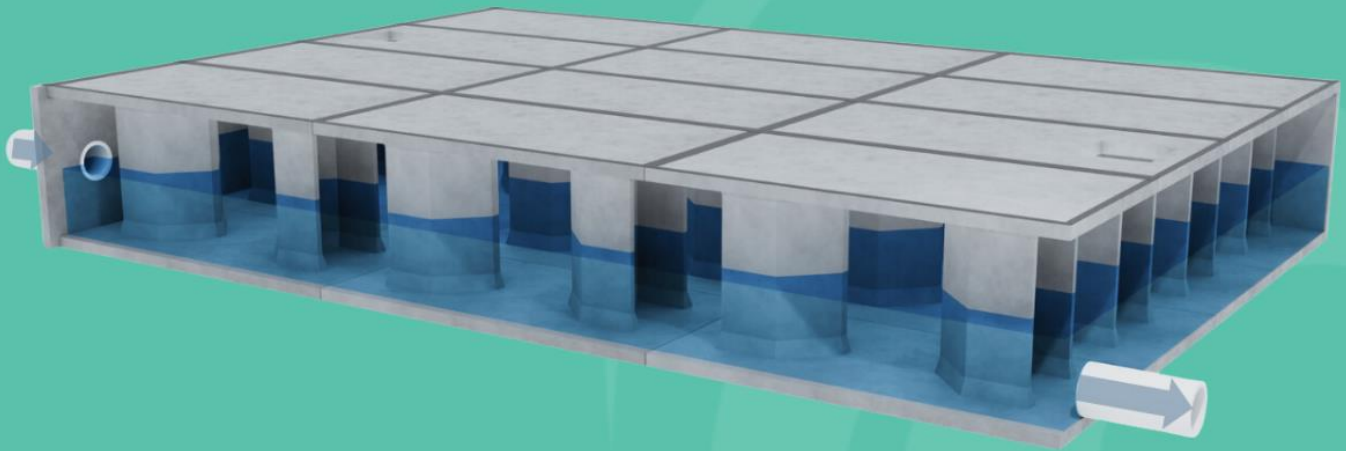


UrbanPond™ Installation Manual



Stopping Pollution Entering Waterways

Contents

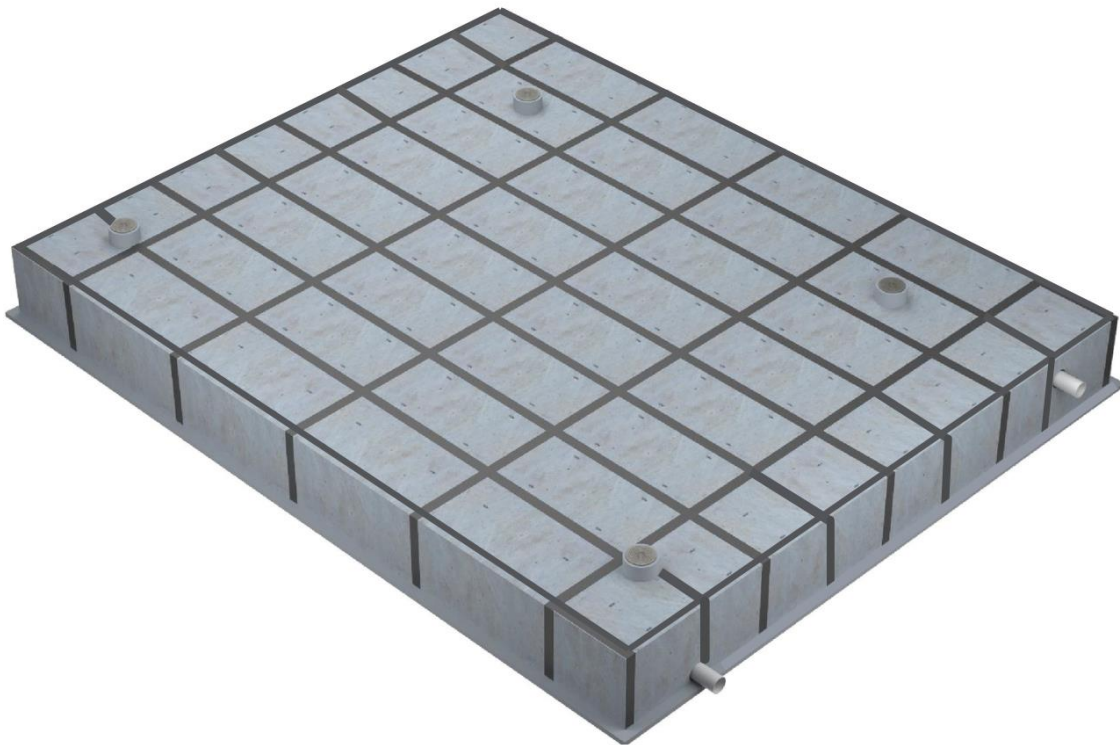
- Overview 3
- UrbanPond™ Components List 4
- Excavation Process 5
 - Site Access 5
 - Excavation 5
 - Dewatering 5
 - Removal of Rock and Unstable Materials 6
- Subgrade, Bedding and Foundation 7
 - Subgrade 7
 - Bedding 7
 - 8
 - Foundation 8
- Delivery, Storage and Handling 9
 - Safety 9
 - Delivery 9
 - Storage 10
 - Handling 11
- Module Installation 12
 - Prepare for Installation 12
 - Inspect Modules Upon Arrival 12
- Backfill and Final Fill 15
 - Backfill 15
 - Final Fill 15

