The operating efficiency of a gutter inlet with a grate located on a continuous grade is expressed as:

$$E = R_f E_o + R_s (1 - E_o) \qquad \text{(Eq. A3-20)}$$

where:
E   =   efficiency of the gutter inlet on a continuous grade
R_f =   ratio of intercepted frontal flow to total frontal flow (see Equation A3-18)
E_o =   ratio of frontal flow to total gutter flow (see Equation A3-16)
R_s =   ratio of intercepted side flow to total side flow (see Equation A3-19)

The interception capacity of a gutter inlet with a grate located on a continuous grade is equal to the efficiency of the inlet multiplied by the total gutter flow, which can be expressed as:

$$Q_i = EQ = Q [R_f E_o + R_s (1 - E^o)] \qquad \text{(Eq. A3-21)}$$

where:
Q_i =   interception capacity of the gutter inlet on a continuous grade, in m^3/sec
E   =   efficiency of the gutter inlet on a continuous grade (see Equation A3-20)

Sump Locations

Gutter inlets in sump locations operate as weirs up to depths that are dependent on grate size and configuration, and as orifices at greater depths. A transition occurs between weir and orifice flow depths. In this transition, the capacity is ill-defined and may fluctuate between weir and orifice control.

The efficiency of inlets in passing debris is critical in sump locations. If the inlet plugs, hazardous ponding conditions can result. Since gutter inlets with grates tend to clog, it is generally beneficial to place an ungrated kerb opening inlet behind each grate. This is known as a *combination inlet*. However, because of the potential for clogging, it is usually appropriate to assume not more than 50% - 60% efficiency for the grated inlet portion.

The interception capacity of a gutter inlet with a grate operating as a weir in a sump location is expressed as:

$$Qi = 0.085 (3.28P) (3.28d)^{1.5} \qquad \text{(Eq. A3-22)}$$

where:
Q_i =   interception capacity of a sump gutter inlet operating as a weir, in m^3/sec
P   =   perimeter of the grate, disregarding bars and the kerb side, in m
D   =   depth of water above the top of the grate, in m

The interception capacity of a gutter inlet with a grate operating as an orifice in a sump location is expressed as:

$$Q_i = 0.204 A (21.52g \, d)^{0.5} \qquad \text{(Eq. A3-23)}$$

where:
Q_i =   interception capacity of a sump grated gutter inlet operating as an orifice, in m^3/sec
A   =   clear opening area of the grate, in m^2
G   =   acceleration due to gravity, 9.806 metres/sec^2
D   =   depth of water above the top of the grate, in m

The transition zone from weir flow to orifice flow for gutter inlets in sump locations is typically between a depth of about 120mm to 430mm. However, this transition zone is known to vary depending on perimeter and clear opening area. This transition zone should be evaluated by