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4.4.5 Inlet Protection Curb



Source: City of Franklin

Definition and Purpose

Curb inlet protection controls are typically placed on or around curb inlets to intercept or filter runoff, reducing sediment, debris, and other pollutants from entering storm drains where they could clog pipes, diminish capacity, degrade water quality, and contribute to localized flooding. By slowing flow velocities near the inlet, these measures promote sediment settling and, in some cases, provide filtration before stormwater enters the drainage system (TDOT). Inlet protection is the last opportunity to treat runoff before it is discharged, and thus, the function and maintenance of these measures is highly important.

Appropriate Applications

Curb inlet protection is appropriate for use on operational curb inlets that receive runoff from disturbed drainage areas, particularly before site stabilization has been achieved. These measures are installed after the inlet grate and roadway surface are in place and can be applied to both on-grade and sag inlets by selecting the proper design (TDOT). Block and gravel systems are recommended for high flow conditions where overflow is likely, while fabric barriers may be used in smaller or flatter drainage areas, though they carry a higher risk of failure if not properly maintained (USEPA, 2021).

Limitations and Maintenance

Inlet protection devices will likely cause ponding and, therefore, are not suitable for high-traffic areas or locations where standing water could create hazards. These measures are considered secondary sediment controls and should always be used in conjunction with



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additional upstream EPSC measures, as they are not capable of filtering out fine silt and clay particles or effective under high sediment loads. A common limitation is the tendency for materials such as stone, gravel, or filter fabric to clog quickly, which can lead to bypass flows, increased ponding, and even erosion of unprotected areas if stormwater cannot enter the system. Maintenance demands are high compared to other measures, with sediment often needing to be removed after each storm event to restore capacity. Additional upkeep may involve inspecting downstream structures after severe storms for bypassed sediment, cleaning accumulated debris from paved areas, and ensuring inlet protection devices and accumulated sediment are removed and disposed of properly after site stabilization (TDOT).



Planning and Design Considerations

All curb inlet protection devices are to be installed before soil disturbance occurs within the drainage area, and in new developments, they should be installed immediately after the storm sewer inlets are constructed. It is critical to consider all stages of construction. For example, when roads are installed to binder grade (i.e., not yet finalized), diversions are likely necessary to divert water from manholes (where water cannot yet enter due to the differences in grade elevation) to the curb. Generally, curb inlet protection measures/devices are not effective sediment retention devices and may result in flooding if drainage areas exceed one acre (TDOT; USEPA, 2021). When drainage areas exceed one acre, it is imperative that upstream EPSC measures detain, divert, or slow runoff from reaching the inlet.

There are multiple types of curb inlet protection devices, each with unique characteristics and functionalities. The four types discussed herein include block and gravel (Type 1), sandbag or stone bag dam (Type 2), coarse aggregate wedge (Type 3), and filter fabrics (Type 4). In addition to the four constructed curb inlet protection devices, a variety of manufactured devices are available, such as dandy sacks, silt sacks, curb inlet filters, etc. TDOT maintains a comprehensive QPL for all applicable manufactured curb inlet protection practices. Selecting the optimal type is dependent on various site characteristics. Further, the designer must consider the level of ponding behind the device and where/how the bypass will be routed. These planning considerations ensure the device will not create public safety hazards or property damage by ponding excessive quantities of runoff or reducing sewer capacity.



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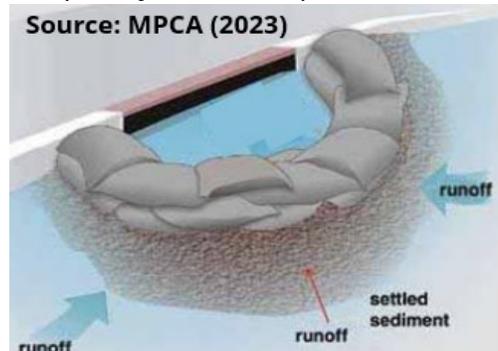
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Curb Inlet Protection Type 1: Block and gravel curb inlet protection devices are designed using standard concrete masonry units combined with coarse aggregate to create a temporary barrier that reduces stormwater velocities and promotes sediment settling before water enters the storm drain system. The blocks are placed lengthwise on their sides with the hollow cores oriented horizontally around the inlet opening, allowing flow to pass through while maintaining structural stability. Wire mesh (19-gauge galvanized hardware cloth), with 0.25-inch openings, is attached to the exterior faces of the blocks to prevent aggregate loss. Coarse aggregate (#57 stone) is then placed against the blocks to the top of the barrier, providing additional filtration for coarse-grained sediments.