Overview

UrbanPond™ is an underground modular storage system designed for stormwater detention, retention and infiltration. UrbanPond™ utilises the strength and durability of precast concrete to create an efficient and resilient stormwater management solution. A modular design gives UrbanPond™ the flexibility to meet nearly any site requirements with configurations ranging from 600 to 3600mm internal height. Modules are delivered ready to be installed, minimizing staging requirements and decreasing installation times.

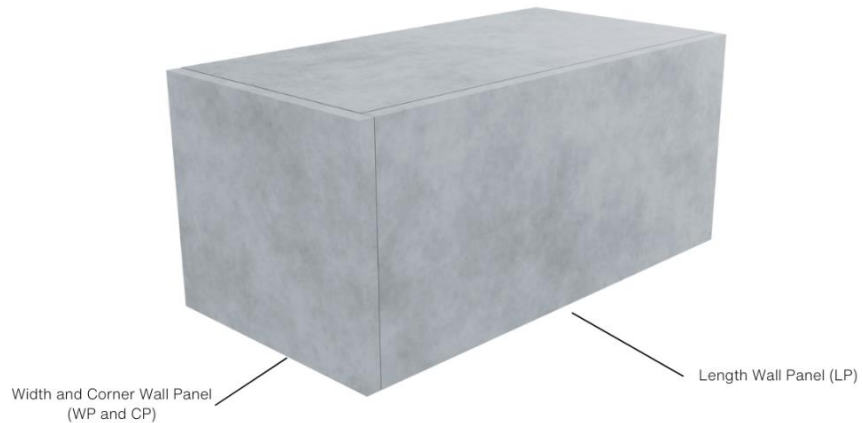
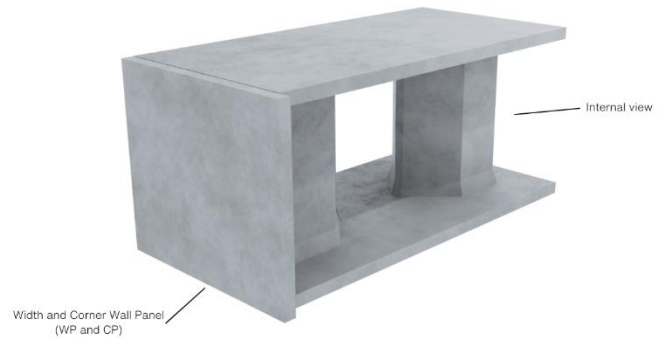
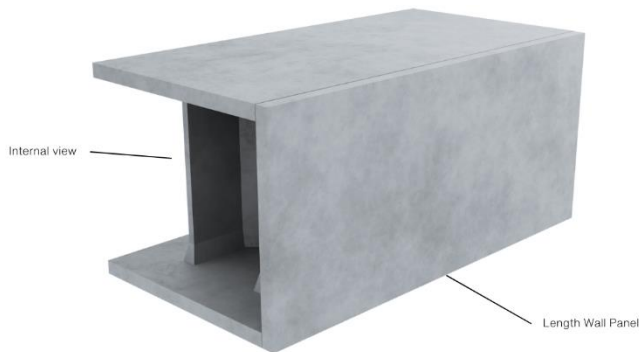
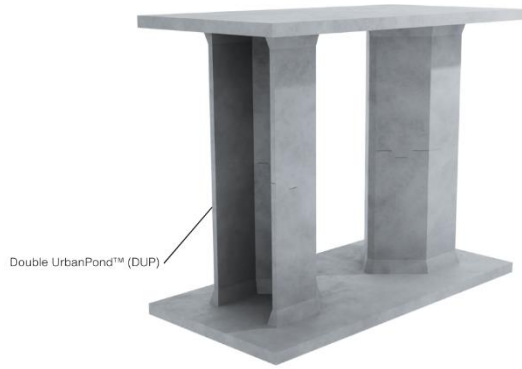
UrbanPond™ can be installed in a variety of configurations and heights. Taller systems are installed by stacking top and inverted bottom modules. Shorter systems consist of the top modules only placed upon a concrete slab. Either configuration can be combined with a membrane liner for leak resistant applications. Installation procedures for both configurations are described herein.

