.

For any basement built into sloping ground, drainage should always be used and it is always safe to do so, as nothing has fundamentally changed with regards to the ground water.

3.2.2. Basements Built Within Flat Ground

When planning to use external drainage for a basement that is built within flat ground, it is vitally important that doing so will not artificially dewater the ground surrounding the basement.

In order to practice the safe use of external drainage to flat or level ground, a good geotechnical understanding of the ground water, the soil types, the soil strata and the water courses is required, and such work should only be undertaken following a comprehensive study of the ground surrounding the basement.

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3.2.3. The Dangers Of Using Drainage Around Basements

The common perception is that if groundwater is removed by dewatering, then there will be no water to test the external Type A waterproofing.

However, this is a dangerous assumption to make, for the following reasons:

1. **How much water is there?**
   Within permeable soils, it is impossible to calculate how much water needs to be removed in order to prevent it bearing against the structure/waterproofing. Water could travel from many miles around, from any direction and in huge quantities, so if there is no way of calculating how much water is arriving, there is no way of knowing how much needs to be removed. It is therefore impossible to calculate the required size/s of the pipes within the drainage system or whether the removal method for the water is able to receive it in such volumes.

2. **Where does the water go?**
   The level of the basement slab/raft is likely to be below the street drainage. Even if it were not, street drainage can surcharge during periods of heavy rainfall, meaning that the ground will become saturated and, with nowhere else to go, the ground water will simply surround the basement to its full height.

3. **What about a soakaway?**
   Soakaways are essentially holes in the ground full of permeable material, designed to slowly dissipate water into the soil and water courses. However if the ground is saturated, then so is the soakaway, and the water level in the soakaway will be more or less the same as the ground surrounding the basement.

4. **How about pumping the water away?**
   Much like point 1, it is impossible to know how much water is to be pumped. Furthermore, external factors such as storms can often cause power cuts, at which point how will the water be removed?

It is not good practice to use dewatering as a waterproofing method, as unless the basement is within a determined area of impermeable clay ground, it is impossible to know how much water will need to be removed to ensure that it does not bear against the structure.

Even when the water level can be calculated, the volume may still be too high for the method of water removal that has been employed.

Overall, if the basement is being constructed within flat or level ground then drainage cannot and should not be relied upon to keep the basement dry or to assist in doing so. It is therefore not safe to rely upon just the external Type A membrane as the only form of waterproofing, regardless of the desired habitable grade internally.

3.2.4. The Dangers of Dewatering With External Drainage

Prior to any excavations being made into the ground, groundwater resides at a level that is dependent on the soil type, the water table location and levels of rainfall. Groundwater within level ground is often slow-moving, and in some cases will not move at all from the point where it entered the ground.

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It therefore makes sense that, when excavating a big hole in the ground that the hole will, more often than not, fill with water. However, if that water is then removed from the hole, it may well be replaced with water from below-ground watercourses that can extend many miles in any direction. This process is called artificial de-watering and the results of this can be very damaging.

Where a basement is built within flat, permeable ground, as water is removed from around the building it will immediately be replaced by water from the surrounding ground. As this water moves towards the dewatering point to replace the pumped water volume, it brings with it fines from the ground; the smallest soil particles that bind it together. However, by constantly removing water from around a basement, and therefore removing the fines too, the soil gradually becomes less dense and, if enough fines are removed, then the ground surrounding the basement can become unstable.

Such situations can potentially result in the subsidence of buildings, whilst significant dewatering can also contribute to the dying out and shrinkage of clay soils.

In conclusion, the use of internal Type C cavity drainage is the safest option for waterproofing a basement, as only small volumes of water are removed, similar to how bilge pumps operate within a ship. Furthermore, in waterproofing as with shipbuilding, the best bet is to build the basement to be dry, and just in case, put in place the necessary measures to remove the small amount of water that may make it through the outer skin.

4. Why Should Combination Waterproofing Be Used?

The British Standard for Waterproofing (BS 8102:2009) recommends the use of combined waterproofing systems in order to provide enhanced protection. In cases where the basement is built within a slope, both of the drainage methods mentioned in this article may be installed on the same project to ensure maximum protection.

In most cases we recommend that the basement waterproofing scheme specifies the internally applied Newton CDM System, including the Newton Basedrain and Newton Titan-Pro systems, as it is the safest option to ensure a dry basement. This provides what is called 'Type C' protection to the building, and wherever possible should be combined with either 'Type A' or 'Type B' protection (or both). The external Newton HydroBond System is defined by the British Standard as Type A waterproofing, and when combined with Type C waterproofing provides an effective overall solution for all below ground structures.

