

TR 10-147-149 R. 513

**LUCK BROS., DEVONPORT: BRICK MANUFACTURING TESTS
BY DE-AIRED EXTRUSION**

Samples

Eight samples were obtained by Geologist V. Threader on behalf of the above company, for brick manufacturing tests by de-aired extrusion.

The following descriptions were supplied with the samples.

No. 1.	Luck Bros. Old Pit	Top 7 feet
No. 2.	New site over Railway line	0 to 6 feet
No. 3.	New site over Railway line	6 to 13 feet
No. 4.	New site over Railway line	13 to 20 feet
No. 5	Cambrian Greywacke	Lower Wilmot
No. 6	Cambrian Greywacke	Sprent
No. 7	Cambrian Greywacke	Beulah
No. 8	Cambrian Greywacke	Lower Beulah

After discussion with Mr. Threader, it was decided to reduce the number of clay samples to three by combining samples 3 and 4 and to combine all greywacke samples in equal proportions for use in blends. This materially reduced the amount of work involved and should not affect the overall test results.

Investigation

Brick manufacturing tests by de-aired extrusion were performed individually on samples Nos. 1 and 2 and an equal weights mixture of clays Nos. 3 and 4. In addition, tests were performed on the clay samples blended with various proportions of the composite greywacke sample to observe the effects of dilution of the clay with this material.

All firings were at a temperature of 1000°C.

Sample Preparation and Testing

All samples were partly dried and roll crushed to minus 10 mesh B.S.S. and thoroughly mixed.

Blends were made up from the required amounts of the various samples and mixed in the dry state.

Required amounts of water were incorporated by hand mixing and the mixes were then pugged by passing through a Rawdon pug mill.

De-aired extrusion was carried out under a vacuum of 27 inches of mercury and the extruded column wire-cut into test briquettes.

Test pieces were weighed, allowed to dry naturally for two days and finished in an electric oven at 110°C.

The dried bricks were then fired at 1000°C with two hours soaking at this temperature.

Blending

De-aired extrusion tests were performed on the following blends.

1B.1. 1 part clay No. 1 to 1 part composite greywacke

1B.2. 1 part clay No. 1 to 2 parts composite greywacke

2B.1. 2 parts clay No. 2 to 1 part composite greywacke

3/4B.1. 2 parts clay 3 & 4 to 1 part composite greywacke

Summary

Clay No. 1

Clay No. 1 was found to be suitable for brick manufacture by de-aired extrusion. The extruded column was very strong and quite smooth except for a slight tendency toward corner notching. Test pieces dry and fire without distortion and the fired bricks were of good appearance, deep orange in colour.

Blending with greywacke reduced plastic and cohesive properties and corner notching increased to serious proportions. Efforts were made to counteract this by the addition of sodium carbonate as a modifying agent. Some improvement was noted with a soda usage of 0.4 lb. per ton of clay, but experiments on these lines were restricted by the quantity of sample available.

Clay No. 2

The extruded column from clay No. 2 was badly dog eared and variations in moisture contents did nothing to remedy this. Similar faults were found in the blend 2B.1, 2 parts No. 2 clay to 1 part greywacke.

However, the material should not be condemned on this evidence alone, as the addition of a suitable modifying or plasticizing agent could correct the defect. The quantity of sample submitted was not sufficient to investigate this aspect.

The bricks were well fired at 1000°C, orange red in colour.

Clays No. 3/4

This material showed extrusion characteristics intermediate between Nos 1 and 2, and it is anticipated that addition of a modifying agent and/or adequate die lubrication (not practicable with the experimental extrusion machine) would correct the tendency to dog earring in the extruded column.

The blend 3/4B 1 showed a slightly greater tendency to dog earing than the undiluted clay.

The test bricks were well fired at 1000°C and were reddish pink in colour.

Test Results: Brick Manufacture by de-aired extrusion

(Note: Contractions shown are progressive)

Sample or Blend No.	Moisture in Green Bricks	Per Cent Contractions		Firing	Remarks re Extrusion
		Drying 110°C	Firing 1000°C	Loss 1000°C	
Clay No. 1.	23.8	8	10	6.5	Slight corner notching, otherwise smooth strong column
Blend 1B 1.	23.2	7	9	6.8	Notching more pronounced
Blend 1B 2.	22.4	6	8	6.9	Similar to 1B 1. Improved by 0.4 lb Na ₂ CO ₃ addition
Clay No. 2	22.1	6	8	6.0	Dog ears, column rather "short", quartz pebbles cause roughness in wire cuts
Blend 2B.1.	19.7	4	6	6.5	Similar to No. 2
Clays 3/4	20.8	5	7	4.9	Moderate notching, strong smooth free cutting column
Blend 3/4B 1.	20.3	5	6	5.1	Similar to 3/4