The specifying engineer is responsible for the approval of the system design, layout, and volume to be stored, as well as load calculations, cover depth, water table elevation, soils report, and backfill requirements. This installation manual is a reference guide only.



UrbanPond™ Components List

The UrbanPond™ system is constructed of multiple modules and panel walls. The system configuration will be shown in the Shop Drawings or Plans and may include:



Excavation Process

Excavation for the UrbanPond™ system should be in accordance with the Project Plans and Specifications. The excavation should consider various factors such as system length, width, depth, and type, as well as any site constraints such as access, water table, stockpile, borrow, and unit staging and placement locations.

Site Access

The excavation process will create a large amount of material that needs to be stored on site or exported from the site. Planning and preparation for this amount of material is necessary. The bottom of the excavation will need to be accessible for placement and preparation of the bedding as well as movement and placement of the modules. This often requires a ramp into the excavation or cutting the excavation in such a manner that one side is accessible from grade level.

Whether placing directly from a truck or where they have been stored onsite, adequate room for large truck access, location of a crane, and staging of the modules is necessary.

Excavation

Excavate the installation area to ensure that the sides will be stable under all working conditions. To achieve this, trench walls may have to be sloped, benched, or supported, with temporary or permanent shoring. The trench walls should be prepared in conformance with all national, state, and local safety standards. Excavate only as much as can be safely maintained by available equipment.

The excavation dimensions should be based on the Project Plans and Specifications and any approved submittal drawing prepared by Ocean Protect. Excavation lengths and widths should allow for adequate amounts of backfill material and appropriate compaction equipment. Where excavation walls are stable or supported, the width of the excavation should be no greater than necessary to ensure working room to properly and safely place and compact embedment materials. This is generally considered as 500-600mm, but this may vary depending on the backfill material and compaction equipment utilised. The space between the stormwater storage system and excavation wall must be wider than the compaction equipment used in the compaction area.

Dewatering

The precast modules and concrete slab foundation should not be placed or poured in standing or running water. Groundwater must be properly managed and surface runoff should be prevented from entering the excavation at all times.

If water is present in the work area, the excavation must be dewatered to maintain the stability of the in-situ and imported materials. The water level must be maintained below the stormwater storage system bedding and foundation, to provide a stable excavation base. Use, as appropriate, any sump pumps, well points, deep wells, geofabrics, perforated underdrains, or stone blankets of sufficient thickness to remove and control water in the excavation. When excavating while depressing ground water, ensure the ground

water is below the bottom of the cut at all times to prevent washout of exposed excavation walls. Maintain control of water in the excavation before, during, and after the stormwater storage system installation and until embedment is installed and sufficient backfill has been placed to prevent flotation of the system, attached piping, or accessory drainage structures.

Removal of Rock and Unstable Materials

Rock in either ledge or boulder formation should be removed and replaced with suitable material to provide a compacted soil, as per design specification and guidelines.

As determined by the Engineer, where there is wet or otherwise unstable soil, incapable of adequately supporting the stormwater storage system, such material should be removed as per the Engineers advice and replaced to the required grade, with select granular material and compacted accordingly.

Subgrade, Bedding and Foundation

The bedding for the UrbanPond™ system should be in accordance with the Project Plans and Specifications. A stable and uniform bedding and foundation is necessary for the stormwater storage system and any associated features. The bedding material and placement method can vary depending on the site conditions and the system type. Storage system foundations may be precast or poured in place depending on the system design.

