Practice 3.52
Fabric Drop Inlet Protection

Purpose *(Exhibit 3.52-A)*
* To capture sediment at the entrance to a storm drain, allowing full use of the storm drain system during the construction period.

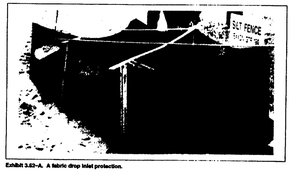

Exhibit 3.52-A. A fabric drop inlet protection.

Requirements *(Exhibits 3.52-B)*
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering a storm drain without bypass flow.
Fabric material: Geotextile fabric for filtration.
Height of fabric: 1 to 1½ ft., measured from top of inlet.
Approach: Pool area flat (less than 1% slope) with sediment storage of 945 cu.ft./acre disturbed.
Stability: Structure must withstand 1½ ft. head of water and sediment without collapsing or undercutting.
Support posts: Steel fence posts or 2 x 2-in. or 2 x 4-in. hard wood posts, 3 ft. minimum length, 3 ft. maximum spacing; top frame support recommended. Cross bracing tops of posts to opposite corners greatly strengthens support.

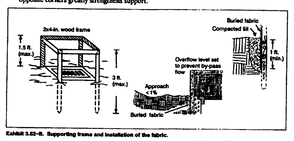

Exhibit 3.52-B. Supporting frame and installation of the fabric.

Installation *(Exhibit 3.52-C)*
1. To prevent runoff from bypassing the inlet, set the top of the fabric at least 6 in. below the downslope ground elevation, OR build a temporary dike (compacted to 6 in. higher than the fabric) on the low side of the inlet (see *Exhibit 3.52-C*).
2. Cut the fabric from a single roll to eliminate joints. (Provide at least 2 ft. of overlap if a joint is needed.)
3. Bury the bottom of the fabric at least 1 ft. deep, backfill, and compact the backfill (see *Exhibit 3.52-B*).
4. Space the support posts evenly against the inlet perimeter a maximum of 3 ft. apart, and drive them about 1½ ft. into the ground. (Overflow must fall directly into the inlet and not on unprotected soil.)

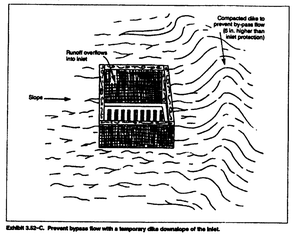

Exhibit 3.52-C. Prevent bypass flow with a temporary dike downslope of the inlet.

Maintenance
* Inspect the fabric barrier after storm events, and make needed repairs immediately.
* Remove sediment from the pool area to provide storage for the next storm. Avoid damaging or undercutting the fabric during sediment removal.
* When the contributing drainage area has been stabilized, remove and properly dispose of all construction material and sediment, grade the area to the elevation of the top of the inlet, then stabilize.

Common concerns
Posts and fabric not supported at the top—results in collapse of the structure.
Fabric not properly buried at bottom—results in undercutting.
Top of fabric barrier set too high—results in the flow bypassing the storm inlet or collapsing the structure.
Temporary dike below drop inlet not maintained—results in the flow bypassing the storm in-let.
Sediment not removed from pool—results in inadequate storage volume for the next storm.
Fence not erected against drop inlet—results in erosion and undercutting.
Land slope at storm drain too steep—results in high flow velocity, poor trapping efficiency, and inadequate storage volume; excavation of the sediment storage area may be necessary.

Practice 3.52 Fabric Drop Inlet Protection
Page 2

Practice 3.53
Block and Gravel Drop Inlet Protection

Purpose *(Exhibit 3.53-A)*
* To trap sediment at the approach to a storm drain inlet, allowing full use of the storm drain system during the construction period.

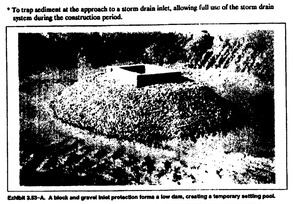
Exhibit 3.53-A. A block and gravel inlet protection forms a low dam, creating a temporary settling pool.

