APPENDIX

I. INLET EFFICIENCIES

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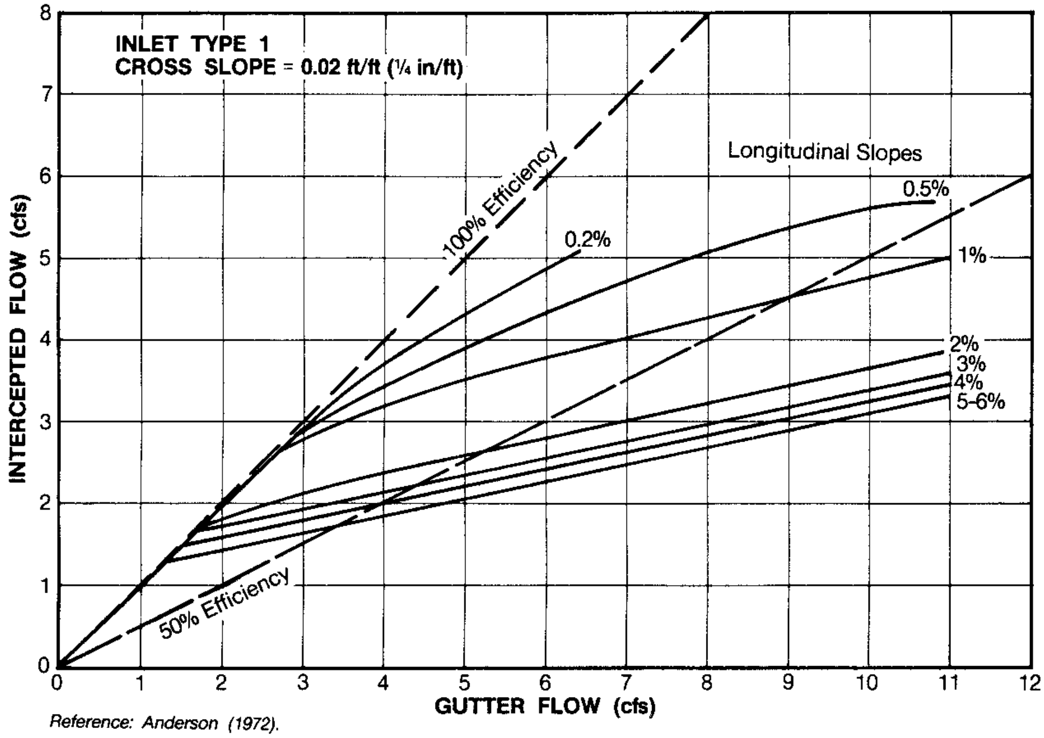


