



# CUDO® CUBES

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Operations and Maintenance Manual  
(Underground Retention/Detention/Infiltration/Water Reuse Systems)

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# CUDO® Stormwater Cube - Modular Stormwater Systems

## Description / Basic Function

CUDO is a modular stormwater system comprised of a grouping of modular polypropylene or concrete cubes that when constructed form an underground storage area for stormwater. This system can be used for infiltration, retention, detention or water reuse. CUDO can help achieve runoff detainment and storage to help attenuate the peak flow to pre-construction levels and can help conform to current Low Impact Development requirements.

## Infiltration

The purpose of a CUDO infiltration system is to capture stormwater runoff, store the runoff, and then allow it to percolate into the ground via the open space area of the cubes and perforations in the side wall. The system is backfilled with a Class I material defined by ASTM D2321 as a cleaned open graded rock or a Class II permeable sand. The rock or sand provide additional storage capacity but also allow for a percolation interface with the native material. The ground water is "recharged" with this type of system.

## Detention

The purpose of a CUDO detention system is to capture stormwater runoff, store the runoff, and then allow it to be released at a controlled rate through an appropriately sized orifice control. A detention system helps attenuate the peak flow from the site assuring that pre-development runoff flows are not exceeded as a result of the development. A CUDO detention requires the cubes to be encapsulated with an impermeable liner for the polypropylene system or the seams of the concrete system to be sealed with a water proof mastic.

## Retention

A CUDO retention system is a hybrid system. It is a combination of a detention system and an infiltration system. A retention system is utilized to attenuate peak flow as well as promote groundwater re-charge. A retention system is outfitted with an overflow pipe at the top of the system which allows the system to fill for infiltration but also outlet if the ground is saturated.

## Water Reuse

The purpose of a water-reuse CUDO system is to capture and store water for future use. The system is constructed in a similar fashion to a detention system but instead of a controlled outlet the system is constructed with an emergency overflow. A water reuse system is a Low-Impact Development (LID) device that helps attenuate peak flows as well as conserve water. Water may be reused through an active pump system or passive irrigation.

## Inspection/Cleanout Ports

Inspection and cleanout ports are 18-inch diameter vertical risers connected to the uppermost polypropylene CUDO cubes or up to 30-inch manhole access connected to the concrete CUDO. They are used for entrance into the system, or for access to place vacuum truck hoses or water-jetting devices or CCTV equipment. Ports are strategically located near inlet and outlet pipes and in other areas or probable deposition in the system. It is recommended to keep surface level access lids sealed and bolted at all times when the system is in service.

## Inlet Bay

Some systems are configured so that pretreatment of the stormwater occurs within the CUDO system. In this case, the CUDO system will house an inlet bay. The inlet bay is separated from the rest of the CUDO system by sidewall plugs and is intended to separate gross pollutants, trash and debris and floatables from the CUDO system and pre-treatment device. The bay contains its own sump area and unique access ports.

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## **Maintenance Overview for CUDO**

State and Local regulations require that stormwater storage systems be maintained and serviced on a recurring basis. The purpose of maintaining a clean and obstruction free CUDO system is to ensure the system performs the intended function of the primary design. Trash and debris, floatables, gross pollutants and sediment can build up in the CUDO leading to clogging of the native soil interface or blockage of the inlet or outlet pipes. This can cause the system to function improperly by limiting storage volume, limiting the design percolation rates or impeding flow in and out of the system. Downstream and upstream, areas could run the risk of flooding and deleterious environmental impact.

### **Recommended Frequency of Service**

It is recommended that the CUDO stormwater systems be serviced on a regularly occurring basis. Ultimately the frequency depends on the amount of runoff, pollutant loading, and interference from trash, debris and gross pollutants as well as proper maintenance of upstream pretreatment devices. However, it is recommended that each installation be inspected at least two times per year to assess service needs.

