

- For outlets at the base of steep slope pipes (pipe slope > 10%), use an engineered energy dissipater.
- Geotextile or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See [BMP C122E: Nets and Blankets](#).
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife.

**For more information:** See [1.4.9 Hydraulic Project Approvals](#).

### ***Maintenance Standards***

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipater if sediment builds up.

## **BMP C220E: Inlet Protection**

### ***Purpose***

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

### ***Conditions of Use***

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment-trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18 inches of sod around each finished lawn and yard drain.

[Table 7.18: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to become plugged and require a high frequency of maintenance. Limit contributing areas for an individual inlet to  $\leq 1$  acre. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

**Table 7.18: Storm Drain Inlet Protection**

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
<b>Drop Inlet Protection</b>			
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30-feet by 30-feet/acre
Block and gravel drop inlet protection	Yes	Paved or earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or earthen	Frequent maintenance required.
<b>Curb Inlet Protection</b>			
Curb inlet protection with a wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
<b>Culvert Inlet Protection</b>			
Culvert inlet sediment trap	Not applicable	Not applicable	18-month expected life.

## ***Design and Installation Specifications***

### **Excavated Drop Inlet Protection**

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth 1 to 2 feet as measured from the crest of the inlet structure.
- Side slopes of excavation should be  $\leq 2H:1V$ .
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.

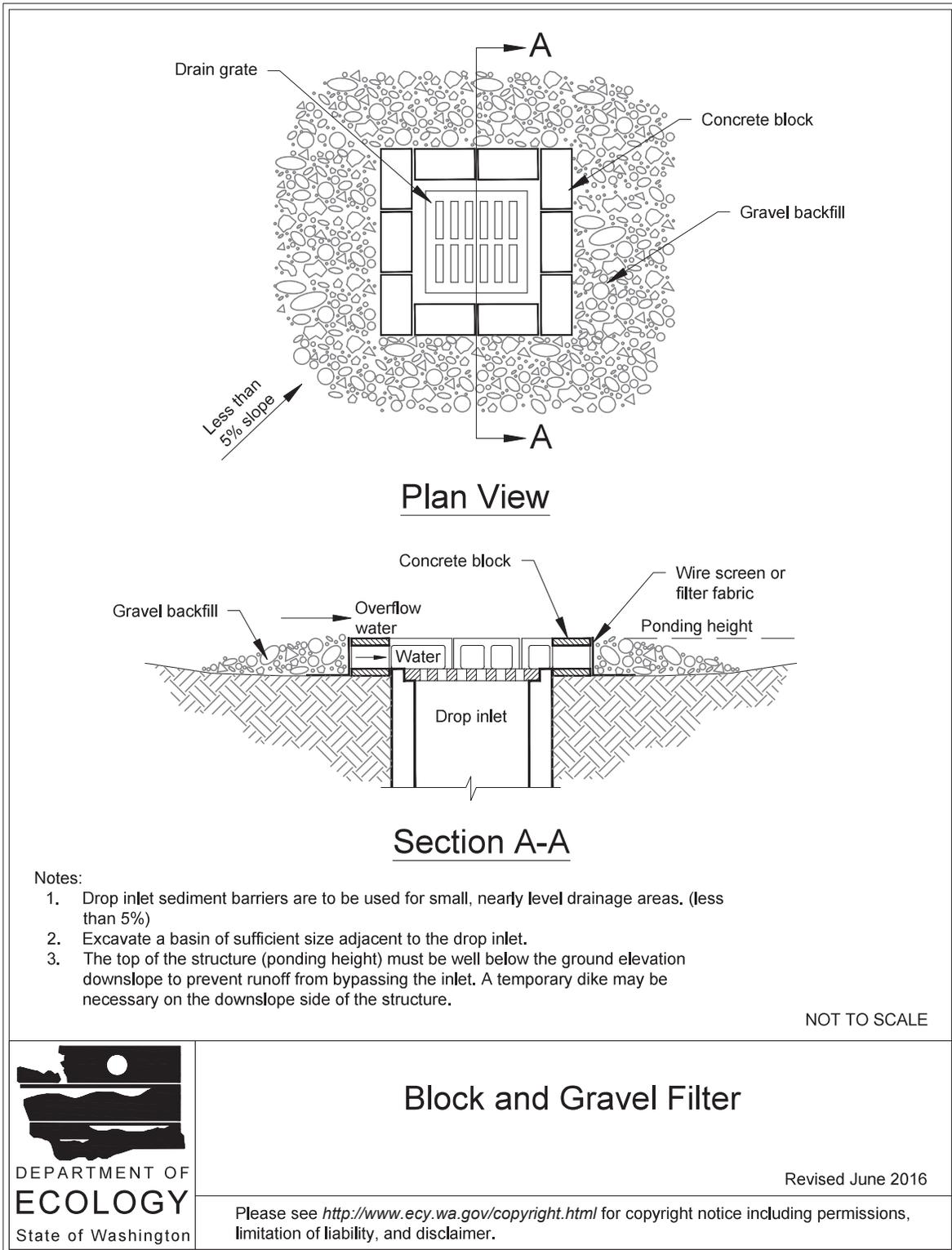
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the downslope side of the structure to prevent bypass flow.

