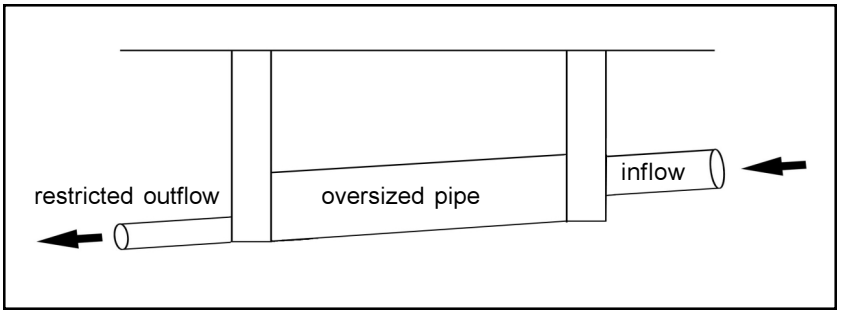
Oversized Pipes



Description

Oversized pipes are designed to reduce peak flow rates by providing temporary, subsurface storage of stormwater runoff. An oversized pipe system is essentially a large pipe that has a small outlet at its invert. When inflow rates are larger than the outflow rates in this pipe series, runoff is detained within the pipes. Generally, detention times are in the order of a few hours. Like detention basins, oversized pipes are designed to empty out between runoff events so that storage capacity is available for subsequent runoff events.

Oversized pipes are designed to drain dry and therefore significant water quality improvements should not be expected; only some of the coarser sediment particles will settle out in the pipes, but can be resuspended by incoming flows if they are not removed before the next storm event. If water quality improvements are also desired, the designer should reference the Wet Vaults BMP.

Oversized pipes are a retrofit alternative for existing storm drains in the upper portions of the drainage system. They lower the peak discharge rate and provide a limited amount of additional temporary storage volume. However, a careful analysis of the storm drainage system is necessary in order to prevent water backup and flooding in the upper reaches of the drainage area.

Generally, oversized pipes are utilized for small development sites where there is insufficient surface space to construct detention facilities. Other underground structures, such as underground detention vaults, can be used to accomplish the same objectives.

Some proprietary versions of this BMP exist in the form of manifold pipe systems. In this type of system, water flows from a catchbasin or stormsewer pipe into several pipes in parallel before outflowing to the larger system, as illustrated in Figure 1.

Purpose

Water Quantity

Flow attenuation	■
Runoff volume reduction	□

Water Quality

Pollution prevention	
Soil erosion	N/A
Sediment control	N/A
Nutrient loading	N/A
Pollutant removal	
Total suspended sediment (TSS)	□
Total phosphorus (P)	□
Nitrogen (N)	□
Heavy metals	□
Floatables	□
Oil and grease	□
Other	
Fecal coliform	□
Biochemical oxygen demand (BOD)	□

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

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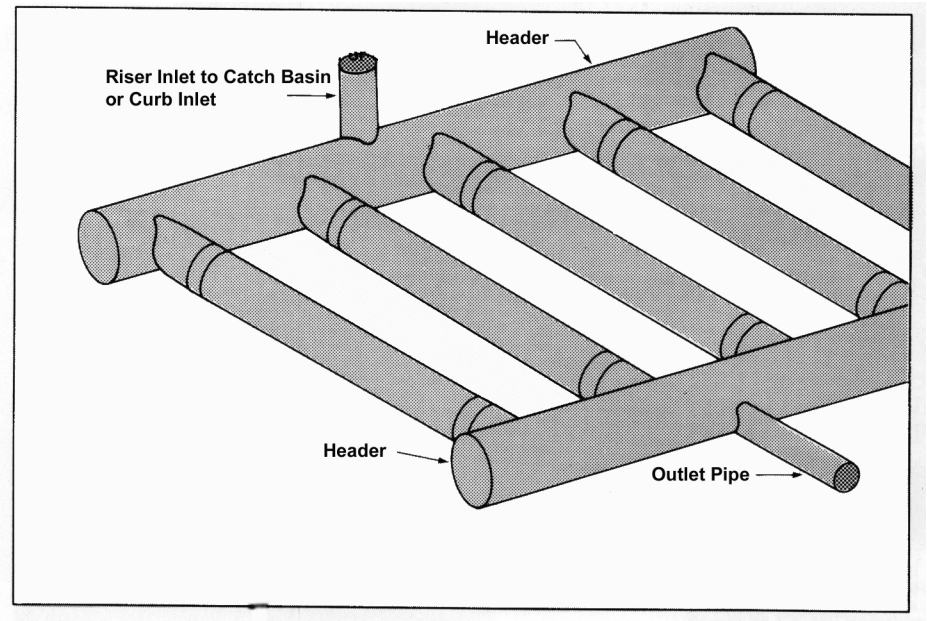

Figure 1: Manifold Underground Detention System
Source: Used with permission from Contech Construction Products, Inc.