Figure I-1: Type 1, S_X = 0.02

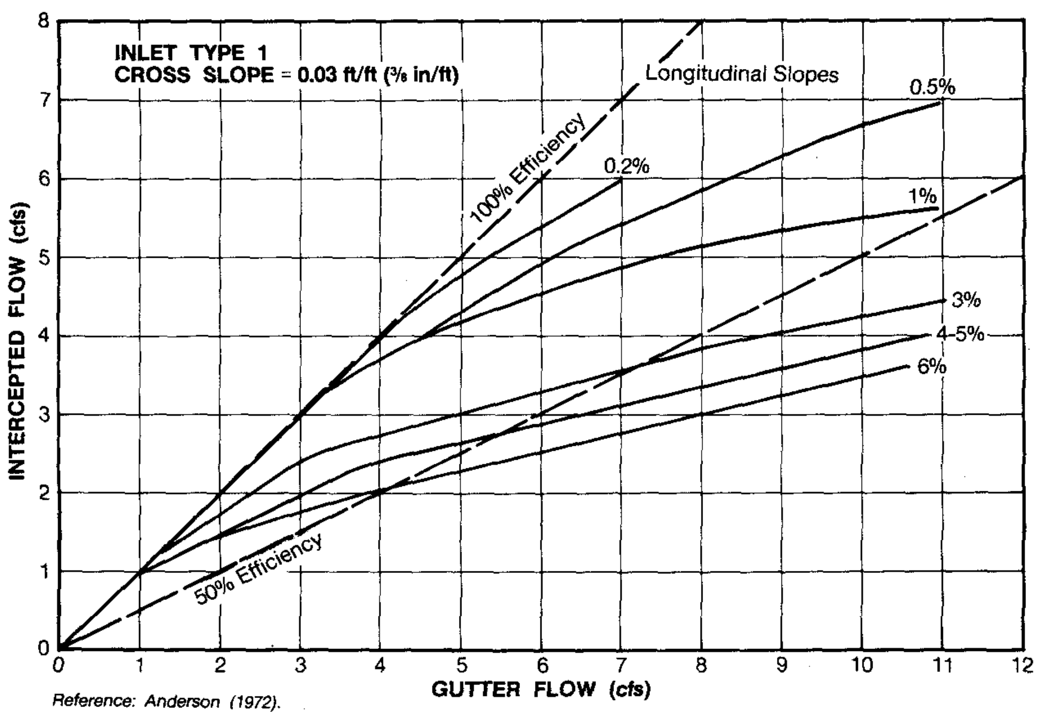


Figure I-2: Type 1, S_X = 0.03

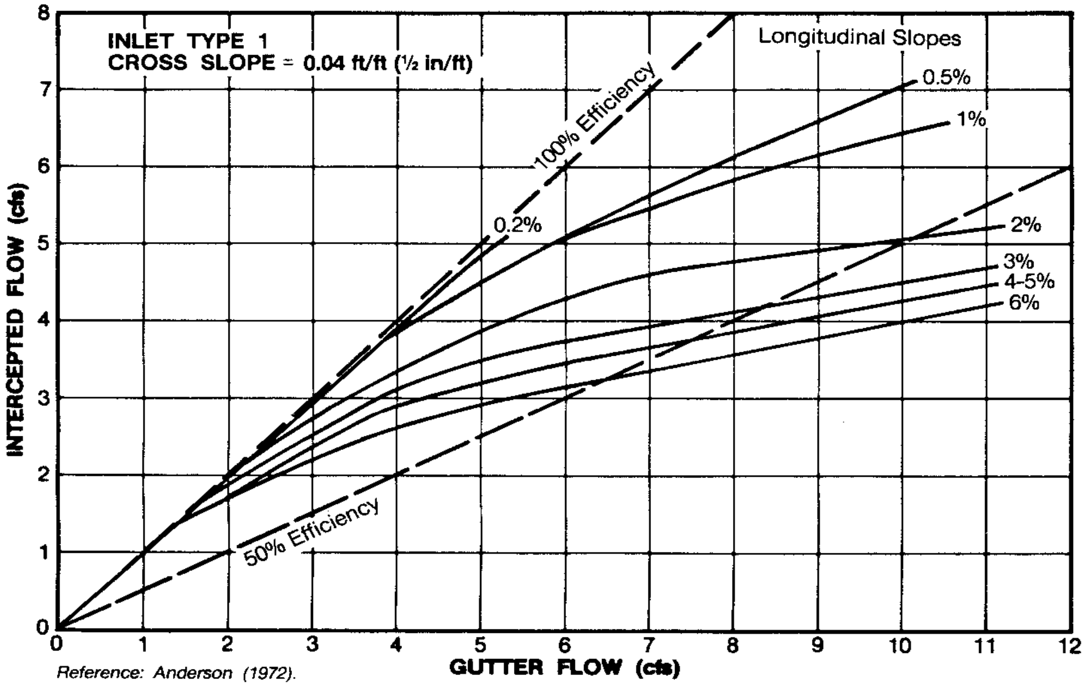


Figure I-3: Type 1, $S_X = 0.04$

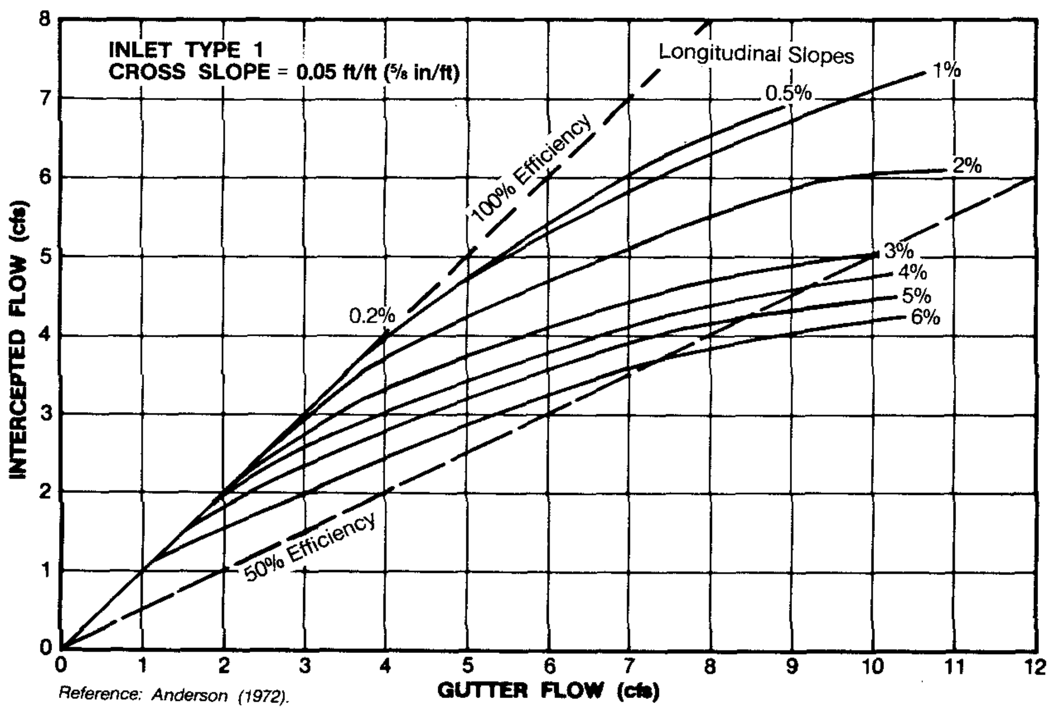


Figure I-4: Type 1, $S_X = 0.05$

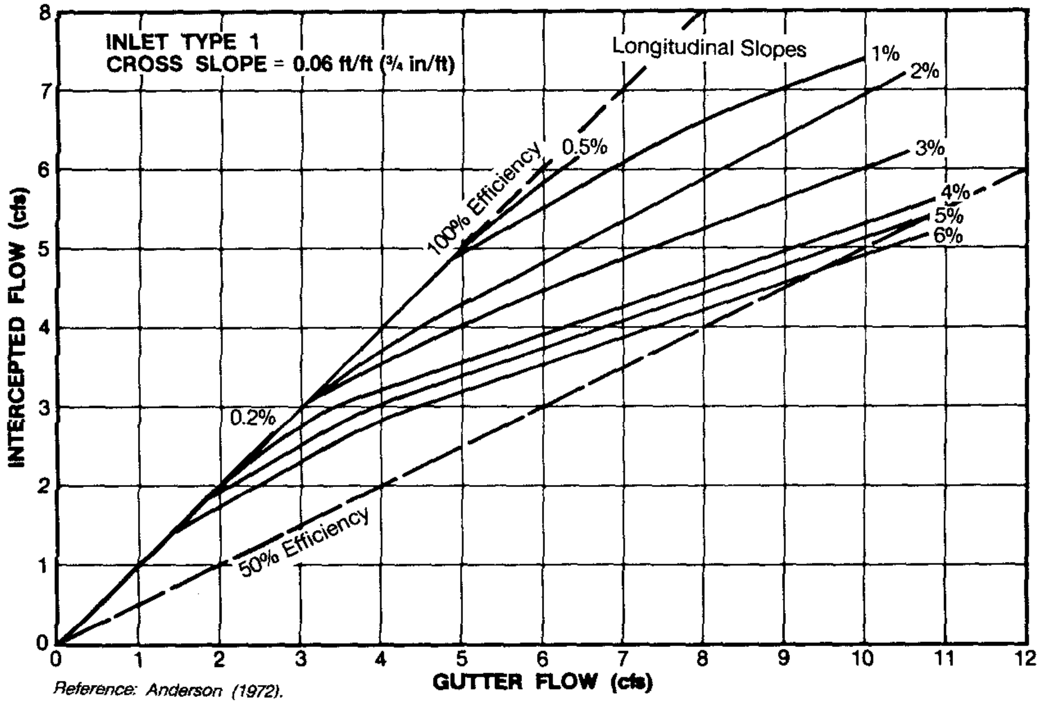


