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SAND USAGE IN THE CEMENT BRICK MANUFACTURING INDUSTRY

By

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Introduction

Raw material resources surveys of the Clay Brick, and Sand, Gravel and Rock Products industries within the Metropolitan Area have shown that considerable production lag exists in relation to the demand for clay bricks, despite eight years post war production, and that the unfulfilled demand is being met in some measure by substitute construction materials, principally cement bricks, and roofing tiles, the manufacture of which is placing an abnormal demand upon the limited known sand resources within the Metropolitan Area.

It is the purpose of this survey to show how, in relation to the comparatively static output of clay bricks, the output of cement bricks is steadily rising to meet a greater proportion of the unfulfilled demand for walling material in the building industry, and the significance of the sand requirement in relation to the overall output, from the limited known sand resources of the Metropolitan Area.

Previous References

Mining Review No. 94. "Survey of the Brick Manufacturing Industry in South Australia", 1951, by C. M. Willington.

Mining Review No. 97. "Rock Products, sand and gravel resources in the Metropolitan Area", 1952, by C. M. Willington (Mining Engineer).

Building Brick Demand

Despite an output of 50 million clay bricks, and approximately 25 million cement bricks during 1952 the demand of the building industry was unfulfilled to the extent of an estimated 20 million bricks.

How long such a demand will continue is impossible to estimate with any degree of accuracy. If, however, the usage of bricks during the eight post war years following World War I is indicative of the present post World War II era of brick usage, there would appear to exist at present an unfulfilled demand for 170 million bricks above normal requirements.

Furthermore, when considered on a housing requirement per capita basis, demand would appear to be even greater when comparing the Metropolitan Area population of 328,000 in 1928 with the 1952 population of 459,000. Without further expansion of the existing brickmaking capacity, both clay and cement, it is reasonable to assume that many years will be required to absorb such an abnormal demand.

Production

Cement brick production on a commercial scale commenced in the Metropolitan Area during 1943, when clay brick production had fallen to a war time output of 15 million bricks for the year. During the war and immediate post war years output of cement bricks was severely restricted by lack of co-ordinated production, and shortage of cement. No recognised quality standard had been adopted, and this factor combined with material and labour shortage resulted in the production of inferior quality bricks, in some instances, accentuating market prejudice for this substitute building construction product.

Despite this prejudice, demand for building construction material has been so great that the output of the industry has been readily absorbed.

During 1950 the principal producers were instrumental in forming the Concrete Masonry Manufacturers Association with the objective of introducing recognised standards of quality, uniformity of products, and regulation of selling prices. This Association which is affiliated with the South Australian Chamber of Manufactures has since its inception done much to organise and establish the industry on a sound foundation, ensure that products conform to standard specifications and dispel public prejudice in the usage of cement masonry products.

Problems associated with the manufacture and usage of cement bricks, such as cracking due to shrinkage, moulding technique and bonding of plaster coatings have to a large extent been overcome, and colour prejudice broken down considerably by the introduction of colored face bricks offered in a variety of colors, some equally, if not more attractive than those offered in the clay bricks.

By the adoption of the Standards Association of Australia, Interim Specification No. 306. "Housing Specifications for Precast Concrete Masonry Units" member producers of this Association are obliged to conform to the following minimum standard of quality and uniformity in brick manufacture.

Compressive Strength

At the time of building into the structure (usually 28 days in the case of air dried bricks) bricks shall possess the following compressive strength:-

Unit	Compressive Strength (lbs. per square inch).			
	Gross Area		Nett Area	
	Average of 12 Units	Individual Unit	Average of 12 Units	Individual Unit
Bricks	1,000	800	1,800	1,450
Blocks Class A1	1,000	800	1,800	1,450
" " A2	700	600	1,200	1,000
" " B	350	300	500	400

Size

Unless otherwise specified bricks must conform to the following dimensions:-

Unit	Length	Height	Width
Bricks	9"	3"	4-5/16"
Solid Block	$18\frac{1}{8}$"	$9\frac{3}{4}$"	3"
Hollow Blocks	$18\frac{3}{8}$"	$9\frac{3}{4}$"	$4\frac{3}{8}$"

Periodic check tests are undertaken by officers of the Association to ensure that manufacturers conform to specification requirements.

At the present time, output of cement bricks is 25 million per annum and approximately 85 per cent of the total output is contributed from producers who are members of the Concrete Masonry Manufacturers Association. Of these producers, seven have an output below 25,000 units per week, eight produce between 25,000 and 50,000 per week and eight produce in excess of 50,000 per week. The

majority of plants rely on hand production, with an output of approximately 1,000 bricks per man per day. There are five fully mechanised plants ranging in output from 30,000 to 80,000 bricks per week. Output per man per day from mechanised plants ranges from 1,200 to 2,000.

In several of the larger mechanical plants, steam drying of the bricks in kilns is practiced, thus eliminating the long period, up to 28 days, required for air drying.

