Kansas Administrative Regulations

Kansas Department of Agriculture—Division of Water Resources

Article 40.—Design of Earth Dams

5-40-31. Design duration rainfall depth.

(a) If the time of concentration is six hours or less, a duration of six hours shall be used for all design storms. The appropriate six-hour storm depth, in inches, shall be selected from the following table.

County	Probability of occurrence in any year					
	50%	20%	4%	2%	1%	PMP
Allen	2.7	3.5	4.8	5.4	6.1	28.0
Anderson	2.7	3.5	4.8	5.3	6.0	27.8
Atchison	2.6	3.4	4.5	5.1	5.7	27.2
Barber	2.4	3.2	4.4	5.0	5.7	27.3
Barton	2.3	3.0	4.1	4.8	5.3	26.6
Bourbon	2.7	3.5	4.8	5.4	6.0	28.1
Brown	2.5	3.2	4.4	5.0	5.6	27.0
Butler	2.6	3.4	4.7	5.3	6.0	27.7
Chase	2.6	3.4	4.6	5.2	5.9	27.5
Chautauqua	2.7	3.5	4.9	5.5	6.2	28.3
Cherokee	2.8	3.6	5.0	5.5	6.2	28.5
Cheyenne	1.8	2.4	3.4	3.8	4.3	24.7
Clark	2.2	3.0	4.1	4.7	5.3	26.7
Clay	2.5	3.2	4.3	5.0	5.5	26.8
Cloud	2.4	3.1	4.2	4.8	5.4	26.6
Coffey	2.7	3.5	4.7	5.3	6.0	27.8
Comanche	2.3	3.1	4.2	4.9	5.5	27.0
Cowley	2.6	3.4	4.8	5.4	6.1	28.0

Crawford	2.8	3.6	4.9	5.4	6.1	28.3
Decatur	1.9	2.6	3.6	4.2	4.6	25.3
Dickinson	2.5	3.2	4.4	5.1	5.6	27.1
Doniphan	2.5	3.2	4.5	5.0	5.6	27.0
Douglas	2.6	3.4	4.6	5.2	5.8	27.5
Edwards	2.2	2.9	4.1	4.7	5.3	26.7
Elk	2.7	3.5	4.8	5.4	6.1	28.1
Ellis	2.1	2.9	3.9	4.6	5.0	26.2
Ellsworth	2.3	3.1	4.2	4.9	5.4	26.7
Finney	2.0	2.6	3.8	4.3	4.8	26.8
Ford	2.1	2.8	4.0	4.6	5.1	26.4
Franklin	2.7	3.5	4.7	5.2	5.9	25.8
Geary	2.5	3.2	4.4	5.1	5.7	27.1
Gove	2.0	2.6	3.7	4.3	4.7	25.7
Graham	2.0	2.7	3.8	4.4	4.8	25.8
Grant	1.9	2.6	3.7	4.2	4.7	25.6
Gray	2.0	2.7	3.9	4.4	4.9	26.1
Greeley	1.8	2.5	3.4	3.9	4.4	25.0
Greenwood	2.7	3.5	4.8	5.3	6.1	27.8
Hamilton	1.8	2.5	3.5	4.0	4.5	25.2
Harper	2.5	3.3	4.5	5.2	5.9	27.5
Harvey	2.5	3.3	4.5	5.1	5.8	27.4
Haskell	2.0	2.7	3.8	4.3	4.8	25.9
Hodgeman	2.1	2.8	3.9	4.5	5.0	26.3
Jackson	2.6	3.4	4.5	5.1	5.7	27.2
Jefferson	2.6	3.4	4.6	5.1	5.8	27.3
Jewell	2.3	2.9	4.0	4.7	5.1	26.3
Johnson	2.6	3.4	4.6	5.2	5.8	27.5
Kearny	1.9	2.6	3.6	4.1	4.6	25.5
Kingman	2.4	3.2	4.4	5.1	5.7	27.3
Kiowa	2.2	2.9	4.2	4.8	5.4	26.7
Labette	2.8	3.6	5.0	5.5	6.2	28.4

Lane	2.0	2.7	3.7	4.3	4.8	25.8
Leavenworth	2.6	3.4	4.6	5.1	5.8	27.4
Lincoln	2.3	3.0	4.2	4.8	5.3	26.6
Linn	2.7	3.5	4.8	5.3	6.0	27.9
Logan	1.9	2.5	3.6	4.1	4.6	25.3
Lyon	2.6	3.4	4.6	5.2	6.0	27.5
Marion	2.5	3.3	4.5	5.2	5.8	27.3
Marshall	2.5	3.2	4.3	4.9	5.5	26.8
McPherson	2.5	3.2	4.4	5.1	5.7	27.1
Meade	2.1	2.8	4.0	4.6	5.1	26.3
Miami	2.7	3.5	4.7	5.2	5.9	27.7
Mitchell	2.3	3.0	4.1	4.7	5.2	26.4
Montgomery	2.8	3.5	5.0	5.5	6.2	28.3
Morris	2.6	3.4	4.5	5.1	5.8	27.3
Morton	1.9	2.5	3.6	4.1	4.6	25.4
Nemaha	2.5	3.2	4.4	5.0	5.6	26.9
Neosho	2.7	3.5	4.9	5.5	6.1	28.2
Ness	2.1	2.8	3.9	4.5	4.9	26.1
Norton	2.0	2.6	3.7	4.3	4.7	25.6
Osage	2.6	3.4	4.6	5.2	5.9	27.5
Osborne	2.2	2.9	4.0	4.6	5.1	26.2
Ottawa	2.4	3.1	4.3	4.9	5.4	26.8
Pawnee	2.2	2.9	4.1	4.7	5.2	26.6
Phillips	2.1	2.8	3.8	4.4	4.9	25.8
Pottawatomie	2.5	3.2	4.4	5.0	5.6	27.0
Pratt	2.3	3.1	4.3	4.9	5.5	27.0
Rawlins	1.9	2.5	3.5	4.0	4.5	25.0
Reno	2.4	3.2	4.4	5.0	5.7	27.2
Republic	2.3	3.0	4.1	4.8	5.3	26.4
Rice	2.4	3.1	4.3	4.9	5.5	26.9
Riley	2.5	3.2	4.4	5.0	5.6	27.0
Rooks	2.1	2.8	3.9	4.5	4.9	26.0

