5.6 OUTLET VELOCITY CONTROL STRUCTURE

1. DESCRIPTION - A stone rip-rap structure placed at a pipe outlet, headwall outlet or the outlet end of an armored channel section.

2. PURPOSE - Used to reduce the outlet flow velocity and dissipate the outlet flow energy to reduce the potential for downstream channel erosion.

3. APPLICATIONS - Applies to all pipe, headwall or armored channel outlets into vegetated channels where the outlet flow velocity exceeds 4 feet per second.

4. LIMITATIONS - Do not use where the downstream channel has a very steep longitudinal slope or where a vertical drop will result at the pipe end or end of the rip-rap pad. Method does not apply well to narrow downstream channels.

5. DESIGN CRITERIA -

A. Design Flow - Runoff from a 100-year storm.

B. Pad Dimensions - See Figure 5.6.A. for L_a and W.

$$\text{Thickness (T)} = (1.5) \times (d_{max})$$

C. Rip-Rap Size - See Figure 5.6.A. for d_{50} size.

$$d_{max} = (1.5) \times (d_{50})$$

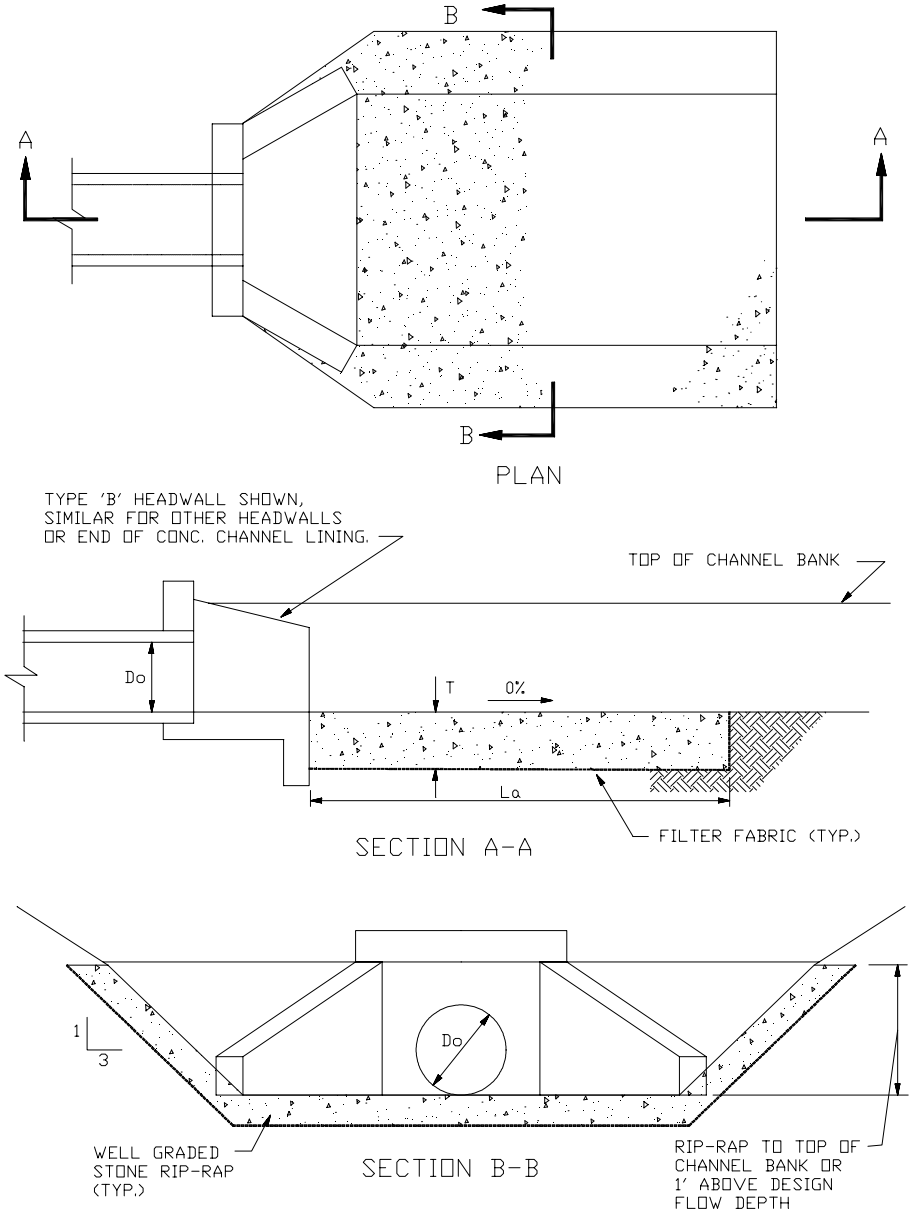
D. Grade - Zero percent (0%) for the length of the pad.