Figure I-5: Type 1, S_X = 0.06

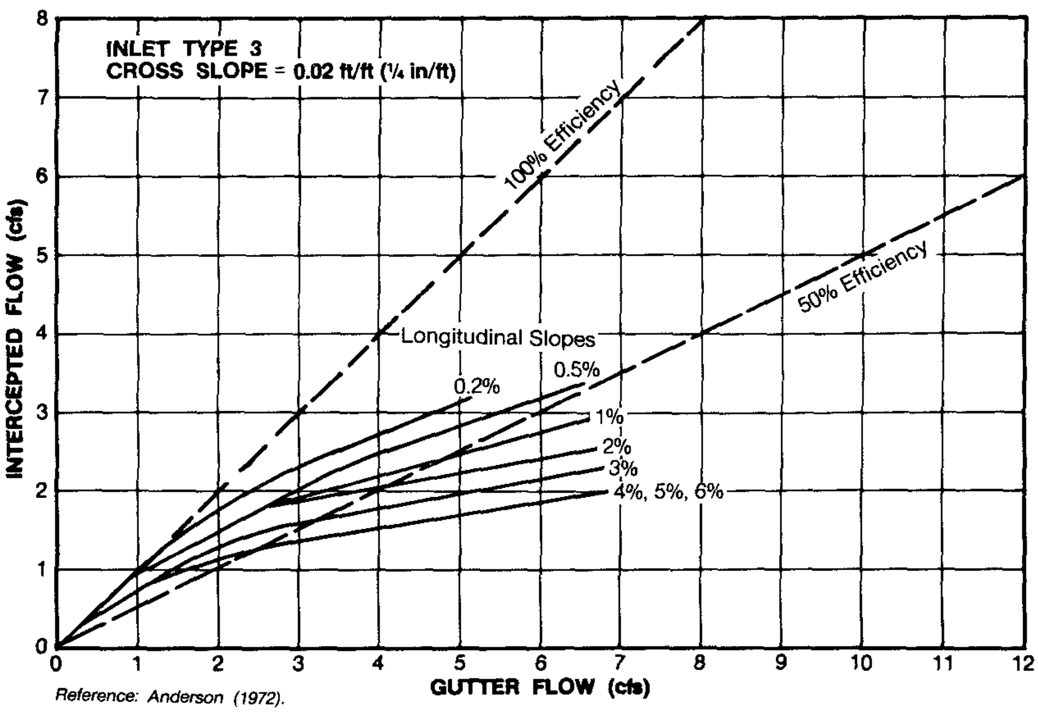


Figure I-6: Type 3, S_X = 0.02

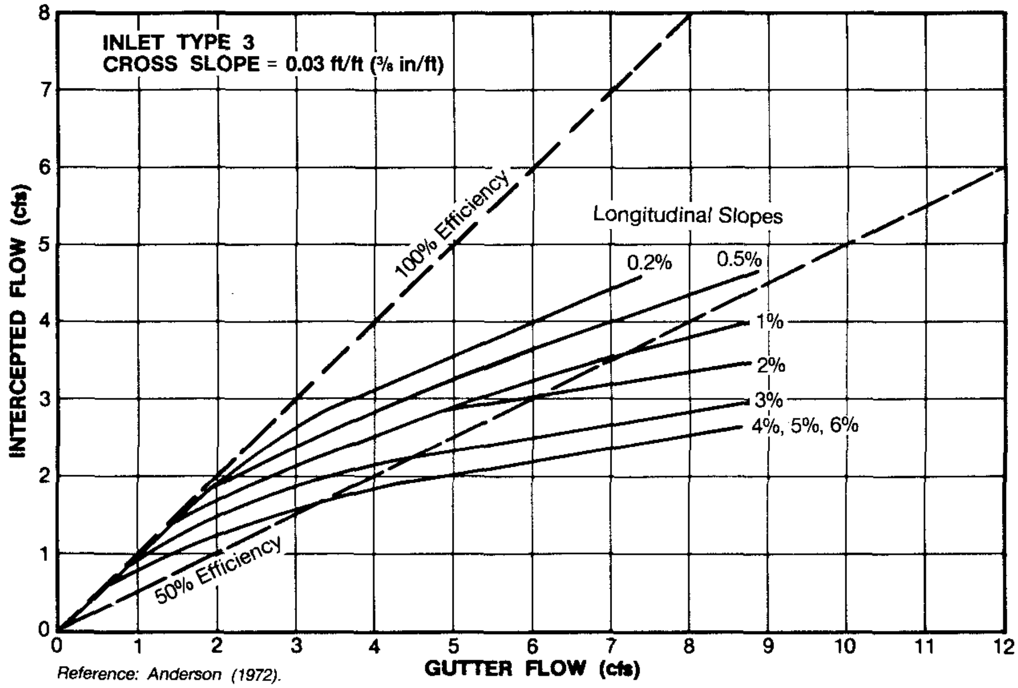


Figure I-7: Type 3, Sx = 0.03

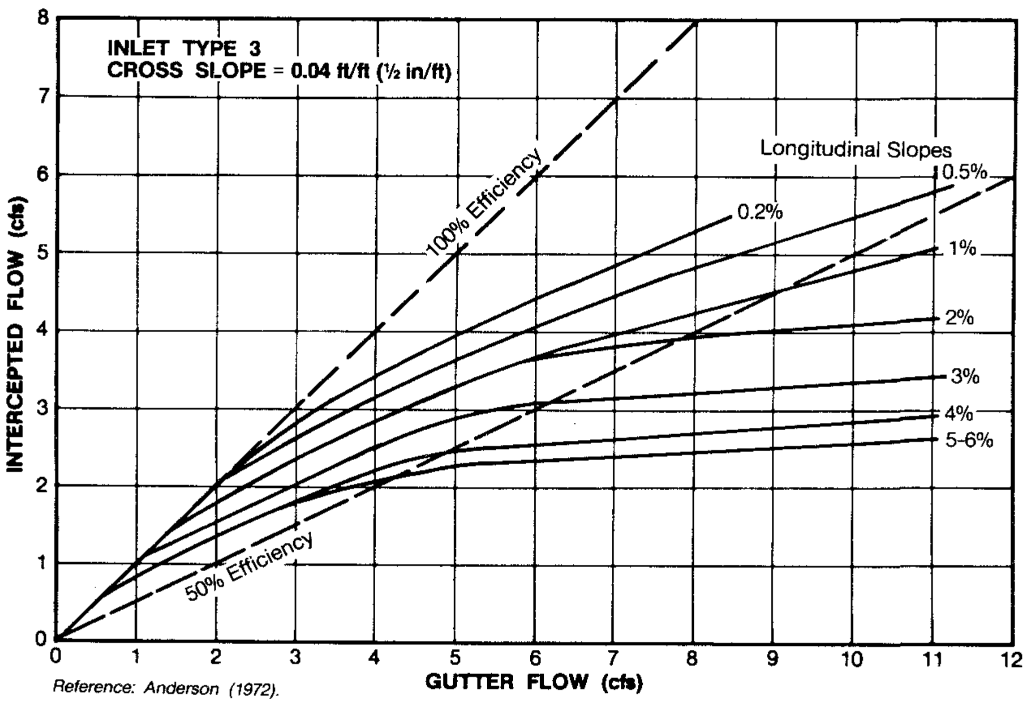


Figure I-8: Type 3, Sx = 0.04

