TR8-234-238

R. 440, to R. 448

CLAYS FROM WYNYARD

Nine samples were received from Brian R. Archer Pty. Ltd. for testing for brick manufacture by pressing methods and tests reported herein are restricted to this method of manufacture.

The Samples

The following descriptions of the samples were supplied by Brian R. Archer Pty. Ltd. Comments in brackets are further identifying details compiled by the Mines Department:—

R.440. No. 1. "Silica grey" from Milabena crown land.
(Greyish coloured decomposed micaceous schist.)
Sample weight: 590 lbs.
Moisture content: 12.8 per cent.

R.441. No. 2. "Silica red" from Milabena crown land.
(Brownish yellow semi-plastic micaceous clay. Contains several quartzite pebbles up to 1" diameter.)
Sample weight: 173 lbs.
Moisture content: 28.6 per cent.

R.442. No. 3. "Plaster clay" from Milabena crown land.
(Yellow to red decomposed schist.)
Sample weight: 170 lbs.
Moisture content: 15.0 per cent.

R.443. No. 4. "Shale" from Quiggins Road, Wynyard Forestry.
(Greyish yellow shale with some decomcomposed plastic material.)
Sample weight: 207 lbs.
Moisture content: 16.6 per cent.

R.444. No. 5. Same description as No. 4.
Sample weight: 205 lbs.
Moisture content: 14.3 per cent.

R.445. No. 6. "Hard clay" from Quiggins Road (Walker).
(Shale similar to No. 4.)
Sample weight: 200 lbs.
Moisture content: 11.5 per cent.

N.446. No. 7. "Crumb top clay" from Quiggins Road (Walker).
(Greyish brown clay with about 2 per cent quartz and quartzite pebbles up to 2" diameter.)
Sample weight: 182 lbs.
Moisture content: 13.3 per cent.

R.447. No. 8. "Crumb top clay" from Quiggins Road (White).
(Chocolate brown clay with occasional pieces of shale. Several quartzite pebbles up to 1½" diameter.)

Sample weight: 180 lbs.
Moisture content: 20.1 per cent.

R.448. No. 9. "Plastic clay" Oldina Road (Seddon).
(Greyish brown clay somewhat earthy in appearance and texture.)

Sample weight: 170 lbs.
Moisture content: 19.9 per cent.

Sample No. 10. "Hard Clay" Oldina Road (Burr).
(This was not received.)

Summary

Each of the nine samples was tested for brick manufacture by semi-dry and stiff plastic pressing. Firing of test pieces was performed at one temperature only—1050°C.

Good quality bricks have been made from samples Nos. R.443—4 to R.448—9 inclusive, in the colour range of light to medium rust red.

Bricks have been pressed from samples R.440—1 to R.442—3 but these bricks, while of good appearance, fail or almost fail to meet the modulus of rupture specification. In addition the green bricks have poor cohesive properties and have a very low green strength.

In general, bricks made by semi-dry pressing have better appearance and conformation than those made by stiff plastic pressing, but have somewhat less strength.

Preparation of Samples for Testing

All samples were partially dried by exposure to atmosphere, forced through a half-inch screen, and thoroughly mixed. A representative sample was taken from each by riffling. These samples were then dried by infra-red dryers, jaw and roll crushed to minus 10 mesh and again mixed in the dry state.

The required amount of water was incorporated by repeated hand mixing followed by a pass through a Rawdon pug mill.

Pressing

No difficulties were encountered in pressing except in the case of sample R.440—1. The green pressed bricks from this sample were extremely fragile and difficult to handle without damage to the test pieces.

Nos. R.441—2, R.442—3, also exhibited this property to some degree, but with reasonable care the green bricks can be handled without damage.

The test pieces from all other samples showed good green strength.

Moisture Contents of the Pressed Bricks

The tabulation shows (A) the per cent moisture in the green brick and (B) the per cent water added to the dry clay.

	Semi-dry		Stiff-plastic	
	(A)	(B)	(A)	(B)
R.440—1	7.7	8.4	13.9	16.1
R.441—2	9.5	10.5	19.6	24.4
R.442—3	11.2	12.6	17.4	21.0
R.443—4	10.2	11.3	19.0	23.6
R.444—5	9.5	10.5	17.4	21.1
R.445—6	9.9	11.0	17.0	20.4
R.446—7	9.8	10.9	17.0	20.4
R.447—8	12.7	14.5	18.7	23.1
R.448—9	13.4	15.5	21.8	27.8

Drying and Firing

The pressed bricks were dried naturally for several days and finished by heating at 110°C in an electric oven.

The dried bricks were fired at a temperature of 1050°C, soaking for two hours at this temperature.

Drying and firing contractions of the various bricks are shown in the following tabulation. All contractions are based on the original length of green pressed brick.

