W. Pretyman Esq.,
Secretary for Mines,
HOBART.

Dear Sir,

Herewith results of further tests carried out on the cement of the National Portland Cement Company, Maria Island since our report of 17th ult.

(1) Zero error of testing machine

It was discovered that the machine was not properly balanced and that this was equivalent to an initial tension of 32lbs. being placed on the briquettes.

This zero error was however almost compensated for as regards the scale readings in the graduations of the machine immediately above Zero. It was found though that the scale was reading 10lbs. too low at readings up to 100 and 15lbs. between 150 and 250lbs.

(2) Tensile strength neat cement at 7 days

This was determined in the previous tests to average 458lbs. per square inch.

(3) Tensile strength neat cement at 28 days

Five briquettes were tested and gave the following results expressed in lbs. per square inch:-

571, 590, 615, 631 and 705. The average of the three highest results is 650lbs. per square inch and of the whole is 622lbs. per square inch.

(4) Increase in tensile strength between 7 and 28 days

Calculated on the average of the three highest results the increase was from 458 to 650lbs. per square inch or 41.9%. Calculated on average results, the increase was from 441 to 622 lbs. per square inch or 41.0%.

Under British Standard specifications the increase should have been to 545 lbs. and 531 lbs. per square inch respectively.

The increase in strength is therefore much greater than required by the specifications.

(5) Blythe sands used in Mortar tests

(a) Nature and composition

Sands from Blythe, north-western Tasmania, were used in the mortar tests. The sands consist of sub-angular quartz grains, rounded chert grains, and rounded hardened clay, with, also, a little organic matter. The chemical composition of the sand is:-

Silica	96. 5 2	per cent
Ferric Oxide	1. 4 2	" "
Alumina	1. 37	" ""
Lime	0. 5 2	" "
Magnesia	0. 29	" "
Organic Matter	0. 1 6	" "

Colour in caustic soda solution - very pale yellow. The sample contained approximately 2.5 per cent of clayey matter, which acted as a binder in the partly consolidated sands underneath.

The specific gravity of the sand is 2.58.

(b) Grading of the sand

The sand was thoroughly washed and dried, and the portion taken that passed through a 20 mesh wire-woven sieve and was retained on a sieve of 30 meshes per square inch. The grading showed that 32 per cent was separated in this manner, 44 per cent being retained on the 20 mesh sieve and 24 passing through the 30 mesh sieve.

(6) Tensile strength (Cement and Sand)

(a) Preparation of the Briquettes

The briquettes were prepared according to the British Standard Specification in the following manner:-

A mixture of cement and sand in the proportion of one part by weight of cement to three parts by weight of graded Blythe sand was gauged with sufficient water (10 per cent) to wet the whole mass through out but without any excess of water. The mixture was then placed in Standard moulds in the manner described in the Specification. The briquettes were kept in a damp atmosphere for 24 hours at a temperature of 59 degrees Fahr. They were then removed from the moulds and submerged in clean water and left there for seven days.

(b) Tensile strength at 7 days

Three briquettes of sand and cement in the proportion of 3 to 1 by weight were tested and gave results of 112, 113 and 127 lbs. per square inch, or an average of 117 lbs. per square inch.

Three briquettes of sand and cement in the proportion of 3 to 1 by volume were also tested and gave results of 67,70 and 70, or an average of 69 lbs. per square inch.

(c) Tensile strength at 28 days

The briquettes composed of sand and cement in the proportion of 3 to 1 by volume were tested at 28 days and gave results of 177, 192 and 201 lbs. or an average of 190 lbs. per square inch.

The 3 to 1 by weight were accidently removed from under water for several days and on being tested at 35 days gave results of 193, 225 and 225 lbs. the average being 214 lbs. per square inch.

(d) Increase in strength between 7 and 28 days

The only briquettes to which this test can be applied under standard conditions is the 3 to 1 by volume series.

These increased from 69 to 190 lbs. per square inch or 175 %. The tests on the 3 to 1 by weight briquettes verify this large increase.

Under the British Standard specifications the 3 to 1

by volume briquettes should have had a strength of 214 lbs. per square inch at 28 days. The low initial strength was against this figure being attained, although 190 lbs. does not fall far short of it. Under standard conditions the 3 to 1 by weight briquettes should have increased in strength from 117 lbs. to 202 lbs. per square inch. Under conditions slightly different to standard ones and for a longer period of 35 days, the strength attained was 214lbs. per square inch, so it is probable that this mxiture would have conformed to the standard increase between 7 and 28 days.

(7) Soundness (Pat Test)

The pat which was previously observed at 7 days was also observed after 28 days. It showed no signs of any cracks, had not curled at the edge off the glass plate and no exessive expansion was observable. The cement therefore gave every evidence of soundness.

CONCLUSIONS

This report and the previous one contain the results of the whole of the standard tests usually applied to cements. It was seen previously that in fineness, specific, gravity, soundness, constancy of volume, time of setting and chemical composition, the cement conformed in every way to standard requirements (British)

The tensile strength at 7 days of the neat cement also was up to standard requirements. The further tests at 28 days proved the cement to have an extra-ordinary increase of 41% which is well above the standard.

The tensile strength at 7 days of the cement and sand mixture (1 to 3 by weight) was 117 lbs. per square inch which is much below the standard requirement of 200 lbs. per square inch. The increase of 28 days as shown by this mixture under different conditions to standard and by the 1 to 3 by volume mixture was high was in the case of the neat cment and probably of standard dimensions.

The low initial strength of the neat cement and the sand and cement mixture is probably connected with the settling time of the cement which is very slow when a relatively large quantity of water is used in the mixing. This also serves to account for the large increase in strength between 7 and 28 days.

While the neat cment conformed to standard requirements the sand and cement did not do so. This may be due to slow setting as explained above. The method of gauging may also have influenced the tensile strengths of the mixtures.

It is thus seen that except in one particular the cement conforms in every way with standard requirements and is one of excellent quality.

P.B. Nye
GOVERNMENT GEOLOGIST

HOBART
26th August, 1924