Requirements *(Exhibits 3.53-B and C)*
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering the storm drain without bypass flow.
Height of barrier: 1-2 ft., measured from the bottom of the sediment pool.
Sediment pool dewatering: One or more blocks in the bottom row placed with openings horizontal and covered with wire screen (hardware cloth) and gravel.
Gravel: 1 in. diameter or smaller (INDOT CA No. 5) on the outside face of the blocks to control drainage rate.
Side slopes: 2:1 or flatter, with top of the gravel 2-4 in. lower than top of the block structure.
Approach: Pool area flat (less than 1% slope), with sediment storage 945 cu.ft./acre disturbed.

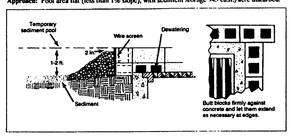

Exhibit 3.53-B. Cross-sectional view of a block and gravel inlet protection.

Installation *(Exhibit 3.53-C)*
1. To prevent runoff from bypassing the inlet, set the top of the fabric at least 6 in. below the downslope ground elevation, OR build a temporary dike (compacted to 6 in. higher than the fabric) on the low side of the inlet (see *Exhibit 3.52-C*).
2. Cut the fabric from a single roll to eliminate joints. (Provide at least 2 ft. of overlap if a joint is needed.)
3. Bury the bottom of the fabric at least 1 ft. deep, backfill, and compact the backfill (see *Exhibit 3.52-B*).
4. Space the support posts evenly against the inlet perimeter a maximum of 3 ft. apart, and drive them about 1½ ft. into the ground. (Overflow must fall directly into the inlet and not on unprotected soil.)

Maintenance
* Inspect the fabric barrier after storm events, and make needed repairs immediately.
* Remove sediment from the pool area to provide storage for the next storm. Avoid damaging or undercutting the fabric during sediment removal.
* When the contributing drainage area has been stabilized, remove and properly dispose of all construction material and sediment, grade the area to the elevation of the top of the inlet, then stabilize.

Common concerns
Posts and fabric not supported at the top—results in collapse of the structure.
Fabric not properly buried at bottom—results in undercutting.
Top of fabric barrier set too high—results in the flow bypassing the storm inlet or collapsing the structure.
Temporary dike below drop inlet not maintained—results in the flow bypassing the storm in-let.
Sediment not removed from pool—results in inadequate storage volume for the next storm.
Fence not erected against drop inlet—results in erosion and undercutting.
Land slope at storm drain too steep—results in high flow velocity, poor trapping efficiency, and inadequate storage volume; excavation of the sediment storage area may be necessary.

Practice 3.52 Fabric Drop Inlet Protection
Page 2

Practice 3.54
Straw Bale Drop Inlet Protection

Purpose *(Exhibit 3.54-A)*
* To capture sediment at the inlet to a storm drain, allowing full use of the drain system during the construction period.
NOTE: This practice not recommended for paved surfaces due to lack of an anchoring system.

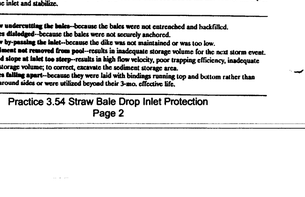
Figure 3.54-A. Straw bale drop inlet protection.

Requirements
Contributing drainage area: 1 acre maximum.
Effective life: Less than 3 months.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering a storm drain without by-pass flow.
Approach: Pool area flat (less than 1% slope), with sediment storage of 945 cu.ft./acre disturbed.
Bale dimensions: Approximately 14 in. x 18 in. x 36 in.
Height of bales above inlet: 14 in. (i.e., 18-in. high bales entrenched 4 in.).
Anchoring: Two 36-in. long (minimum) steel rebars or 2 x 2-in. hardwood stakes driven through each bale.