Subgrade

The UrbanPond™ system requires a foundation that is stable, uniform, and between 0 to 2% grade (as per design). This begins with preparation of the subgrade. The subgrade should be prepared in accordance with the Project Plans and Specifications. Grade the foundation subgrade to a uniform and level to slightly sloping ($\leq 2\%$) grade surface. If the subgrade is clay or a relatively non-porous material and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.

Bedding

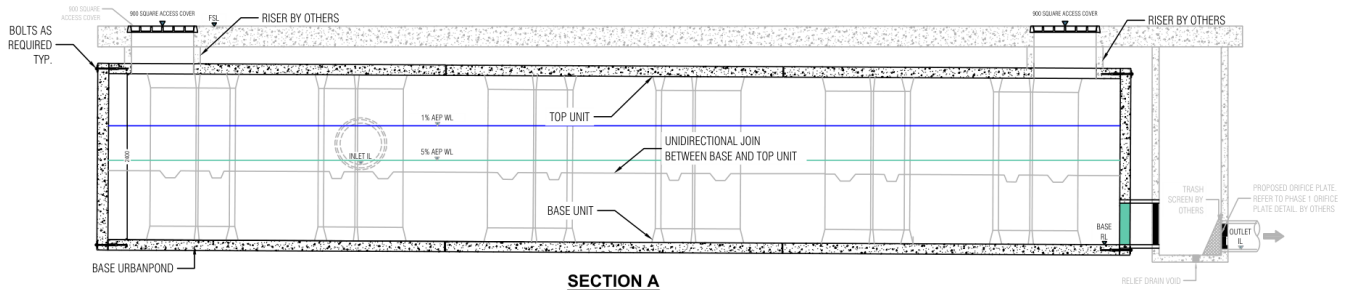
The bedding for the UrbanPond™ system provides a structural and hydraulic connection to the subgrade. The material type and placement are critical to the performance of the system. Detention and Infiltration systems require different types of bedding.

The bedding layer thickness and material type are based on the subgrade material type, storage system type, and required soil bearing pressure. The UrbanPond™ system design requires a minimum soil bearing pressure of 150kPa. Specific projects may require higher bearing pressures, and this should be confirmed prior to selection of the bedding material type.

Infiltration systems require a single or poorly graded bedding material to allow incoming water to pass through to the subgrade and in-situ material. Detention systems can utilise a broader range of materials including poorly graded and well graded materials.

The bedding material for an UrbanPond™ infiltration system should consist of coarse granular material design by the specifying engineer. These materials are typically washed granular material such coarse aggregate, gravel screenings, stabilised backfill/bedding rock or washed sand.

Example System Cross-Section



Foundation

The foundation for the UrbanPond™ system can be either constructed on site or precast depending on the system design. A poured-in-place concrete slab serves as the foundation for the mono UrbanPond™ system while the lower module of the stacked UrbanPond™ system serves as the precast foundation.

The design of the poured-in-place concrete slab should be per the Project Plans and Specifications. The foundation slab dimensions should be considered when preparing the excavation, subgrade, and bedding. The foundation slab should extend beyond the footprint of the UrbanPond™ modules by 300mm (minimum) on all sides of the system with a rebate around the perimeter. Contact Ocean Protect for specific detail. Design of the foundation slab is the responsibility of the Engineer and/or Contractor.

Delivery, Storage and Handling

The installation process begins with delivery of the UrbanPond™ precast concrete components. Proper planning for the delivery, storage, and handling of the system will ensure a safe and efficient installation.

Safety

Ocean Protect considers safety a priority for all construction projects. It is important for all parties involved with the installation of the UrbanPond™ system to observe all regulations and practice safety requirements during all aspects of the installation including delivery, unloading, handling, storage, and placement.

The contractor should comply with all applicable city, state, and federal safety codes in effect in the area where work is being performed.

The UrbanPond™ modules should only be lifted using the appropriate lifting equipment and rigging, and this rigging should be properly fitted to the designated lift points of the modules. All rigging equipment should be certified to lift the specific weight and identified as such in permanent marking. All rigging should be inspected prior to use. The weight of the UrbanPond™ modules will vary depending on type. Weights will be clearly marked on the precast units and on the Shop Drawings.