### **Block and Gravel Filter**

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure 7.19: Block and Gravel Filter](#). Design and installation specifications for block and gravel filters include:

- Provide a height 1 to 2 feet above the inlet.
- Recess the first row of blocks 2 inches into the ground for stability.
- Support subsequent courses by placing a piece of pressure-treated wood (2x4) through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with 0.5-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
  - Provide a slope of 3H:1V on the upstream side of the berm.
  - Provide a slope of 2H:1V on the downstream side of the berm.
  - Provide a 1-foot-wide level rock area between the gravel berm and the inlet.
  - Use rocks  $\geq 3$  inches in diameter on the upstream slope of the berm.
  - Use gravel with a diameter of 0.5 to 0.75 inches at a minimum thickness of 1 foot on the downstream slope of the berm.

**Figure 7.19: Block and Gravel Filter**



### **Gravel and Wire Mesh Filter**

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with 0.5-inch openings.
  - Place wire mesh over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure.
  - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
  - Provide  $\geq 12$ -inch depth of aggregate over the entire inlet opening and extend  $\geq 18$  inches on all sides.

### **Catch Basin Filters**

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This combined inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provide 5 cubic feet of storage.
- Require dewatering provisions.
- Provide a high-flow bypass that will not become clogged under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

### **Curb Inlet Protection With Wooden Weir**

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

- Use wire mesh with 0.5-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

### **Block and Gravel Curb Inlet Protection**

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure 7.20: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with 0.5-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

### **Curb and Gutter Sediment Barrier**

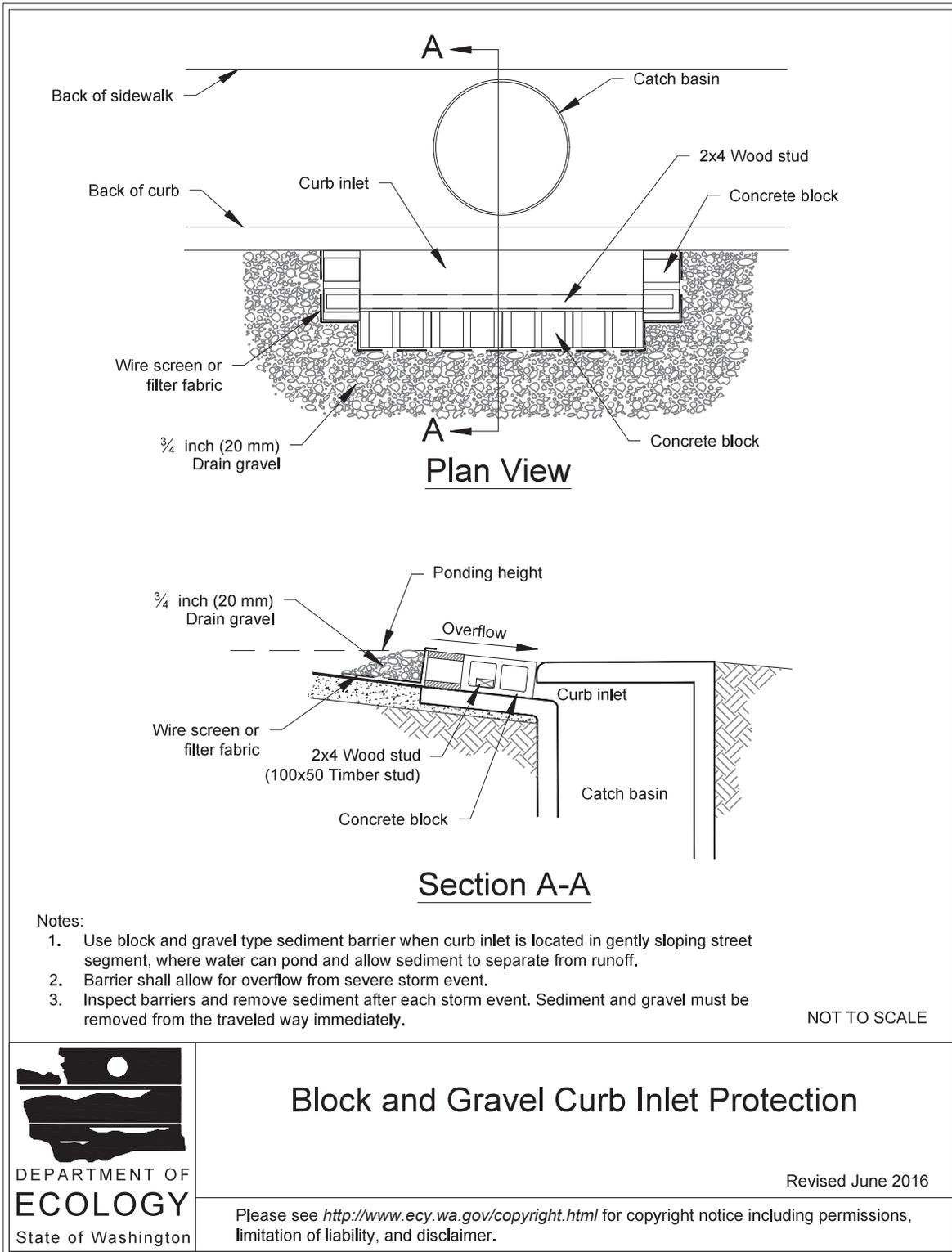
A curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure 7.21: Curb and Gutter Barrier](#). Design and installation specifications for curb and sediment barriers include:

