TR5-249-250

Reg. Nos. 768-769. Luck Brothers, Dulverton

COMPARISON OF EXTRUSION AND PRESSING OF BRICKS FROM CLAY AND SHALE

by F. C. Gillespie.

SUMMARY

Samples of clay and shale obtained by Mr. F. C. Gillespie on the 28th July, 1960, from the Dulverton quarry of Luck Bros. Pty. Ltd., have been tested for suitability for brick production by extrusion, in comparison with the stiff-plastic pressing method. The red and black materials were tested separately, and also in a blend with proportions two to one respectively.

Little difference was found in the working properties of the red and black materials, but the latter had a considerably shorter firing range, and this characteristic was also evident in the blend. Extrusion without de-airing was unsatisfactory, but de-aired extruded briquettes were superior in strength and appearance to the pressed specimens, and were adequately fired for facing bricks at 900°C. For full sized extruded brick production, perforation would be desirable to facilitate drying and firing.

DESCRIPTION

Reg. No. 768. Sample of red and white clay and shale, taken from the top portion of the quarry face.

Reg. No. 769. Sample of black shale, taken from the bottom portion of the quarry face.

*Blend No. B*19. Two parts of No. 768 and one part of No. 769.

PREPARATION AND TESTING

Each material was crushed wet, by passing three times through high speed rolls, with the gap set initially to approximately three-eighths of an inch, then reduced to one-quarter of an inch, and finally one-eighth of an inch. Water was added as required, and mixing carried out in a pug mill, which simultaneously formed the clots for stiff-plastic pressing.

Briquettes produced either by pressing in a screw press, or by extrusion in an auger machine, were dried, (test specimens were placed in an oven at 50°C and the temperature slowly raised to reach 110°C in 1½ hours), and fired at various temperatures, soaking for two hours. Fired briquettes were tested for efflorescence.

RESULTS

I—Forming

Material	*Forming Method*	*Tempering Moisture (%)*	*Remarks*
768	S.P.	21½	Laminates readily; warps slightly.
	N.D.A.	23½	Dog-ears badly; laminates.
	D.A.	23½	Clean, firm and very strong.
769	S.P.	19½	Laminates readily; requires considerable oil lubrication; warps slightly.
	N.D.A.	21½	Dog-ears badly; laminates; weak.
	D.A.	21	Very clean, firm and strong.
B19	S.P.	21	Laminates readily; requires considerable oil lubrication; warps slightly.
	N.D.A.	22½	Dog-ears and laminates badly.
	D.A.	22½	Very clean, firm and strong.

NOTE—S.P. = Stiff-plastic pressed.
N.D.A. = Not de-aired extruded.
D.A. = De-aired extruded.

II—Drying and Firing

Material	*Forming Method*	*Drying Contraction*	*Total Contraction after Firing (%)*					
		%	850°C	900°C	950°C	1,000°C	1,050°C	1,100°C
768	S.P.	5½	6	7	8½	12½	15	15
	N.D.A.	7½	..	..	11	..	..	..
	D.A.	8	..	10	12	15½	16½	16½
769	S.P.	4½	..	7	9½	11(S.B.)	(B)	..
	N.D.A.	5½	..	..	10	..	..	..
	D.A.	6	6½	9	10½	12½	(B)	..
B19	S.P.	5	6	6½	9	12	(B)	..
	N.D.A.	6	..	..	10	..	..	..
	D.A.	6½	7	8½	11	14(S.B.)	(B)	..

NOTE—S.B. = Slightly bloated.
B = Bloated and partially fused.

All briquettes withstood the oven drying test except Nos. 769 N.D.A. and B19 S.P., both of which cracked badly.

All stiff-plastic briquettes developed moderate cracks during firing, No. 769 being least affected in this way. De-aired briquettes fired at 850°C cracked during cooling, but no cracks occurred in de-aired specimens fired at 900°C or higher.

The approximate firing ranges of these materials are given in the following table:—

Material	Firing Range (°C) Stiff-plastic Pressed	De-aired Extruded
768	950 — 1050	900 — 1050
769	950	900 — 1000
B19	950 — 1000	900 — 950

II—Efflorescence

Two types of efflorescence occurred on the briquettes tested; a yellow material identified as a vanadium compound, and white crystals consisting mainly of magnesium sulphate. The vanadium efflorescence appeared on almost all briquettes fired below 1000°C, but was not detected on those fired above that temperature. The magnesium sulphate was very irregularly distributed, but mainly confined to No. 769; it did not appear on briquettes fired above 1000°C.