Installation *(Exhibit 3.54-B and C)*
1. To reduce by-pass flow, ensure that the top of the bales will be at least 6 in. below ground elevation on the downslope side of the inlet. This may require constructing below the inlet a temporary dike (compacted to at least 6 in. higher than the blocks and stabilized appropriately) OR using the block and gravel inlet protection in conjunction with an excavated drop inlet protection (Practice 3.51).
2. Excavate a trench at least 4 in. deep and a bale's width around the inlet.
3. Place the bales lengthwise in the trench so the bindings are oriented around the sides, rather than top and bottom, to minimize deterioration of the bindings.
4. Allow the bales to overlap at the corners, and abut them tightly against each other.
5. Anchor the bales by driving two 36-in. long steel rebars or 2x2-in. hardwood stakes through each bale until nearly flush with the top. Drive the first stake at an angle towards the previously laid bale to form the bales together.
6. Chink (i.e., tightly wedge) straw into any gaps between bales to prevent sediment-laden water from flowing directly into the inlet.
7. Backfill and compact the excavated soil 4 in. high against the outside of the bales.

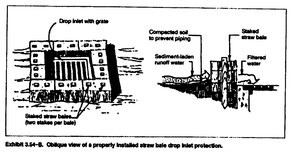

Exhibit 3.54-B. Oblique view of a properly installed straw bale drop inlet protection.

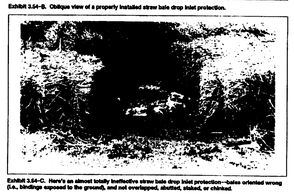
Exhibit 3.54-C. Here's an almost totally ineffective straw bale drop inlet protection—bales oriented wrong (i.e., bindings exposed to the ground), and not overlapped, abutted, staked, or chinked.

Maintenance
* Inspect the drop inlet protection after each storm event, and make needed repairs immediately.
* Remove sediment from the pool area to ensure adequate runoff storage for the next rain, taking care to not damage or undercut the bales.
* When the contributing drainage area has been stabilized, remove all bales, construction material, and sediment and dispose of properly, grade the disturbed area to the elevation of the top of the inlet and stabilize.

Common concerns
Flow undercutting the bales—because the bales were not entrenched and backfilled.
Bales dislodged—because the bales were not securely anchored.
Flow by-passing the inlet—because the dike was not maintained or was too low.
Sediment not removed from pool—results in inadequate storage volume for the next storm event.
Land slope at inlet too steep—results in high flow velocity, poor trapping efficiency, inadequate storage volume; to correct, excavate the sediment storage area.
Bales falling apart—because they were laid with bindings running top and bottom rather than around sides or were utilized beyond their 3-mo. effective life.

Practice 3.54 Straw Bale Drop Inlet Protection
Page 2

Practice 3.55
Slotted-Barrel Drop Inlet Protection

Purpose *(Exhibit 3.55-A)*
* To trap sediment at the entrance to a round casting-covered drop inlet storm drain, allowing full use of the drain system during the construction period.
NOTE: This practice not recommended for paved surfaces due to lack of an anchoring system.

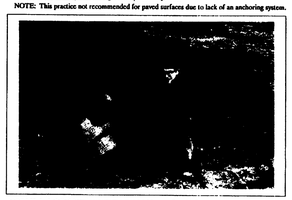
Exhibit 3.55-A. A slotted-barrel protects this drop inlet from sediment inflow.

Requirements
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering the storm drain without bypass flow.
Height of riser: 1 ft. minimum.
Approach: Pool area flat (less than 1% slope), with sediment storage of 945 cu.ft./acre disturbed.
Barrel dimension: Equal to or greater than the casting grate.
Geotextile fabric (optional): For filtration, wrapped around the outside of the barrel riser.
Gravel (optional): For filtration, INDOT CA No. 1 mounded around base of riser.

Installation *(Exhibits 3.55-B)*
1. Set barrel riser height at least 6 in. below ground elevation on the downslope side of the inlet to prevent runoff from by-passing the inlet.
2. If necessary, on the low side of the inlet, build a temporary dike compacted to 6 in. higher than the riser and stabilized appropriately.
3. Cut slots at least 1 in. wide and 5 in. long in the barrel, and cut out the barrel ends (see *Exhibit 3.55-B*).
4. Place the barrel riser over the casting grate.
5. If using geotextile fabric, wrap it around the riser before placement and tuck it under the bottom of the barrel; attach the fabric top to the barrel with cord or wire.
6. If using gravel, mound it around the base of the barrel no higher than the bottom of the lowest slots.
7. Consider using an excavated drop inlet protection in conjunction with this practice to improve trap efficiency, and provide sediment storage capacity (Practice 3.51).