### **Recommended Timing of Service**

Guidelines for the timing of service are as follows:

1. For areas with a definite rainy season the system should be serviced prior to and following the rainy season.
2. For areas subject to year-round rainfall service should occur on a regularly occurring basis. (A minimum of two times per year.)
3. For areas with winter snow and summer rain the system should be serviced prior to and after the snow season.
4. For installed devices that are subject to dry weather flows only (i.e. wash racks, parking garages, etc...) the unit should be serviced on a regularly occurring basis. (A minimum of two times per year.)

## **Inspection**

An inspection should be performed when the system is new. This allows the owner to establish a baseline condition for comparison to future inspections. Sediment build up can typically be monitored without entering the system. (No confined space entry.) Initial and subsequent inspection data should be recorded and filed for reference. Some regulatory agencies require that the results of the inspections be documented and reported. Inspection reports should comply with regulatory requirements and be submitted as required.

### **Inspection Procedures**

5. Locate the inspection, cleanout and access ports. Inspection and cleanout ports are typically 18-inch diameter. Access ports are typically 24-inch or 30-inch diameter. Pictures should be taken to document the location or a site map should be generated to detail the as-built locations of the ports.
6. Unbolt and remove the access port lids.
7. Insert a measuring device into the opening making note of a point of reference to determine the quantity of sediment and other accumulated material. If access is required to measure, ensure only certified confined space entry personnel having appropriate equipment are allowed to enter the system.
8. In addition, for accessible concrete CUDO systems personnel should utilize appropriate confined space entry procedures to enter the system and photograph its condition.
9. Inspect inlet and outlet locations for obstructions. Obstructions should be removed at this time.
10. Inspect the structural components of the system.
11. Fill in the CUDO Inspection/Maintenance Data Sheet and send a copy to the regulatory agency if necessary.

## **Disinfection of Water Reuse System**

Periodic disinfection of water held for reuse may be required to abate bacteria and algae growth. This may be done using calcium hypochlorite tablets or by the addition of an ozone generator in a small recirculation system.

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## Maintenance

Cleanout of the CUDO system should be considered if there is sediment buildup of two or more inches at over 50% of the inspection ports. Cleaning shall be performed if sediment buildup is two inches or more over 75% of the system floor. In the event of a spill of a foreign substance, cleanout of the system should be considered.

## Maintenance Procedures

1. Locate the inspection, cleanout and access ports. Inspection and cleanout ports are typically 18-inch diameter. Access ports are typically 24-inch or 30-inch diameter. Pictures should be taken to document the location or a site map should be generated to detail the as-built locations of the ports.
2. Unbolt and remove the access port lids.
3. Measure the sediment buildup at each port. If access is required to measure ensure only certified confined space entry personnel having appropriate equipment are allowed to enter the system.
4. A thorough cleaning of the system (inlets, outlets, ports, and inlet bays) shall be performed by either a vacuum truck or by manual methods.
5. Inspect inlet and outlet locations for obstructions. Obstructions should be removed at this time.
6. Inspect the structural components of the system.
7. Fill in the CUDO Inspection/Maintenance Data Sheet and send a copy to the regulatory agency if necessary.

## Inspection / Maintenance Requirements

Below are some recommendations for equipment and training of personnel to inspect and maintain a CUDO system.

Personnel: OSHA Confined Space Entry Training is a prerequisite for entrance into a system. In the state of California personnel should be CalOSHA certified.

Equipment: Record Taking (pen, paper, voice recorder)  
Proper Clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)  
Flashlight  
Tape Measure  
Measuring Stick  
Pry Bar  
Traffic Control (flagging, barricades, signage, cones, etc.)  
First Aid Materials  
Debris and Contaminant Containers  
Vacuum Truck

## Disposal of Gross Pollutants, Hydrocarbons, and Sediment

The collected gross pollutants, hydrocarbons, and sediment shall be offloaded from the vacuum truck into DOT approved containers for disposal. Once in the container the maintenance contractor has possession and is responsible for disposal in accordance with local, state and federal agency requirements.

*Note: As the generator, the landowner is ultimately responsible for the proper disposal of the collected materials. Because the material likely contains petroleum hydrocarbons, heavy metals, and other harmful pollutants, the materials must be treated as EPA class 2 Hazardous Waste. Proper disposal is required.*