

**FILE**

CANADA  
DEPARTMENT OF MINES AND TECHNICAL SURVEYS  
OTTAWA

Mines Branch Investigation Report IR 58-52

EFFECTS OF DEAIRING DISRAELI CLAY  
WITH AND WITHOUT ADDITIONS OF ASBESTOS TAILINGS

by  
S. Matthews  
Industrial Minerals Division

March 31, 1958



EFFECTS OF DEAIRING DISRAELI CLAY  
WITH AND WITHOUT ADDITIONS OF ASBESTOS TAILINGS

INTRODUCTION

Initial tests on clay sample No. 62 from Disraeli, Quebec, with and without additions of asbestos tailings, are described in I.M. Report No. 495 dated December 11, 1957. From this work it was found that the clay, being of a silty nature, had little plasticity and very poor workability. Furthermore, a 25% addition of asbestos tailings produced a slight improvement in working properties, but not in sufficient degree to permit stiff-mud processing.

On obtaining the foregoing results it was suggested that workability of the material might be improved by deairing and that experiments be carried out with this end in view.

EXPERIMENTAL

Raw materials consisting of clay from Disraeli, Quebec and asbestos tailings from the same locality were ground to minus 16 mesh, and bodies 80A & 80B prepared with composition as follows:

Body 80A - 100% clay

Body 80B - 76.5% clay + 3.5% asbestos tailings.

In each case the bodies were tempered to stiff-mud consistency and extruded with deairing applied under 27 - 28 inches of vacuum. Test specimens were cut from the extruded column for subsequent determination of properties.

A third body, No. 80C, consisting of 100% clay was prepared and processed by the dry-press method.



Test specimens were oven dried and subsequently fired in an electric heated kiln at cone 02 (2014°F). In addition, a few dry-press briquettes were fired at cone 1 (2077°F).

#### PROPERTIES DETERMINED & RESULTS

Unfired characteristics such as working properties, condition of extruded column, drying shrinkage and dry strength were carefully noted in each instance. After firing, the specimens were tested for firing shrinkage, water absorption, colour and hardness. The results obtained are recorded in Table 1.

#### DISCUSSION

Body No. 80A consisting of 100% clay, extruded with deairing, produced a poor column with frayed edges. The material, even with deairing applied, lacked the necessary plasticity and workability for stiff-mud processing. The fired properties at cone 02 are favourable, but as indicated in the previous report, clays containing appreciable amounts of calcium carbonate generally have a short firing range. Materials of this nature require very close temperature control in order to obtain the desired degree of hardness and porosity in face brick production without overfiring.

With the addition of 35% asbestos tailings in Body 80B, the desired column showed slight improvement but not sufficient to eliminate the occurrence of frayed edges. However, the addition of tailings had the disadvantage of increasing firing shrinkage and absorption values.



TABLE 1 - PROPERTIES OF CLAY AND CLAY-TAILINGS MISTURE; STIFF-MUD, DEAIRED

Clay No.	UNFIRED CHARACTERISTICS	P.C.E.	FIRED CHARACTERISTICS				REMARKS										
			Cone No.	Fired Shrinkage %	Absorption %	Colour		Hardness									
80A	<u>100% clay #80</u> Calcareous silt, processed stiff-mud, deaired Plasticity - very weak drying shrinkage - 1.4%	Cone 3	02	5.8	4.0	Medium red	very hard	Plasticity too weak for stiff-mud process - produced ragged column - fired briquettes scummed.									
80B	<u>65% clay + 35% tailings #1</u> Processed - stiff-mud, deaired Plasticity - very weak Drying shrinkage - 1.8%	Cone 5	02	7.4	12.2	light reddish brown	hard	Plasticity very slightly improved with tailings. Poor column - not suitable for stiff-mud process.									
PROPERTIES OF CLAY BODY - DRY-PRESSED																	
80C	<u>100% Clay</u> Processed Dry-press Dry strength - very low	Cone 3	02 1	5.2 10.0	11.1 1.4	medium red dark red	fairly hard very hard	Briquettes have low dry strength. Fired properties passable at Cone 02. Fire shrinkage of 10% at cone 1 is very high and undesirable.									
	<table border="1"> <thead> <tr> <th>Cone No.</th> <th>Approx. Temp.</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>2014°F</td> </tr> <tr> <td>1</td> <td>2077°F</td> </tr> <tr> <td>3</td> <td>2106°F</td> </tr> <tr> <td>5</td> <td>2151°F</td> </tr> </tbody> </table>	Cone No.	Approx. Temp.	02	2014°F	1	2077°F	3	2106°F	5	2151°F						
Cone No.	Approx. Temp.																
02	2014°F																
1	2077°F																
3	2106°F																
5	2151°F																



Dry-press specimens made from 100% clay (Body 80C) were very friable with low dry strength. Fired at cone 02 the briquettes were fairly hard and showed moderate shrinkage and absorption. Firing to cone 1 produced favourable properties with the exception of fired shrinkage which increased to 10%. This amount of fire shrinkage is abnormally high and undesirable.

#### SUMMARY & CONCLUSIONS

In seeking to improve the workability of Disraeli clay, with and without the addition of asbestos tailings, experiments were carried out with deairing. Body 80A containing 100% clay and Body 80B comprising 65% clay + 35% tailings were extruded under 27 to 28 inches of vacuum. A third body containing 100% clay was processed by the dry-pressed method.

Test specimens prepared from the respective bodies, on being thoroughly dried, were fired at temperatures indicated and subsequently tested for physical properties.

According to the results obtained the conclusions reached are as follows:

1. The working properties of the clay and of the clay-tailings mixture were not improved sufficiently by deairing to produce a satisfactory column for stiff-mud processing.
2. Since the clay has a rather short firing range, careful temperature control would be required for production of good quality face brick.
3. A 35% addition of asbestos tailings improved working properties slightly, but adversely affected fired properties.



4. Dry-press briquettes made from 100% clay were deficient in dry strength. Another objectionable feature is the abrupt increase in fired shrinkage in the critical maturing range between cone 02 and cone 1.

SM/LED

S. Matthews  
Head  
Ceramic Section