ACO StormBrixx®

Structural Calculator User Guide

Introduction

ACO recommends using this guide alongside the ACO StormBrixx® Structural Calculator online.

www.acosbstructural.com

The ACO Structural Calculator is designed to help you determine which StormBrixx system is best suited for your application and loading criteria. The program takes into account site conditions (including groundwater, soils, system cover, pavement types, and traffic loading) to help the designer optimize their StormBrixx design for vertical and horizontal loads, buoyancy, and surface deflection. The program will then provide either a comprehensive or summarized output for your review and submittal.

To save a project, you will be required to fill in all the relevant project details listed below. The outputted results of the Structural Calculator will be sent to the entered email address.

Project Information

Project Name

Project Location

Project Location

City | State | Zip Code

Date - Designer - *All fields mandatory **Submit**

Contents

TOGGLE SWITCH

- Change units and/or loading standards via toggles on the top-left of the page.
- Units include Imperial and Metric; loading standards include AASHTO LRFD (US) and CIRIA C680 Structural and geotechnical design of modular geocellular drainage systems (Europe).

Imperial | Metric **AASHTO** | CIRIA

Disclaimer: Although ACO makes every effort to generate correct and accurate information with this complimentary tool, we cannot guarantee results. Your use of this tool is exclusively governed by the ACO Structural Calculator Terms of Use, which can be found at:

https://acosbstructural.com/pdf/ACO-Structural-Calc-Terms-of-Use.pdf

By using the ACO Structural Calculator, you are agreeing to be bound by the Terms of Use. ACO recommends a licensed structural engineer check all results before proceeding with the project.

1. StormBrixx Layout

1.1 Choose StormBrixx Product

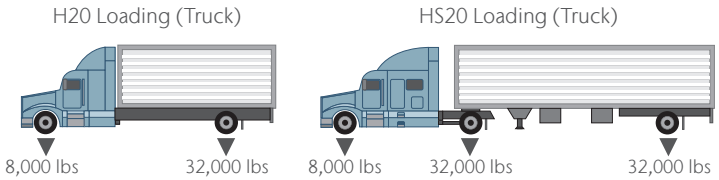
StormBrixx is designed to exceed the American Association of State Highway and Transportation Officials (AASHTO) LRFD recommended design factors for Earth loads and Vehicular live loads. Two products are available based on the maximum anticipated live loading conditions as defined by AASHTO. The maximum-size truck series for each product is described below.

The two AASHTO truck series classifications are: a **H** series truck (two-axles) and a **HS** series truck (multiple loaded axles, i.e. a semi-trailer vehicle). The number following the H or HS is the gross tonnage of the vehicle. To determine the total tonnage of the HS series truck, add one additional trailer axle load. The images below illustrate the axle load and spacing breakdown for both H and HS trucks.

Note: H series equivalent of these loads removes the back axle.

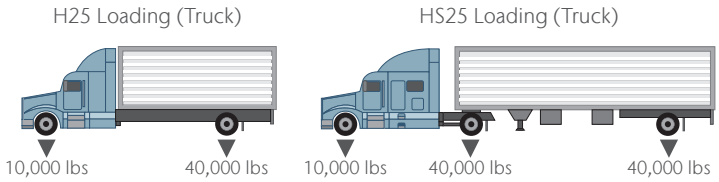
1.1.1 StormBrixx SD

StormBrixx SD is a standard-duty geocellular tank for applications where the tank will be subjected up to and including AASHTO HS-20 loading conditions. Both **H20** and **HS20** series trucks have an 8,000 lb axle load for the drive axle and a 32,000 lb axle load for the axle(s) under the trailer. The difference between the two vehicles is that a H20 series truck has one axle under the trailer and a total load of 40,000 lbs, and a HS20 series truck has an additional 32,000 lb-load axle located under the trailer, which is separated by a min. distance of 14' for a total load of 72,000 lbs.