Advantages

- Can be very effective in reducing peak runoff flows from small sites.
- Can be used in sites with insufficient space to construct larger, traditional types of detention facilities.
- Can be useful in retrofit projects.

Limitations

- Provides little or no water quality treatment of runoff.
- High material costs relative to traditional surface storage facilities.
- Must be located in areas where the pipes can be easily accessed for maintenance.

Oversized Pipes

Requirements

Design

Location:

Oversized pipes should be installed where the pipes can be easily accessed for maintenance. Subsurface locations include parking lots, grassed swales, adjacent to property boundaries, upper portion of catchment areas, etc. Oversized pipes should not be constructed under structures that cannot be excavated.

Inlets and Outlets:

Inlets and outlets must be sized for each structure. Outflow rates should be defined in a drainage plan or a storm sewer analysis. Generally, inlets are sized to convey frequent runoff events from paved surfaces, as in the typical stormwater design. Outlets are much smaller pipes. The size and configuration of the outlet should be designed to restrict flows to the allowable discharge rate. The allowable discharge rate will be determined by local authorities' requirements and stormwater management goals.

Pipe Diameter (inches)	Storage (ft^3/ft)
72	28.3
84	38.5
96	50.3
108	63.6
120	78.5

Table 1: Reinforced Concrete Round Pipe Storage
(per linear foot)

Length and Diameter:

The length and diameter of the oversized pipe will be a function of the storage required to meet the allowable discharge rates. Generally, sizing the oversized pipe involves a standard hydraulic analysis- comparing the incoming flow to the desired outgoing flow to obtain the storage needed in the pipe. Maximum pre-manufactured diameters are approximately 10 feet and are generally dependent on the diameter that can be transported by truck to the site. Minimum diameters should be approximately 72 inches as smaller sizes are difficult to clean. Some municipalities have established minimum sizes to facilitate cleaning.

Some examples of the storage available in circular pipes (RCP) of several different diameters are presented in Table 1.

Slope:

Slopes of the oversized pipe should be approximately 0.2%, as a slight slope must be maintained to completely drain the pipe. Slopes should be kept to a minimum as steep slopes will reduce the amount of storage available within the pipe.

Emergency Overflows:

Emergency surface overflow paths should be located and sized to convey the 100-year runoff in case the oversized pipe (inlet/outlet) becomes plugged or inoperable.

Access Points:

- At a minimum, personnel access points should be located at the upstream and downstream ends of the oversized pipe. Additional, intermediate locations (approximately every 100 feet depending on the cleaning method) should be included.

Oversized Pipes

Requirements

Sequencing

- Sequencing for installation of the oversized pipes should progress with the installation of the storm sewer system.
- Inlet protection for sediment control should be installed immediately after each storm sewer inlet is completed. This will minimize costs and delays of removing large quantities of sediment from the pipes during construction.

Construction

- Oversized pipes should not be placed under structures that cannot be excavated.
- Placing the oversized pipe at some minimum slope is important to ensure that the pipe will completely drain between storm events.

Maintenance

- At a minimum, personnel access points should be located at the upstream and downstream ends of the oversized pipe. Additional, intermediate locations (approximately every 100 feet depending on the cleaning method) should be included.
- For safety, confined space entry procedures must be followed by maintenance personnel when removing sediments.
- Whenever possible, sediment removal should be by mechanical means other than flushing. Sediment should be removed from the pipe and not flushed downstream.
- If flushing is the only cleaning option, special care should be taken to trap and remove sediment before it moves downstream.

Sources

1. Contech Construction Products, Inc. P.O. Box 800 Middletown, Ohio 45042. www.contech-cpi.com
2. Ontario Ministry of the Environment. 1999. *Stormwater Management Planning and Design Manual.* Draft Final Report. Toronto.
2. U.S. Environmental Protection Agency. 1999. *Preliminary Data Summary of Urban Storm Water Best Management Practices*. Report EPA-821-R-99-012. Washington, D.C.