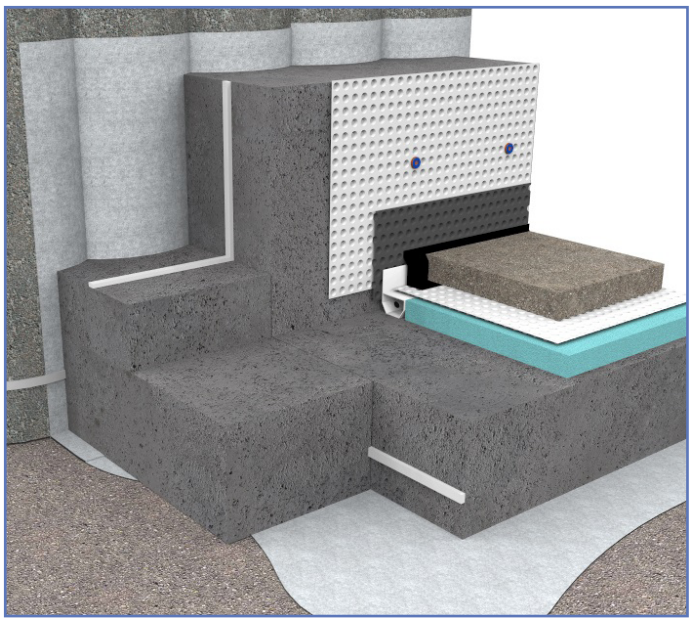

Figure 3: Comprehensive waterproofing with Type A protection externally, Type B protection integrally, and Type C protection internally

"Guardian Preservation Services LLP would highly recommend Newton Waterproofing Systems. The products are industry leading and the technical information they provide is outstanding"

Tim Herbert, Director, Guardian Preservation

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5. Guaranteed Waterproofing Installations

Newton highly recommends that installation is undertaken by a Newton Specialist Basement Contractor (NSBC). NSBCs can provide a substantial insured guarantee and take full design liability on the project, fulfilling the role of 'Waterproofing Specialist' as recommended by BS 8102:2009.

Please contact us for a list of NSBCs in your area.

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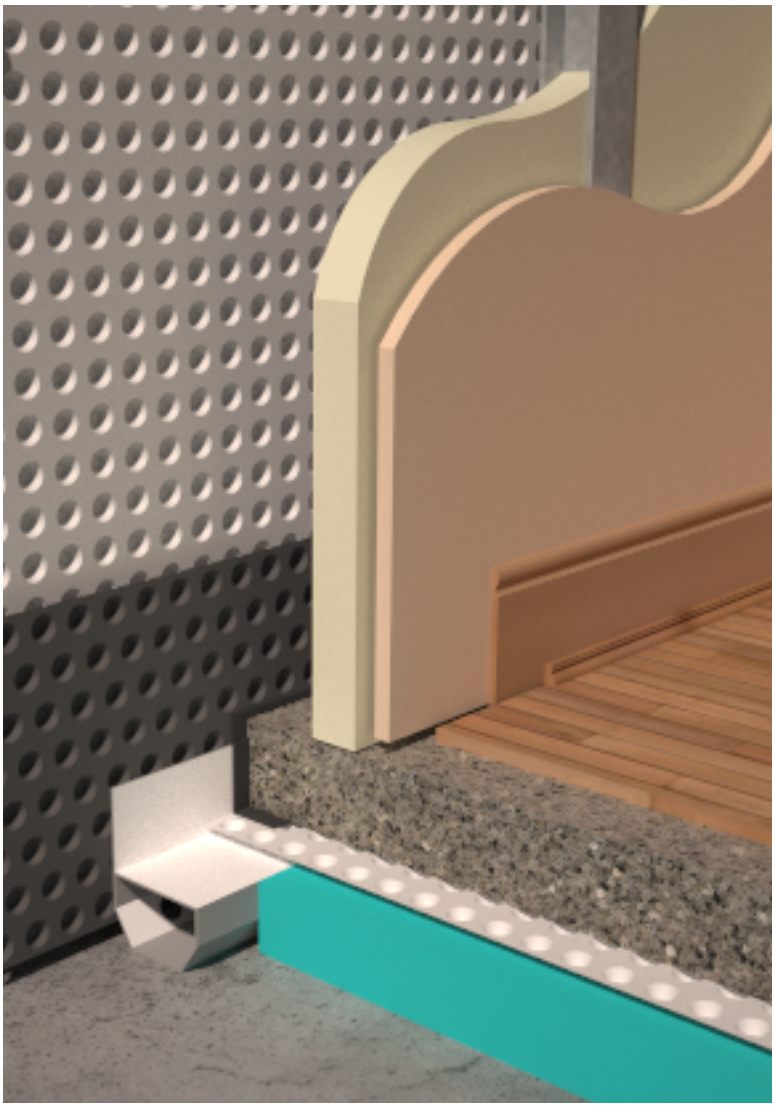

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