6. MATERIAL SPECIFICATIONS -

A. Stone Rip-Rap - Natural stone or re-cycled concrete meeting the gradation requirements for NCTCOG Specification 2.1.6.(b)(2) and 2.1.8.(d) mixed in a 1:1 ratio.

B. Filter Fabric - NCTCOG Specification 2.23.3.

7. MAINTENANCE REQUIREMENTS - Inspect periodically and after major rain storm events to ensure that the facility is functioning properly. Repair dislodged or missing stone rip-rap and repair any downstream erosion as soon as possible.



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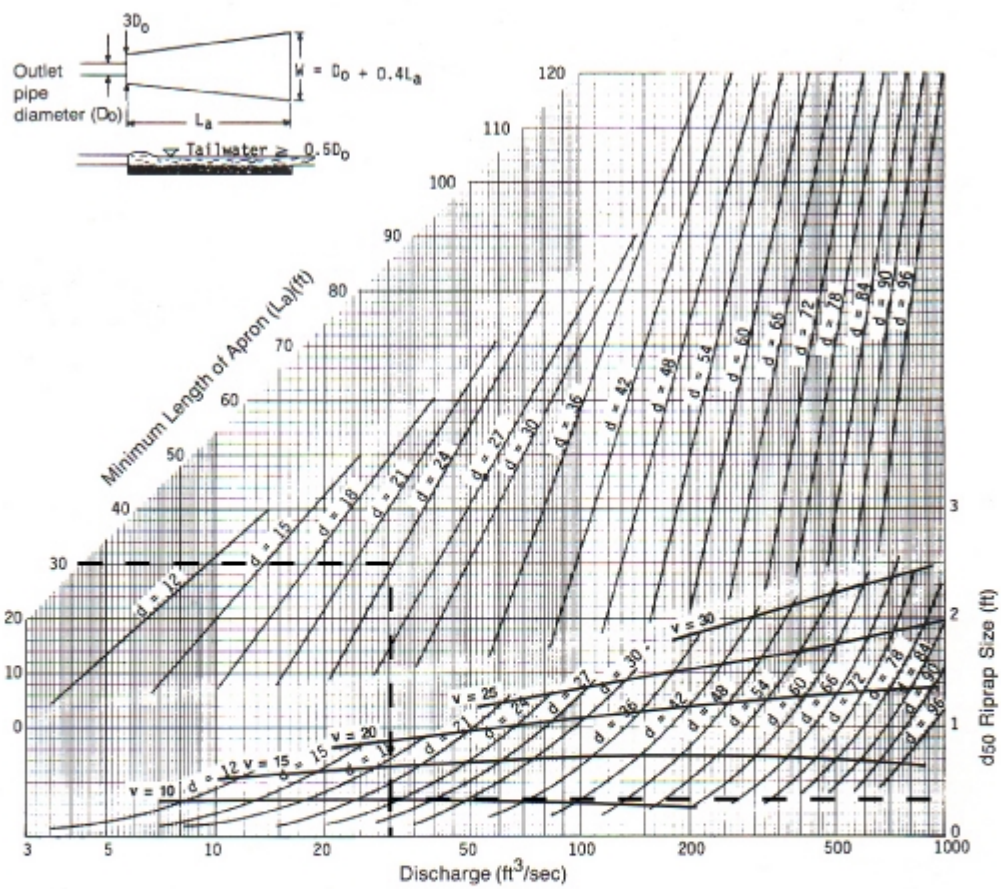
N.T.S.

FIGURE 5.6.A.

Example: Pipe Diameter = 24”
Design Flow = 30 cfs

From Chart: d_{50} = 0.3 ft. = 4 in.
$d_{max.}$ = (1.5) x (d_{50}) = 6 in.
Apron Thickness = (1.5) x ($d_{max.}$) = 9 in.
From Chart: L_a = 30 ft.



Curves may not be extrapolated.

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