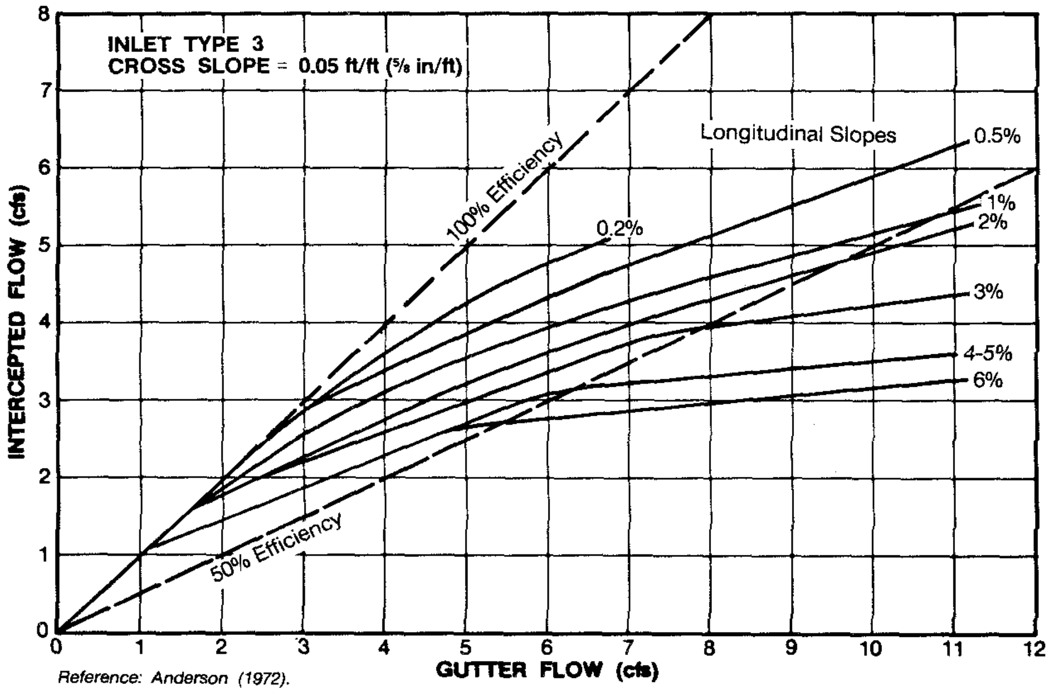


Figure I-9: Type 3, S_X = 0.05

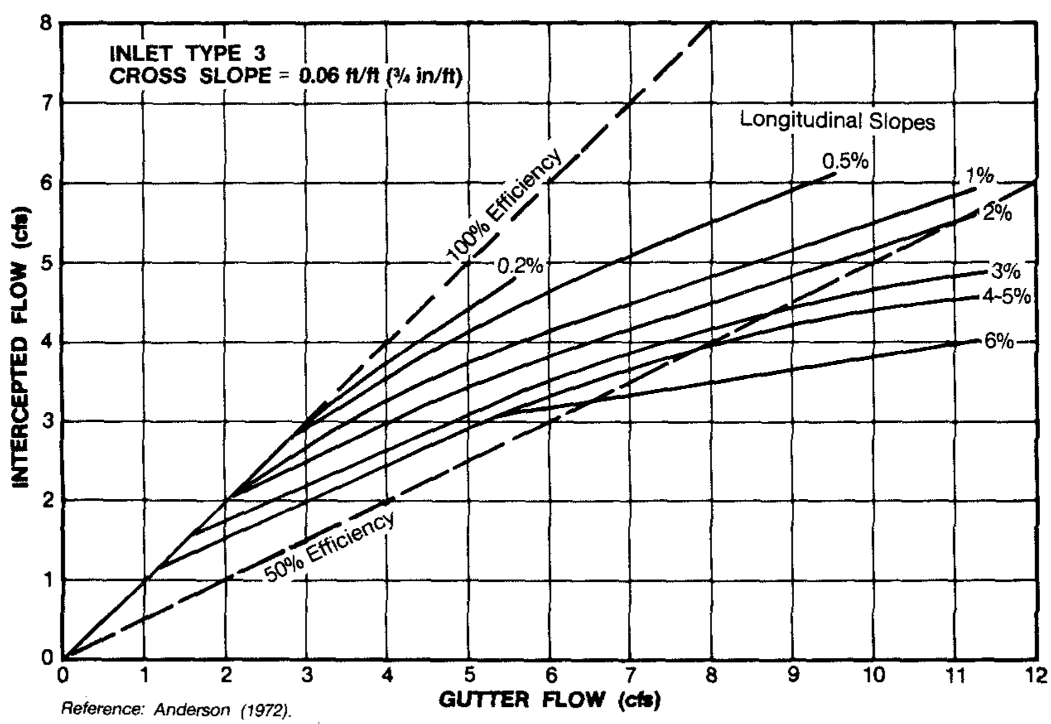


Figure I-10: Type 3, S_X = 0.06

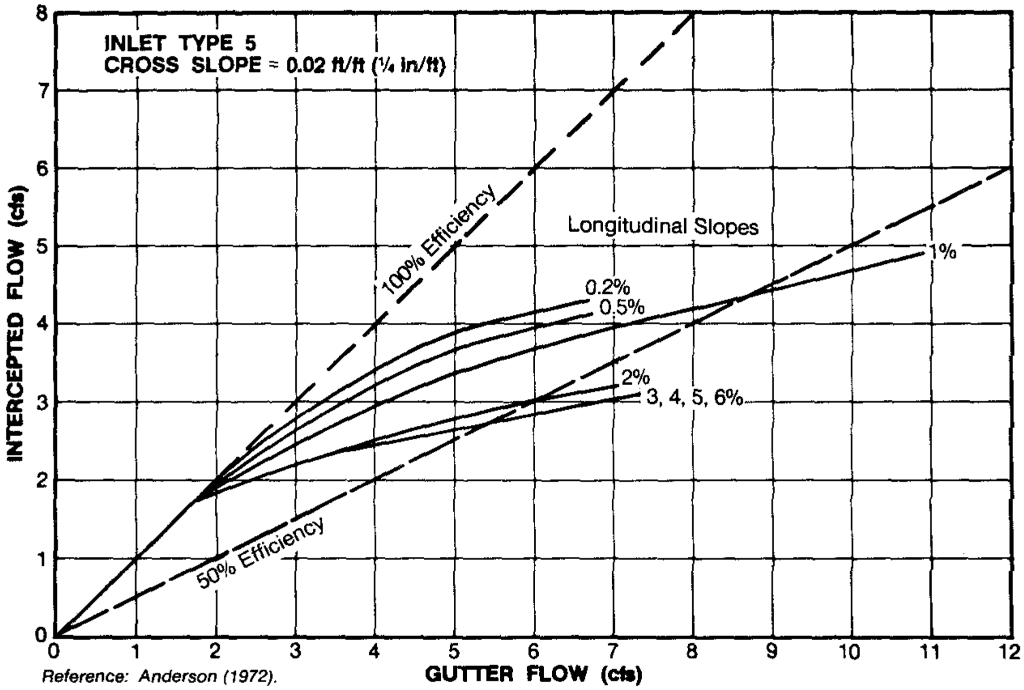


Figure I-11: Type 5, S_X = 0.02

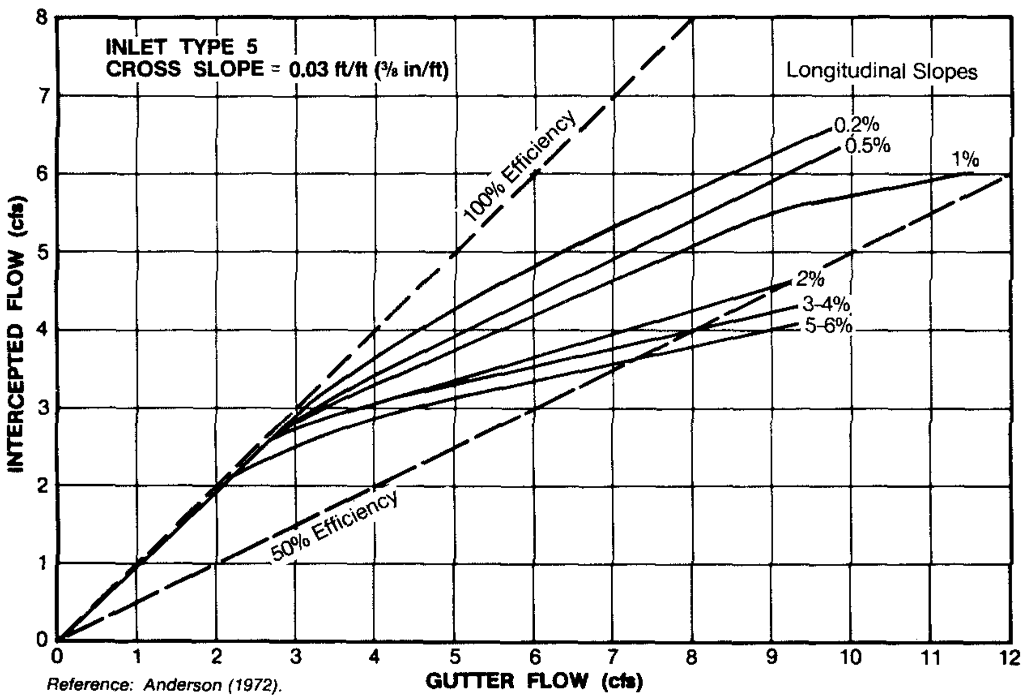


Figure I-12: Type 5, S_X = 0.03