The configuration is designed to create ponding in front of the inlet, which encourages sediment deposition while still allowing overtopping during high flows. Because the height of a typical concrete masonry unit (approximately eight inches) exceeds the average curb height, overtopping is expected; however, once water flows over the curb, the large opening across the inlet face prevents excessive ponding above the curb level. Stability is often reinforced by inserting a wooden stud through the outer holes of the end blocks to secure the front row in place. While effective at reducing sediment transport, the system is prone to clogging, which significantly reduces flow-through capacity. For this reason, periodic maintenance is required, including pulling back and cleaning or replacing the gravel when it becomes clogged, which may be more intensive than maintenance regimes for other types or manufactured devices.

Curb Inlet Protection Type 2: Sandbags or bags filled with #57 stone can be stacked in an interlocking fashion to form a small dam that provides temporary curb inlet protection. For inlets located on a grade, the dam is constructed just upstream of the grate in a curved, J-hook-shaped alignment extending approximately three feet from the curb. A single bag is intentionally omitted from the upper row to create a spillway. At sag locations, the dam encircles the inlet, with one bag omitted on each side to form dual spillways. To minimize direct discharge of sediment-laden runoff, spillways should not be aligned immediately adjacent to the curb. Where feasible, the spillway should be set about one inch below curb height to reduce the potential for overtopping.





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The sandbags or gravel-filled bags must be tightly packed. Where this is not achievable, geotextile fabric can be placed on the upstream face of the dam and reinforced with additional coarse aggregate (#57 stone), particularly in areas with high silt or clay content. This measure functions by slowing upstream flow velocities to promote sediment deposition, though it provides limited effectiveness during larger rainfall events due to reduced ponding depths compared to other inlet protection types. It should also be noted gravel gravel-filled bags are preferred over sandbags since sandbags themselves offer no significant filtration capacity and can easily enter the storm drain if the bag tears. Curb Inlet Protection Type 2 functions primarily by slowing upstream flow velocities so that sediments can drop out. However, the Type 2 device may create ponding depths which are somewhat lower than Type 1 or Type 3 inlet protection, and so, may not be as effective for this purpose in larger rainfall events (TDOT).

Curb Inlet Protection Type 3: Coarse aggregate wedge inlet protection consists of a wooden 2 x 4 frame placed over the curb iron, fitted with wire mesh (19 gauge galvanized hardware cloth), with 0.25-inch openings that extend over the grate, and is covered with #57 stone. This configuration reduces flow velocities within the curb, promoting sediment deposition, while the coarse aggregate provides limited filtration for larger particles. Curb Inlet Protection Type 3 can be used at both sags and on-grade inlets. Its compact design is an advantage; however, its overflow capacity is restricted to a one-and-a-half-inch slot (width of a 2 x 4), meaning flow is not conveyed until curb overtopping occurs. In sag locations, this can result in ponding several inches above the curb, while on-grade applications may experience significant bypass flow. Such a bypass can dislodge the aggregate, making this measure unsuitable for curbs with longitudinal slopes greater than one percent. In addition, locations with high sediment loads should be avoided, as the aggregate is prone to clogging (TDOT).



Curb Inlet Protection Type 4: Filter fabric inlet protection is installed by wrapping a continuous piece of geotextile fabric around the inlet grate prior to placement. At the back of the grate, the fabric is secured to a pressure-treated 2 x 4 with wire staples, which is then positioned along the gutter line above the grate. This configuration filters runoff as it enters the inlet. Type 4 devices can be used at both sag and on-grade inlets. Because they do not significantly obstruct gutter flow, ponding is unlikely at on-grade inlets; however, flow through the fabric is limited and further reduced once sediment accumulates, leading to substantial bypass, particularly where gutter slopes and velocities are high. Designers should confirm that bypassed flows can be adequately conveyed within the gutter for the design storm. At sag



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locations, the 2 x 4 obstructs much of the curb opening, resulting in limited overflow capacity and potentially causing ponding depths that exceed the curb height.

Example Application

No formal design or quantities are required for this measure and therefore are not presented here.

References

IECA. (2001). *International Erosion Control Association Photo Gallery*.

MPCA. (2023). *Minnesota Stormwater Manual: Sediment control practices – Storm drain inlet protection*.

OPEA. (2006). *Rainwater and Land Development: Sediment Controls – Storm Drain Inlet Protection*.

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USEPA. (2021). *Stormwater Best Management Practice: Storm Drain Inlet Protection*.