Deep Sump Catch Basins

Source: Nonpoint Education for Municipal Officials (NEMO).

Description

Deep sump catch basins, also known as oil and grease catch basins, are storm drain inlets that typically include a grate or curb inlet and a sump to capture trash, debris, and some sediment and oil and grease. Stormwater runoff enters the catch basin via an inlet pipe located at the top of the basin. The basin outlet pipe is located below the inlet and can be equipped with a hood (i.e., an inverted pipe). Floatables such as trash and oil and grease are trapped on the permanent pool of water, while coarse sediment settles to the bottom of the basin sump. **Figure 11-S3-1** shows a schematic of a typical deep sump catch basin.

Catch basins are commonly used in drainage systems and can be used as pretreatment for other stormwater treatment practices. However, most catch basins are not ideally designed for sediment and pollutant removal. The performance of deep sump catch basins at removing sediment and associated pollutants depends on several factors including the size of the sump, the presence of a hooded outlet, and maintenance frequency.

Reasons for Limited Use

Catch basins have several major limitations, including:

- *Even ideally designed catch basins (those with deep sumps, hooded outlets, and adequate sump capacity) are far less effective at removing pollutants than primary stormwater management practices such as stormwater ponds, wetlands, filters, and infiltration practices.*
- *Can become a source of pollutants unless maintained frequently.*
- *Sediments can be re-suspended and floatables may be passed downstream during large storms.*
- *Cannot effectively remove soluble pollutants or fine particles.*
- *May become mosquito breeding habitat between rainfall events.*

(EPA, 2002).

Treatment Practice Type

Primary Treatment Practice
Secondary Treatment Practice ●

Stormwater Management Benefits

Pollutant Reduction	
Sediment	■
Phosphorus	□
Nitrogen	□
Metals	□
Pathogens	□
Floatables	■
Oil and Grease	■
Dissolved Pollutants	□
Runoff Volume Reduction	
Runoff Capture	□
Groundwater Recharge	□
Stream Channel Protection	□
Peak Flow Control	□

Key: ■ Significant Benefit
■ Partial Benefit
□ Low or Unknown Benefit

Suitable Applications

Pretreatment	■
Treatment Train	■
Ultra-Urban	■
Stormwater Retrofits	■
Other	□

Suitable Applications

- *For limited removal of trash, debris, oil and grease, and sediment from stormwater runoff from relatively small impervious areas (parking lots, gas stations, and other commercial development).*
- *To provide pretreatment for other stormwater treatment practices.*
- *For retrofit of existing stormwater drainage systems to provide floatables and limited sediment control. See Chapter Ten for examples of catch basin stormwater retrofits.*

Design Considerations

Drainage Area: The contributing drainage area to any deep sump catch basin generally should not exceed 1/4 acre of impervious cover.

Design: Catch basin performance is related to the volume of the sump below the outlet. A recommended catch basin sizing criterion relates the catch basin sump depth to the diameter of the outlet pipe (D), as follows:

- *The sump depth (distance from the bottom of the outlet pipe to the bottom of the basin) should be at least 4D and increased if cleaning is infrequent or if the contributing drainage area has high sediment loads.*
- *The diameter of the catch basin should be at least 4 feet.*
- *The bottom of the outlet pipe should be at least 4 feet from the bottom of the catch basin inlet grate.*

(Lager et al., 1997). Where high sediment loads are anticipated, the catch basin can be sized to accommodate the volume of sediment that enters the system, with a factor of safety (Pitt et al., 2000).

Where feasible, deep sump catch basins should be designed as off-line systems (i.e., collectors or preceded by a flow diversion structure) to minimize re-suspension of sediment during large storms. The basic design should also incorporate a hooded outlet consisting of an inverted elbow pipe to prevent floatable materials and trash from entering the storm drainage system. Hooded outlets may be impractical for outlet pipes larger than 24 inches in diameter. Catch basin hoods that reduce or eliminate siphoning should be used. Catch basins should be watertight to maintain a permanent pool of water and provide higher floatable capture efficiency. Catch basin inserts, which are described elsewhere in this chapter, can be used to filter runoff entering the catch basin, although their effectiveness is unproven and they require frequent sediment removal.

Maintenance: Typical maintenance of catch basins includes trash removal from the grate (and screen or other debris-capturing device if one is used) and removal of sediment using a vacuum truck. Studies have shown that catch basins can capture sediments up to approximately 50 percent of the sump volume. Above this volume, catch basins reach steady state due to re-suspension of sediment (Pitt, 1984). Frequent cleanout maintains available sump volume for treatment purposes.