1.1.2 StormBrixx HD

StormBrixx HD is a heavy-duty geocellular tank for applications where the tank will be subjected up to and including AASHTO HS-25 loading conditions. **H25** and **HS25** trucks are similar to H20/HS20, except the drive axle supports 10,000 lbs and the axle(s) under the trailer support 40,000 lbs each.



1. StormBrixx Layout

1.2 American Truck Load Description

Multiple axle trucks fall into the same category as the AASHTO standards documented above. This is due to maximum gross vehicle weight limits set at 80,000 lbs by the US Department of Transportation – Federal Highway Administration.

Below are the federally mandated maximum weights for the National System of Interstate and Defense Highways and reasonable access thereto (23 CFR Part 658.17):

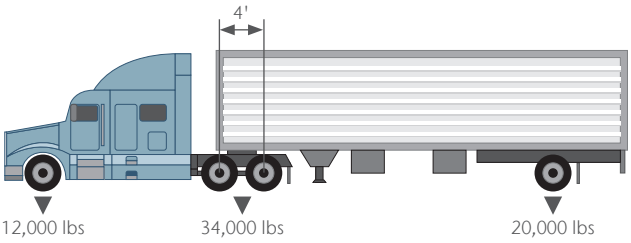
1. 80,000 lbs gross vehicle weight
2. 20,000 lbs single axle weight
3. 34,000 lbs tandem axle weight

Axle capacities are limited either by the axle strength or legal weight limits, whichever is lower. Trucks shown have a front-drive axle rated at 12,000 lbs, limiting the weight on those axles. The legal weight limit of a rear axle on a **single-drive** truck is 20,000 lbs. The legal weight limit of the two rear axles on the **tandem-drive** truck is 17,000 lbs for each axle, or 34,000 lbs combined if the overall distance between the first and last axle is 36' or more.

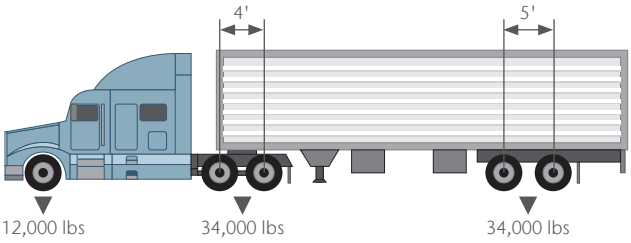
Axle load is applicable to trucks that may have more than two wheels per axle. In this case, the axle load remains the same, but the load applied by the individual wheels is reduced by having more contact area due to more wheels to distribute the load. The primary factor is distance between axle centerlines.

Vehicles exceeding AASHTO HS25, see AASHTO Modified Advanced Military Loading (AML) or contact local officials.

Single-Drive Truck



Tandem-Drive Truck



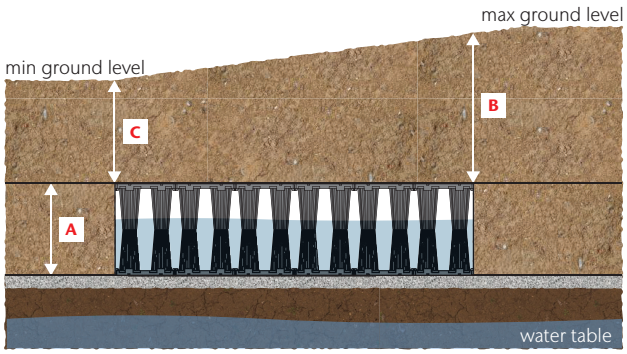
1. StormBrixx Layout

1.3 StormBrixx Layout Information

Once you have selected the correct StormBrixx product for your project application you must enter the following information in regards to your specific project:

StormBrixx Layout

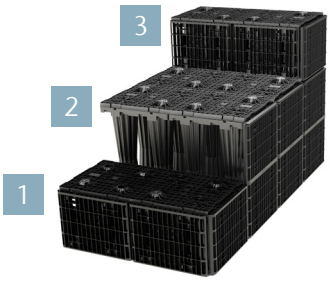
A	Number of Layers			
B	Max Cover Depth		ft	in
C	Min Cover Depth		ft	in
D	Water Level Below Tank	Yes		No



1.3.1 Number of Layers

Both the StormBrixx SD and HD systems are stackable modules allowing flexibility for the overall height of the tank to tailor to your project's needs. The SD system allows for a maximum of 3 full modules giving a total system height of 9' while the HD system being a shorter module height can accommodate 4 layers giving a total system height of 8'.