It is estimated that there are one hundred men engaged in the cement brick industry.

The following table shows a comparison of the cement brick and tile and the clay brick and tile yearly production in the post war period:-

Year	Cement Brick	Cement Tiles	Clay Bricks	Clay Tiles
	Millions	Millions	Millions	Millions
1943	Production commenced.	N.A.		
1944		N.A.		
1945		N.A.		
1946	Production not available	0.5	29.0	2.0
1947		1.1	36.0	1.9
1948		2.9	41.0	2.1
1949		3.8	42.0	2.0
1950	25.0	7.7	46.0	2.1
1951	31.0	7.7	43.0	2.1
1952	21.0	8.6	50.0	2.2
1953	25.0 (Estm.)	N.A.	60.0 (Estm.)	N.A.
1954	33.0 (Estm.)	-	-	-

During the past four years output of cement bricks has to a large extent been governed by the availability of cement. This position will be considerably relieved when the increased cement output from the South Australian plants becomes available during 1954. It is estimated that the combined output of cement brick manufacturers will then reach 33 million bricks per annum, and tile production expand likewise.

Costs

Current market prices (October, 1953) of bricks which are under Government Price Control are as follows:-

Brick Type		Medium Price Per 1,000
Cement	Standard Grey	£13 5 6
Clay	Insides	£14 2 6
"	Outside	£14 17 0
"	Specials	£15 12 6
Cement	Special - cream etc. - up to -	£18 0 6

Based on material costs of 21/- per ton for sand, and £10/16/0 per ton for cement and labour cost of £2/10/0 per 1,000 bricks, direct production costs for cement bricksare approximately £10/16/0 per 1,000 for hand operated plants where output is based on 1,000 bricks per man day. In the case of fully mechanised plants output per man day may reach 1,500 bricks, but the lower production cost would be offset to some extent by plant overhead, power, and drying costs.

There does, however, appear to be a considerably greater margin between production and selling costs of cement bricks than clay bricks, which in a competitive market would react in favor of the cement brick.

Raw Material Supply and Usage

Material requirements for standard bricks of dimensions 9" x 3" x 4-3/16", and standard tiles are:-

Cement, sand ratio one to six.

Per 1,000 bricks

Cement 0.415 tons (10 bags)

Sand 3.50 tons

Per 1,000 tiles

Cement 0.75 tons

Sand 2.53 tons

Requirements to meet the present output of 25 million bricks and 8.6 million tiles per annum are 108,000 tons of sand, and 17,000 tons of cement. Such quantities represent a significant proportion of both the total cement and building sand output in the Metropolitan Area, which during 1952 was 502,000 tons of sand, and 118,000 tons

of cement.

Requirements to meet the estimated output of cement bricks and tiles for 1954 would be 141,000 tons of sand and 21,000 tons of cement. To meet this greatly increased sand requirement consideration must be given to the exploration and proving of additional resources to supplement the known limited supply of sand within economic transport distance of the Metropolitan Area.

Sand for cement brick manufacture is at present drawn from the deposits at Highbury, Montacute, Christies Beach, Noarlunga, Virginia, Gawler River, and to a limited extent Golden Grove, also quarry sand from several of the quartzite quarries in the Mount Lofty ranges. These are the principal sources of sand for all concrete and building construction purposes.

The geographical location of brick making plants is governed more by proximity of housing areas under development than source of sand supply. Sand supply is a matter of preference by individual manufactures for particular classes of sand. For example it was noted that sand from a Virginia source was preferred by a producer located in the Southern suburbs and Highbury sand was used in a Western suburb.

Few Manufacturers maintain their own transport service either for material supply or delivery of bricks. This work is undertaken independently by cartage contractors.

Total consumption of sand within the Metropolitan Area for building construction purposes during 1952 was supplied from the following sources:-

Golden Grove	-	33,000 tons
Highbury	-	110,000 "
Christies Beach	-	147,000 "
Noarlunga	-	64,000 "
Virginia	-	44,000 "
Torrens Valley	-	14,000 "
Quarries	-	90,000 "
Total		502,000 tons

Of this total quantity 108,000 tons or 21% was used in the manufacture of cement bricks, blocks and tiles for building construction purposes.

Conclusion

The cement bricks, or more broadly the concrete masonry manufacturing industry, which gained its place through force of circumstances in the post war shortage of building construction materials can now be regarded as firmly established, and likely to expand to still greater output. Competition in a direct sense with the clay brick industry is not foreseen, as demand for both types of products is likely to exceed production for some years to come.

With regard to material supply for the cement brick industry, cement will be freely available to meet all requirements by June 1954, but sand supply which at present is limited, will become an acute problem, if the industry is to continue even at present capacity.

To assure continuance of sand supply it would appear most desirable to institute investigations into future sources of supply, such as the Golden Grove area, and the buried river channels of the Virginia-Gawler River area.

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