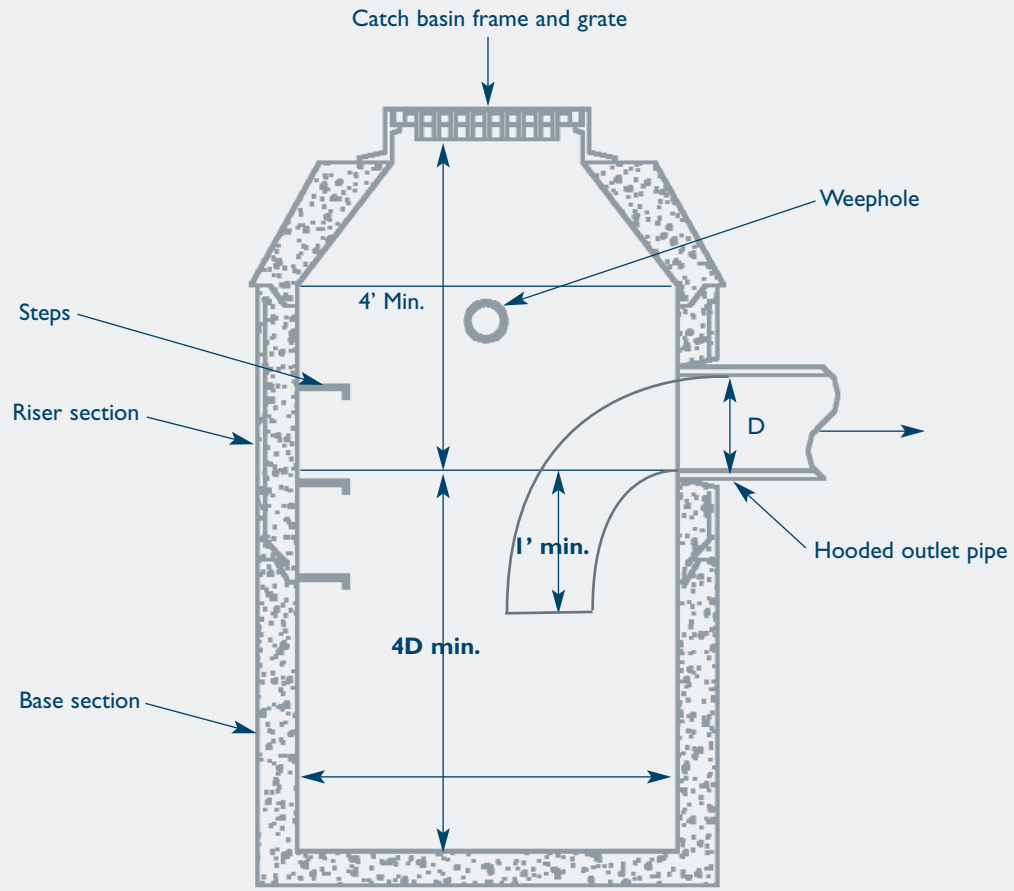
Catch basins should be cleaned at least annually, after the snow and ice removal season is over and as soon as possible before spring rainfall events. In general, a catch basin should be cleaned if the depth of deposits is greater than or equal to one-half the depth from the bottom of the basin to the invert of the lowest pipe in the basin (EPA, 1999). If a catch basin significantly exceeds this one-half depth standard during the annual inspection, then it should be cleaned more frequently.

In addition, areas with higher pollutant loadings or discharging to sensitive water bodies should also be cleaned more frequently (WEF and ASCE, 1998). More frequent cleaning of drainage systems may also be needed in areas with relatively flat grades or low flows since they may rarely achieve sufficiently high flows for self-flushing (Fergusen et al., 1997).

Plans for catch basins should identify detailed inspection and maintenance requirements, inspection and maintenance schedules, and those parties responsible for maintenance.

Sediment Disposal: Polluted water or sediment removed from catch basins should be properly handled and disposed in accordance with local, state, and federal regulations. Before disposal, an appropriate chemical analysis of the material should be performed to determine proper methods for storage and disposal (EPA, 1999).

Figure 11-S3-1 Typical Deep Sump Catch Basin



Source: Adapted from Urban Stormwater Management and Technology: Update and Users' Guide, 1977.

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