1. Half-Module + Half Layer Top Cover Plate
2. Module (two half-modules assembled)
3. Module + Half-Module + Half Layer Top Cover Plate

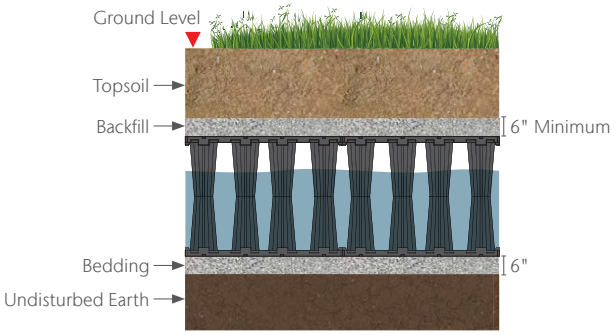


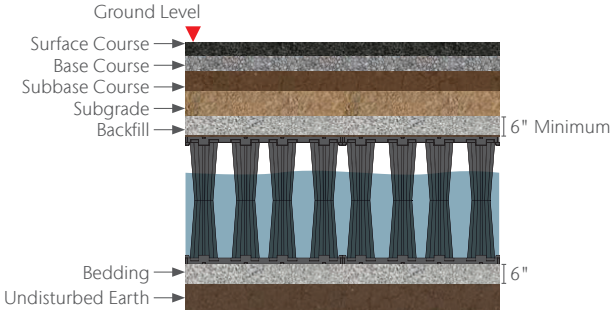
1.3.2 Maximum and Minimum Cover Depth

The maximum and minimum cover depth fields require you to enter the maximum and minimum vertical cover, respectively, that will be placed on the StormBrixx system. Maximum and minimum fields are provided so that the designer can reflect a sloped surface condition over the system footprint.

Note: If the surface will be flat over the system, enter the same values for the minimum and maximum cover depths.

The total cover thickness is inclusive of the 6" minimum backfill layer immediately above the tank, as-needed additional backfill, and the surface material (e.g. topsoil or pavement section) as shown in the figures below.





The following minimum and maximum cover depths are recommended guidelines during the development of your design. Depending upon your selected inputs and site constraints, your actual minimum cover depths may vary. **If your project requires the maximum cover depth to exceed the guideline, please contact ACO for design support.**

Installation Location	StormBrixx Product	Minimum Cover Depth (ft)	Maximum Cover Depth (ft)
Non-trafficked areas, i.e landscaping	SD	1.65	6.5
	HD	1.65	11.16
Parking lots, vehicles up to 5,512 lbs gross mass	SD	1.8	6.5
	HD	1.8	11.16
Parking lots, vehicles greater than 5,512 lbs gross mass	SD	2.0	6.5
	HD	2.0	11.16
Heavy truck traffic up to HS-20	SD	*	6.5
Heavy truck traffic up to HS-25	HD	*	11.16

** Consult with ACO for minimum cover*

Geogrids

Your project needs may require the cover thickness to be below the minimum listed in our guidelines for a given installation location. When that is the case, other construction technologies—such as geogrids—may be used in tandem with the StormBrixx system. Geogrids also offer the benefit of reducing surface deflection and resisting differential settlement conditions. Geogrids size, layout, and installation should be completed in accordance with the manufacturer's instructions. If you're considering other construction technologies to enhance the StormBrixx system, **please contact ACO for design support.**

1.3.3 Water Level Below Tank

This function accounts for potential water table depths you may encounter while planning to utilize the StormBrixx system on your project. Selecting "Yes" indicates that your maximum water table elevation is below the invert of the StormBrixx system.