Maintenance
* Inspect the structure after each storm event.
* Remove accumulated sediment and make needed repairs immediately.
* When the contributing drainage area has been stabilized, remove and properly dispose of all construction material and sediment and stabilize.


Exhibit 3.55-B. A slotted barrel in place with a hole in the top to allow high storm flow to enter.

Common concerns
Top of riser too high—results in by-pass storm flow, which causes severe erosion or excessive ponding.
Barrel end not removed—results in obstruction of high storm flow causing by-pass flow, or the barrel floats off the casting allowing excessive sediment to enter the storm drain.
Slots of riser too small—slots clog with debris blocking flow.
Drainage area too large—results in poor trap efficiency and/or sediment overload.
Approach to drain too steep—causes high flow velocity and poor trap efficiency; correct by installing an excavated drop inlet protection in the approach (Practice 3.51).
Sediment not removed following a storm—results in sediment entering the storm drain.
Casting diameter too large or barrel does not fit over adequately—results in excessive sediment entering the storm drain.
Inadequate trap efficiency—correct by mounding gravel greater than 1 in. in diameter around the riser up to the bottom of the lower slots.

Practice 3.55 Slotted-Barrel Drop Inlet Protection
Page 2

Practice 3.56
Gravel Donut Inlet Protection

Purpose *(Exhibit 3.56-A)*
* To trap sediment at the approach to a storm drain inlet, allowing full use of the drain system during the construction period.

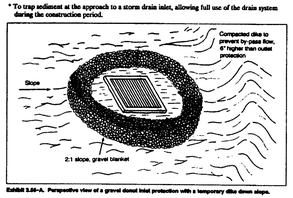

Exhibit 3.56-A. Perspective view of a gravel donut inlet protection with a temporary dike down slope.

Requirements *(Exhibit 3.56-B)*
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering a storm drain without bypass flow.
Height of structure: 1-2 ft. above top of inlet.
Gravel for donut: INDOT CA No. 1 (outside face, INDOT CA No. 5).
Slope of donut: Outside, 2:1 or flatter; inside 3:1 or flatter.

Exhibit 3.56-B. Cross-section view of a gravel donut drop inlet protection.

Installation
1. Excavate an 8 in. deep and minimum 1 ft. wide area immediately out from the storm drain.
2. Around that excavated area, lay a ring of gravel (INDOT CA No. 1) to a height 1-2 ft. above the top of the inlet and having a 2:1 or flatter outside slope and a 3:1 or flatter inside slope (but be sure the toe of the inside slope does not extend into the excavated area.) The top of the gravel ring on the downslope side of the inlet should be 6 in. below ground elevation to reduce bypass flow.
3. Cover the outside face of the donut with at least 1 ft. of INDOT CA No. 5 gravel, maintaining a 2:1 or flatter slope.

4. Also blanket the area from the toe of the inside slope to the inlet structure with INDOT CA No. 5, leaving the excavated area adjacent to the structure recessed at least 4-in. to keep stone out of the storm drain.
5. Where necessary to prevent bypass flow, construct a temporary dike on the downslope side of the inlet, compacting it to at least 6 in. higher than the top of the gravel donut, and stabilize (see *Exhibit 3.56-A*).

Maintenance
* Inspect the structure after each storm event, removing sediment and making needed repairs immediately.
* When the contributing drainage area has been stabilized, remove and properly dispose of any unstable sediment and construction material, and re-stabilize.

Common concerns
Top of structure too high—results in runoff bypassing the structure causing severe erosion.
Drainage area too large—results in poor trap efficiency and/or sediment overload.
Approach to drain too steep—results in high flow velocity and poor trap efficiency; solved by installing an excavated drop inlet protection in the approach (Practice 3.51).
Sediment not removed following a storm event—results in sediment entering the storm drain.
Stone in gravel donut not large enough or inside slope too steep—results in poor sediment filtration efficiency.
Stone enters the storm drain—caused by insufficient recessed area or distance between the toe of the inside slope and the inlet.