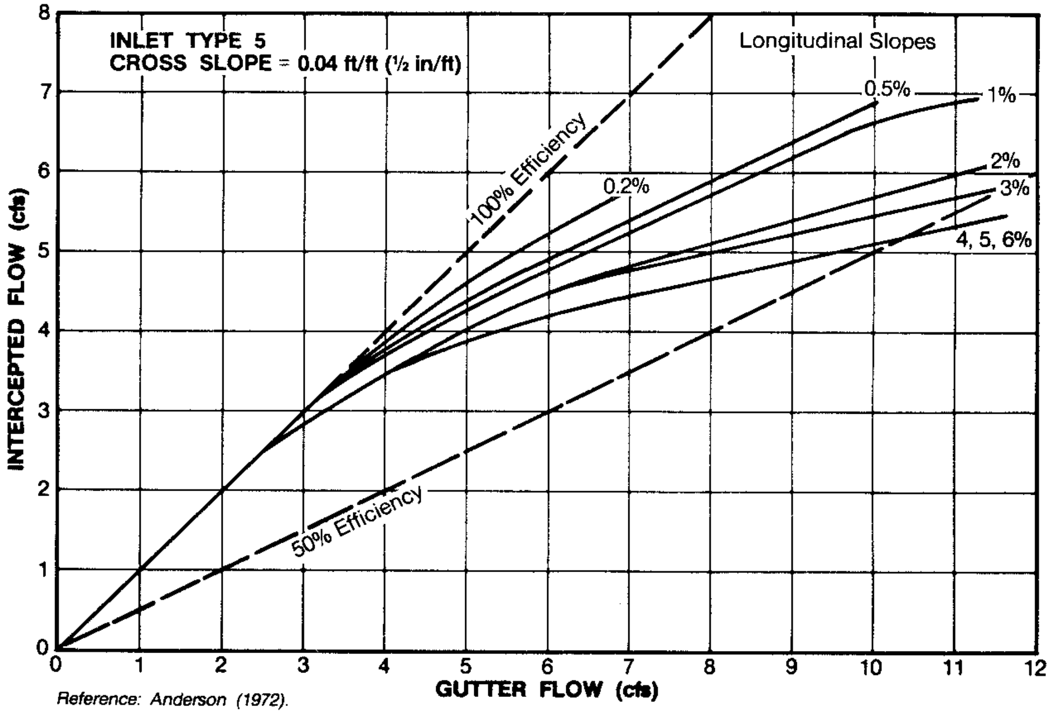


Figure I-13: Type 5, S_X = 0.04

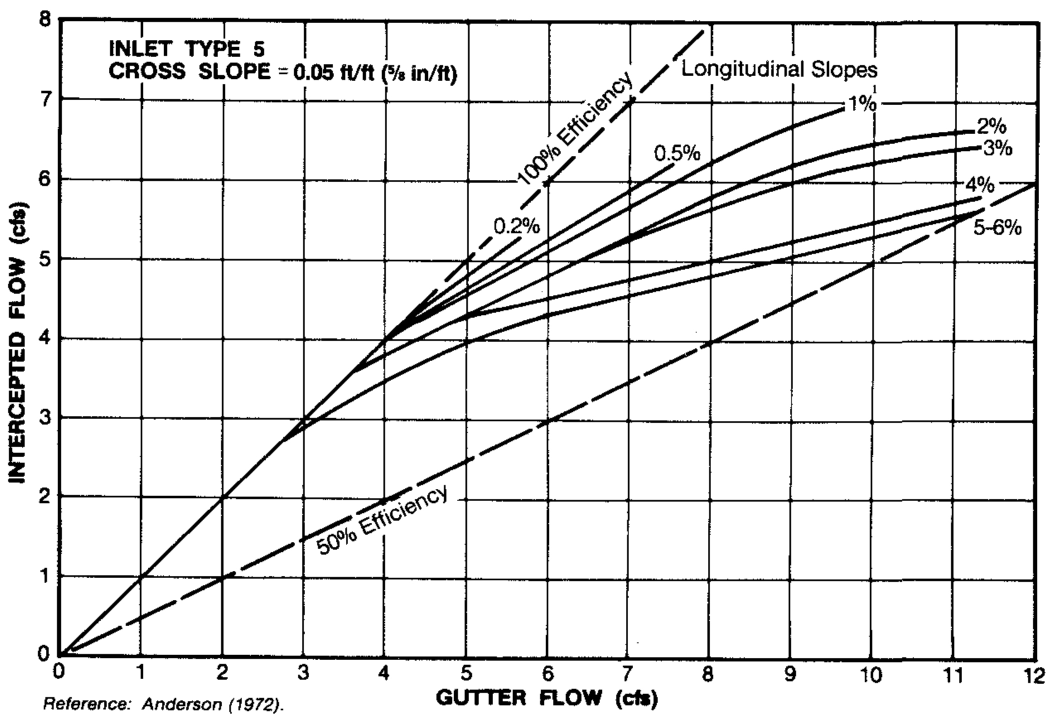


Figure I-14: Type 5, S_X = 0.05

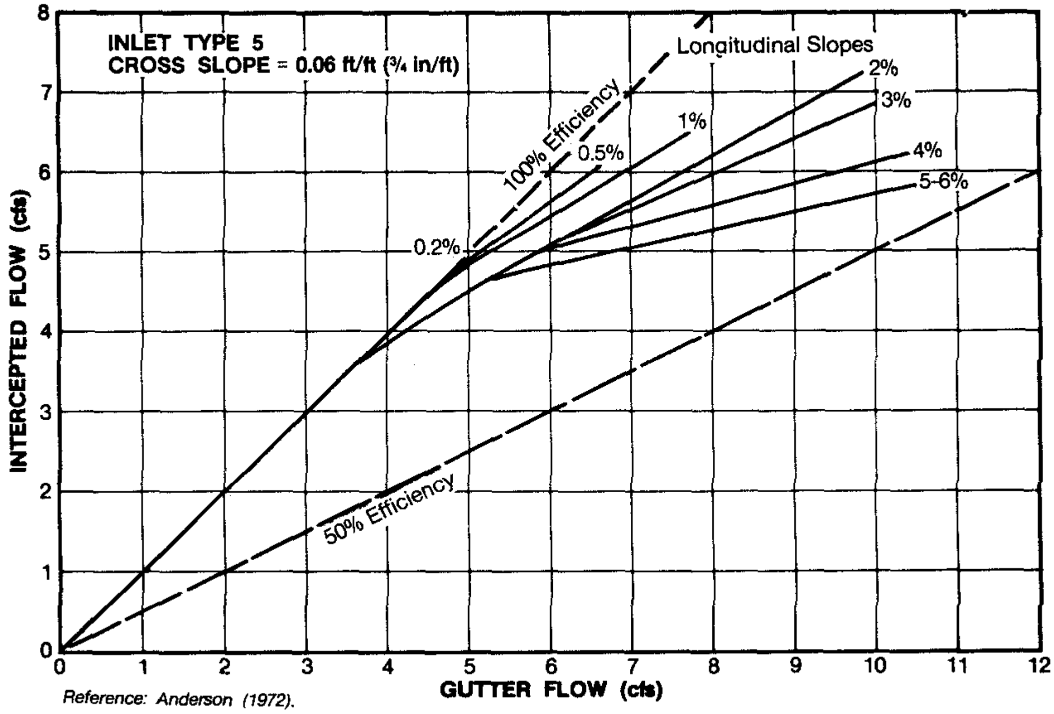


Figure I-15: Type 5, S_X = 0.06

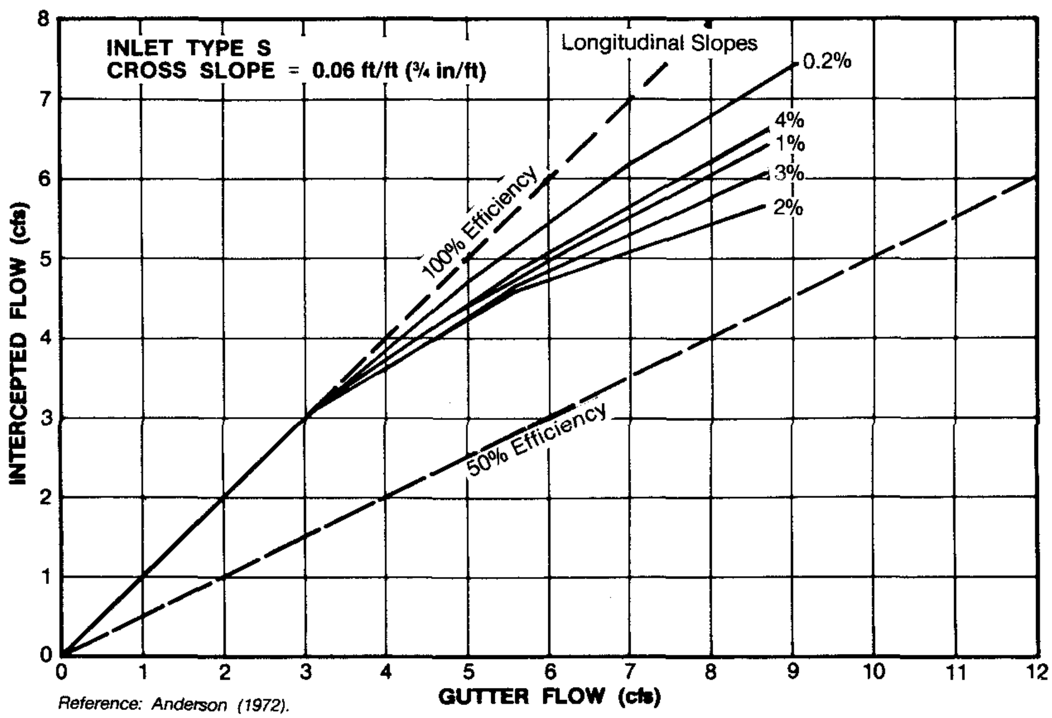


