

CEMENT MATERIALS AT RAILTON

INTRODUCTION

On properties owned by James Blenkhorn in the vicinity of Railton extensive deposits of limestone occur. These deposits have been known and worked for many years and the product has been sold in local markets for agricultural and building purposes. Recently an investigation of the deposits was made by the writers in order to ascertain whether or not this material, with the associated clays, was suitable for the manufacture of Portland cement. The investigation was extended to include deposits of oil shale on a 60 - acre section half a mile south of Latrobe, and further information was obtained also in regard to neighbouring coalfields.

A brief account of the several deposits is given in this report.

AREA, SITUATION, ETC.

The Tasmanian Cement Company has secured an option over a 100 - acre block situated 30 chains north of Railton on the west side of the railway line. On this property No. 2 limestone quarry has been opened up by James Blenkhorn. The Company has obtained also certain rights over a 60-acre lease near Latrobe containing a 4-foot seam of oil shale.

ACCESS

Railton is a small agricultural settlement situated at the point where the Staverton branch line connects with the Western railway. On its way the Western line passes in succession the townships of Dulverton (2½ miles), Latrobe (8 miles), Tarleton (10 miles) and Devonport (15½ miles). Dulverton and Tarleton are coal mining areas; Latrobe is the centre of the oil shale industry; and Devonport is the chief shipping centre of the North-Western districts.

From the foregoing it will be seen that the deposits of cement materials at Railton are very favourably situated in regard to supplies of coal and oil shale, transport facilities and working conditions.

GEOLOGY

Beds of limestone are exposed at surface at many points in the Railton area. The up-turned edges of these beds constitute the floor upon which the Permo-Carboniferous formation, containing the seams of coal and oil shale, were laid down. Their exposure in comparatively small isolated areas was due to the removal of the Permo-Carboniferous strata by agencies of erosion.

Their true position in the geological scale is still in doubt. Apparently they directly succeed the Caroline Creek series of the Cambrian and as they contain fossils of organisms suggestive of the Ordovician they have been assigned tentatively to this division.

This rock is confined to the west side of Mersey River, dipping north-east at its western edge near Melrose and south-west at an angle of 65 degrees at its eastern edge at Blenkhorn's No. 1 quarry. The only exposures visited were those of Blenkhorn's quarries on the east and west sides of the railway line near Railton, but other occurrences are known at Langmaid's, Ramsdale's and Dally's land in the vicinity. So far as can be seen the limestone deposit is 30 chains wide and probably it is much wider, but its full extent could not be determined at Railton because of the covering of Tertiary and Pleistocene gravels which occupy the greater part of the surface in this locality. Between Blenkhorn's Nos. 1 and 2 quarries at a point 160 feet west of the railway line and a little north of the station a shaft and bore, sunk by Henry Law many years ago in search of coal, were in limestone all the way down to 550 feet. There is no doubt that the limestone continues to a depth far below the reach of mining operations.

On the 100-acre block owned by Blenkhorn, in which the Tasmanian Cement Company is interested, limestone is exposed at surface in a low, rounded hill rising 75 feet above the level of the railway line. An open-cut (No. 2) 24 feet deep and 40 feet wide has been cut into this hill a distance of 60 feet. The material exposed here is wavy and even schistose in character, and where unweathered it is hard and compact and of a bluish-grey colour. It weathers along bedding planes to a soft yellowish-brown clay leaving the fresh material in conical form with rounded outlines. In places large cavities have been formed in the rock by the solvent action of percolating waters. Being impervious to water, alteration of the rock has taken place along joints and bedding planes only.

The top of the hill is covered with conglomerate debris from the basal member of the Permo-Carboniferous formation, and a little farther north a thin sheet of diabase overlies the limestone. At the base of the hill the limestone is covered with Tertiary gravels and recent alluvium to depths varying from 10 to 40 feet.

Limestone is being excavated here from an open-cut on the south side of the hill. It is proposed by the Tasmanian Cement Company to open up the beds from the east side nearer the railway line and at a lower level. With this object in view the necessary surveys are being performed. A very large quantity of limestone can be excavated here by open-cutting before quarrying below ground level need be undertaken.

Blenkhorn's No. 1 quarry is situate on the east side of the railway line about 20 chains away and half a mile north-east of Railton station.

Although operations have been carried on here for many years the annual production is not large. Sufficient only to meet the demands of builders and agriculturalists in the neighbourhood is crushed and burnt, consequently production is intermittent. In these operations a large quarry has been gradually opened up in the massive limestone exposing splendid sections for examination. The rock here is more schistose than that opened up in No. 2 quarry on the other side of the railway line, and it varies slightly therefrom in composition. In every other respect, however, it is similar.

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A rather striking feature of these workings is the absence of a waste dump thereby providing silent testimony to the high quality and even grade of the limestone.

The large deposits of associated clay represent the insoluble residue from the dissolution of the lime carbonate component of the rock. This clay contains silica and alumina in the desired proportions.

The samples obtained at No. 2 Quarry represent the quality of the limestone in the open cut. They have been taken over an average of 15 feet in height by 40 feet in width.

By an inspection of the table of analyses it will be seen that the limestone is of very high grade and of uniform composition.

The calcium carbonate is in the form of calcite. The magnesia content is low, the average being 1.47 per cent only.

The proportion of calcium carbonate (93%) is much higher than is needed in a Portland cement mixture, viz. 75-77%, so that the addition of clay or material of similar composition is required.

A representative sample of clay from the open cut showed a ratio of silica to alumina plus ferric oxide of 2.57 to 1. Clay, the composition of which bears this ratio, is suitable for use in the manufacture of cement.

