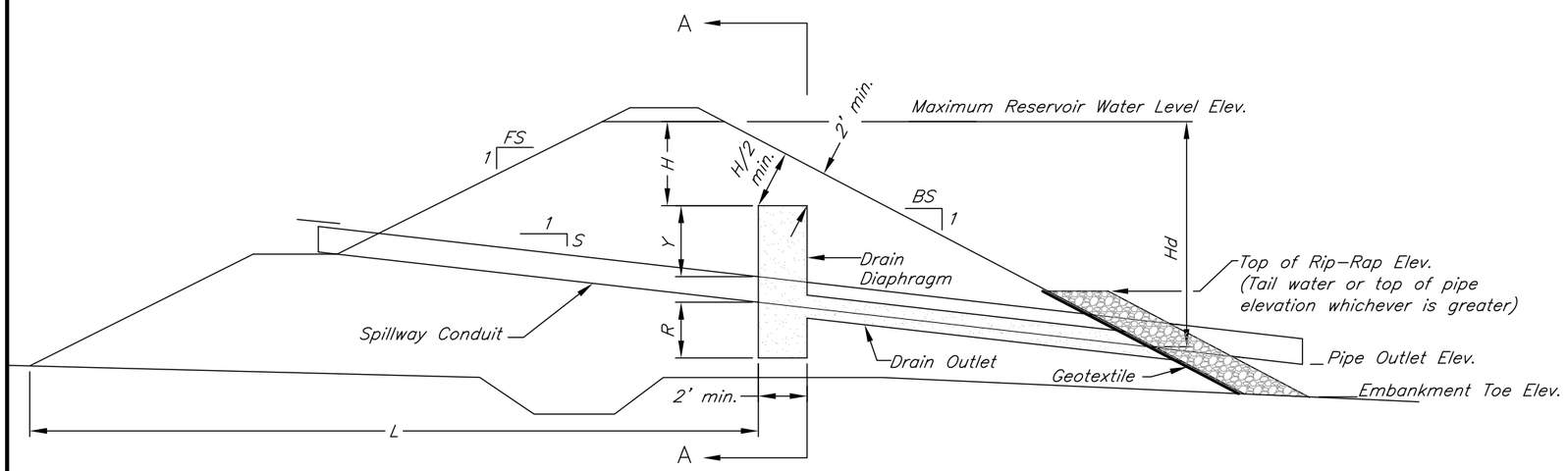
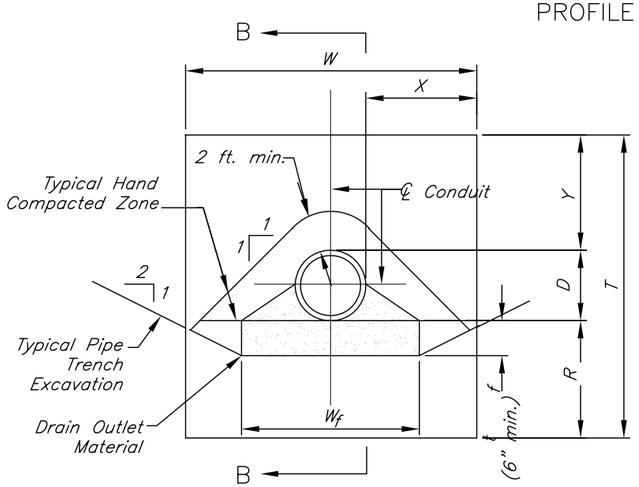
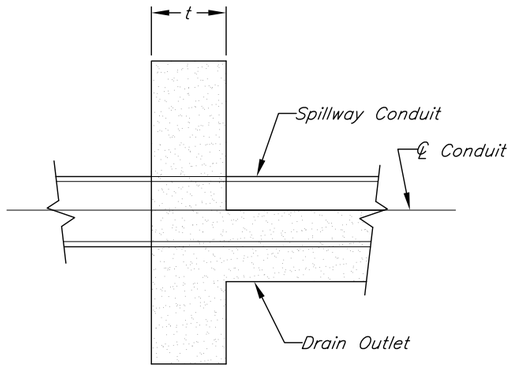