All lifting and placement must proceed with caution and strictly in accordance with all relevant occupational health and safety standards. Bumping or impact of modules can cause damage and should be avoided.

The contractor is responsible for the safety of his/her employees and agents.

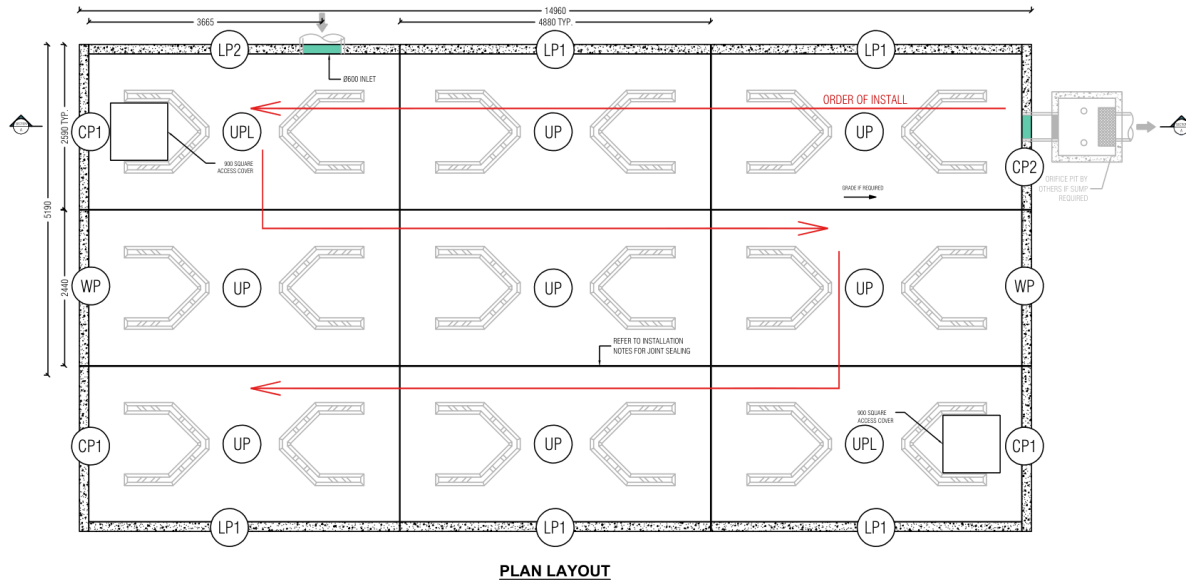
Delivery

A preconstruction meeting will be held prior to any delivery of material for the UrbanPond™ system installation. During the meeting, delivery plans will be finalized which will include a sequencing of the module delivery and placement. Proper sequencing should be a consideration for installation directly from the truck to the excavation as well as installation from an on-site staged or stored location.

The shipping plan will help to alleviate multiple handlings of the modules, which will reduce the time and effort required for the installation. The delivery plan will also make efficient use of the installation equipment (crane) and reduce congestion on the construction site. The shipping plan will be provided to the Contractor for review and approval prior to shipment of any material to the job site.

Example Delivery Sequence

Delivery Plan



The UrbanPond™ modules will be delivered to the job site on a flat-bed trailer. Each truck typically contains between one and four modules, but the quantity will vary based on the module size and weight. The first truck of modules typically takes the longest to unload and place. Subsequent truck deliveries typically require less time to offload and place but can vary based on job site conditions.

