ALUMINUM "TOEWALL" DROP SPILLWAY

Fabricated corrugated aluminum drop spillways are approved in the standard sizes shown on Table IA6-1. The standard overfall heights (F) are 1.9 feet, 3.0 feet and 4.0 feet. Larger overfall heights may be available from the manufacturer; however, their use must be approved by the state conservation engineer. The flow depth in the downstream channel at the design capacity should not be less than ¾ of the overfall height to provide backwater conditions at the structure outlet.

Iowa standard drawing IA-1410 (Fabricated Corrugated Aluminum Toewall Drop Spillway) may be used in combination with Table IA6-1. Utilize Table IA6-1 to select a standard dimensioned toewall structure that will meet or exceed the site specific conditions of drop to be controlled and peak flow to be passed as per practice standard 410 (Grade Stabilization). Once you have identified a suitable sized structure, input the parameters of: Overfall Height (F), Notch Width (W), Weir Length (L), and Sidewall Extension (B) into drawing IA-1410 for inclusion into a set of construction plans.

Table IA6-1. Standard Dimensioned Aluminum Toewall Structures With Overfalls of 1.9 feet, 3.0 feet, and 4.0 feet.

Overfall Height "F" (feet)	Structure Capacity (cfs)	Notch Width "W" (feet)	Weir Length "L" (feet)	Sidewall Extension "B" (feet)	Minimum Riprap Volume (cyds)
1.9	65	7	14.2	1.4	4.9
	75	8	14.2	0.7	5.2
	95	10	17.4	0.7	6.1
	110	12	20.6	0.7	7.0
	130	14	23.8	0.8	8.0
	150	16	27.0	0.8	9.0
	170	18	30.2	0.8	10.0
	190	20	33.4	0.8	11.0
3.0	95	7	14.2	1.4	5.5
	95	8	14.2	0.7	5.8
	105	7	15.8	2.2	5.6
	110	8	15.8	1.5	5.9
	120	8	17.4	2.3	6.0
	120	10	17.4	0.7	6.7
	130	10	19.0	1.5	6.8
	145	10	20.6	2.3	6.9
	145	12	20.6	0.7	7.6
	150	10	22.2	3.1	7.1
	155	12	22.2	1.5	7.7
	165	12	23.8	2.3	7.9
	165	14	23.8	0.8	8.6
	175	12	25.4	3.1	8.0
	175	14	25.4	1.6	8.7
	190	14	27.0	2.4	8.8
	190	16	27.0	0.8	9.6
	200	14	28.6	3.2	8.9
	200	16	28.6	1.6	9.7
	210	14	30.2	4.0	9.1
	210	16	30.2	2.4	9.8
3.0	210	18	30.2	0.8	10.6
	220	16	31.8	3.2	9.9
	220	18	31.8	1.6	10.7
	235	16	33.4	4.0	10.0
	235	18	33.4	2.4	10.8
	235	20	33.4	0.8	11.6
	245	18	35.0	3.2	10.9
	245	20	35.0	1.7	11.8
	255	18	36.6	4.0	11.1
	255	20	36.6	2.5	11.9
	270	18	38.3	4.8	11.2
	270	20	38.3	3.3	12.0
	280	20	39.9	4.1	12.1
	290	20	41.5	4.9	12.2
	300	20	43.1	5.7	12.4
4.0	115	7	14.2	1.4	6.0
	125	7	15.8	2.2	6.2
	140	7	17.4	3.0	6.3
	140	8	17.4	2.3	6.6
	155	8	19.0	3.1	6.7
	155	10	19.0	1.5	7.4
	165	10	20.6	2.3	7.5
	165	12	20.6	0.7	8.2
	180	10	22.2	3.1	7.6
	180	12	22.2	1.5	8.3
	190	10	23.8	3.9	7.7
	190	12	23.8	2.3	8.4
	190	14	23.8	0.8	9.1
	200	10	25.4	4.7	7.8

Overfall Height "F" (feet)	Structure Capacity (cfs)	Notch Width "W" (feet)	Weir Length "L" (feet)	Sidewall Extension "B" (feet)	Minimum Riprap Volume (cyds)
4.0	205	12	25.4	3.1	8.5
	205	14	25.4	1.6	9.3
	220	12	27.0	3.9	8.6
	220	14	27.0	2.4	9.4
	220	16	27.0	0.8	10.1
	230	12	28.6	4.7	8.8
	230	14	28.6	3.2	9.5
	230	16	28.6	1.6	10.2
	245	14	30.2	4.0	9.6
	245	16	30.2	2.4	10.4
	245	18	30.2	0.8	11.1
	260	14	31.8	4.8	9.7
	260	16	31.8	3.2	10.5
	260	18	31.8	1.6	11.3
	270	14	33.4	5.6	9.9
	270	16	33.4	4.0	10.6
	270	18	33.4	2.4	11.4
	270	20	33.4	0.8	12.2
	285	16	35.0	4.8	10.7
	285	18	35.0	3.2	11.5

Overfall Height "F" (feet)	Structure Capacity (cfs)	Notch Width "W" (feet)	Weir Length "L" (feet)	Sidewall Extension "B" (feet)	Minimum Riprap Volume (cyds)
4.0	285	20	35.0	1.7	12.3
	300	16	36.6	5.6	10.8
	300	18	36.6	4.0	11.6
	300	20	36.6	2.5	12.4
	310	16	38.3	6.4	11.0
	310	18	38.3	4.8	11.7
	310	20	38.3	3.3	12.6
	325	18	39.9	5.6	11.9
	325	20	39.9	4.1	12.7
	340	18	41.5	6.4	12.0
	340	20	41.5	4.9	12.8
	350	18	43.1	7.2	12.1
	350	20	43.1	5.7	12.9
	365	20	44.7	6.5	13.0
	380	20	46.3	7.3	13.2
	390	20	47.9	8.1	13.3
	400	20	49.5	8.9	13.4

The minimum volume of riprap associated with Iowa standard drawing 1410 (Fabricated Corrugated Aluminum Toewall Drop Spillway) is shown in the last column of Table IA6-1 above. These riprap quantities were derived from the following equations.

A. Volume of riprap (ft^3) upstream of structure:

- Riprap $Vol._{upstream}$ = $\left[\left(0.11W^2\right)+\left(4B\right)+\left(5W\right)+12\right]\times 1.0$

B. Volume of riprap (ft^3) in the exist apron "flat section" of the structure outlet:

- Riprap $Vol._{downstream\ flat\ section}$ = $\left(5.0W\right)$

C. Volume of riprap (ft^3) in the exist apron "side slopes" of the structure outlet:

1. Where the minimum side slope ratio is 2:1 and the vertical height of rock placement shall be 0.75 times the overfall height as measured from the exit apron elevation

- Riprap $Vol._{downstream\ side\ slopes}$ = $\left(15F+10\right)$

D. Minimum Total Volume of Structure Riprap in (cyds.):

Total Riprap Volume = $\left[\left(0.11W^2\right)+\left(10.0W\right)+\left(4.0B\right)+\left(15.0F\right)+22\right]\div 27$