

1894.

## NEW ZEALAND.

## MILBURN LIME AND CEMENT COMPANY (LIMITED)

(REPORT OF R. L. MESTAYER, Esq., M.Inst.C.E., ON CERTAIN PARCELS OF CEMENT SUPPLIED TO THE GOVERNMENT BY THE).

*Laid on the Table by the Hon. Mr. Seddon, with the leave of the House.*

Drainage Engineer's Department, Wellington, 1st October, 1894.

SIR,—

*Re the Milburn Cement.*

I have the honour to report as follows on the several parcels of this cement delivered to the Government, and which I was directed by you to examine:—

On the 27th August last I met Mr. Wilson, C.E., representing your department, and Mr. Woodhead, representing the Milburn Cement Company, at the railway-yard, Pipitea, and took samples from four parcels of cement. In selecting the samples, six bags were taken from each lot, and an equal quantity of cement from each bag was put into a wooden box, which was nailed and sealed up in my presence; the boxes were then sent to the Corporation yard, at Clyde Quay, and remained there unopened until I could be present. Each box was marked according to the parcel from which the sample had been taken, the marks being as follows:—

M1: From a parcel of 462 bags in the carpenter's shop, delivered on the 30th April last.

M2: From a parcel of 180 bags, also in the carpenter's shop, delivered on the 26th June last.

M3: From a parcel of 300 bags in the Permanent-way Store, delivered on the 11th June last.

M4: From a parcel of 180 bags, also in the Permanent-way Store, delivered on the 16th June last.

A summary of the results of the various tests is given in Table A, and in Table B are given the results in full of the tests for tensile strength. The methods of procedure were as follows:—

Eight pats of neat cement were gauged with 21 per cent. of water on the 8th September; they were marked M1, M2, M3, M4, two being taken from each sample. They were allowed to set for twenty-four hours in air, and then one of each pair was immersed in water, and left there until last Friday; the remaining four were kept in air. I send herewith the eight pats, and have marked those that were kept in water with a "W," in addition to the sample-marks before described. No signs of cracking or distortion are perceptible in any of the parts; those kept under water were all attached to the glass when taken out of the water, those kept in air were all loose on the glass within two days after setting.

For tensile strength twelve briquettes were prepared from each sample; three of each were broken at each trial. The trials were made when the briquettes were three, seven, fourteen, and twenty-one days old.

The briquettes were prepared on a slab of glass, the cement being well worked and rammed into the moulds to insure absence of air-bubbles, and allowed to remain in the air for twenty-four hours; they were then immersed in water until they were removed to the testing-machine.

The briquettes are 1 square inch in section at the centre, and were broken in a Bailey's cement-testing machine, the weight being obtained from water flowing into a receiver attached to the lever of the machine. All the briquettes broke fairly through the centre, and appear to have yielded to a direct strain only, as there is a total absence of splintering or of diagonal fracture which invariably accompanies any cross strains. In Table A is given the mean result of all the tests. All the samples stood the 300lb. per square inch at seven days, and, with one exception, they showed a marked increase in strength at fourteen and twenty-one days; the exception is sample M2, which gives a mean strength of 443lb. at seven days and only 440lb. at fourteen days, recovering, however, during the succeeding fortnight, and giving a result slightly better than that for M1 at the twenty-eight-day test. I could not detect any difference in the rate of settling of the parts; all the samples set very slowly, and could be easily marked with the thumb-nail twenty-four hours after gauging. Judging from the results of the tensile tests, it appears that the samples M2 and M3 set rather more quickly than the others, but for all practical purposes there is very little difference between the four.

In addition to the tests of neat cement, I had some briquettes made of three parts of sand to one part of cement; some of these were allowed to set and dry in air, others were kept in air for twenty-four hours and then immersed in water until tested. At seven days those kept under water broke at less than 40lb. per square inch. At seven days those kept in the air broke at less than 70lb. per square inch. Similar briquettes made with sand and Portland cement stood from 112lb. to 168lb. at seven days when kept under water.

The twenty-eight-day tests of these sand and cement briquettes will, no doubt, show an improvement upon the seven-day tests, and I will forward you the results as soon as they are completed; but as these tests are not included in those specified, I thought it better not to delay sending in this report for them:—

TABLE A.

Description of Test.	Samples.			
	M1.	M2.	M3.	M4.
Residue on sieve of 40 meshes, per lineal inch ...	6%	5%	4%	4%
"    50    "    "    ... ..	10%	9%	10%	9%
"    80    "    "    ... ..	27%	29%	28%	29%
Specific gravity ... ..	3.38	3.14	3.12	3.07
Tensile strength, in pounds, per square inch—				
At 3 days (mean of three tests) ... ..	276	310	273	266
At 7    "                                  ... ..	316	443	401	327
At 14   "                                  ... ..	377	440	420	402
At 28   "                                  ... ..	457	463	488	480
Weight, in pounds, per Imperial bushel ... ..	108	109	108	105

*Summary.*

The P.W. tests are: (1) The cement to weigh 110lb. per bushel; (2) to stand a tensile strain of 300lb. per square inch at seven days; (3) to leave not more than 10 per cent. residue on a sieve of 50 meshes per inch; (4) pats of neat cement to show no signs of cracking or blowing when kept in either air or water.

All the samples comply with Nos. 2, 3, and 4 of the above conditions, and, although slightly under the specified weight per bushel, the difference is so small as to come fairly within the limits of error usually allowed, as a difference of 5lb. per bushel may be made by a slight difference in the method of filling the measure.

I also tested each sample for magnesia, of which I found less than 10 per cent. present.

In my opinion the cement is of fairly good quality, and though inferior in strength to some of the imported cements, is quite up to the standard specified in the conditions laid down in the copy of the Public Works, New Zealand, Stores Supply and Delivery Contract, which you sent to me with your instruction to examine and report upon this cement.

I have, &c.,

R. L. MESTAYER, M.Inst.C.E.

H. J. H. Blow, Esq., Under-Secretary for Public Works.

TABLE B.

*Total Results of Tests for Tensile Strength.*

Sample	Tensile strength at 3 days, in pounds, per square inch...	Breaking-weight.			Mean.
Sample M1:—					
Tensile strength at 3 days, in pounds, per square inch...		290	280	260	275
"                                  7    "                                  ... ..		320	305	325	316
"                                  14   "                                  ... ..		365	410	355	377
"                                  28   "                                  ... ..		490	430	450	457
Sample M2:—					
Tensile strength at 3 days, in pounds, per square inch...		330	320	280	310
"                                  7    "                                  ... ..		435	425	470	443
"                                  14   "                                  ... ..		450	470	400	440
"                                  28   "                                  ... ..		444	460	490	463
Sample M3:—					
Tensile strength at 3 days, in pounds, per square inch...		280	260	280	273
"                                  7    "                                  ... ..		405	410	390	401
"                                  14   "                                  ... ..		400	390	470	420
"                                  28   "                                  ... ..		480	475	510	488
Sample M4:—					
Tensile strength at 3 days, in pounds, per square inch...		280	250	270	266
"                                  7    "                                  ... ..		300	330	350	327
"                                  14   "                                  ... ..		395	410	400	402
"                                  28   "                                  ... ..		490	470	480	480

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