

## 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.

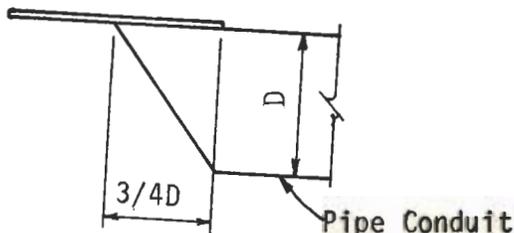
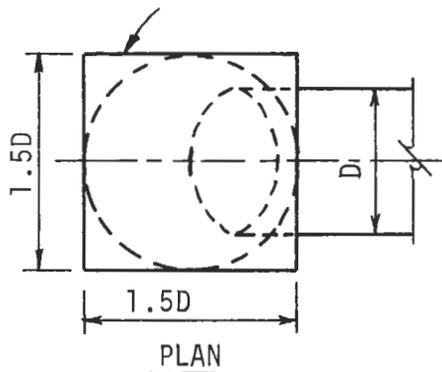
PVC welding solvent must be formulated for the intended use to produce a weld of maximum strength.

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

Anti-vortex device (square or round)



### WEIR FLOW

$h \div D$	0	0.2	0.4	0.5	0.6	0.8	1.0	1.2	1.8
$Q \div D^{5/2}$	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)

$$\frac{h}{D} = 1.05 + 0.025 \frac{Q}{D^{5/2}}$$

### PIPE FLOW FORMULA

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

$$K_e = 1.0$$

$$K_m = \frac{n\alpha}{3} \quad (\text{for } \alpha \leq 30^\circ)$$

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

### Symbols

- Q = Discharge in c.f.s.
- D = Inside diameter of pipe in feet.
- $\alpha$  = The deflection angle in the pipe, degrees.
- h = Height of water over invert of inlet in feet.
- a = Area of pipe in square feet.
- H = Total available head in feet.
- $K_e$  = Entrance loss coefficient.
- $K_m$  = Miter-bend loss coefficient.
- $K_p$  = Pipe-friction loss coefficient.
- L = Length of pipe in feet.
- g = Acceleration of gravity = 32.2 feet/Sec.<sup>2</sup>
- n = Manning's roughness coefficient for pipe.
  - = 0.027 for C.M.P. (1" x 3" corrugations)
  - = 0.025 for C.M.P. (1/2" x 2 1/2" corrugations)
  - = 0.010 for smooth pipe.
  - = 0.023 for Helical C.M.P.

### CAVITATION CHECK

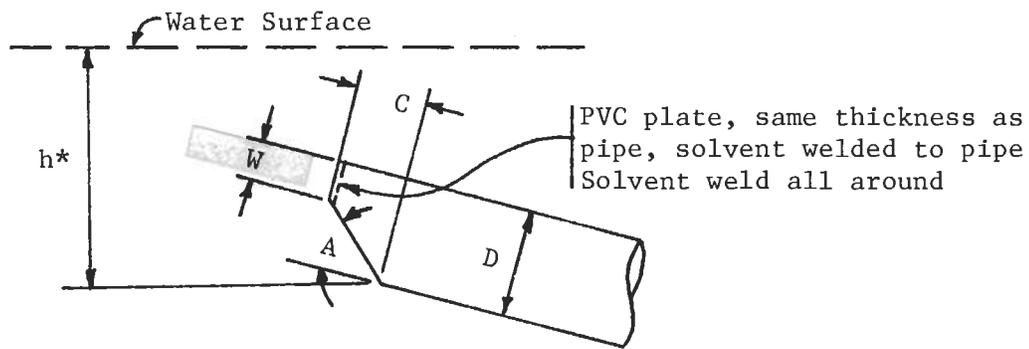
See Technical Release No. 3 dated 6-27-56 page 17 for condition where conduit slope > friction slope

### 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.)	PLOTING 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	

# CANOPY INLET ON PVC PIPE



\*Minimum height for full pipe flow

## PIPE FLOW FORMULA

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

$$K_e = 1.0$$

$$K_m = \frac{n\alpha}{3} \quad (\text{for } \alpha \leq 30^\circ)$$

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

## SYMBOLS

- Q = Discharge in c.f.s.
- D = Inside diameter of pipe in inches
- $\alpha$  = The deflection angle in the pipe, in degrees
- h = Height of water over invert of inlet in feet
- a = Area of pipe in square feet
- H = Total available head in feet
- $K_e$  = Entrance loss coefficient
- $K_m$  = Miter-bend loss coefficient
- $K_p$  = Pipe-friction loss coefficient
- L = Length of pipe in feet
- g = Acceleration due to gravity = 32.2 ft/sec/sec
- n = Manning's roughness coefficient for pipe = 0.010 for smooth pipe
- W = PVC plate width in inches
- C = Canopy length in inches
- A = Angle of inlet bevel in degrees

## CANOPY INLET DIMENSIONS

D (in.)	Pipe Grade %	W (in.)	C (in.)	A (degrees)	h* (ft.)
6	0-5	1 1/8	3 1/4	56	0.9
6	5.1-15	1 1/4	4 7/8	45	0.9
6	15.1-25	1 5/8	6 5/8	33	0.9
6	25.1-32	2 1/8	7 7/8	26	0.9

CANOPY INLET DIMENSIONS

D (in.)	Pipe Grade %	W (in.)	C (in.)	A (degrees)	h* (ft.)
8	0-5	1 1/2	4 3/8	56	1.2
8	5.1-15	1 5/8	6 3/8	45	1.2
8	15.1-25	2 1/8	8 3/4	33	1.2
8	25.1-32	2 7/8	10 3/8	26	1.2
10	0-5	1 7/8	5 3/8	56	1.5
10	5.1-15	2	8	45	1.5
10	15.1-25	2 5/8	11	33	1.5
10	25.1-32	3 1/2	13	26	1.5
12	0-5	2 1/4	6 1/2	56	1.8
12	5.1-15	2 3/8	9 5/8	45	1.8
12	15.1-25	3 1/4	13 1/4	33	1.8
12	25.1-32	4 1/4	15 5/8	26	1.8