- Construct a horseshoe-shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide,  $\geq 2$  feet from the inlet.
- Construct a horseshoe-shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

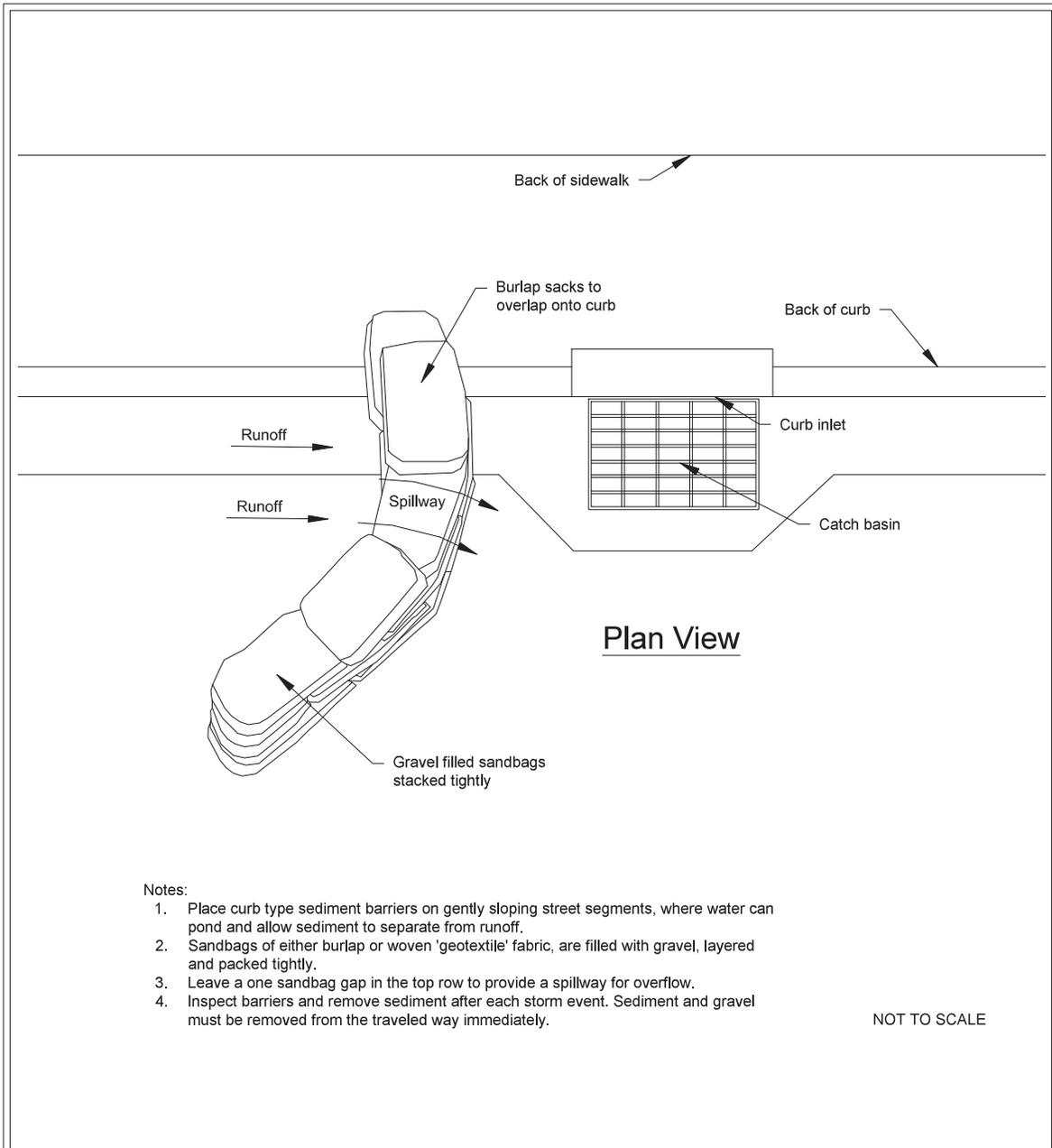
### ***Maintenance Standards***

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach is to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

**Figure 7.20: Block and Gravel Curb Inlet Protection**



**Figure 7.21: Curb and Gutter Barrier**



**Notes:**

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



## Curb and Gutter Barrier

Revised June 2016

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