Figure I-16: Type S (Shoulder Gutter Inlet), S_X = 0.06

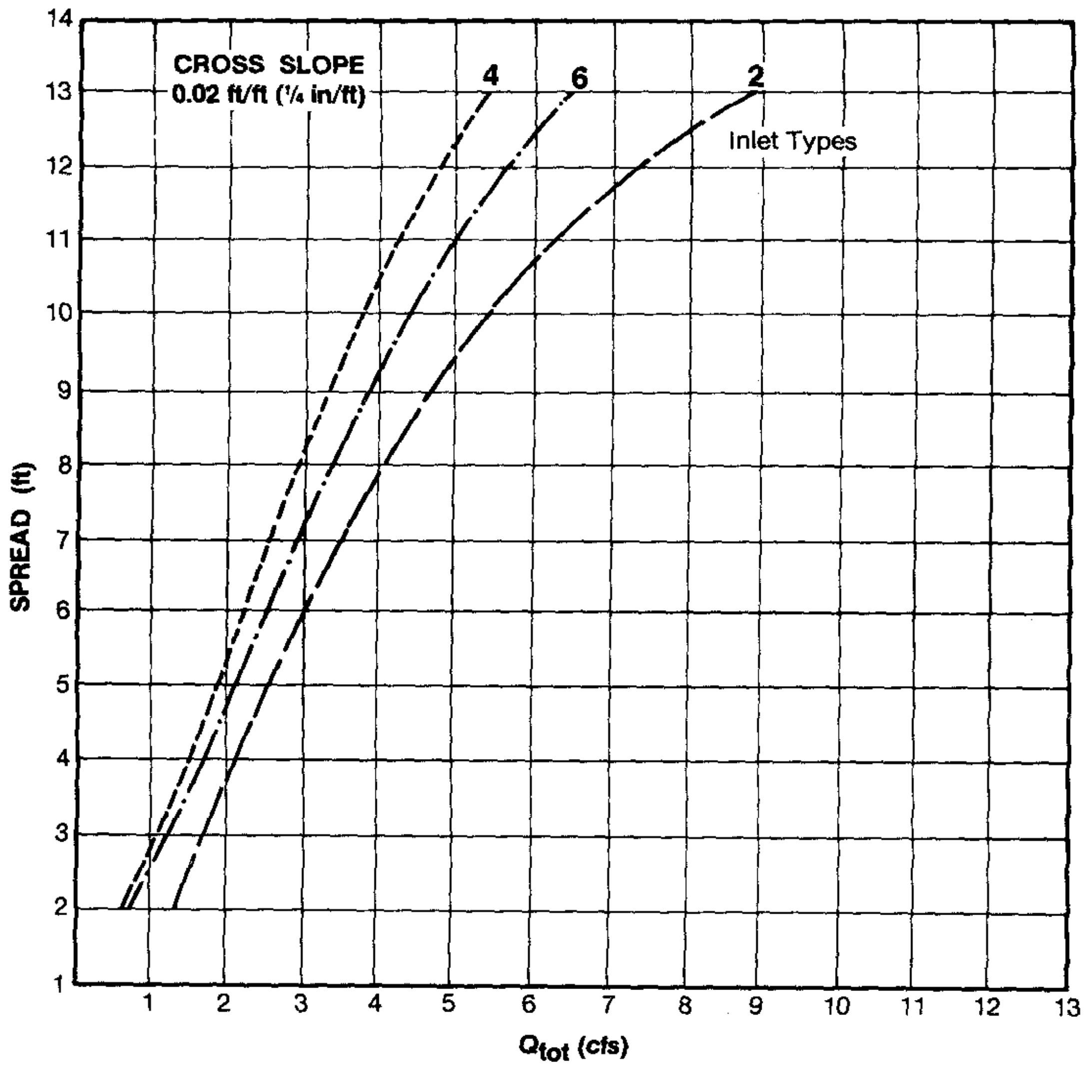


Figure I-17: Sump Conditions for Types 2, 4 & 6; Sx = 0.02

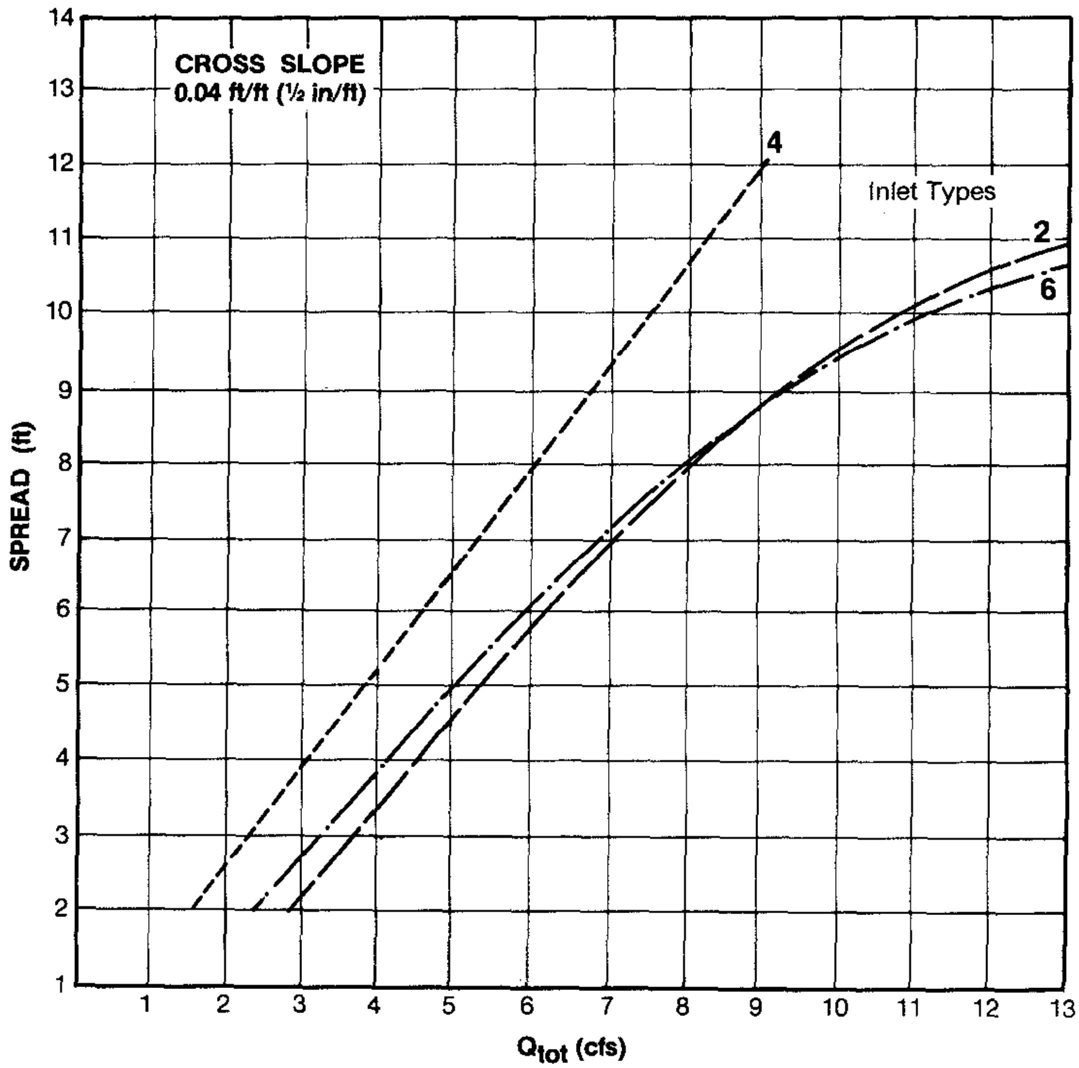


Figure I-18: Sump Conditions for Types 2, 4 & 6: S_X = 0.04

