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A REPORT ON DETERMINING THE BOND STRENGTH DEVELOPED BETWEEN GROUT AND THE INNER WALL OF HOLLOW CONCRETE BLOCKS

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State of California
Department of Public Works
Division of Highways
Materials and Research Department

February 4, 1957

Lab. Authorization
63-Q-6083

Mr. E. A. Boyd
State Architect
Division of Architecture
Sacramento, California

Attention: Mr. M. W. Sahlberg

Dear Sir:

Submitted for your consideration is:

A REPORT ON

DETERMINING THE BOND STRENGTH DEVELOPED

BETWEEN GROUT AND THE INNER WALL OF

HOLLOW CONCRETE BLOCKS

Study made by . . . . . Structural Materials Section
Under general direction of . . . . . J. L. Beaton
Work supervised by . . . . . H. F. Kuhlman
Report prepared by . . . . . W. E. Faist and H. F. Kuhlman

Very truly yours,

F. N. Hveem
Materials and Research Engineer

cc: CMHerd
CPeterson
MAEwing
AHBrownfield
EWithycombe

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INTRODUCTION

The purpose of this test is to determine the relative bond strength developed between grout and sandblasted or unsandblasted inner walls of hollow concrete blocks.

The test was requested by Mr. M. W. Sahlberg, Principal Structural Engineer for the Division of Architecture by letter of October 8, 1956.

The masonry blocks were furnished by Mr. M. W. Sahlberg. The blocks were identified as follows:

Group Ident. No.	SIC No.	File Appl. No.	Agg.	Sampled from	Color
A	Z-9676	41-32-14145	Basalite	Brisbane	Dark Pink
B	Z-9677	43-54-13875	"	San Miguel	Light Pink
C	Z-9678	41-22-14122	"	Hawes Park	Tan
D	Z-9679	41-H2-13027	"	Westmoor	Cream
E	Z-9680		Haydite	Person & Wik Yard	Uncolored
F	Z-9681		Basalite	Basalt-Napa	"

PROCEDURE

As outlined by Mr. Sahlberg, it was the intent of this test to duplicate as nearly as possible actual field conditions. So as to accomplish this and at the same time create a specimen that lent itself to a proper testing technique, a special procedure was followed in preparing specimens. The preparation of the masonry blocks for testing consisted of sawing the blocks through the web. The parts sawed off were then sawed into slabs approximately 1/2 in. in thickness. These slabs were fitted into the remaining half of the block; in this manner the slabs produced two sides for the grout that were free and therefore produced no bond on the parent block, but at the same time provided a four sided block as exists in the field. Half of the blocks were sand blasted to remove the glaze, otherwise the same conditions of construction were followed throughout.

The grout was mixed in proportion as specified in the Division of Architecture's specifications. The blocks were not water soaked prior to the placing of the grout. The grout was vibrated during placement.

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The curing of the grout was in air covered by a tarpaulin. The blocks were cured 28 days after which they were sawed into test specimens as shown in Photo 1.

The test specimens were fixed in a special set of clamps and placed in the test machine as shown in Photos 2 and 3.

Load was applied until failure; no increment readings were recorded since all failures, whether in the bond or block, were instantaneous.

Photos 4 and 5 show the types of failures obtained. Left-hand view in both cases indicates the failure in bond of the non-sandblasted surface, whereas the right-hand view shows the failure in bond of the sandblasted surface and also a failure in the block.

TEST RESULTS

The blocks that had been sandblasted showed an average higher bond strength than the blocks that were not sandblasted. About one third of the test specimens failed in bending in the block rather than in bond.

The results of the tests are plotted by groups in Exhibit I and are tabulated on Exhibit II.

Absorption tests on the blocks averaged 12.54%.

Crushing strength of grout ($3\frac{1}{2}$" x 4" x $7\frac{1}{2}$" high specimen removed from test unit) = 3020 psi.