Rush	2.2	2.9	4.0	4.6	5.1	26.4
Russell	2.2	2.9	4.1	4.7	5.2	26.5
Saline	2.4	3.1	4.3	5.0	5.5	26.9
Scott	1.9	2.6	3.6	4.2	4.7	25.5
Sedgwick	2.5	3.3	4.6	5.2	5.9	27.5
Seward	2.0	2.7	3.8	4.4	4.9	26.0
Shawnee	2.6	3.4	4.6	5.1	5.8	27.4
Sheridan	2.0	2.6	3.7	4.2	4.7	25.5
Sherman	1.8	2.4	3.4	3.9	4.4	24.8
Smith	2.2	2.9	3.9	4.6	5.0	26.1
Stafford	2.3	3.0	4.2	4.9	5.4	26.9
Stanton	1.9	2.5	3.6	4.1	4.5	25.3
Stevens	1.9	2.6	3.7	4.3	4.7	25.8
Sumner	2.6	3.4	4.7	5.3	6.0	27.8
Thomas	1.9	2.5	3.5	4.1	4.5	25.2
Trego	2.0	2.7	3.8	4.4	4.9	25.9
Wabaunsee	2.6	3.4	4.5	5.1	5.8	27.3
Wallace	1.8	2.4	3.4	3.9	4.4	24.9
Washington	2.4	3.1	4.2	4.9	5.4	26.6
Wichita	1.9	2.5	3.5	4.1	4.5	25.3
Wilson	2.7	3.5	4.9	5.4	6.1	28.1
Woodson	2.7	3.5	4.8	5.4	6.1	28.0
Wyandotte	2.6	3.4	4.6	5.1	5.8	27.4

(b) If the time of concentration of the watershed, or any subwatershed being used to develop the inflow hydrograph, is more than six hours, the ratio for the time equal to or greater than the computed time of concentration shall be selected from the following table. Linear interpolation shall be acceptable. That ratio shall be multiplied by the depth of the six-hour rainfall in the table in subsection (a). The resulting depth is the design duration rainfall depth.

Relative increase in rainfall amount
for storm durations over six hours

Time (hours)	100-year ratio	PMP ratio
6	1.000	1.000
6.5	1.019	1.013
7	1.035	1.025
7.5	1.051	1.037
8	1.066	1.048
8.5	1.081	1.058
9	1.094	1.068
9.5	1.108	1.078
10	1.120	1.087
10.5	1.132	1.096
11	1.144	1.104
11.5	1.155	1.112
12	1.166	1.120
13	1.187	1.134
14	1.207	1.148
15	1.225	1.161
16	1.243	1.173
17	1.259	1.185
18	1.275	1.196
20	1.305	1.217
22	1.333	1.236
24	1.359	1.254

(c) If the drainage area exceeds 10 square miles, the rainfall depth obtained from the table in subsection (a) may be reduced by the ratio shown in the table in this subsection. The ratio for the zone in which the dam is located and a drainage area less than or equal to the actual drainage area above the dam shall be selected. The use of

linear interpolation shall be acceptable. That ratio shall be multiplied by the depth of rainfall from the table in subsection (a). The result is the design duration rainfall depth. The ratios in subsection (b) and this subsection may be used together, if subsections (b) and (c) both apply.

Drainage area	Reduction ratio		
(sq. mi.)	Zone 1	Zone 2	Zone 3
10	1.00	1.00	1.00
12	0.99	0.99	0.98
15	0.97	0.95	0.93
17	0.96	0.94	0.91
20	0.94	0.91	0.88
22	0.93	0.90	0.86
25	0.92	0.88	0.83
27	0.92	0.87	0.82
30	0.91	0.86	0.80
35	0.90	0.84	0.77
40	0.88	0.82	0.75
45	0.87	0.80	0.72
50	0.86	0.78	0.70
60	0.84	0.75	0.65
70	0.82	0.72	0.62
80	0.80	0.70	0.59
90	0.79	0.68	0.57
100	0.78	0.67	0.55

Zone 1, zone 2, and zone 3 shall have the meanings specified in K.A.R. 5-40-1 under the definition of a "stream."

(Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)