United States
Department of
Agriculture

Soil
Conservation
Service

693 Federal Building
210 Walnut Street
Des Moines, IA 50309

August 13, 1986

ENGINEERING FIELD MANUAL
IA210-ENG - AMENDMENT IA30, CHAPTERS 6, 8 AND 17

Purpose. To transmit pages IA6-15(9 and 10), IA6-54(1 thru 4), IA8-103(39 and 40), IA8-103(45 thru 48) and IA17-54(9.1 and 9.2).

Effective Date. This amendment is effective upon receipt.

Filing Instructions. These pages should be filed in the EFM to replace corresponding pages having an earlier date. Superseded material should be removed from the file and discarded.

This amendment adds the effective range for slug flow in a hood inlet, corrects errors in dimensions for aluminum drop spillway, corrects errors in terrace chart for 20 ft. stakeline and intake capacity chart, and adds to the prequalified list for plastic tile.

Each copy of the EFM should have these pages. Additional copies may be ordered from the State Office. This transmittal may be destroyed when it has been documented on the directive tabulation sheet and the material has been filed.

J. Michael Nethery
J. Michael Nethery
State Conservationist

Attachments

IA17-54(9.1 and 9.2)
is superceded by
Amendment IA35

A
F
EN3
MNTC - 5
DSC - 2 (Krishan, Lindquist)
SCE - Midwest States

HOOD INLET DESIGN CRITERIA

General.

The attached sheets show formulas, nomenclature, criteria, coefficients, dimensions, and other information to be used in the design of hood inlet spillways using metal pipe and canopy inlet spillways using PVC pipe.

PVC Pipe.

The canopy inlet will be used when PVC pipe is planned as principal spillway for a pond designed in accordance with Iowa Standard and Specification 378.

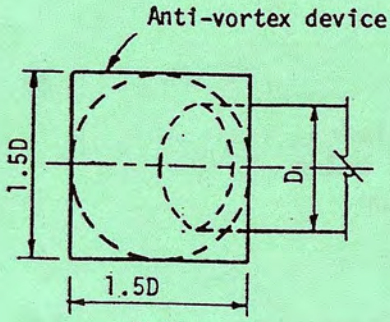
SDR 26 pressure rated PVC pipe shall conform to ASTM D-2241. Schedule 40 and 80 PVC pipe shall conform to ASTM D-1785. The pipe material designation shall be PVC 1120 or PVC 1220. The longest section of pipe in the installation shall not exceed 20 feet.

PVC welding solvent must be formulated for the intended use to produce a weld of maximum strength.

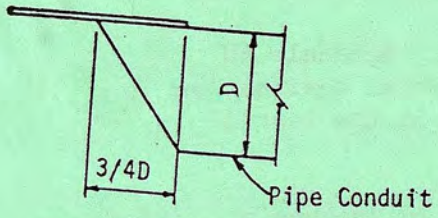
PVC pipe shall be joined by single or double gasketed couplings capable of resisting 160 psi internal pressure.

Wrap the exterior of exposed pipe with black plastic tape unless the pipe is specifically formulated to resist ultra-violet degradation. The pipe shall be firmly and uniformly bedded so the lower one-sixth of the circumference will bear against original or compacted earth.

HOOD INLET ON METAL PIPE



PLAN



SECTION ON CENTERLINE

WEIR FLOW

h/D	0	0.2	0.4	0.5	0.6	0.8	1.0	1.2	1.8
$Q/D^{2.5}$	0	0.16	0.46	0.65	0.88	1.56	2.20	2.80	4.30

SLUG FLOW FORMULA (before full, steady flow starts)

$h/D = 1.05 + 0.025Q/D^{2.5}$ (for $1.1 \leq h/D \leq 1.8$)

PIPE FLOW FORMULA

$$Q = a\sqrt{\frac{2gH}{1 + K_e + k_m + \Sigma K_p L}}$$

$K_e = 1.0$, $K_m = n\alpha/3$ (for $\alpha \leq 30°$)

(When entire length of conduit is on same slope, $K_m = 0$)

SYMBOLS

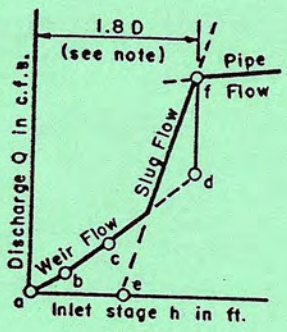
Q = Discharge, cfs
D = Inside diameter of pipe, feet
α = Deflection angle in the pipe, degrees
h = Water height over invert of inlet, feet
a = Area of pipe, square feet
H = Total available head, feet
Ke = Entrance loss coefficient
Km = Miter-bend loss coefficient
Kp = Pipe friction loss coefficient
L = Length of pipe, feet
g = Acceleration of gravity = 32.2 ft/sec^2
n = Manning's roughness coefficient for pipe
= 0.027 for CMP (1" x 3" corrugations)
= 0.025 for CMP (1/2" x 2 1/2" corr.)
= 0.023 for Helical CMP
= 0.010 for smooth pipe

CAVITATION CHECK

See Technical Release No. 3, dated 6-27-56, page 17, for condition where conduit slope is greater than friction slope

NOTE

For design, it is recommended that 1.8D be used as the priming head for pipe with corrugations or other discontinuities which deviate from a smooth, continuous pipe wall.



Pipe Dia. In.	PLOTTING COORDINATES									
	b		c		d		e		f	
	h	Q	h	Q	h	Q	h	Q	h	Q
12	0.5	0.7	1.0	2.2	1.80	4.3	1.05	0	1.80	*
15	0.62	1.1	1.25	3.8	2.25	7.5	1.31	0	2.25	*
18	0.75	1.8	1.50	6.1	2.70	11.9	1.57	0	2.70	*
21	0.87	2.6	1.75	8.9	3.15	17.4	1.84	0	3.15	*
24	1.00	3.7	2.00	12.4	3.60	24.3	2.10	0	3.60	*
30	1.25	6.4	2.50	21.7	4.50	42.5	2.62	0	4.50	*
36	1.50	10.1	3.00	34.3	5.40	67.0	3.15	0	5.40	*
42	1.75	14.9	3.50	50.4	6.30	98.6	3.68	0	6.30	*
48	2.00	20.8	4.00	70.4	7.20	137.6	4.20	0	7.20	*

* Full pipe flow

(EFM, Amend. IA30, August 1986)