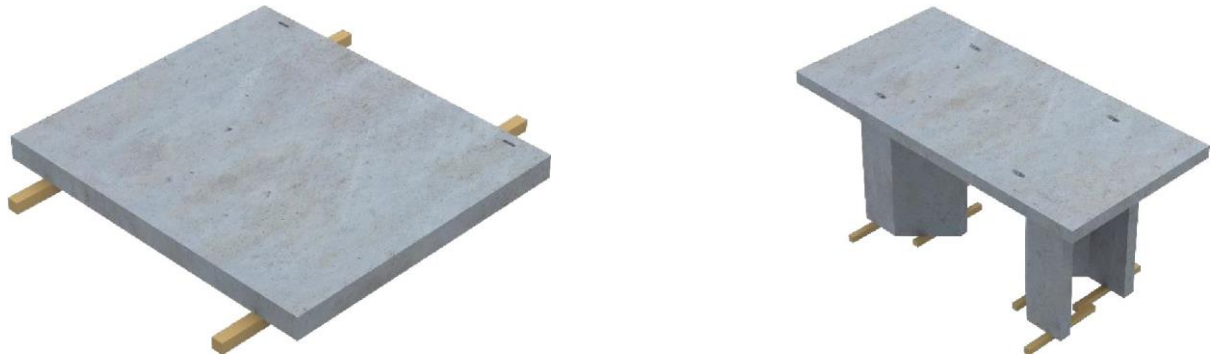
Storage

The UrbanPond™ modules may have to be stored on site temporarily or for extended periods of time. Modules should be stored adequately to prevent cracking, warping, or distortion. Modules should be stored on a firm and level foundation to avoid or minimize product damage. The use of dunnage is the preferred method for storage. Dunnage should be positioned such that the product is level, the load is evenly distributed, and sufficient bearing area is provided to prevent damage to the concrete. For lower modules and wall panels, dunnage must be placed evenly beneath the slab.

Accessory components will be delivered to the job site in the manufacturer's original, unopened packaging and/or containers, with labels that clearly identify the manufacturer and part number of the component. Accessory components should remain in the original manufacturer's packaging until the item(s) have been inspected and are ready for installation.

Accessory components should be stored in a clean, dry area out of direct sunlight until such time that the component is to be utilised.

Examples of Proper Storage



Handling

The UrbanPond™ modules should be handled in such a manner to prevent damage to the components and to prevent injury or death. The precast components are supplied with cast-in lift anchors to ensure safe and proper handling. Some components may be handled with forked equipment, but proper care and techniques must be utilised to prevent damage, injury, or death.

UrbanPond™ modules will not be shipped to the job site until the concrete has achieved design strength, thus ensuring all components can be safely handled and installed directly into the excavation. Whenever possible, all components should be installed directly from the delivery truck into the excavation.

UrbanPond™ modules and panels are supplied with cast-in anchors. These anchors are designed to be used with standard lifting clutches, which is detailed on the lifting and handling guide.

The UrbanPond™ modules should be rigged in such a manner that loads are balanced and equalized. This may require the use of spreader bars, roller blocks, or other rigging means that will evenly distribute the load across all lift anchors. Examples of rigging are shown below. At no time should the rigging be connected to a precast component under load and the angle of the sling or chain be less than 60 degrees from horizontal. Failure to do so may result in an increased load that is beyond the capacity of the lifter and/or concrete. Please refer to the site-specific lifting and handling drawing.

Module Installation

The UrbanPond™ system is to be installed in general accordance with approved engineering drawings and specifications. Where specific installation procedures are not indicated in this Referenced Specification or the Project Plans, the following guidelines should serve as the specific procedures for installation.

A representative from Ocean Protect will be present on site at the start of module installation to provide support to the Contractor and observe delivery and installation.

