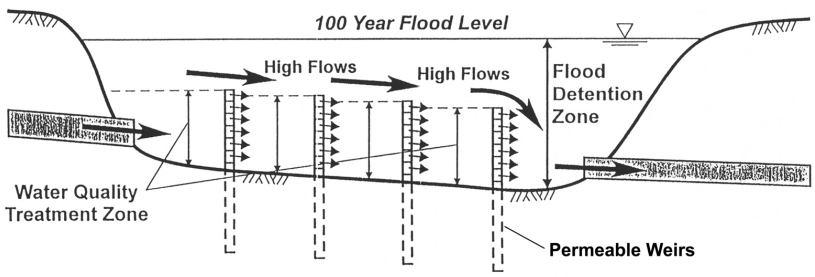
Permeable Weirs



Description

Permeable weirs are a relatively new BMP concept. As such, information regarding their application and design is limited in the current body of literature on BMP systems.

Permeable weirs are typically constructed from treated lumber, stacked with spaces between each timber to provide long, narrow openings that slowly pass stormwater. They have the appearance of a wooden fence. Under low flow conditions, water ponds behind the permeable weir and slowly seeps through the openings between the timbers, functioning like a dry extended storage pond. Under high flow conditions, water flows both over and through the weir.

Permeable weirs are generally used in low-quality wetland areas or constructed water quality treatment ponds. They promote sedimentation by slowing flow velocities as water ponds behind the weir. They also provide a means of spreading runoff as it is discharged, helping to decrease concentrated flow and reduce velocities as the water travels downstream.

Currently, permeable weirs are most often used in large drainage areas as regional BMPs. Figure 1 shows an example of a regional permeable weir. Figure 2 shows another type of permeable weir—a perforated sheetpile wall.

The permeable weir concept could be applied to smaller sites as well. In this case, a permeable weir would act as a wooden check dam, placed in a ditch or swale. Or, it may be used as a control structure in a dry extended detention area. Figure 3 shows how permeable weirs can be incorporated into a dry pond design (See the Dry Ponds BMP Section for more information on this type of BMP).

Purpose

Water Quantity	
Flow attenuation	■
Runoff volume reduction	□
Water Quality	
Pollution prevention	
Soil erosion	**N/A**
Sediment control	**N/A**
Nutrient loading	**N/A**
Pollutant removal	
Total suspended sediment (TSS)	◧
Total phosphorus (P)	□
Nitrogen (N)	□
Heavy metals	□
Floatables	◧
Oil and grease	□
Other	
Fecal coliform	□
Biochemical oxygen demand (BOD)	□

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

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Requirements

Design

Permeable weir design generally includes considering the long, narrow openings as orifices to estimate the flow that passes through them at different water elevations. The 2-year runoff event is commonly chosen as the storage volume behind the weir, with 100 percent of the 2-year runoff passing through gaps in the weir. The length of the weir and the gaps between the boards should be designed so that the 2-year storm event is retained behind the weir approximately 1 to 2 days before fully draining down to normal conditions. Also, a structural analysis of the weir should be conducted and the length of piles should be designed to prevent overturning of the weir under the force of the inflowing stormwater (as shown in Figure 1).

Maintenance

The biggest maintenance concern of permeable weirs is that the timbers can swell, decreasing the size of the opening between each timber. Clogging, therefore, is a prime concern and must be accounted for in the design. Sediment removal from behind the permeable weir is also an important maintenance activity; otherwise, sediment resuspension is likely.

