United States
Department of
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TECHNICAL NOTE

Natural
Resources
Conservation
Service

Huron, South Dakota

ENGINEERING – DESIGN – SD-2000-1 June 29, 2000

DESIGN AID FOR DETERMINATION OF THE PIPE ELBOW ANGLE NEEDED FOR A POND PRINCIPAL SPILLWAY PIPE INSTALLATION

James Reedy, Agricultural Engineer

The following illustration and table were developed by James Reedy, Agricultural Engineer, Winner, South Dakota, for use by field personnel when designing ponds with principal spillways.

The South Dakota Technical Guide Standard 378 (Pond) requires the outlet section slope of a pond principal spillway cannot exceed five percent. For cases where the pipe slope is greater than five percent an elbow will need to be installed on the upstream end of the last section of pipe.

This table will provide the required elbow angle that must be entered on the job plans for the pond principal spillway if the pipe slope and the outlet slope are known.

/s/

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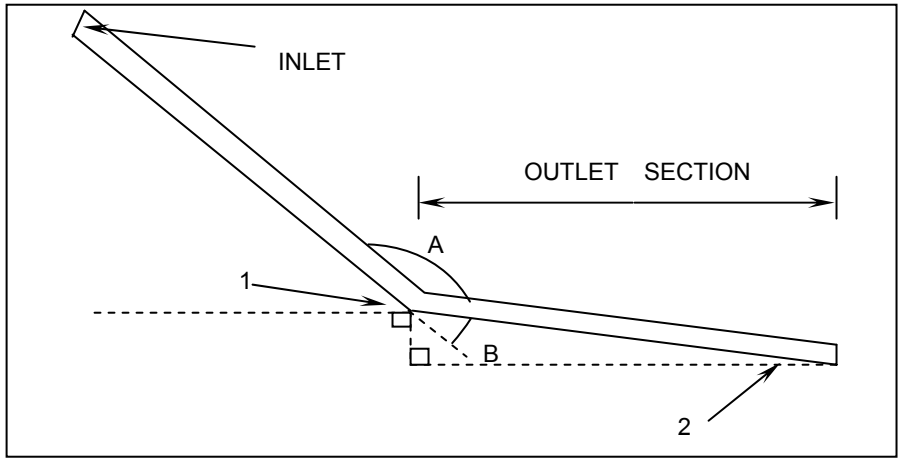
Acting State Conservation Engineer

Attachment

The following table indicates the angle, A, needed for a principal spillway elbow given the pipe slope and the outlet section slope.



		Outlet Section Slope				
		1%	2%	3%	4%	5%
Pipe Slope	1%	180.0				
	2%	179.4	180.0			
	3%	178.9	179.4	180.0		
	4%	178.3	178.9	179.4	180.0	
	5%	177.7	178.3	178.9	179.4	180.0
	6%	177.1	177.7	178.3	178.9	179.4
	7%	176.6	177.1	177.7	178.3	178.9
	8%	176.0	176.6	177.1	177.7	178.3
	9%	175.4	176.0	176.6	177.1	177.7
	10%	174.9	175.4	176.0	176.6	177.2
	11%	174.3	174.9	175.4	176.0	176.6
	12%	173.7	174.3	174.9	175.4	176.0
	13%	173.2	173.7	174.3	174.9	175.5
	14%	172.6	173.2	173.7	174.3	174.9
	15%	172.0	172.6	173.2	173.8	174.3
	16%	171.5	172.1	172.6	173.2	173.8
	17%	170.9	171.5	172.1	172.6	173.2
	18%	170.4	170.9	171.5	172.1	172.7
	19%	169.8	170.4	171.0	171.5	172.1
	20%	169.3	169.8	170.4	171.0	171.6
	21%	168.7	169.3	169.9	170.4	171.0
	22%	168.2	168.7	169.3	169.9	170.5
	23%	167.6	168.2	168.8	169.3	169.9
	24%	167.1	167.7	168.2	168.8	169.4
	25%	166.5	167.1	167.7	168.3	168.8
	26%	166.0	166.6	167.1	167.7	168.3
	27%	165.5	166.0	166.6	167.2	167.8
	28%	164.9	165.5	166.1	166.6	167.2
	29%	164.4	165.0	165.5	166.1	166.7
	30%	163.9	164.4	165.0	165.6	166.2

Angle solution method:

Angle 1 = $\tan^{-1}$ (pipe slope)
Angle 2 = $\tan^{-1}$ (outlet slope)
Angle A = 360 – 90 - Angle 1 - (180 - 90 - Angle 2)
Angle B = 180 – Angle A