FACTSHEET

mpa British Precast Drainage Association

Storm Water Attenuation Storage Tanks for Sustainable Drainage (SuDS) Applications

Precast concrete attenuation storage tanks are used to create underground space for the temporary storage of surface water prior to infiltration, controlled release or 'use' as part of a sustainable drainage system (SuDS).

The flexibility in size, shape and modularity of precast concrete drainage systems means that they can be tailored to suit many of the specific characteristics, constraints and requirements of different types of site.

In general terms, the main benefits of underground attenuation storage tanks are:

1. Potential for installation beneath roads, car parks and below recreational areas and other open space.
2. Profit opportunities and cost savings relating to the potential use of land above the tanks.
3. Through the use of flow controls, may enable smaller sizes of pipework downstream of the tank.
4. Efficient storage volume (e.g. compared to systems filled with aggregates).

Important considerations include:

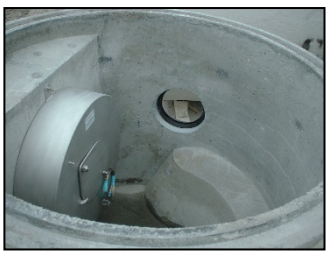
Simplicity / complexity of the design and installation. Systems with inherent strength such as precast concrete can be simpler to construct. For example, lightweight thermoplastic (flexible) tanks usually need to be ballasted with water during installation to prevent flotation whilst backfilling with concrete. They may also need additional anchorage against flotation after construction when subject to high groundwater levels and additional protection (e.g. a concrete slab) may need to be provided for installations in trafficked areas. In contrast, concrete systems will not generally require ballasting during installation or need concrete backfill or a concrete slab to provide structural integrity.

Accessibility and maintainability. Good access for inspection and cleaning is vital and effective upstream treatment is required to enable sediment removal. Unlike some alternatives, all precast concrete systems provide ample scope for easy, clear access to carry out maintenance operations.

Water quality requirements. Underground storm water attenuation tank systems will require integration with the overall surface water treatment strategy, as they do not have inherent treatment capability. Proprietary precast treatment chambers are available.

Capital, operating and whole-life cost. Sustainable drainage systems must perform effectively over the lifetime of a development. Precast concrete drainage systems provide inherent strength, durability and a long service life that offers simplified, lower cost construction and assured long term performance. For example, structural precast concrete systems can enable shallower installations with reduced excavation, reduced selected backfill, less compaction and reduced installation time compared to flexible systems. Precast systems allow quick installations and immediate backfilling so work can progress on or ahead of schedule.

Sustainable solutions. Overall, concrete drainage systems have a lower carbon footprint than equivalent products made from other materials. Furthermore, the raw materials used in their manufacture are sourced locally and certified to the Responsible Sourcing standard BES 6001. BPDA members are committed to the British Precast Sustainability Charter which sets out ongoing reduction targets for a variety of environmental factors. The long service life of precast concrete drainage systems reduces maintenance interventions with less frequent need for renovation or replacement, further helping to achieve superior long term sustainability performance.



Why is the structural integrity of buried tanks so important?

CIRIA document C680 *Structural design of modular geocellular drainage tanks* 2008 provides information and images on failures of modular thermoplastic geocellular tanks (Figure 1.2, Example of the consequences of failure of a modular geocellular tank after three years, page 16 and Figure 1.5, Loss of use of car park spaces due to geocellular tank collapse, page 20).

It states:
The four main contributing factors to most failures are:

1. Inadequate design, often not taking account of particular ground conditions on a site, or not allowing for creep of the units.

2. Lack of understanding of the performance of the tanks, leading to overloading, for example by running heavy plant across tanks that were not designed to carry such loads, or by using unsuitable backfill, for example containing boulders.

3. Lack of appreciation of the influence of groundwater levels or the effect of surface water flows into excavations during construction.

4. Inappropriate laboratory testing that overestimates the strength of the units.

Laboratory strength testing of a tank element does not provide a reliable indication of the structural performance of the installed system without giving due consideration to the short and long term behaviour of the buried structure, the interaction between the loads applied to it and with the surrounding embedment and soil.

References & Further Reading:

1. CIRIA SuDS Manual C753
   http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx
2. Factsheet: Assessing attenuation storage volumes for SuDS
   www.susdrain.org
3. BPDA embodied carbon reports
   https://www.precastdrainage.co.uk/page/sustainable-urban-drainage-systems
4. British Precast Sustainability Charter
   https://www.britishprecast.org/Sustainability/Sustainability-Charter.aspx

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