

TR5.240-243

Reg. Nos. 190-193

## PRELIMINARY INVESTIGATIONS OF SURGES BAY MATERIALS

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### SUMMARY

Four samples of material obtained from Surges Bay, and submitted by Mr. R. Young, have been tested to determine their suitability for brickmaking and other possible uses. One (Reg. No. 190) was highly siliceous and abrasive, but could be formed into whitish bricks by either semi-dry or stiff-plastic pressing, a higher firing temperature being required for semi-dry bricks. This material may also be suitable for the production of high density low alumina refractories. The remaining samples differed little except in colour, and could be pressed semi-dry or extruded de-aired with equally good results. Stiff-plastic pressing, although successful, resulted in warping and cracking during drying and firing. The firing characteristics (strength, contraction, colour) were affected by the forming method used, but in all cases accurate temperature control would be necessary for satisfactory results. By blending these three materials with a proportion of No. 190, the firing range was considerably extended, without any adverse effects. If suitably prepared by fine grinding, Nos. 191 and 192 may be acceptable for use in sanitary-ware and dinner-ware bodies, but they are too highly coloured for whiteware.

## DESCRIPTION

**Sample No. 1**

*Reg. No. 190.* Soft highly weathered blue white siliceous siltstone, with quartz pebbles up to one inch diameter.

**Sample No. 2**

*Reg. No. 191.* Very soft siliceous kaolin, mainly cream, with some white felspathic grit.

**Sample No. 3**

*Reg. No. 192.* Very soft siliceous kaolin, mainly light cream, with a few quartz pebbles and some white felspathic grit.

**Sample No. 4**

*Reg. No. 193.* Very soft siliceous kaolin, mainly yellow, with some white felspathic grit.

**Blend No. B17**

Two parts of No. 190 with one part each of Nos. 191, 192, and 193.

## PREPARATION AND TESTING

Each sample was dried and roll crushed, and preliminary tests carried out to determine the working moisture requirements. Small portions were ground to pass a 100 mesh B.S. sieve, and formed into cones for refractoriness tests.

After thorough mixing of each material with suitable quantities of water, briquettes were formed by semi-dry and stiff-plastic pressing, and by extrusion with and without de-airing. These were dried, and fired at various temperatures with two hours soaking time. Fired briquettes were tested for efflorescence.

## RESULTS

## I—Refractoriness and Ignition Loss

<i>Reg. No.</i>	<i>Refractoriness</i>	<i>Ignition Loss</i> (%)
190	No sign of fusion at 1,500°C	3½
191	No sign of fusion at 1,500°C	7½
192	No sign of fusion at 1,500°C	8½
193	No sign of fusion at 1,500°C	7

## II—Semi-dry Pressing

<i>Reg. No.</i>	<i>Pressing Moisture</i> %	<i>Drying Contraction</i> %	<i>Firing Contractions (%)</i>					<i>Remarks</i>
			900°C	950°C	1,000°C	1,050°C	1,100°C	
190	9½	0	(½ exp.)	½	½	1½	2½	Presses well, very dense, abrasive. Well fired at 1,050°C, overfired at 1,100°C.
191	15	½	1	1½	3½	7½	8½	Presses well, soft when dry. Rather soft at 1,000°C, overfired at 1,050°C.
192	13½	½	1	2	3½	7	8	Presses well, soft when dry. Well fired at 1,000°C, overfired at 1,050°C.
193	13½	½	1	2	4½	7½	8	Presses well, soft when dry. Well fired at 1,050°C, overfired at 1,100°C.
B17	13	½	0	1½	2	3½	4½	Presses well, fairly dense. Reasonably well fired at 1,000°C, slightly overfired at 1,100°C.

All semi-dry pressed briquettes withstood rapid drying at 110°C.

## III—Stiff-plastic Pressing

Reg. No.	Pressing moisture %	Drying Contraction %	Firing Contractions (%)						Remarks
			850°C	900°C	950°C	1,000°C	1,050°C	1,100°C	
190	15½	2	..	..	1½	..	..	..	Presses well. Very solid at 950°C.
191	20	4½	..	1	3	6	..	..	Rather weak. Distorted on drying and firing.
192	19½	4½	..	1½	3	5	..	..	Rather weak. Distorted on drying and firing.
193	20	4	..	½	3	7	..	..	Rather weak. Distorted on drying and firing.
B17	17½	3½	0	½	2	4½	6	7	Presses fairly well. Slightly distorted on drying and firing. Well fired at 950°C.

All stiff-plastic pressed briquettes, except No. 192, withstood rapid drying at 110°C.

## IV—Extrusion, not de-aired

All briquettes were very weak, and with the exception of No. 192, were badly dog-eared.

## V—Extrusion, de-aired

Reg. No.	Ex-trusion Moisture %	Drying Contraction %	Firing Contraction (%)						Remarks
			850°C	900°C	950°C	1,000°C	1,050°C	1,100°C	
190	17	3	(½ exp.)	(½ exp.)	1½	2½	4	5½	Not sufficiently plastic, badly notched. Tended to lose water and block the die.
191	23½	7	1	1	3½	5½	7	8	Extrudes fairly well. Well fired at 950°C, slightly over-fired at 1,000°C.
192	22	7½	½	1	3	5	7	7½	Extrudes well. Well fired at 950°C, over-fired at 1,000°C. Some firing cracks.

Reg. No.	Ex-trusion Moisture %	Drying contraction %	Firing Contractions (%)						Remarks
			850°C	900°C	950°C	1,000°C	1,050°C	1,100°C	
193	2½	6	½	½	3½	6½	7½	8½	Extrudes fairly well. Well fired at 1,000°C, over-fired at 1,050°C.
B17	21	5½	0	½	1½	4	6	7	Extrudes fairly well. Well fired at 950°C, slightly over-fired at 1,050°C.

All de-aired briquettes were strong and firm. Number 191 withstood rapid drying at 110°C. Nos. 192 and 193 developed slight cracks, and No. 190 cracked badly.

#### VI—Fired Colour

Number 190 fired white with streaks of red from iron particles abraded from the forming dies. At higher temperatures a pale greyish buff colour developed. Nos. 191, 192 and B17 fired pale pink, slightly streaked with red on pressed briquettes. Semi-dry pressed briquettes were slightly mottled, and turned pinkish buff at 1100°C. Extruded briquettes turned pale buff at 1050°C, and greyish buff at 1100°C.

Number 193 when semi-dry pressed fired a strong pink, darkening at higher temperatures. Stiff-plastic briquettes were pink with patches of red, darkening to reddish buff at 1000°C. Extruded briquettes were pink, turning buff at 1000°C, and red at higher temperatures.

#### VII—Efflorescence

All briquettes were liable to orange and green vanadium efflorescence, the latter colour appearing only on briquettes fired at 1000°C or above.

#### VIII—General Remarks

Most of the briquettes not classed as well fired or overfired, were quite sound and had a good ring. They would be considered doughboys solely on account of their lack of resistance to abrasion and chipping.

Blends such as No. B17, semi-dry pressed and fired to approximately 1000°C, appear to be the best proposition for brickmaking purposes. In any blending considerations, Nos. 191, 192 and 193 could be substituted for each other without materially affecting the finished product, except in regard to colour.

The results given in this report apply only to the samples submitted.

Key to abbreviations on briquettes:—

SDP Semi-dry pressed.

SPP Stiff-plastic pressed.

DA De-aired extruded.