Note: Water table elevations vary seasonally. Please consult the project Geotechnical Engineer of Record for guidance on the maximum anticipated water table elevation.

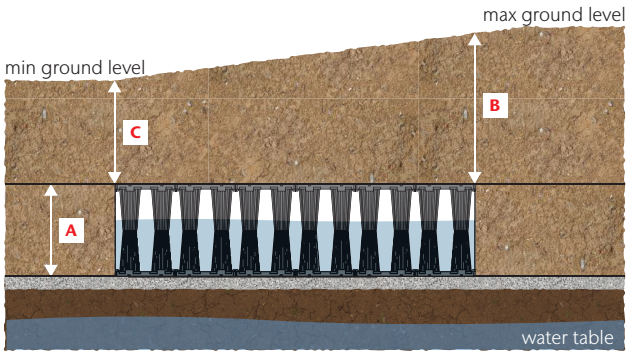
StormBrixx Layout

A Number of Layers

B Max Cover Depth ft in

C Min Cover Depth ft in

D Water Level Below Tank Yes ☑ No ☐



If your water table depth sits higher than the invert of the StormBrixx system this calculator will determine the amount of buoyancy that the tank will be subject to as well as the design pressure it will be subject to.

StormBrixx Layout

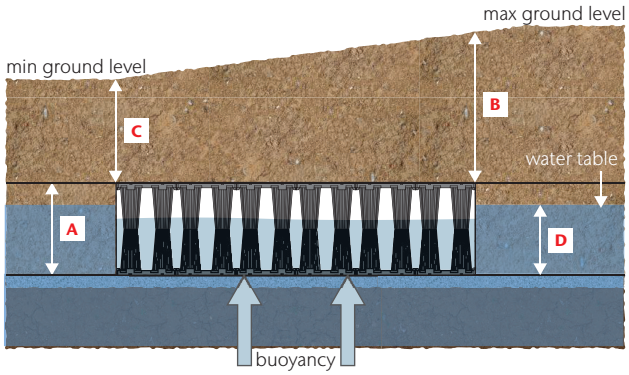
A Number of Layers

B Max Cover Depth ft in

C Min Cover Depth ft in

D Water Level Below Tank Yes ☐ No ☑

Max Water Level ft in

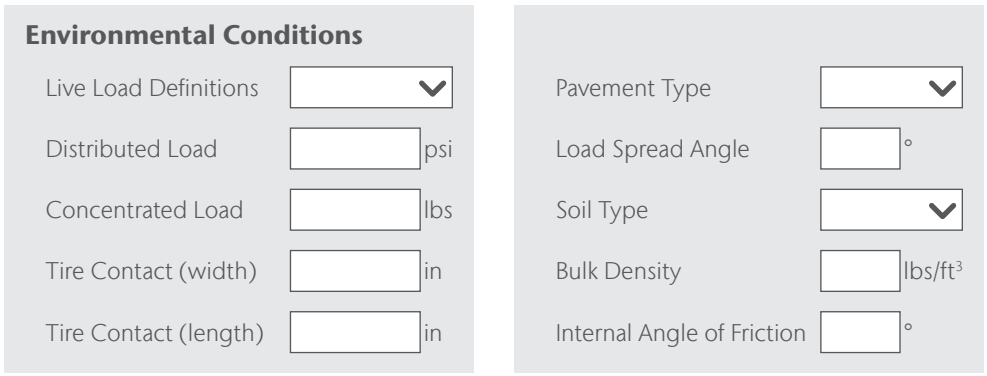


Max Water Level refers to the distance between the top of the water table and the base of the StormBrixx system.

1. StormBrixx Layout

1.4 Environmental Conditions

This section of the program will take into account what live loads will be in contact with your system as well as the finished pavement type and soil type surrounding your system.



