

# Technical Note

## TN 6.24 Best Practices for Under-Structure Detention Systems

### Introduction

Site development in urban settings continues to have challenges due to population growth and increasing water containment requirements. When site constraints don't allow for retention/detention systems to be placed outside of a building structure, designers are looking to place these systems within the structure's foundation system. This application raises many questions related to system & foundation installation, adverse affects due to the presence of water, and ability of the system to be inspected & maintained. This document attempts to provide designers with considerations for best practices when using an ADS detention system below a structure.

### Structure Types

ADS detention system can be installed under building structures, provided the level directly above the system is dedicated to parking. Multi-use structures, where the bottom level(s) are for parking and the upper levels are for office/retail/residential space are acceptable. Maintaining parking directly above the system allows for access directly to the system for critical inspection and maintenance activities to help achieve the maximum service life of the system.

Products used in these applications follow standard cover requirements. Minimum cover is measured to the base of the foundation slab, base of flexible pavement, or top of rigid pavement. Ensure the finished surface is considered during design of the system.

### Product Specifications

The Internal Plumbing Code (IPC) [2024] and International Building Code (IBC) [2024] do not inherently identify standard specifications for implementation of stormwater detention systems below buildings, however the IBC does note that systems placed below a structure must not adversely affect that structure. The use of ADS products below structures should ensure no structural loading is applied to the products, for this reason.

Note that local codes & specifications are often more specific and may govern in a particular scenario. ADS has not performed any local investigations to determine product or system requirements and such investigations are to be completed by the designer of record.

While not inherently mentioning detention systems, the IPC does identify polypropylene pipe conforming to ASTM F2881 as an appropriate material to be used for building storm sewer pipe. HP Storm and SaniTite HP both conform to ASTM F2881.



#### StormTech® Stormwater Chambers

ADS recommends any of the current StormTech chamber offerings for use below parking structures. See product specifications for additional information. These StormTech chamber products meet ASTM F2418 and ASTM F2787. The StormTech installation guide shall be followed to ensure suitable system performance.

To facilitate ease of access, inspection and maintenance, pipe manifolds and connections are recommended to conform to minimum diameters listed in Table 1. Access structures shall be designed to meet OSHA confined space entry requirements.

**Table 1:** Minimum Manifold Diameter by Chamber Type

Chamber	SC-160LP	SC-310	All Other chambers
Min. Manifold Diameter in (mm)	8 (200)	12 (300)	24 (600)

### High Performance (HP) Polypropylene Pipe

To facilitate ease of access for inspection and maintenance, ADS recommends pipe diameters 24" (600 mm) and larger be used. ADS HP Storm or SaniTite HP pipe meet ASTM F2881 and AASHTO M330. The ADS pipe installation guide shall be followed to ensure suitable system performance.

ADS HP pipe provides a watertight joint in accordance with laboratory testing ASTM D3212, however there are still allowable leakage rates for watertight performance. Currently, there is no maximum defined limit in the stormwater industry for fittings. If leakage and/or soil saturation are of concern, a thermoplastic liner shall be installed around the system.



### Thermoplastic Liner (not sold by ADS)

A thermoplastic liner may be required to create a fully contained detention system (chambers or pipe) with zero infiltration or exfiltration. The use of a liner is recommended to prevent water infiltration into the underlying soils or to contact the surrounding foundation system. ADS does not recommend detention system under a parking structure be installed at or below the seasonal high groundwater table (see Groundwater Elevation section in this document), even if buoyant conditions can be managed.

Thermoplastic liners are typically polyvinyl chloride (PVC), linear low-density polyethylene (LLDPE), or ethylene propylene diene terpolymer (EPDM). ADS recommends a minimum thickness of 30 mil. See ADS Technical Note 6.50 "Thermoplastic Liners for Detention Systems" for additional information.

If a thermoplastic liner is not desired, then the project's geotechnical and structural engineers shall review the impact water will have on the soils and foundation system. The project geotechnical engineer shall review the soil conditions to determine whether moisture-sensitive native soils are at or below the system elevation. The project structural engineer shall evaluate the foundation system specified to determine whether water will adversely affect the system and determine if waterproofing is required. If it's determined a thermoplastic liner is not required by these parties, a non-woven geotextile is required to minimize soil migration into the detention system's structural backfill.

### System Inspection

ADS recommends the detention system be inspected during placement and backfill and 30 days after installation. The area to install a detention system beneath a parking structure is often tightly constrained and adequate spacing between the detention system and the foundation system is critical. Additionally, construction activities for foundation preparation and building erection increases the risk of excessive loading on the buried detention system. Phasing and proximity restrictions of construction vehicles, cranes, tower cranes, and temporary shoring (among others), should be considered to ensure these activities do not place excessive load on the detention system. Post-installation inspection after these activities have been completed allow the designer and owner to ensure the detention system is in suitable condition for in-service use.

## Project Conditions

### Foundation System

Under no circumstance should the foundation system (piers, columns, footer, structural walls, etc.) exert any loads on the ADS detention system. Even if the loading is minimal, ADS products are flexible and are intended to slightly change shape in order to transfer the load to the surrounding or underlying soil. This

behavior can adversely affect the support and stability of the overlying structure foundation. Do not use ADS detention systems beneath a mat or raft foundation system where a continuous slab will transfer weight to the underlying soil.

### **Groundwater Elevation**

ADS detention systems are recommended to be installed entirely above the seasonal high groundwater table. This practice allows for safe system access for inspection and maintenance.

### **Soil Conditions**

The benefit of installing a detention system beneath a parking structure is the underlying soils have likely already been evaluated for suitability with respect to the structure's foundation system and the required minimum bearing capacity. The soil bearing capacity should be compared to the Foundation Depth tables in the StormTech Design Manual to determine the appropriate stone bedding depth required for the expected installation conditions.

If the engineer of record would like ADS to provide guidance on required base stone for a specific application, allowable bearing capacity for subsurface stormwater systems must be provided by the engineer of record.

### **Construction Loading**

See the chamber-specific StormTech Installation Guide for more information on minimum cover requirements for given loading conditions.

Practices like proof rolling and temporary shoring may exceed the allowable loading on the chamber or pipe. Prior to any activities or loads that fall outside of what is published in the Installation Guide, the contractor should consult an ADS representative to review loading and proximity to the detention system.

For construction loading exceeding that of the AASHTO design vehicle, please reach out to an ADS representative for a project-specific analysis to be completed.

### **Other Loading**

Local building codes may specify specific loads that must be withstood by underlying systems. ADS has performed no evaluation of local codes to determine suitability of product selection, design or service loads for a specific site. Should any project-specific loads beyond what is addressed in ADS literature be anticipated, please contact an ADS representative to discuss the application further.

ADS has performed no seismic evaluation to determine the suitability of a chamber or pipe system underneath a parking structure or the effects the system may have on the building/foundation in such an event.

## **Design Layout**

Once it's been determined by the designer of record that the site and the system performance are suitable to proceed to design with an ADS detention system, ADS can provide CAD layout services to aid in identifying the configuration that will best meet the project requirements. This may include a base stone depth recommendation given an allowable bearing capacity for the stormwater system is provided. Contact an ADS representative to learn more about these services.

*Disclaimer: ADS is providing these considerations for reference and review by the project-specific site/ civil engineer, geotechnical engineer, and structural engineer. ADS has not performed any site-specific analysis on the suitability of a system within a parking structure. ADS provides design layout services as a supporting service under the guidance of the designer of record.*

