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R. 472

29. CRISP AND GUNN CO-OPERATIVE LTD., HOBART: BRICK MANUFACTURING TESTS

Samples

Four samples of raw materials were obtained by the Chief Chemist and Metallurgist from the above company for tests to determine their suitability for brick manufacture by stiff plastic pressing.

The samples were defined as follows:—

1. "Knocklofty Shale".
2. "Mt Romney Shale".
3. "Kingston Permian Mudstone".
4. "Kingston Cream Clay".

In addition to these four samples a sample, in the form of a green half-brick, representative of currently used material, was submitted to test the effect of finer crushing on the quality of the finished product.

Tests on individual samples Nos. 1 and 2 were required and blends of these with each other and with No. 3. Sample No. 4, Kingston Cream Clay, was stated to be a more costly material than local shale and was not to be included in blends if satisfactory quality bricks could be manufactured from the other materials.

The firing temperature of test pieces was 1050°C.

Summary

1. Moderate to good quality bricks in a colour range of dark to medium rust have been manufactured from the individual samples and the blends indicated in the tabulation.

2. The strength of the green pressed bricks appears to be adequate in all cases and they can be handled without damage.

3. Bricks from the Knocklofty Shale are slightly vitrified in texture when fired at 1050° C, which indicates that close control of kiln temperature is necessary when firing bricks of this material.

4. Blends containing the Knocklofty Shale produce bricks of superior appearance to those obtained from other blends. Slight to moderate glazing is apparent in all Knocklofty Shale blends.

5. The influence of finer crushing on material in current use is to eliminate disfiguring cracks which develop during the drying of bricks pressed from the coarsely crushed material.

6. Since satisfactory quality bricks were made from blends of samples 1, 2 and 3 the influence of the Kingston Cream Clay in blending was not investigated.

Preparation and Testing

The samples were dried and jaw and roll crushed to pass a 10 mesh screen and thoroughly mixed. Blends were made from the requisite amounts of each sample and thoroughly mixed in the dry state.

The required amount of water for stiff plastic pressing was incorporated by hand mixing followed by a pass through a Rawdon pug mill.

The pressed bricks were weighed and dried one day at 50° C in an electric oven, finishing at 110° C.

Moisture content and drying contractions were determined on the oven dried bricks.

The dried bricks were fired to 1050° C in an electric muffle furnace, soaking for two hours at this temperature, after which firing losses and contractions were determined.

Modulus of rupture tests were carried out on the fired specimens by Mr. K. Payne, Acting Principal, Launceston Technical College.

Test Results

Stiff Plastic Pressed Bricks

Sample No.	Per Cent					Modulus of Rupture lbs/sq. inch
	Moisture in Green Brick	Contractions			Firing Loss	
		Drying	Firing 1050°C	Total		
1. Knocklofty Shale ..	13.0	4	3	7	2.5	2,500
2. Mt Romney Shale ..	13.9	3	3	6	3.5	1,200
3. Kingston Mudstone	13.4	2	4	6	3.3	2,600
5. Blend, equal parts of 1 plus 3	12.5	3	3	6	3.1	3,000
6. Blend, equal parts of 1 plus 2	12.9	3	3	6	3.1	2,300
7. Blend, equal parts of 2 plus 3	12.7	2	3	5	3.5	2,600
8. Blend, 25% of 1, 25% of 2, 50% of 3	12.5	2	3	5	3.4	2,000

Effect of fine crushing on the finished product

A test was performed on a sample of material in current use for brick manufacture at the works to investigate the effect of finer crushing of the raw material on the appearance of the finished product.

The procedure adopted was as follows:—

The sample (a green pressed half-brick) was dried, jaw crushed to approximately minus ¼ inch size, mixed and divided into two halves by riffling. One half was then crushed to minus 10 mesh. Stiff plastic pressed bricks were then made from both minus ¼ inch and minus 10 mesh.

Specimens from each pressing were subjected both to rapid oven drying and a slow preliminary air drying followed by oven drying after which they were fired at 1050° C.

Irrespective of the method of drying, severe disfiguring cracks developed on bricks made from the coarser material—these cracks remained obvious after firing.

This was not the case with bricks from the more finely crushed material. These were of good appearance although the rapid dried specimen showed minor surface cracks.

Notes on Brick Manufacturing Tests—All Materials—10 Mesh B.S.S.

All firings at 1050°C.

1. *Knocklofty Shale.*

Green pressed bricks well formed without lamination. Good green strength bricks dry rapidly (50° C) without cracking or distortion. Fired bricks (1050° C) dark rust red in colour—rather glassy but with very smooth surfaces and good appearance. Increase in firing temperature could produce more glazing with possible distortion.

2. *Mt Romney Shale.*

Green pressed bricks form well but with slight tendency to laminate. Moderate green strength. Faint hairline cracks develop during drying but no distortion observed. Fired bricks medium rust red in colour and of good appearance. No glazing as in 1. Random hairline cracks show on the fired pieces but these are not considered significant. Test pieces well fired with good ring.

3. *Kingston Mudstone*

Less amenable to pressing than 1 or 2. Strong tendency to adhere to die surfaces and green pressed bricks somewhat bowed. Moderate green strength. Rapid drying produces rather more surface cracks than in No. 2. The fired bricks show slight surface glazing with numerous random cracks and rather rough surfaces. Medium rust red in colour and of moderate appearance.

Blend 5. 50 *per cent Knocklofty Shale*—50 *per cent Kingston Mudstone.*

Presses well and dries rapidly without distortion or significant cracking. Green strength good. Fired brick of very good appearance, medium rust red in colour with slight surface glazing. A few random hairline cracks are not significant.

Blend 6. 50 *per cent Knocklofty Shale*—50 *per cent Mt Romney Shale.*

Similar to Blend 5 in all respects.

Blend 7. 50 *per cent Mt Romney Shale*—50 *per cent Kingston Mudstone.*

Presses well and dries rapidly without cracking or distortion. Green strength good. Bricks fire to medium rust red with slight glazing. Surface imperfections similar to Sample 3 bricks but rather less pronounced. The bricks are of good appearance.

Blend 8. 25 *per cent Knocklofty Shale,* 25 *per cent Mt Romney Shale,* 50 *per cent Kingston Mudstone.*

Pressing and drying similar to Blend 5. The fired bricks are of good appearance with slight glazing and insignificant hairline cracks. Colour medium rust red.