Live Load Definitions

Select the vehicle weight from the Live Load Definitions drop-down menu that the StormBrixx system will be subjected to. The live load definitions are predetermined in accordance with national standards for both the United States (AASHTO) and Europe (CIRIA). The options provided are taken directly from these standards, which help determine the load classification for particular gross vehicle weights/axle loading by giving us predetermined distributed loads, concentrated loads, and tire contact areas (width x length). If necessary, the User Defined option will allow you to enter custom values.

Pavement Type

Different pavement types will affect the way the load is distributed through to the StormBrixx system. Typical standard surface types will be provided in the Pavement Type drop-down menu, which will determine load spread angle dependent on the surface type in accordance with national standards. If your pavement type is not listed in the drop-down menu, the User Defined function will allow you to enter a custom load spread angle.

Soil Type

Different soil types will affect both vertical & lateral pressures the StormBrixx system will be subject to. Soil types are listed in accordance with the Unified Soils Classification System (USCS) with midrange values for bulk density and internal angles of friction. If you have project-specific soil information, the User Defined function will allow you to enter a custom bulk density and internal angle of friction.

2. Calculated Results

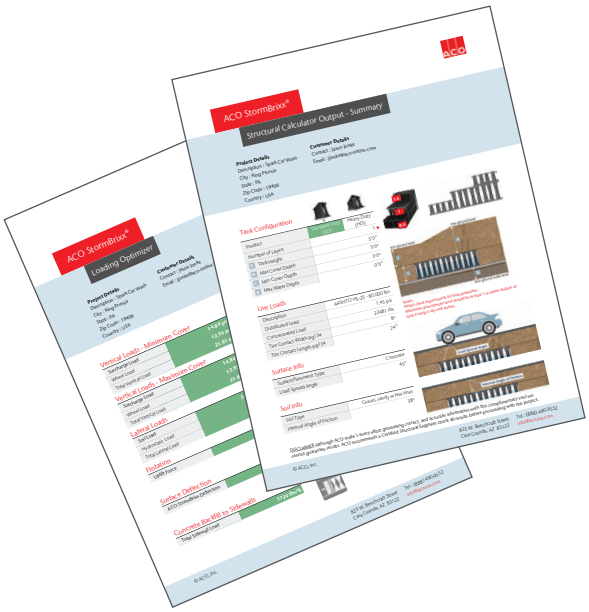
Once you have completed the necessary steps within the ACO Structural Calculator program, you will be asked to register for an account to view your Output results. Once you have an account, you will then have access to create more projects and view previous ones. We recommend signing in to your account at the beginning of each new project and you will see all previous projects.

Each report contains the following:

- Full recap of your project details and information entered.
- Full recap of your StormBrixx HD/SD information highlighting product type & height.
- Full breakdown of the different cover depths and backfill placed over your StormBrixx system.
- Ability to include existing water table depths to ensure that buoyancy/flotation is not an issue.
- Full breakdown of all live load definitions for traffic load & vehicle weights which includes distributed loads, concentrated loads and the tire contact area of all live loads.
- Full recap of all final pavement design including the typical load spread angle of each material.
- Full recap of typical soil types or backfill materials used to install your StormBrixx system. These will also include the bulk density of each material and the typical internal angle of friction.

Summary Report Option

The results, projected details, and inputted data will be shown in a simplified manner to indicate whether or not the ACO StormBrixx system will be compatible with the installation and loads. Green fields will indicate compatibility. Red fields will indicate incompatibility, at which point we recommend contacting us at ACO for further recommendations.



Comprehensive Report Option

The results, projected details, inputted data, calculation methodology, and details that affect tank performance will be shown in a comprehensive manner to indicate whether or not the ACO StormBrixx system will be compatible with the installation and loads. Green fields will indicate compatibility. Red fields will indicate incompatibility, at which point we recommend contacting us at ACO for further recommendations.