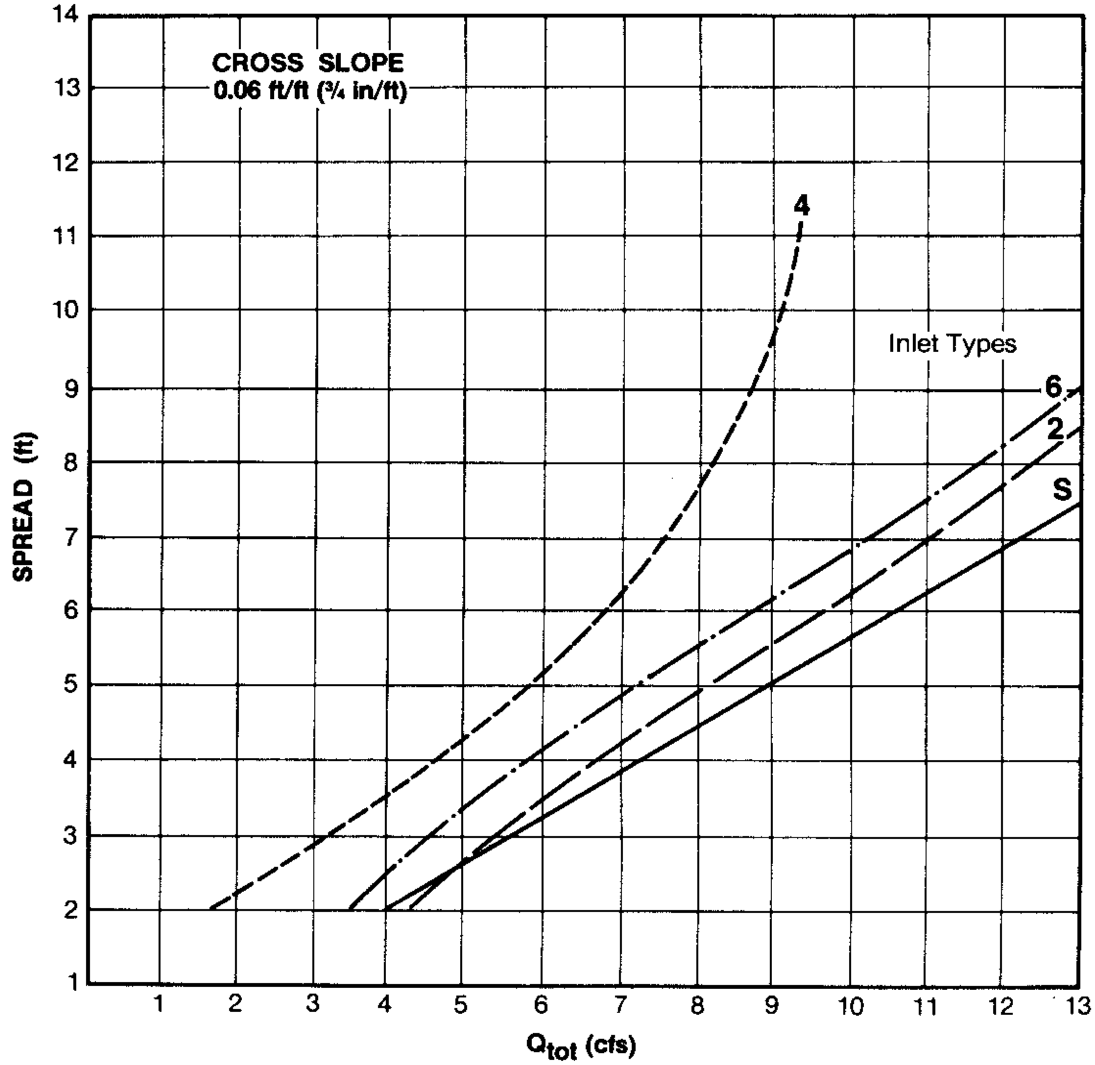


Figure I-19: Sump Conditions for Types 2, 4, 6 & S; S_X = 0.06

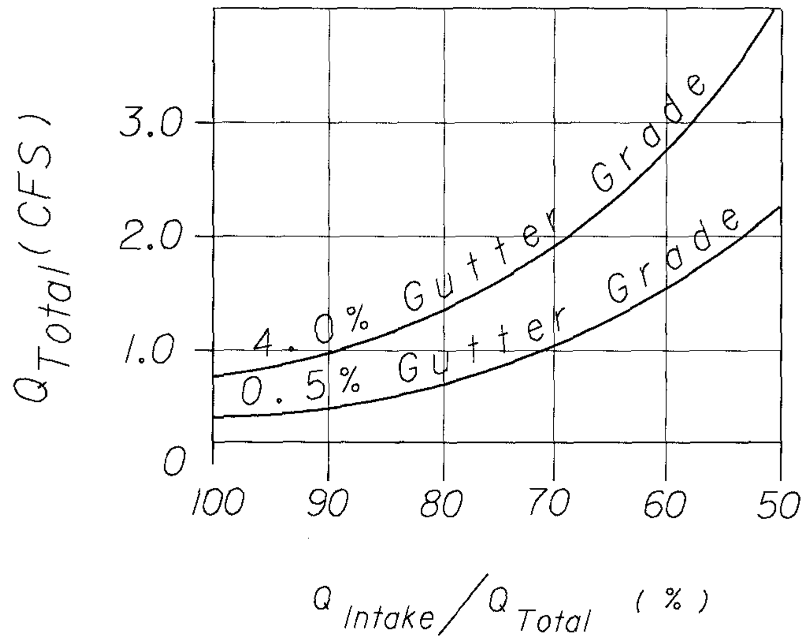


Figure I-20: Type 9 Inlet

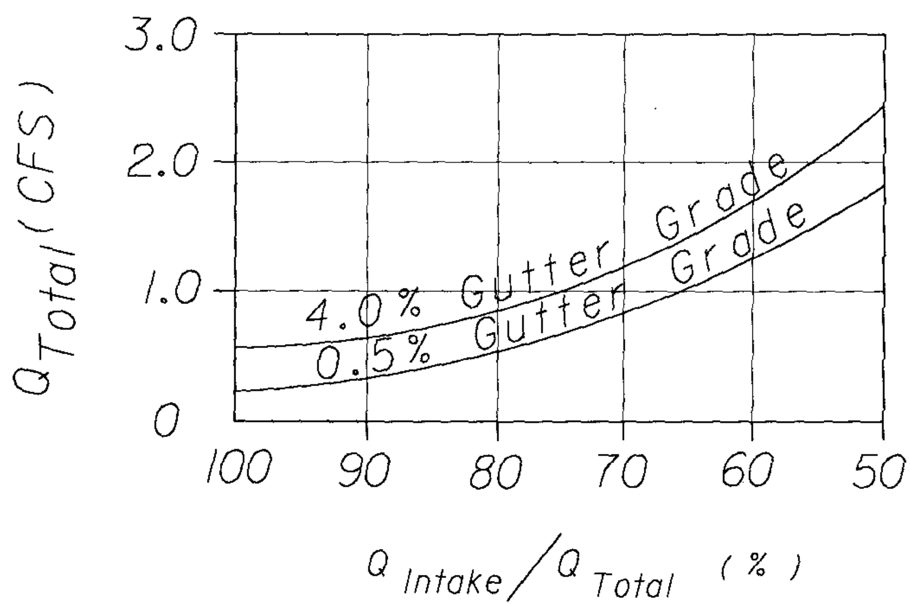
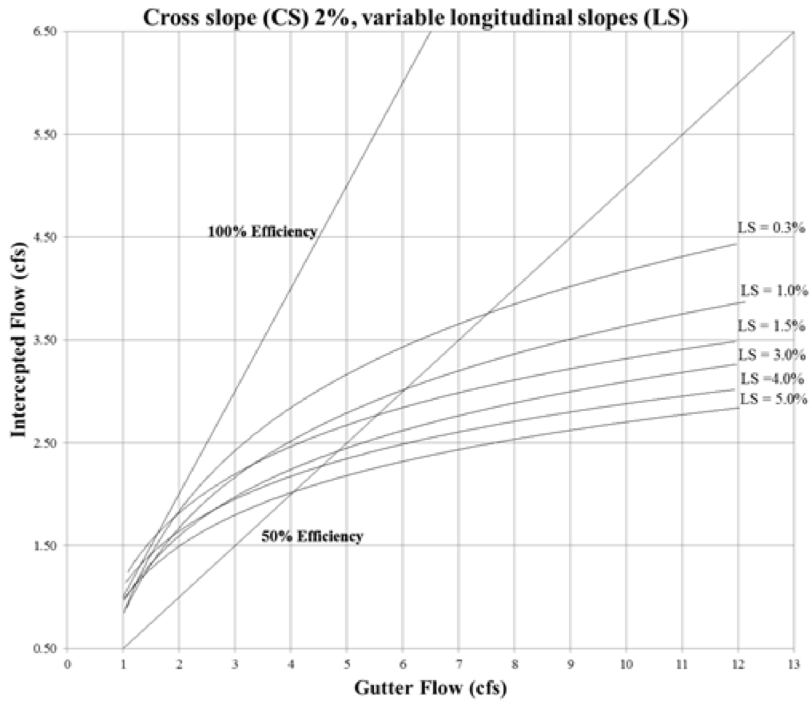
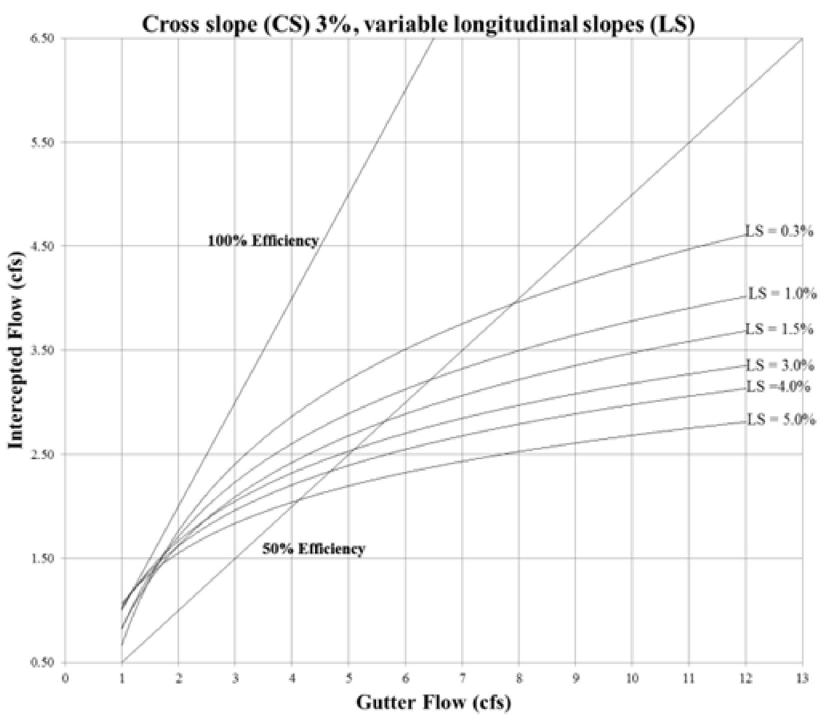