Prepare for Installation

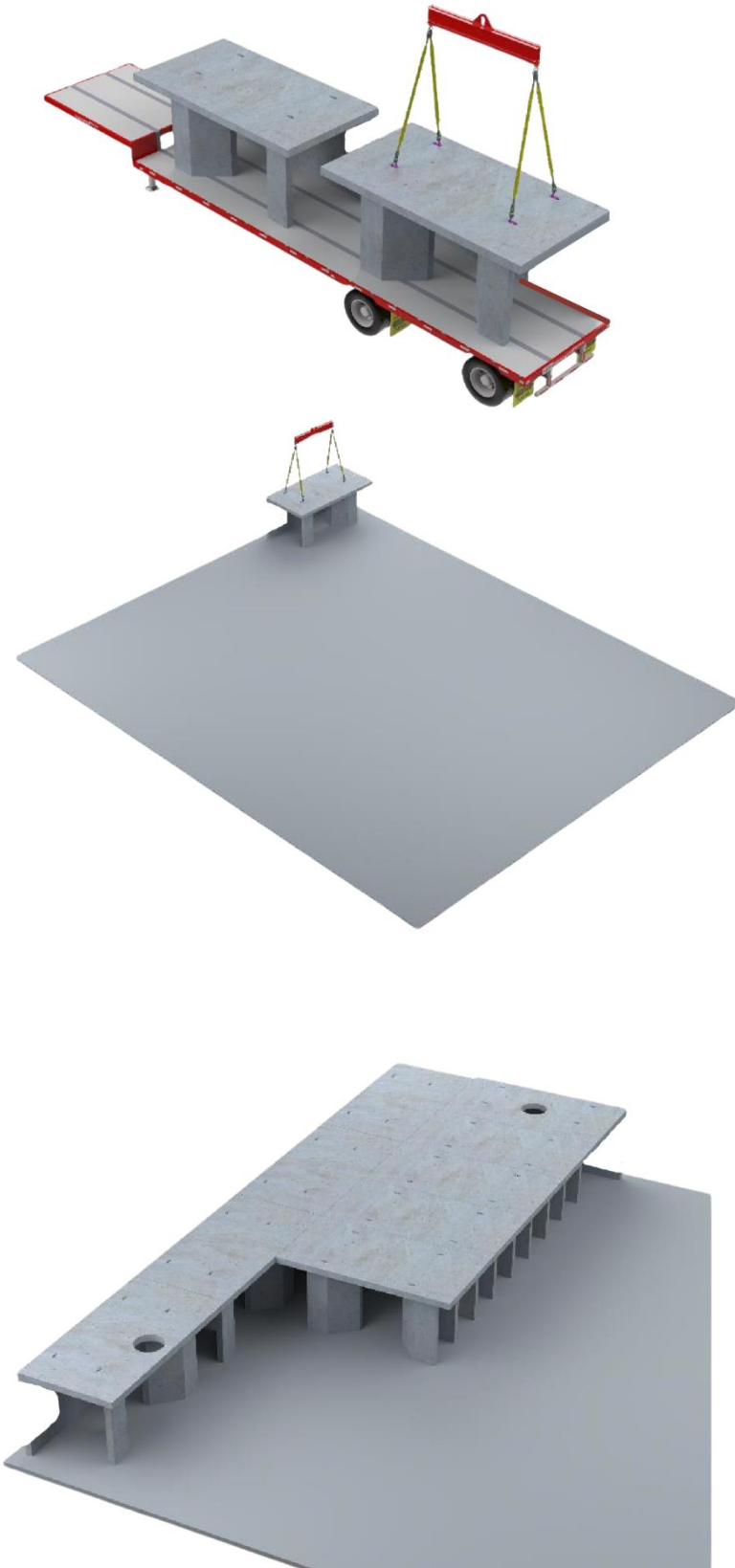
Ensure the following are complete before beginning installation. This can be done before the first delivery arrives.

- Clean Foundation - Clear the concrete foundation of all equipment and material and sweep it clean of all debris.
- Clear Work Area - Clear the area in which the concrete components are to be offloaded, picked, and placed of all people not associated with the installation. Isolate the work area wherever possible using caution tape or other methods as necessary.
- Layout Installation - Confirm line and grade, then set chalk lines or string lines to mark the placement of all modules. Mark the location of the first module to be installed.
- Set Teams - Divide the installation crew into an unloading crew and a placement crew. This will help minimize entry and exit from the excavation.

Inspect Modules Upon Arrival

All UrbanPond™ modules should be inspected for defects and cracks before being lifted from the delivery truck. Any nonconformance to approved drawings or damage to any part of the system shall be documented on the shipping ticket.

Concrete Slab and Stacked Configuration Installation



1. Lift First Module

Begin with a module in the corner of the system to ensure proper system alignment in the X and Y directions. Lift the module slowly and carefully, taking care to keep it away from other modules and equipment on site. Striking or bumping the modules should be avoided to prevent damage to the modules.

2. Place First Module

Lower the module to within 20mm of the foundation, then align it to the layout lines to ensure proper placement in the X and Y directions. Ensure the module is properly aligned and squared to the lines, then slowly lower the module the remaining distance to the slab. Confirm module placement is in accordance with the Plans, recheck for squareness, and finally check for level.