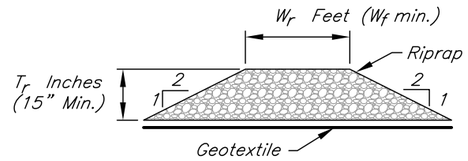
PROFILE ALONG ℄ OF CONDUIT



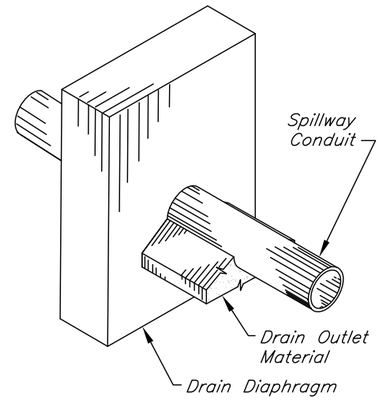
SECTION A–A



SECTION B–B



SECTION OF RIPRAP
Perpendicular to Slope



PARTIAL ISOMETRIC
Showing conduit, drain diaphragm, & drain outlet material

SUMMARY OF DESIGN

BS = _____ Feet	S = _____ Feet
D = _____ Feet	t = _____ Feet
FS = _____ Feet	T = _____ Feet
H = _____ Feet	W = _____ Feet
Hd = _____ Feet	X = _____ Feet
R = _____ Feet	Y = _____ Feet
S = _____ Feet	

Max. Reservoir Water Level Elev. _____
Top of Rip–Rap Elevation _____
Pipe Outlet Elevation _____
Bedrock at Elevation _____

ESTIMATED QUANTITIES

Drain Filter Material _____ Cubic Yards
Geotextile _____ Square Feet
Rip–Rap _____ Cubic Yards

This standard drawing applies to structures designed to meet the requirements of Conservation Practice Standard 378, Pond.

DEFINITIONS:

A_d = Area of drainage diaphragm, sq.ft.
A_f = Required area of filter outlet, sq.ft.
BS = Back slope of dam in feet of fall per horizontal foot
D = Outside diameter of circular conduit, ft
FS = Front slope of dam in feet of fall per horizontal foot
H = Seepage head flow over diaphragm, ft
Hd = Vertical distance from maximum potential reservoir water level to conduit invert at D.S. face of slope, ft
i = Hydraulic gradient
k_e = Permeability of embankment material, ft/day
k_f = Permeability of filter material, ft/day
L = Seepage flow path into diaphragm, ft
Q = Flow rate from drain diaphragm, cfs
R = Vertical extension downward from the bottom of the diaphragm, ft
S = Slope of conduit in feet of fall per horizontal foot
t = Thickness of drain diaphragm, ft
t_f = Thickness of filter outlet, ft
T = Total height of drain diaphragm, ft
T_r = Thickness of riprap, ft
W = Total width of drain diaphragm, ft
W_f = Width of filter outlet, 2.5 D minimum, ft
W_r = Top width of riprap, ft
X = Distance between the edge of the conduit and the edge of the diaphragm, ft
Y = Vertical distance from top of conduit to top of diaphragm, ft

DESIGN CALCULATIONS:

R = 18 inches minimum, but not to extend beyond a bedrock surface
t = 2 feet minimum.
T = R + D + Y
W = 2X + D
X = 3D or 5 feet beyond any excavation made to install the conduit.
Y = 3D or no higher than maximum potential reservoir water level
A = W * T

i = H / L
Q = 100 * k_e * i * A_d
A_f = Q / k_f * i
W_f = A_f / t_f

QUANTITY CALCULATIONS:

Volume of Drainfill in Drain Diaphragm (cu.yds.)

$$V_{dd} = \frac{1}{27}(W * T * t)$$

Volume of Drain Outlet Material Per Unit Length Along Spillway Conduit (sq.yds./ft.)

$$V_{dc} = \frac{1}{9}\left[W_f t_f + \frac{DW_f}{4} + \frac{D^2(2-\pi)}{8}\right]$$

Volume of Riprap (cu.yds.)

$$V_{rr} = \frac{1}{27}(2T_r^2 + W_r T_r) * (\text{Top of Riprap Elev.} - \text{Bottom of Riprap Elev.})$$

Date .
Designed .
Drawn .
Checked .
Approved .

DRAIN DIAPHRAGM AND OUTLET
Layout for Hood–Inlet & Drain Filter
Instructions

. County, Minnesota

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Drawing Name
MN–ENG–301C Inst
Eng. Job Class
.
Sheet . of .