It is proposed by the Company to mix spent shale with the limestone in place of the clay. The composition of the former is approximately 3% volatile combustible matter; 6% fixed carbon, and a little over 91 per cent ash.

The analysis of the latter is as follows:

Silica	76.76	per cent
Ferric Oxide	3.43	" "
Alumina	16.57	" "
Lime	0.20	" "
Magnesia	1.30	" "
Sulphuric Anhydride	0.31	" "

The spent shale is the residue from retorts after the oil shale has been subjected to distillation at a temperature of 400-500 degrees Centigrade.

From the foregoing it will be seen that the spent shale is a most satisfactory substitute for clay as the proportion of silica to alumina plus ferric oxide in the analysis quoted clearly indicates.

The ratio is:-

$$\frac{\text{Silica}}{\text{Alumina ferric oxide}} = \frac{76.76}{20.00} = 3.83$$

As already pointed out either the clay or the spent shale may be used, or if desired an appropriate mixture of the two may be employed to effect a composition of the required ratio.

With modern appliances the fine grinding of these materials can be accompanied at a low cost.

In crushing the limestone it was found that a considerable proportion was reduced to powder, the ultimate comminution of which was easily effected.

SAMPLE NUMBER	SILICA %	FERRIC OXIDE %	ALUMINA %	CALCIUM CARBONATE %
Sample No. 1 (No 2 Quarry)	3.00	0.64	1.32	94.61
" No.2 (No 2 Quarry)	3.00	0.57	1.63	93.44
" No.3 (No 2 Quarry)	3.68	1.79	2.17	90.41
" No.4 (No 2 Quarry)	3.00	0.43	1.17	94.61
" No.5 (No 2 Quarry)	3.68	0.86	1.90	92.64
" No.6 (No 2 Quarry)	3.52	1.07	1.73	93.06
Average of samples) from No.2 Quarry)	3.30	0.89	1.65	93.13
Sample of clay from) No. 2 Quarry)	65.48	8.87	16.63	0.93
Sample No. 1 (No. 1 Quarry)	7.40	1.72	4.20	85.39
Sample No. 2 (No. 1 Quarry)	8.80	2.00	4.12	82.21
Sample No. 3 (No. 1 Quarry)	7.00	1.50	3.10	87.91
Average of samples) from No.1 Quarry)	7.73	1.74	3.81	85.17
Sample of oil shale	39.20	3.94	9.90	Lime- Trace
Spent shale ash	76.76	3.43	16.57	Lime- 0.20

MAGNESIA %	IGNITION LOSS %	SULPHURIC ANHYDRIDE %	RATIO <u>SILICA</u> ALUMINA + FERRIC OXIDE
1.59			1.53
1.45			1.36
1.81			0.93
1.30			1.87
1.45			1.33
1.23			1.25
1.47			1.30
2.25	5.90		2.57
1.45			1.25
2.39			1.44
1.16			1.52
1.66			1.39
0.82	46.42		
1.30		0.31	3.83

COAL SUPPLIES

Coal-bearing strata of Permo-Carboniferous age occupies a great extent of country between the Mersey and the Don Rivers. The coal occurs in a seam 18 to 24 inches thick, and has been opened up by means of shafts and tunnels at many widely separated points. The most important collieries are at Dulverton, Tarleton and Spreyton. One or two of these are worked to supply local requirements, amounting to 2000 tons yearly. The seam has been worked intermittently since 1850, but, owing to its small size and the faulted nature of the ground, without marked success. The reason for its limited applicability to industrial uses is that it contains a comparatively high amount of sulphur. In other respects it is a coal of good quality, and if required as a fuel in the manufacture of cement it will serve the purpose admirably. An idea of its quality may be obtained by reference to the analyses given in the subjoined table:-

	No. 1 Sample	No. 2 Sample	
Proximate.	(Moisture at 105°C.	13.58	13.42
	(Volatile Matter	36.28	35.06
	(Fixed Carbon	45.30	46.88
	(Ash	4.84	4.64
Ultimate	(Sulphur	4.39	4.04
	(Hydrogen	6.83	6.13
	(Carbon	65.02	58.03
	(Oxygen	18.05	26.22
	(Nitrogen	0.87	0.94
Heat Value	(Calories	6142	5950
	(British Thermal Units	11056	10711
	(Evaporative Power	11.43	11.08
	Specific Gravity	1.31	1.32

OIL SHALE DEPOSIT

This deposit occurs on a 60-acre lease half a mile south of Latrobe. A three to four-foot seam, exposed in shallow trenches dips into a low hill at an angle of 6 degrees. An examination of this property showed that no serious interruption in the continuity of the seam need be apprehended, but faulting on a minor scale occurs.

It has been estimated that oil shale extends over 38 of the 60 acres and that 200,000 tons of material is available for extraction. The writers were not able to confirm this estimate in the short space of time that could be allotted to the work.

GYPSUM DEPOSIT

Gypsum, of which 600 tons per annum will be required has been discovered recently near Latrobe. The extent of the deposit has not been determined but exploratory works to this end have been started. Gypsum is used as a retarding agent to prevent the quick-setting of cement. Deposits of commercial value have not been proved in Tasmania but ample supplies may be obtained from South Australia.

SUMMARY

In this district all the raw materials required in the manufacture of Portland cement are found. Limestone, shale, clay and coal occur here in abundance and of such quality as to leave no doubt of their suitability for cement making. In addition to these advantages an ample supply of water, free from deleterious impurities, is available from nearby sources. Situated within easy reach of a populous district and connected by rail and road with an important shipping centre the conditions for economical operation and the facilities for the transportation of the product to overseas markets are very favourable.

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