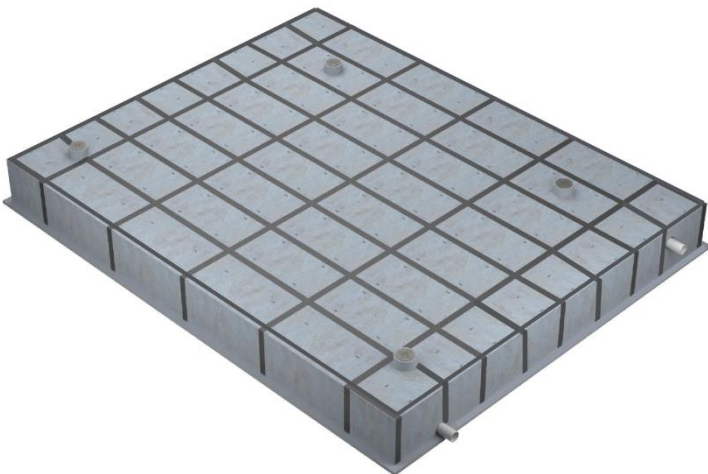
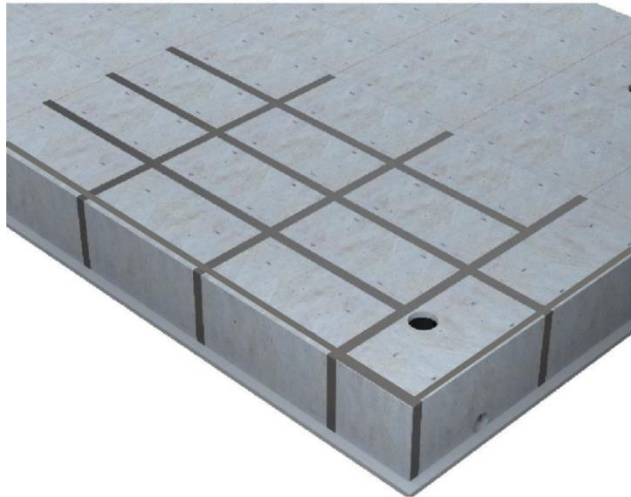
Modules should be placed to within 20mm of the elevations as indicated on the Plans. Any module that has had its grade disturbed after placement should be removed and reset. Any defective, damaged, or unsound module should be removed and replaced.

3. Install Subsequent Modules

Install subsequent modules as above, proceeding in an orderly manner moving in rows that follow a line and grade that is true to the first-placed corner module.

Modules should be placed and aligned to within $\pm 10\text{mm}$ of each other horizontally and vertically. Modules not within 20mm grade of the prior placed module should be removed and reset. The Engineer should be consulted for a course of action if module gaps cannot be made to be 20mm or less.

Mono on Concrete Slab and Stacked Configuration Installation



1. Install Wall Panels

Following the same lifting guidelines as above, lower a Wall Panel into position. Using the round holes in the panel as a guide, align the hole with the M20 ferrule cast into the UrbanPond module. Thread M20 bolt and washer into ferrule and tighten with a torque wrench or impact driver. Once the panel is properly aligned, tighten the bolts to the correct torque.

Wall Panels for Single UrbanPond (SUP) and Double UrbanPond (DUP) systems will have two 50mm round holes at the top and bottom. Wall Panels for cast in-situ base systems will have two 50mm holes at the top only.

2. Seal Joints

Seal all joints between modules and between modules and wall panels on the exterior top and side surfaces. The joint wrap should span the joint by a minimum of 100mm on either side of the joint.

3. Finish Installation

Install risers and manholes as indicated in the Plans and Shop Drawings.

Make Pipe Connections, referring to the following pages for details and requirements.

Backfill and Final Fill, referring to the following pages for details and requirements.

Backfill and Final Fill

Backfill

After all modules and wall panels have been installed and sealed, and after all pipe connections have been made, the system can be backfilled. Note: Pipe connections at the top of the system may be deferred until the backfilling operation has reached the level of the pipes in order to facilitate the backfilling operation.

Select material from excavation or borrow, at a moisture content that will facilitate compaction, should be placed along all sides of the system in layer depths to ensure minimum compaction density is obtained evenly throughout the backfill material. The backfill should be brought up evenly on all sides of the system. Each layer should be thoroughly compacted with mechanical tampers or rammers. Tests for density should be made as necessary to ensure conformance to the compaction requirements as Specified in the Geotechnical Report.

The backfill material for an UrbanPond™ infiltration system should consist of borrow that conforms to the specifications These materials are typically washed granular material such as graded 20mm crushed rock or washed sand.

Final Fill

After backfilling has been completed to the top of the UrbanPond™ system and access structures have been set, the final fill material should be placed and compacted. Material for the final fill should be based on the Project Plans and Specifications and the recommendations of the Geotechnical Engineer.



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