

## Command Reference

### Grate Inlets in Sag Calculations

A grate inlet in sag configuration operates in weir flow at low ponding depths. The transition to orifice flow begins as the ponded depth increases. The procedure for calculating the inlet capacity is as follows:

The capacity of a grate inlet operating as a weir is determined with the following equation:

$$Q_w = (1 - P_R) C_w P h^{1.5}$$

where:

$Q_w$  = weir capacity of grate (cfs)

$C_w$  = weir coefficient = 3.087

$P$  = perimeter of the grate (ft)

$h$  = allowable head on grate (ft)

$P_R$  = perimeter reduction factor to account for clogging

Under orifice conditions, the grate area controls the capacity. The capacity of a grate inlet operating under orifice flow is computed equation:

$$Q_o = A * (1 - A_R) C_o \sqrt{2gh}$$

where:

$Q_o$  = orifice capacity of grate (cfs)

$C_o$  = orifice flow coefficient = 0.67

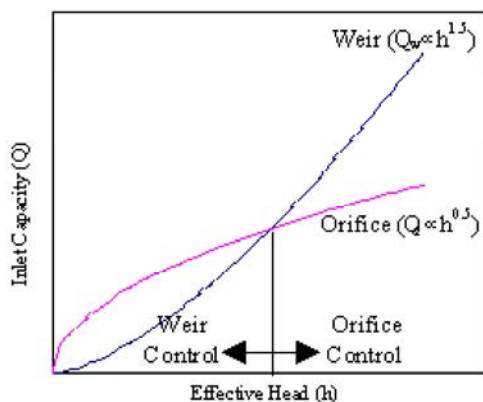
$A$  = clear opening area (ft<sup>2</sup>) of the grate (the total area available for flow)

$g$  = acceleration due to gravity (32.2 ft/s<sup>2</sup>)

$h$  = allowable head on grate (ft)

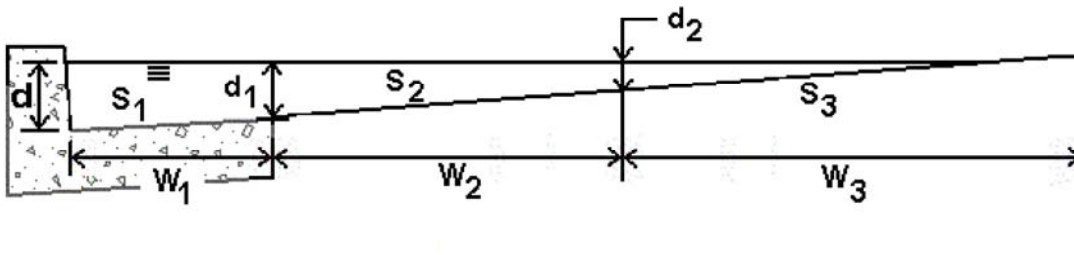
$A_R$  = area reduction factor to account for clogging

The capacity of a grated inlet in a sag is based on the minimum flow calculated from weir and orifice conditions. The figure below demonstrates the relationship between weir and orifice flow. If  $Q_o$  is greater than  $Q_w$  (to the left of the intersection in the figure), then the capacity would be that calculated with the weir equation. If, however,  $Q_o$  is less than  $Q_w$  (to the right of the intersection), then the capacity as determined with the orifice equation would be used.



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### Inlet Spread Computations



The spread or ponded width of runoff at an inlet location is a geometric function of the cross sectional geometry, longitudinal pavement/gutter slope and discharge. A direct solution is not possible for complex cross sections with multiple breaks in the transverse slope so an iterative procedure derived from HEC-22 is employed.