	Contractions—Per Cent					
	Semi-dry			Stiff-plastic		
Sample No.	Drying 110°C	Firing 1050°C	Total	Drying 110°C	Firing 1050°C	Total
R.440—1	0.5	0.5	1.0	1	2	3.0
R.441—2	0.5	2.5	3.0	2	4	6.0
R.442—3	1	1	2.0	1	2	3.0
R.443—4	0.5	5.5	6.0	4	9	13.0
R.444—5	0.5	4.5	5.0	3	9	12.0
R.445—6	0.5	6.5	7.0	3	7	10.0
R.446—7	0.5	1.5	2.0	4	3	7.0
R.447—8	1	1	2.0	4	4	8.0
R.448—9	1	9	10.0	5	11	16.0

Losses of weight on firing the various bricks at 1050°C are shown below. Calculations are based on the weight of brick dried at 110°C.

Sample No.	Firing Loss: Per Cent Weight
R.440—1	4.5
R.441—2	7.1
R.442—3	5.4
R.443—4	6.7
R.444—5	6.1
R.445—6	6.1
R.446—7	5.1
R.447—8	6.9
R.448—9	7.7

Colour of Fired Bricks

R.440—1. Very light orange-yellow with micaceous sheen.
R.441—2. Medium rust-red with slight micaceous sheen.
R.442—3. Lighter rust-red with slight micaceous sheen.
R.443—4. Medium rust-red.
R.444—5. Medium rust-red.
R.445—6. Light rust-red.
R.446—7. Light rust-red.
R.447—8. Light to medium rust-red.
R.448—9. Light to medium rust-red.

Modulus of Rupture

Modulus of rupture tests on dried and fired specimens of both methods of pressing were performed. These tests were undertaken by Mr. K. Payne, Officer-in-Charge, Engineering Department, Launceston Technical College.

	Modulus of Rupture/lbs. per sq. inch			
	Semi-plastic Pressing		Semi-dry Pressing	
Sample No.	Dried 110°C	Fired 1050°C	Dried 110°C	Fired 1050°C
R.440—1	No reading	300	No reading	300
R.441—2	100	700	100	500
R.442—3	<100	200	<100	400
R.443—4	<100	1700	<100	2200
R.444—5	100	1700	<100	1800
R.445—6	100	2500	<100	3000
R.446—7	100	800	100	800
R.447—8	300	800	200	1100
R.448—9	200	2600	100	2300

Each reading in the above tabulation was obtained from one brick specimen only.

S.A.A. Interim 323 specifies an average requirement of 400 lbs. per square inch. All fired bricks with the exceptions of R.440—1 and R.442—3 meet this specification.

Efflorescence

The fired bricks were tested for efflorescence with the following results:—

R.440—1. Slight vanadium efflorescence.
R.441—2. Moderate vanadium efflorescence.
R.442—3. Slight to moderate vanadium efflorescence.
R.443—4. Trace of vanadium efflorescence.
R.444—5. Slight vanadium efflorescence.
R.445—6. Slight to moderate vanadium efflorescence.
R.446—7. Moderate vanadium efflorescence.
R.447—8. Trace of vanadium efflorescence—Trace of white encrustation.
R.448—9. Trace of vanadium efflorescence.

NOTE: Efflorescence varies with changing firing conditions and the notes above apply only to bricks fired at 1050°C.

Notes on the Manufacture of Test Bricks from the Various Samples

R.440—1. Material has poor cohesive and plastic properties. Bricks can be formed but the green and dried bricks are very fragile. The fired bricks are easily abraded and have very poor strength.

R.441—2. Material has poor cohesion and little plasticity. The green and dried bricks have poor strength and are easily abraded. The fired bricks have good conformation and somewhat greater strength than those of R.440—1. Slight surface cracks evident in bricks manufactured by stiff-plastic pressing.

R.442—3. Poor cohesion and plasticity. Green and dried bricks have poor strength and are easily abraded. Fired bricks have good appearance and conformation but have poor strength and are easily abraded. There is a slight tendency to lamination with stiff-plastic pressing.

R.443—4. Good cohesive and plastic properties. Pressed bricks have good green strength. Fired bricks have good appearance and strength, but there is slight glazing, and a rather roughened surface. Some irregular surface cracks were observed in stiff-plastic pressed bricks and odd pieces show signs of curved surfaces. Slight tendency to lamination observed in odd pieces. High shrinkage.

R.444—5. Similar to R.443—4, but no evidence of curved surfaces was observed.

R.445—6. Good plasticity and cohesion. Pressed bricks have good green strength. Fired bricks are of good appearance and strength. Bricks made of stiff-plastic pressing show irregular surface cracks. Fairly high shrinkage.

R.446—7. Similar to R.445—6, but rather inclined to lamination in stiff-plastic pressing, and less shrinkage.

R.447—8. Similar to R.446—7, but with rather less surface imperfections.

R.448—9. Very good cohesive properties and good plasticity. Pressed bricks have good green strength. High shrinkage on firing, but no surface imperfections observed. Fired brick is very dense and has good appearance and strength. Slight signs of glazing were observed.