Stormwater Best Management Practice

Storm Drain Inlet Protection

Minimum Measure: Construction Site Stormwater Runoff Control
Subcategory: Sediment Control

Description

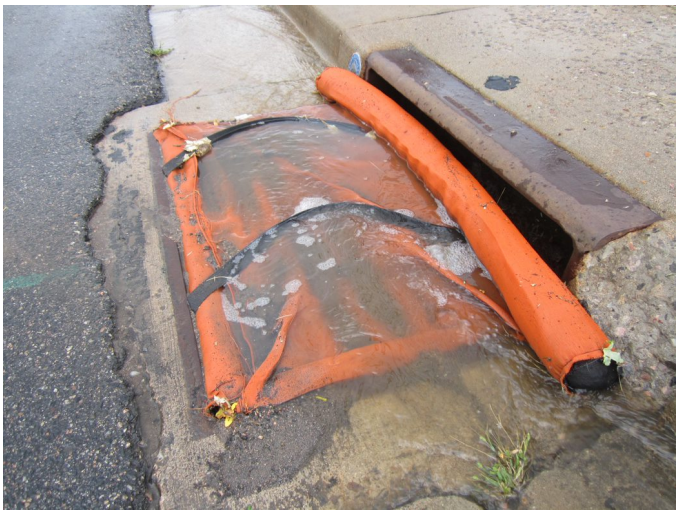
Storm drain inlet protection controls prevent soil and debris from entering storm drain inlets. These controls are usually temporary and allow storm drain inlets on-site to remain operational prior to permanent site stabilization. Inlet protection is often the last opportunity to provide treatment to stormwater prior to discharge. There are several types of inlet protections that construction site operators can use depending on site conditions, inlet configurations and material availability. Inlet protection can be either internal or external. Internal controls consist of a filter insert that construction staff place within a storm drain, and these controls are generally only useful for larger sediment. External controls enable ponding around the storm drain inlet using some type of filter barrier made of stone, gravel or fabric. Construction staff can create the ponded area by either excavating around a drop inlet or by building the filter material up around a drop inlet's perimeter. External controls slow flow velocities and allow for sediment settling and filtration before stormwater enters the inlet.

A variety of controls can protect storm drain inlets, such as the mostly structural controls that this fact sheet discusses or non-structural controls that the Compost Filter Socks and Fiber Rolls fact sheets discuss in greater detail.

Applicability

Inlet protection is applicable to operational inlets for which all or some of the inlet's drainage area is disturbed. Storm drain inlet protection is a secondary control device, meaning that construction staff should always use inlet protection in conjunction with other sediment and erosion control practices.

Internal controls are applicable to areas with high construction traffic or where roadway flooding is a concern (WSDOT, 2019). External controls—which require more space for stormwater ponding but are generally more effective as sediment control practices—are applicable to a wide range of inlet configurations. Excavated drop inlet protection and block and gravel inlet protection are applicable to areas of high flow, where drain overflow is likely. Fabric (e.g., silt fence or geotextile) barriers are applicable to smaller, flatter drainage areas, but construction staff should be aware that some locations caution against this practice due to its high failure rate (e.g., TDEC, 2012).



Storm drains and curb inlets should be protected with filter fabric and filter socks, which trap sediment and allow water to flow through.

Photo Credit: PG Environmental for USEPA

Siting and Design Considerations

Construction staff should install temporary inlet protection controls before any soil disturbance occurs in the drainage area. Generally, drainage areas to each control should be no greater than 1 acre per inlet. In all cases, the overtopping depth of an inlet protection control should not be greater than any surrounding low point in the drainage area so that stormwater does not bypass the inlet. In some cases, controls may require an emergency overflow (City of Seattle, 2017).

