NATIONAL BUREAU OF STANDARDS REPORT

8342

Quarterly Report
on

EVALUATION OF REFRACTORY QUALITIES OF
CONCRETES FOR JET AIRCRAFT WARM-UP, POWER CHECK
MAINTENANCE APRONS, AND RUNWAYS

by

J. V. Ryan, E. C. Tuma, and W. N. Bettum

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Fire Research Section
Building Research Division

Sponsored by:

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3.1 Vacuum Drying

The blast furnace slag aggregate and the Volcanite aggregate concrete specimens were removed from the vacuum chamber after 121 days at pressures below the vapor pressure of water. On the basis of measurements of electrical resistance, the specimens had reached a state of dryness equivalent to that obtained by thorough oven drying. The BF-2 specimens were broken in flexure, and compressive strength measurements were made on some of the beam ends. The results are given in Table 1. These data, plus those in NBS Reports 7878 and 8118, indicate that low pressure drying of concrete test specimens may be used, in place of oven drying, without significant effect on the strength of the concrete. However, the cited data are somewhat limited and the above conclusion should be recognized as at best tentative.

3.2 Minimal Conditioning

In an attempt to determine the combination of fog room and oven drying times required to develop both strength and jet resistance, two sets of specimens were prepared, conditioned, and tested. The first set consisted of six 12 in. diameter by 6 in. thick cylindrical specimens; the second set the same as the first plus nine 3 by 4 x 16 in. beams. The cylindrical specimens were instrumented with themocouples at surface, 1/8 in., 1/4 in., 3/8 in., 1/2 in., and with pressure probe tubes at 1/2 in. depth. All the specimens in each set were put in the fog room as soon as the forms were stripped. At fourteen days, three cylinders, and for the second set three beams, were put in an oven heated to about 100°C. The first set (Di-4) was oven dried fourteen days, the second (Di-5) seven days. At the end of the oven drying, all six cylindrical specimens of each set were exposed to the jet impingement test. The beam specimens were broken in flexure and compressive strength measurements made on the beam ends. The results are given in Table 2.

Both sets of specimens were made of diabase aggregate concretes nominally identical to that of Di-1 described in NBS Report 7578. Additional sets will be made for other conditioning programs or with other aggregates.

Table 1. Effect of Conditioning at Vacuum (approx. vapor pressure of water) vs. Air Drying at One Atmosphere. Specimens of BF-2 Concrete.

Modulus of rupture, psi	980
Compressive strength, psi	10310
Moisture content after, percent	1.0

Table 2. Results From Specimens After Short Conditioning Periods.

	Oven Dried			Fog Room[a]		
	12" x 6"	Spall Volume cc	Max Pressure psi	12" x 6"	Spall Volume cc	Max Pressure psi
Di-4[b]	1	0	40	2	120	162
	3	0	14	4	184	112
	5	0	0	6	200	220
	Avg	0	18	Avg	168	165
Di-5[c]	1	0	42	2	176	83
	3	0	60	4	178	20
	5	0	96	6	160	288
	Avg	0	66	Avg	171	130

[a] Kept in fog room until same age as duplicates oven-dried.

[b] Fog room to 14 days, oven dried to 28 days, tested.

[c] Fog room to 14 days, oven dried to 21 days, tested.

Table 3. Supplementary Tests on Specimens After Short Conditioning Periods. Di-5 Concrete.

Concretes	Modulus of Rupture, Psi		Compressive Strength, psi		Moisture Content, %	
	Avg	Max	Avg	Max	Avg	Max
Oven Dried	765	880	7950	8125	0	0
73°F/50% RH	645	700	8550	8690	4.60	4.75
Fog Room	960	1005	8830	9380	5.75	6.10

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