

EXAMPLE DESIGN - DRAINAGE APPURTENANCE WITH
DROP INLET

This example is for the purpose of demonstrating use of routing procedures included in EFM, Exhibit 11-4, Table A, page 11-55b.

All steps are as shown on pages 6-145, 6-146, and 6-147.

The example on page 6-148 will be used to illustrate this procedure. The example facts are as shown on 6-148 except a 24" diameter CMP will be used rather than the 21" diameter shown. Steps 1 thru 7 do not change.

8. Assume 24" Helical CMP x 40 feet long with 30" riser.

9. CFS provided: Outlet control = $\underline{21.7 \times 1.13 = 24.5 \text{ cfs}}$
(page 6-42.1 EFM).

10. Critical slope = 0.03 ft/ft (page 3-82d EFM for $n = 0.02$)

Actual pipe slope = $\frac{93.0 - 92.8}{40} = \frac{0.2}{40} = 0.005 \text{ ft/ft.}$

Pipe will flow full because actual pipe slope is less than critical or friction slope.

11. Hydraulic head at inlet on:

weir = $98.0 - 96.0 = 2.0'$ (weir flow)

barrel = $(98.0 - 93.0) - 2.0'$ (pipe diameter) = $3.00'$
over top of pipe.

12. Capacity of weir = 56 cfs plus (page 6-43 of EFM) O.K.

Capacity of barrel = 26 cfs (page 3-94.1 of EFM) O.K.

13. Outlet control $Q = 24.5 \text{ cfs}$ from step 9. Inlet control $Q = 26 \text{ cfs}$ from step 12. Structure capacity is 24.5 cfs (the smallest of weir, barrel, or outlet).

14. Storage is available.

15. Pipe release rate per acre = $\frac{24.5 \text{ cfs (from step 13)}}{42 \text{ Ac. (from step 1)}} = 0.58 \frac{\text{cfs}}{\text{acre}}$
 $0.58 \text{ cfs/acre} > 0.47 \text{ cfs/acre}$ - Use Exhibit 11-4, Table A, page 11-55b EFM to determine required storage.

$$\frac{Q_o}{Q_i} = \frac{24.5 \text{ cfs (step 13)}}{36.8 \text{ cfs (step 6)}} = 0.67$$

Using Table A, page 11-55b of EFM, find $\frac{Q_o}{Q_i} = 0.67$ in the table.

$$V_s/V_r = 0.21.$$

$$V_r = 1.72" \text{ (step 6)}$$

$$V_s = V_r \times 0.21 = 1.72" \times 0.21 = 0.36 \text{ inches/acre}$$

$$V_s = \frac{0.36 \times 42 \text{ acres}}{12 \text{ inches/ft}} = 1.26 \text{ Ac. Ft.}$$

16. Available storage = 2.1 Ac. Ft. from field surveys. Storage is adequate.

This example is for illustration only. The 21" diameter CMP would normally be installed for this situation because of less cost.