

Design Criteria for Formless Concrete Flumes

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The formless concrete flume is a spillway constructed of concrete without forms. The earth is excavated to the dimensions and shape of the structure. Concrete is placed on this earth form to the required depth and floated into shape. Two types of formless concrete flumes are shown in Fig. 1.

Adaptability: This structure is best adapted to overfalls less than 6 feet. It may be used to control overfalls in natural and constructed channels; to prevent erosion at the ends of waterways and diversions; and to lower runoff water over drainage ditch banks.

Advantages: The use of earth as a form eliminates the need for construction of wood forms.

Limitations: Hand labor is required to form the earth to the desired shape and to place the concrete. This structure is limited to sites that have good natural drainage and it should not be used as a water impounding structure.

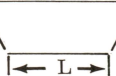
Design: Follow suggestions given in UMC Guide 1509 "Types of Stabilization Structures" in selecting the design storm which the structure should carry.

After the desired capacity has been determined the size of the notch for Type A structure can be determined from Table 1, and for Type B structure from Fig. 1. The principal dimensions needed for construction are given in Fig. 1. If the width of notch is greater than 8 feet or if the height of the overfall is 6 feet or more, increase the thickness of the concrete in the floor of the Type A structure to 5 inches and use additional reinforcing.

Construction: The earth form should be smooth and shaped to the proper grade to prevent the use of an excessive amount of concrete. The soil must be damp and firm to provide a good base for the concrete. Use concrete with a 28-day strength of at least 2,500 pounds per square inch. Use a stiff mix to prevent the concrete from slumping down the slopes.

Take precautions during construction to assure that the proper thickness of concrete is obtained with the reinforcing mesh placed as indicated in Fig. 1. Work the concrete into proper shape with a wood float. Use a curing compound or cover the structure with straw, earth or other type of cover and keep moist for at least one week following construction.

Table 1
CAPACITIES OF TYPE A FORMLESS CONCRETE FLUMES

Depth of Notch feet	Capacities in Cubic Feet Per Second															
	Length of Notch - Feet - Measured Thus: 										Computed from Formula $Q = 3.75LD^{1.55} + 3.2D^{2.6}$					
	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24
1.0	11	15	18	22	26	30	33	37	41	48	56	63	71	78	86	93
1.25	16	22	27	32	38	43	48	53	59	69	80	91	101	112	122	133
1.50	23	30	37	44	51	58	65	73	80	94	108	122	136	150	164	178
1.75	32	41	49	58	67	76	85	94	103	121	139	157	174	192	210	228
2.00	41	52	63	74	85	96	107	118	129	151	173	195	217	239	261	283
2.25	53	66	79	92	105	119	132	145	158	185	211	237	264	290	316	343
2.50	66	81	97	112	128	143	159	174	190	221	252	283	314	345	376	407
2.75	80	98	116	134	152	170	188	206	224	260	296	332	368	404	440	476
3.00	97	117	138	159	179	200	220	241	262	303	344	385	426	467	509	550

