INTERIOR TEMPERATURES IN LARGE MASSES OF CONCRETE DURING TIME OF SETTING.

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The following data show the changes in temperature in the interior of large masses of concrete during the time of setting and the temperature of the air. The observations were made at intervals from November, 1910, to August, 1911, and at times during the erection of the piers and abutments of the new Walnut Street Bridge at Des Moines, Iowa. The instruments used were tested Fahrenheit thermometers, and the inside readings were made from 5 feet to 10 feet below the top of and 3.5 feet to 6 feet back from the face of the concrete, the thermometers being placed in pipes within the concrete. The cement used was the Hawkeye brand, made by the Iowa Portland Cement Co., and was up to the standard requirements, the concrete being composed of 1 part cement, 3 parts sand, and 6 parts broken stone. A summary of the readings shows that the temperature increases 15° to 20° within the mass during the time of setting of the concrete, and the maximum is attained from 7 to 10 days after the concrete is poured, after which the temperature begins to fall, the rate of decrease depending on the outside temperature of the air.

East abutment.

Date.	Time.	Temperature.		Date.	Time.	Temperature.	
		Concrete.	Air.			Concrete.	Air.
1911.		°	°	1911		°	°
Aug. 1	9 a. m.	70	75	Aug. 7	6 p. m.	[1] 88	86
1	6 p. m.	[1] 72	70	7	10 p. m.	[1] 88	70
1	9 p. m.	[1] 72	66	8	8 a. m.	[1] 88	72
1	12 mid.	[1] 72	62	8	12 m.	[1] 88	80
2	3 a. m.	[1] 72	58	8	6 p. m.	[1] 88	81
2	6 a. m.	[1] 72	56	9	7 a. m.	[1] 87	74
2	12 m.	[1] 78	83	9	3 p. m.	[1] 89	86
2	3. p. m.	[1] 78	88	10	7 a. m.	[1] 88	72
2	6 p. m.	[1] 78	82	10	12 m.	[1] 89	98
2	9 p. m.	[1] 76	70	10	3 p. m.	[1] 90	104
2	12 mid.	[1] 76	68	10	6 p. m.	[1] 89	98
3	7 a. m.	[1] 76	66	11	7 a. m.	[1] 87	68
3	9 a. m.	[1] 78	69	11	1 p. m.	[1] 88	74
3	12 m.	[1] 78	71	11	6 p. m.	[1] 88	74
3	3 p. m.	[1] 82	86	12	7 a. m.	[1] 88	70
3	6 p. m.	[1] 82	82	12	10 a. m.	[1] 89	80
4	7 a. m.	[1] 82	70	12	12 m.	[1] 89	74
4	9 a. m.	[1] 83	78	12	3 p. m.	[1] 90	96
4	12 m.	[1] 83	86	12	6 p. m.	[1] 90	94
4	3 p. m.	[1] 84	90	13	3 p. m.	[1] 90	100
4	6 p. m.	[1] 84	88	14	7 a. m.	[1] 89	78
4	10 p. m.	[1] 83	76	14	12 m.	[1] 90	96
5	7 a. m.	[1] 83	74	14	3 p. m.	[1] 90	104
5	9 a. m.	[1] 83	76	14	6 p. m.	[1] 89	96
5	12 m.	[1] 84	81	15	7 a. m.	[1] 88	79
5	3 p. m.	[1] 85	88	15	1 p. m.	[1] 90	102
5	6 p. m.	[1] 86	87	15	3 p. m.	[1] 91	104
6	3 p. m.	[1] 86	90	15	6 p. m.	[1] 90	96
7	7 a. m.	[1] 86	66	16	7 a. m.	[1] 89	89
7	12 m.	[1] 86	78	16	1 p. m.	[1] 91	106
7	3 p. m.	[1] 88	89	16	7 p. m.	[1] 89	80

[1] New concrete.

East abutment—Continued.

Date.	Time.	Temperature.		Date.	Time.	Temperature.	
		Concrete.	Air.			Concrete.	Air.
1911.				1911.			
Aug. 16	11 p. m.	[1] 89	72	Aug. 25	10 a. m.	[1] 87	77
17	7 a. m.	[1] 88	73	26	10 a. m.	[1] 87	82
17	2 p. m.	[1] 89	82	27	10 a. m.	[1] 86	67
17	6 p. m.	[1] 89	94	28	10 a. m.	[1] 86	64
18	1 a. m.	[1] 88	70	29	10 a. m.	[1] 85	70
18	6 a. m.	[1] 88	71	30	5 p. m.	[1] 86	78
18	3 p. m.	[1] 90	88	Sept. 1	10 a. m.	[1] 86	88
19	1 a. m.	[1] 88	68	2	10 a. m.	[1] 86	82
19	6 a. m.	[1] 88	68	5	10 a. m.	[1] 86	84
19	10 p. m.	[1] 88	70	6	10 a. m.	[1] 86	82
20	3 p. m.	[1] 88	89	7	10 a. m.	[1] 85	62
21	3 p. m.	[1] 88	82	8	10 a. m.	[1] 85	64
22	10 a. m.	[1] 89	68	9	10 a. m.	[1] 85	72
23	10 a. m.	[1] 87	72	10	2 p. m.	[1] 85	84
24	10 a. m.	[1] 87	72	11	10 a. m.	[1] 85	80

[1] New concrete.

[Pier No. 1.]

Date.	Temperature of concrete.	Average daily temperature (Weather Bureau).	Date.	Temperature of concrete.	Average daily temperature (Weather Bureau).
1910.			1910.		
Nov. 21	[1] 45	32	Dec. 6	55	25
22	[1] 45	40	7	54	20
23	[1] 45	44	8	52	18
26	62	44	9	51	25
28	64	27	10	49	30
29	64	26	12	46	14
30	64	22	13	45	22
Dec. 1	64	19	14	44	40
2	62	20	15	43	33
3	60	29	16	42	32
5	56	30			

[Pier No. 2.]

1910.			1911.		
Dec. 28	43	33	Jan. 3	[1] 58	−6
30	[1] 48	24	4	[1] 58	14
31	[1] 54	36	6	[1] 56	18
			10	[1] 51	35
			12	[1] 46	16

[1] New concrete.

West abutment.

Date.	Temperature of concrete.	Average daily temperature (Weather Bureau).
1911.		
May 17	66	79
27	[1] 86	72

[1] New concrete.