Preliminary report on the quality of the cement manufactured by the National Portland Cement Company at their Maria Island Works.

THE SAMPLE FOR TESTING

A sample of cement weighing 10 pounds was obtained for this purpose from Messrs. Chas. Davis and Company Limited, the local agent for the National Portland Cement Company. The material supplied, it is stated, is truly representative of that placed on the market; and, it is claimed, that the variation in somposition and in quality is inappreciable.

THE CHEMICAL COMPOSITION OF THE CEMENT

A sample of the material, analysed in the Mines Department Laboratories in Launceston, showed the following composition :-

Silica	25.00	per cent
Ferric Oxide	3.29	" "
Alumina	4.51	" "
Lime	63.15	" "
Magnesia	0.72	" "
Sulphur Trioxide	1.26	" "
Alkalies	1.07	" "
Insoluble Residue	0.40	" "
Loss of Ignition	1.50	" "

Standard requirements are not more than 3 per cent of magnesia and not more than 1.75 per cent of anhydrous sulphuric acid (sulphur trioxide).

The alkalies were derived largely from the ash of the powdered coal used in burning the mixture of cement materials and from the clays used in the mixture.

The ratio of lime to silica alumina , ferric oxide on the percentage basis is 1.92 and on the molecular basis is 2.56 (Standard ratio is not less than .6 or north more than 2.3 on percentage basis; and not greater than 2.85 on the Molecular basis).

COLOUR OF CEMENT

Dark yellowish grey.

SPECIFIC GRAVITY

The Specific Gravity of the Cement was determined in accordance with the method recommended by the British Standard Committee and was found to be 3.122. (The British Standard Specification requires that the specific quality be not less than 3.10).

FINENESS

One hundred grms. of cement was sifted for a period of 15 minuts on each of the under-mentioned sieves and in the order given below, with the following results:-

(1) The residue on a 180 -mesh sieve was 8.9 per cent.

(2) The residue on a 76 -mesh sieve was

o.22 per cent.

The Standard requirements are that the residue on the 180 -mesh sieve shall not exceed 14 per cent and on the 76 -mesh sieve shall not exceed 1 per cent.

The residue consisted of coarse grey cement and coarse grains of quartz.

TESTS FOR SETTING TIME

Neat cement was gauged in the manner and under the conditions specified by the British Standard Committee, and the Vicat Neele apparatus was used in the operation.

The following results were obtained :-

Lot	Water used per cent	Initial Setting time in Minutes	Final Setting Time in minutes
No. 1	21½	12	81
	24½	121	540
	27	255	535
No. 2	24½	130	560

It will be noted that the percentage of water used has a marked effect on the rate of setting. The lowest percentage of water used is that required by the British Standard Specification. The results show that this is a cement of medium setting rate.

CONSTANCY OF VOLUME AND SOUNDNESS

The cement was tested for soundness and constancy of volume by the Le Chatelier method. The expansion after 24 hours submersion in water and six hours boiling was 2.5 mms. (Standard requirements are an expansion no exceeding 10 mms.)

TENSILE STRENGTH (NEAT CEMENT)

PREPARATION OF THE BRIQUETTES

The cement was mixed with water (in the proportion of 27 per cent) and the plastic mxiture was then filled into moulds of Standard shape according to specification. The briquettes were kept in a damp atmosphere at a temperature of 59 degrees after gauging. and then were removed from the moulds and submerged in clean water in filling the moulds. Only a small trowel was used and no ramming was carried out.

TESTING OF THE BRIQUETTES

The Briquettes were tested in a tensile-testing machine known as the Patent Cement Tester made by W.H. Bailey and Company Albion Works, Salford. The load in this machine is applied by means of water entering a graduated cylinder suspended from one end of the lever arm.

RESULTS AFTER SEVEN DAYS

Four briquettes were tested after a period of seven days.

The three highest results obtained were:

428 lbs. per sq. inch, 459 lbs. per sq. inch and 433 lbs. per square inch.

The fractured surfaces were examined and showed the presence of a small number of air-bubbles. The majority of these were below 1/16 inch diameter but in one case (459 lbs. per sq. inch) one bubble was $\frac{1}{8}$ inch diameter. The presence of these was due to the fact that no ramming was performed, only a trowel being used to fill the moulds. The strength of a rammed mixture would probably be higher.

The British Standard Specifications require that the breaking strength of the briquettes at 7 days after gauging shall not be less than 450 lbs. per sqare inch of section.

The average of the above results is 458 lbs. per square inch.

PAT TESTS FOR SOUNDNESS

A pat of neat cement of standard specification was prepared on a plate of glass. It was allowed to remain in a moist atmosphere for 24 hours and then placed in cold water.

At 7 days the pat showed no sign of cracking or warping.

CONCLUSIONS

The following tests were carried out under the specified standard (British) conditions on the sample of Maria Island cement:

Fineness
Specific Gravity
Batting-time
Soundness and Constancy of Volume
Chemical Composition 12
Tensile Strength (Neat Cement) after seven days.

The tests of tensile strength of the neat cement at 28 days and that of cement and sand at 7 and 28 days have not been completed at time of writing this report. The results of these tests will be submitted when completed.

It must be concluded from the above tests that the Maria Island cement is; of suitable chemical composition and specific gravity; fineness; of standard soundness and constancy of volume; a medium-setting cement the time of setting of which varies greatly according to the amount of water used in mixing; and of standard tensile strength as far as tested.

A comparison is made with the British Standard Specifications in every test and of the results show that the cement conforms to these in every instance.

The Cement produced by the National Portland Cement Co. Maria Island, is therefore one of excellent quality.

17th July, 1924 P.B. NYE