Practice 3.56 Gravel Donut Inlet Protection
Page 2

Practice 3.61
Gravel Curb Inlet Protection

Purpose *(Exhibit 3.61-A)*
* To prevent excessive sediment from entering storm sewers at curb inlets, allowing full use of the storm drainage system during the construction period. This practice is especially important when storm sewers empty off-site outside the construction area.
NOTES: (1) Trapping sediment at a curb inlet will be difficult if erosion/sediment control measures are not installed to reduce the volume of sediment reaching the inlet. (2) If ponding at an inlet would be a problem, consider block and gravel curb inlet protection (Practice 3.62.)


Exhibit 3.61-A. This would have been good spot for a gravel curb inlet protection.

Requirements *(Exhibit 3.61-B)*
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering the storm drain without bypass flow.
Location: At curb inlets where ponding is not likely to cause inconvenience or damage.
Gravel: 1-2 in. diameter (INDOT CA No. 2)
Wire mesh: Chicken wire or hardware cloth with 1/2-in. openings.
Geotextile fabric (optional): For filtration.

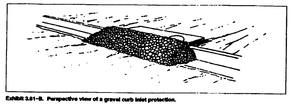
Exhibit 3.61-B. Perspective view of a gravel curb inlet protection.

Installation *(Exhibit 3.61-B)*
1. Install gravel curb inlet protections as soon as the streets are paved in a new development situation or before land-disturbing activities in stabilized areas.

2. Place wire mesh over the curb inlet opening and/or grate so it extends at least 12 in. beyond both top and bottom of the opening/grate.
3. Install geotextile fabric over the wire mesh for additional filtration (optional).
4. Pile gravel over the wire mesh to anchor it against the curb, covering the inlet opening completely.

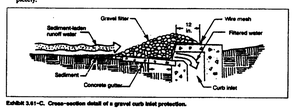

Exhibit 3.61-C. Cross-section detail of a gravel curb inlet protection.

Maintenance
* After each storm event, remove sediment and replace the gravel; replace the geotextile filter fabric if used.
* Periodically remove sediment and tracked-on soil from the street (but not by flushing with water) to reduce the sediment load on the curb inlet practice.
* Inspect periodically, and repair damage caused by vehicles.
* When the contributing drainage area has been stabilized, remove the gravel, wire mesh, geotextile fabric, and any sediment, and dispose of them properly.

Common concerns
Sediment not removed from roadway and gravel and fabric not replaced following a storm event—results in increased sediment tracking, traffic hazard, and excessive ponding.
Drainage area too large—causes sediment overload at the inlet and/or by-pass flow.
Slope too steep—results in bypass flow and/or dislodgement of the gravel and hardware cloth; consider replacing with or using in combination with a sandbag curb inlet protection (Practice 3.64).

Practice 3.61 Gravel Curb Inlet Protection
Page 2

Practice 3.62
Block and Gravel Curb Inlet Protection

Purposes *(Exhibit 3.62-A)*
* To prevent excessive sediment from entering storm sewers at curb inlets, allowing full use of the storm drain system during the construction period.
* To minimize ponding at an inlet.
NOTES: (1) Trapping sediment at a curb inlet will be difficult if erosion/sediment control measures are not installed to reduce the volume of sediment reaching the inlet. (2) Use this practice only where traffic would not be adversely affected.


Exhibit 3.62-A. A block and gravel curb inlet protection reduces ponding problems at the inlet.

Requirements *(Exhibit 3.62-B)*
Contributing drainage area: 1 acre maximum.
Capacity: Runoff from 2-yr. frequency, 24-hr. duration storm event entering the storm drain without bypass flow.
Location: At curb inlets where ponding is likely to occur without bypass flow.
Gravel: 1-2 in. diameter (INDOT CA No. 2).
Wire mesh: Chicken wire or hardware cloth with 1/2-in. opening.
Geotextile fabric (optional): For filtration.
Traffic barricades: For protection from vehicles.

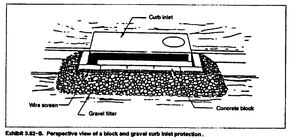

Exhibit 3.62-B. Perspective view of a block and gravel curb inlet protection.