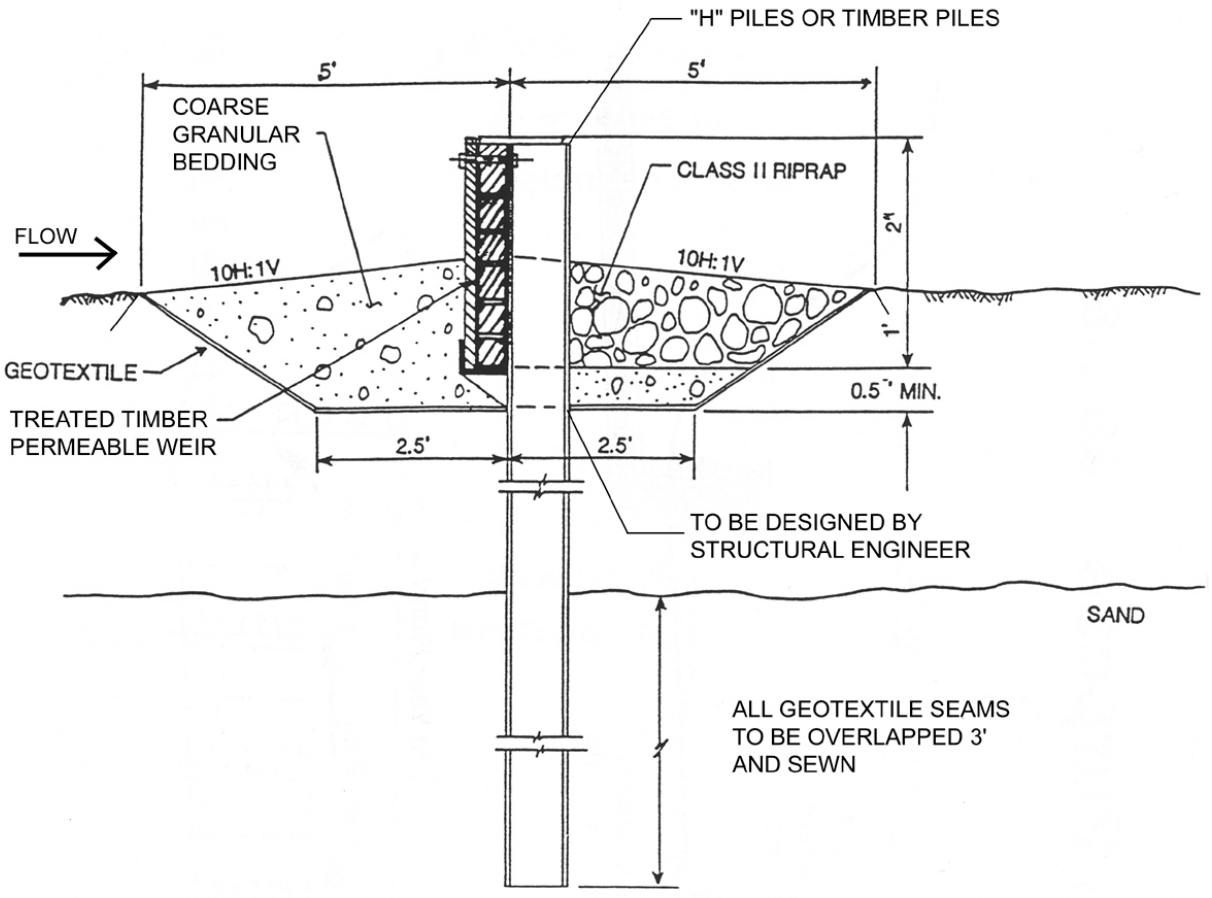

Figure 1: Typical Permeable Weir Section
Source: Klein, 1997

Permeable Weirs

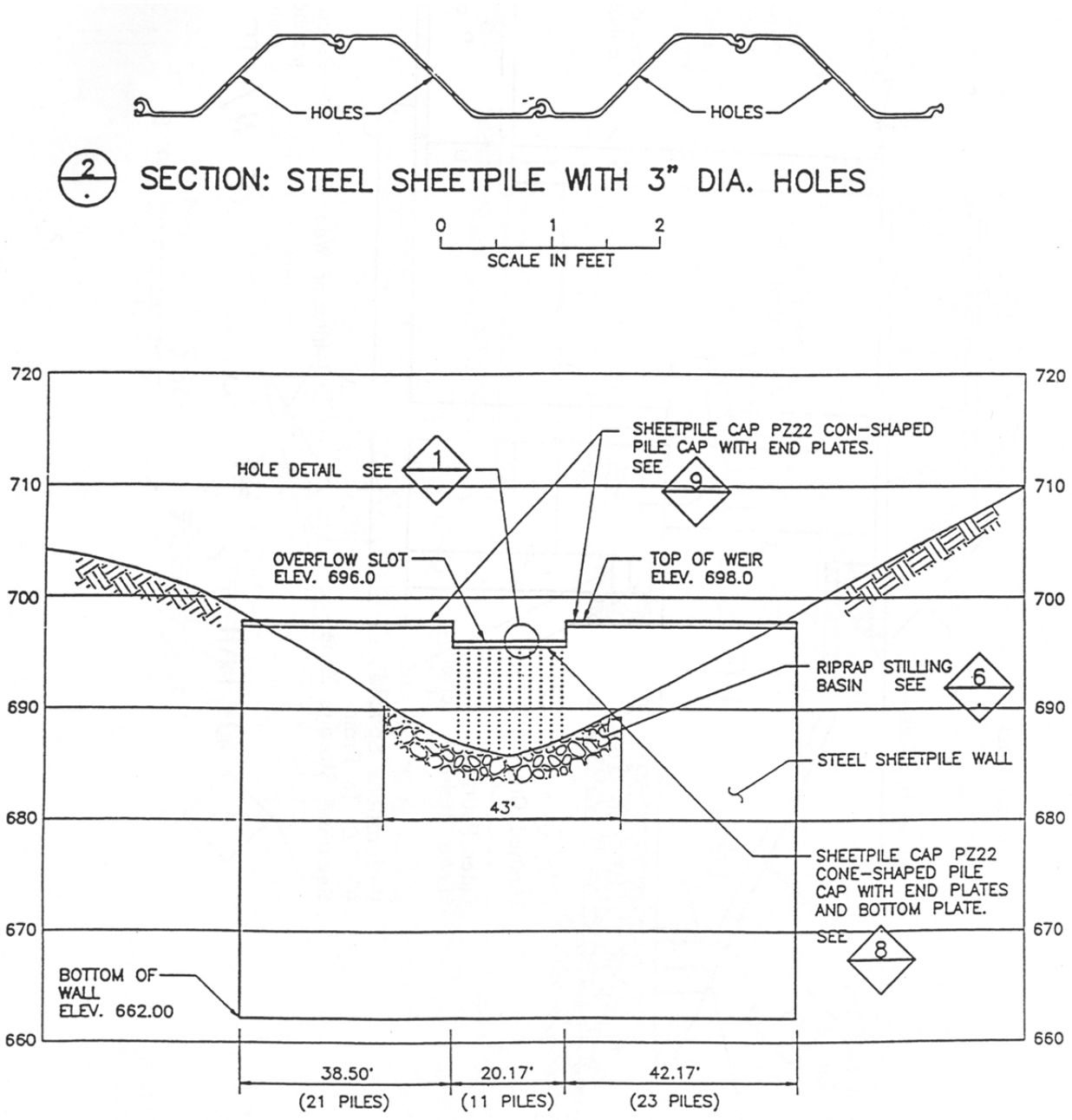

Figure 2: Perforated Sheetpile Wall
Source: Klein, 1997

Permeable Weirs

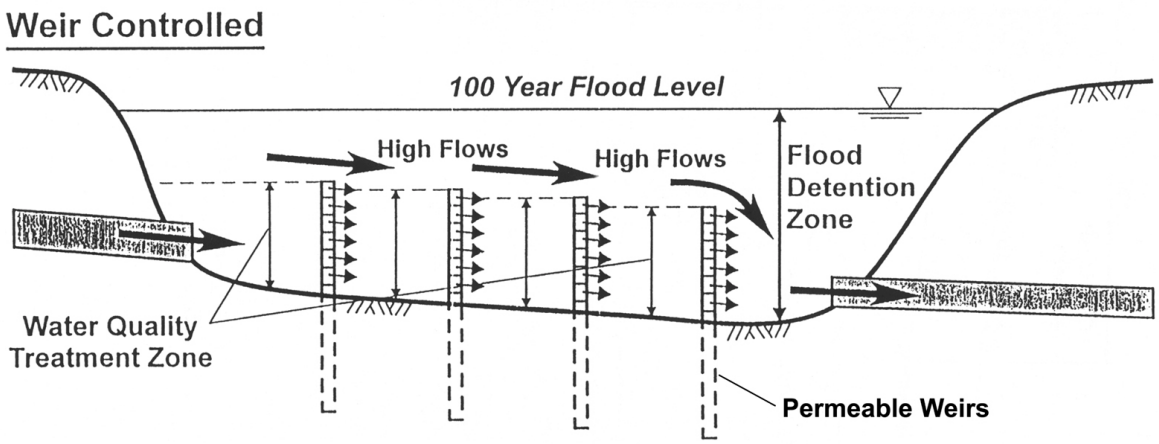

Figure 3: Dry Pond with Permeable Weir Control
Source: Klein, 1997

Sources

1. Center for Watershed Protection. 1997. *Stormwater BMP Design Supplement for Cold Climates.* Ellicott City, MD.

2. Klein, Steve M., Barr Engineering Company. 1997. "Alternatives to Wet Detention Basins" presentation at 30th Annual Water Resources Conference. Minneapolis.

3. Minnesota Pollution Control Agency. 2000. *Protecting Water Quality in Urban Areas: Best Management Practices for Dealing with Storm Water Runoff from Urban, Suburban and Developing Areas of Minnesota.* St. Paul.