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Given the wide variety of inlet protection types, design engineers and construction staff should always consult local, state and manufacturer specifications for siting, installation and maintenance requirements. Considerations for common inlet protection controls are below (City of Seattle, 2017; DC, 2017; Lake, 2016; TDEC, 2012; WSDOT, 2019):

- ***Excavated drop inlet protection*** – This consists of a small area that construction staff can excavate or leave below grade around an inlet to create a settling pool. Small holes (also called weep holes) with gravel and/or filter fabric protection slowly release stormwater into the inlet. Recommended depths vary by location but are generally between 1 and 2 feet depending on site configurations. Most jurisdictions also provide recommendations for minimum storage volume as a function of drainage area. For example, the New York State Department of Environmental Conservation recommends a minimum of 35 cubic yards per acre disturbed (Lake, 2016).
- ***Fabric drop inlet protection*** – This consists of a barrier of porous fabric around an inlet that creates a shield against sediment while allowing water to flow into the inlet. This barrier slows stormwater while catching soil and other debris. If water levels are high enough, water should be able to overflow into the inlet leaving settled sediment behind. Most jurisdictions specify a maximum fabric height of 1.5 feet unless adequate reinforcement is in place.
- ***Block and gravel inlet protection*** – Standard concrete blocks and gravel form a barrier to sediments that permits stormwater to flow through select sideways blocks. Similar to fabric drop inlet protection, block and gravel controls should be high enough to pond stormwater and enable settling of sediments, but not so high as to prohibit overtopping during times of high flows. Designs typically require wire mesh between the blocks and gravel to prevent gravel from entering the inlet.
- ***Sod inlet protection*** – For permanent inlet protection after construction staff have stabilized the surrounding area, staff can install sod. This permanent measure is an aesthetically pleasing way to slow stormwater near drop inlet entrances and to remove sediments and other pollutants from stormwater. Only use sod inlet protection after staff have stabilized the entire drainage area.

Limitations

Stormwater inlet protection is not appropriate as a primary sediment control. Construction staff should always use it with other controls, such as an upstream buffer strip or storm drain diversion (Lake, 2016). In general, stormwater inlet protection is only practical for areas receiving relatively clean stormwater that does not contain large amounts of sediment, as the controls often clog quickly. If sediment and other debris clog the water intake, inlet protection controls can cause stormwater to bypass the inlet and erode unprotected areas.

Maintenance Considerations

Storm drain inlet protection controls require regular maintenance to prevent clogging and ensure effective operation. Regular maintenance activities include:

- Checking all controls after each storm event.
- Removing accumulated sediment from settling areas when the capacity decreases by half.
- Removing sediment from the settling area or unclogging weep holes if the control does not drain within 48 hours.
- Immediately replacing tears in fabric controls or internal filtering controls. This may require replacing the entire control depending on the amount of damage.
- Periodically removing additional debris from the shallow pools.

Effectiveness

Inlet protection controls alone have limited effectiveness, as stormwater would quickly overwhelm them if used as a primary control. However, inlet protection can provide a moderate level of pollutant removal in conjunction with other controls. Given the wide variability in designs of external controls, performance data for external controls is limited. In a review of 11 internal inlet protection controls, Clary et al. (2011) found inlet inserts to reduce total suspended solids concentrations from a median influent concentration of 52 mg/L to a median effluent concentration of 33 mg/L. Removals for other parameters, including metals and nutrients, were variable but mostly positive.

Cost Considerations[1]

The cost of implementing storm drain inlet protection controls varies depending on many factors including the control type, availability and proximity of materials, prevailing wage rates, and regional cost trends. It is therefore difficult to develop cost estimates that apply nationwide. The New York State Department of Environmental Conservation used average bid prices from 2013 to estimate a cost of $210 for each filter fabric inlet control and $1,100 for each excavated or block and gravel inlet control; they also suggest maintenance costs to be about 60 percent of construction costs (Lake, 2016).

[1]Prices updated to 2020 dollars. Inflation rates obtained from the Bureau of Labor Statistics CPI Inflation Calculator Web site https://data.bls.gov/cgi-bin/cpicalc.pl. Reference dates for the calculation are October 2011 and September 2019."

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

References

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