Installation *(Exhibit 3.62-B)*
1. Install as soon as streets are paved in a new development or before land-disturbing activities in a stabilized area.
2. At each side of the inlet, place a concrete block lengthwise out from the curb with its openings facing outward (not upward) to serve as a spacer block.
3. Place a row of blocks (openings facing out) across the front of the inlet and abutting the spacer blocks.
4. Cut a 2 x 4-in. wood stud the length of the inlet plus spacer blocks, and insert it through the front-most openings of the spacers to keep the row of blocks ahead of it from being pushed back toward the inlet (see *Exhibit 3.62-C*).
5. Run wire mesh from the top of the blocks, down their outside vertical face, to about 12 in. into the street (see *Exhibit 3.62-C*).
6. Install geotextile fabric over the wire mesh for additional filtration (optional).
7. Pile gravel in front of the barrier up to the top of the blocks. (If the curbs are sloped, use extra wire mesh and gravel to fill in the space between the final block and the curb.)

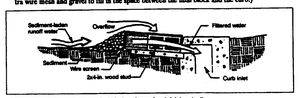

Exhibit 3.62-C. Cross-section detail of block and gravel curb inlet protection.

Maintenance
* After each storm event, remove the sediment and replace the gravel; replace the geotextile fabric, if used.
* Periodically remove sediment and tracked-on soil from the street (but not by flushing with water) to reduce the sediment load on the curb inlet protection.
* Inspect periodically for damage and repair; keep grates free of debris.
* When the contributing drainage area has been stabilized, remove the gravel, wire mesh, geotextile fabric, and any sediment, and dispose of them properly.

Common concerns
Damage by vehicles—results in sediment entering the storm drain or the barrier becoming a traffic hazard.
Sediment not removed, and gravel and fabric not replaced following a storm event—results in increased sediment tracking, traffic hazard, and excessive ponding.
Gravel enters drain—because the wire mesh openings were too big or the mesh did not cover the block openings or gaps.
Drainage area too large—causes sediment overload at the inlet, excessive ponding, or overtopping of the barrier.
Approach to drain too steep—causes high flow velocity, resulting in bypass flow or dislodging of the gravel; consider a sandbag curb inlet protection upslope from the drain (Practice 3.64).

Practice 3.62 Block and Gravel Curb Inlet Protection
Page 2

Practice 3.63
Basket Curb Inlet Protection

Purpose *(Exhibit 3.63-A)*
* To prevent excessive sediment from entering storm sewers at curb inlets, allowing full use of the storm drain system during the construction period.

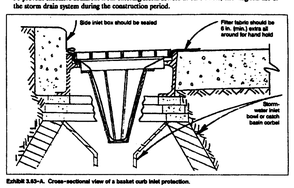

Exhibit 3.63-A. Cross-sectional view of a basket curb inlet protection.

Requirements *(Exhibit 3.63-B)*
Location: At curb inlets where barriers surrounding them would be impractical or unsafe.
Contributing drainage area: 1/4 acre maximum.
Capacity: Runoff from a 2-yr. frequency, 24-hr. duration storm event entering the storm drain without bypass flow.
Basket: Fabricated metal with top width-length dimensions such that the basket fits into the inlet without gaps (see *Exhibit 3.63-A and B*).
Geotextile fabric: For filtration.

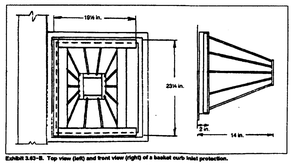

Exhibit 3.63-B. Top view (left) and front view (right) of a basket curb inlet protection.

AE2 ANDY EASLEY ENGINEERING
CIVIL ENGINEERING (812) 424-2481 LAND SURVEYING
1133 WEST MILL ROAD EVANSVILLE, INDIANA 47710

RALPH A. EASLEY, JR. REGISTERED No. 12892 STATE OF INDIANA PROFESSIONAL ENGINEER

EROSION CONTROL DETAILS
WESTCREEK LEISURE LIVING
LEISURE LIVING, LLC
VANDERBURGH COUNTY, INDIANA

DRAWN BY:	
CHECKED: R.A.E.	DATE: 4/21/03
SCALE: NONE	PROJECT NO.:
	REVISIONS

SHEET NO.: S4.8 OF