Figure I-21: Type 10 Inlet



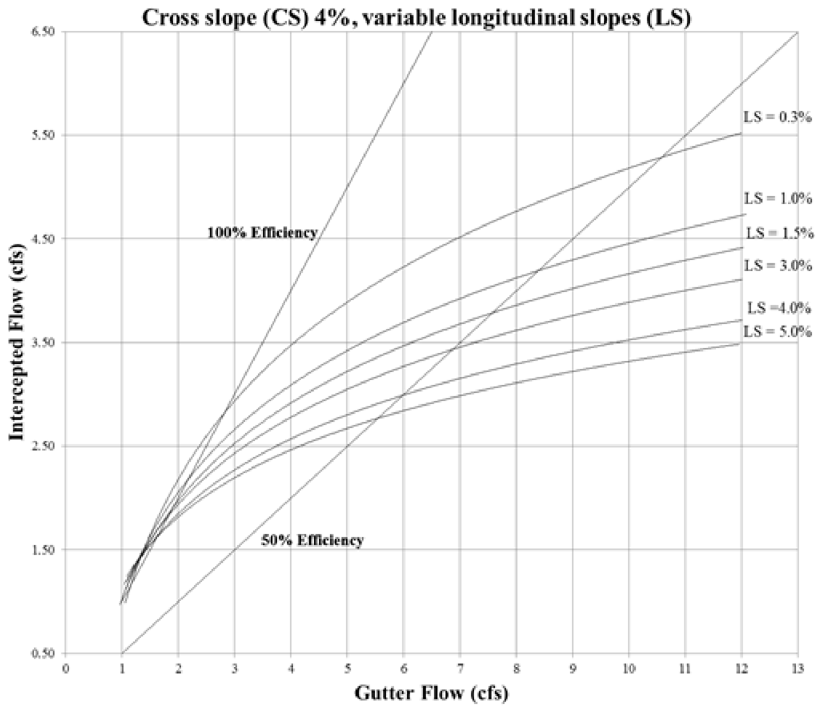
Reference: Muste, Craig, Bayraktar

Figure I-22: Closed Flume Inlet, S_X = 0.02



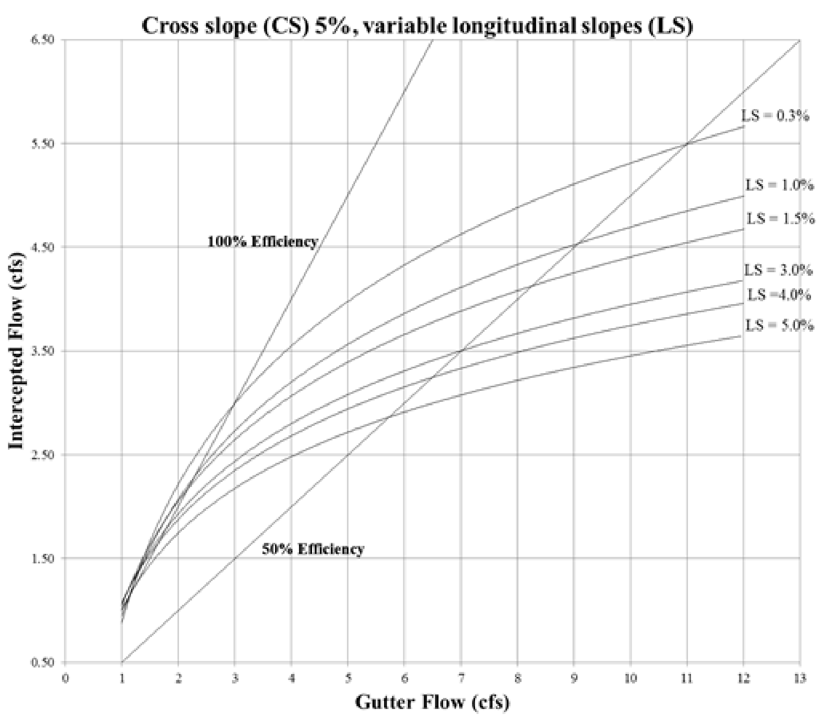
Reference: Muste, Craig, Bayraktar

Figure I-23: Closed Flume Inlet, SX = 0.03



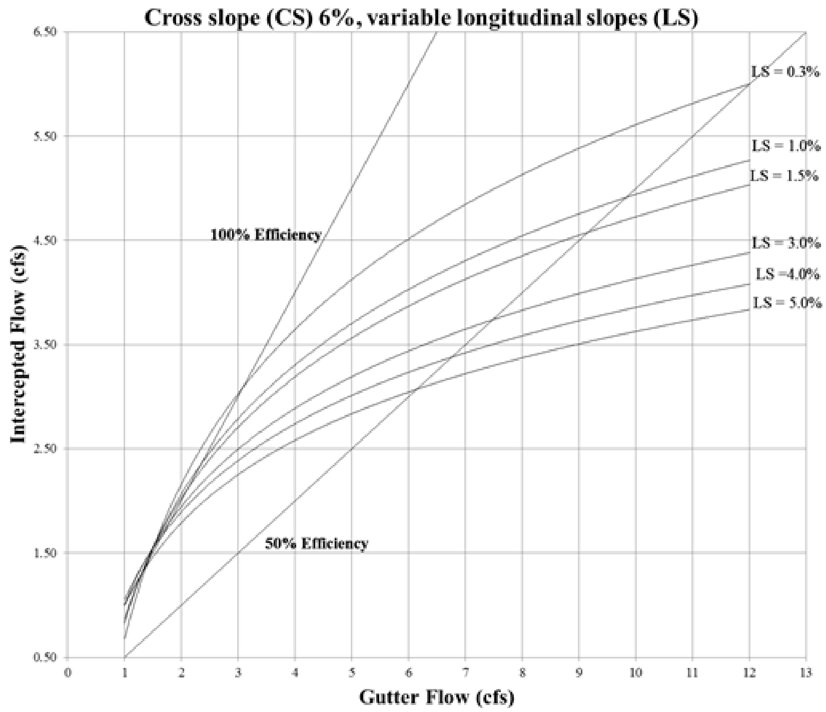
Reference: Muste, Craig, Bayraktar

Figure I-24: Closed Flume Inlet, S_X = 0.04



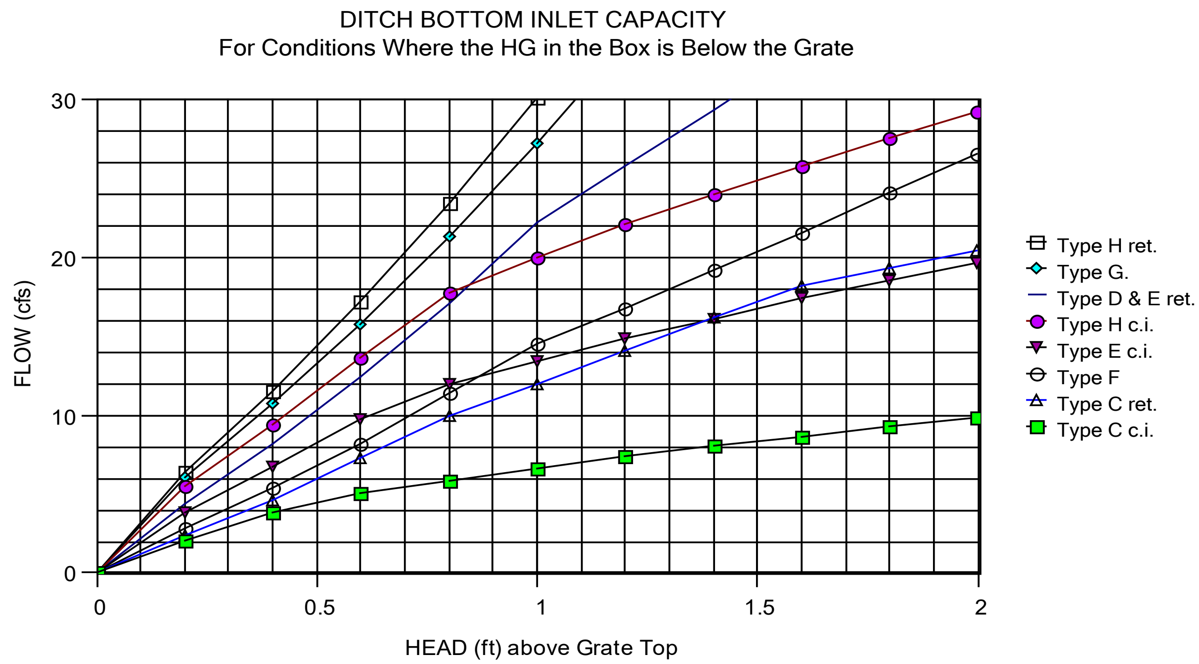
Reference: Muste, Craig, Bayraktar

Figure I-25: Closed Flume Inlet, S_X = 0.05



Reference: Muste, Craig, Bayraktar

Figure I-26: Closed Flume Inlet, S_X = 0.06



1. The above graph should be used where the hydraulic gradient in the inlet box is below the top of the grate. For other conditions, see the discussion below.
2. The above is based on 50% debris blockage and inlets without slots.
3. The symbols on the curves do not represent-measured data points. They are calculated points from the equation and coefficients in the research report by the University of South Florida titled “Investigation of Discharge through Grated Inlets”, February 1993, WPI No. 0510611. Contact the FDOT Research Center at 850-414-4615 to obtain a copy. The grate flow areas used in the equations are from U.S. Foundry & Mfg. Corp.

Figure I-27: Ditch Bottom Inlets

Where the hydraulic gradient is above the top of the grate, the system capacity may control the flow through the grate. The total system loss is a sum of friction losses and various minor losses, including the loss across the grate. In this situation, the loss across the grate is typically small but can be calculated from:

$$\text{Head Loss [feet]} = K\frac{V_g^{\,2}}{2g}$$

Where K = 0.46 for reticuline grates; 3.2 for cast iron grates
V_g = velocity [fps] across the grate based on the grate full face area (grate width x grate length)
g = acceleration of gravity

Example:
A DBI is needed to capture 5 cfs in a depressed area behind the sidewalk. The hydraulic gradient due to friction loss in the system is estimated to be 0.8 ft above the grate.

Try a Type C DBI:
Full Face Area = 2.33' x 3.0' = 7.0 ft^2,
then $V_g = Q / A = 5 / 7 = 0.7$ fps
Assume a Cast iron grate is used. Then K = 3.2
Then: Head loss $= K \times V_g^2/2g = 3.2 \times (0.7)^2 / 64.4 = 0.02$ ft

This is an insignificant amount of head loss and is typical of most design situations. Where a DBI accepts high flow rates (usually under high head conditions) as perhaps in a stormwater pond, the additional loss could be substantial and may dictate a larger inlet (large grate area.)