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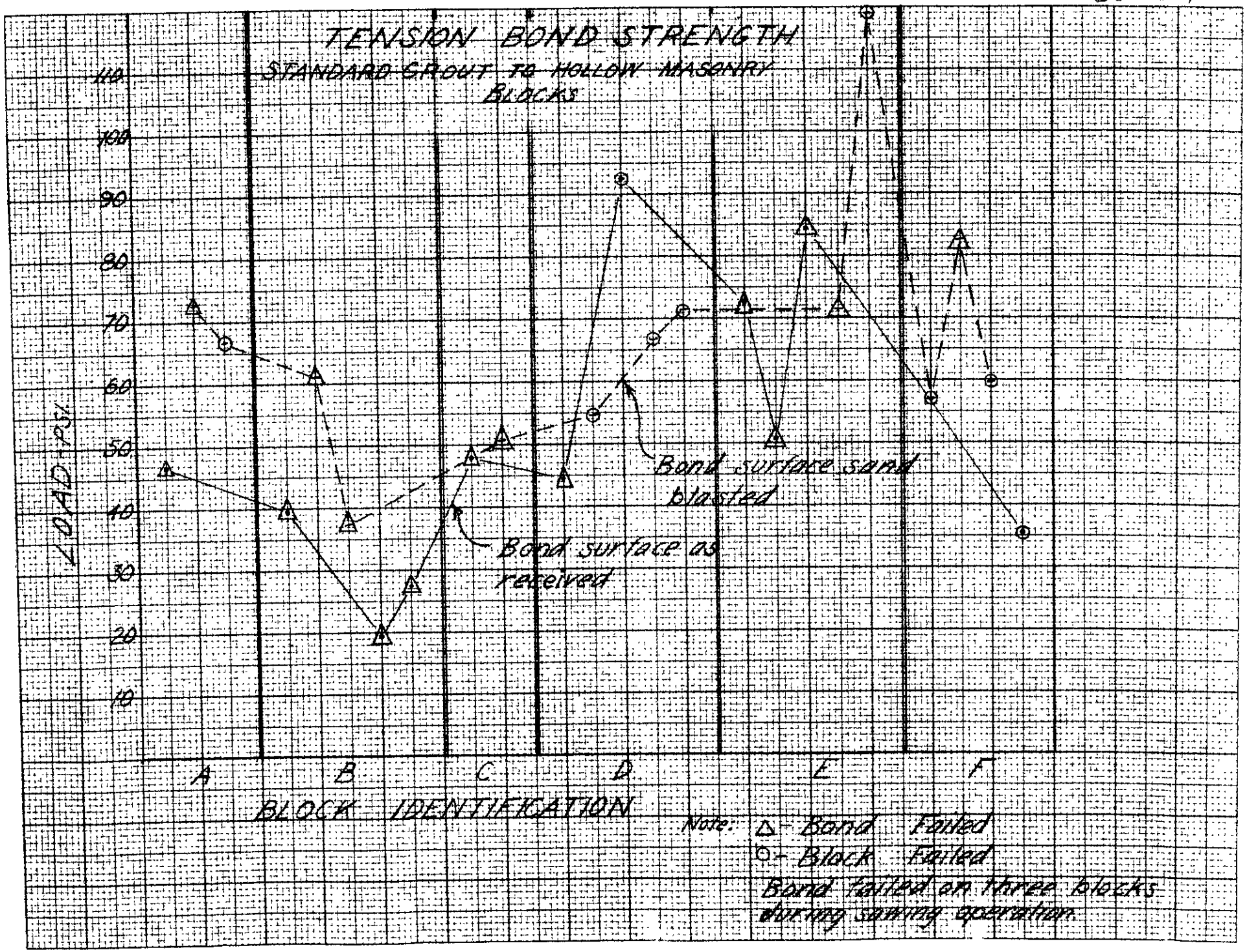

EXHIBIT I

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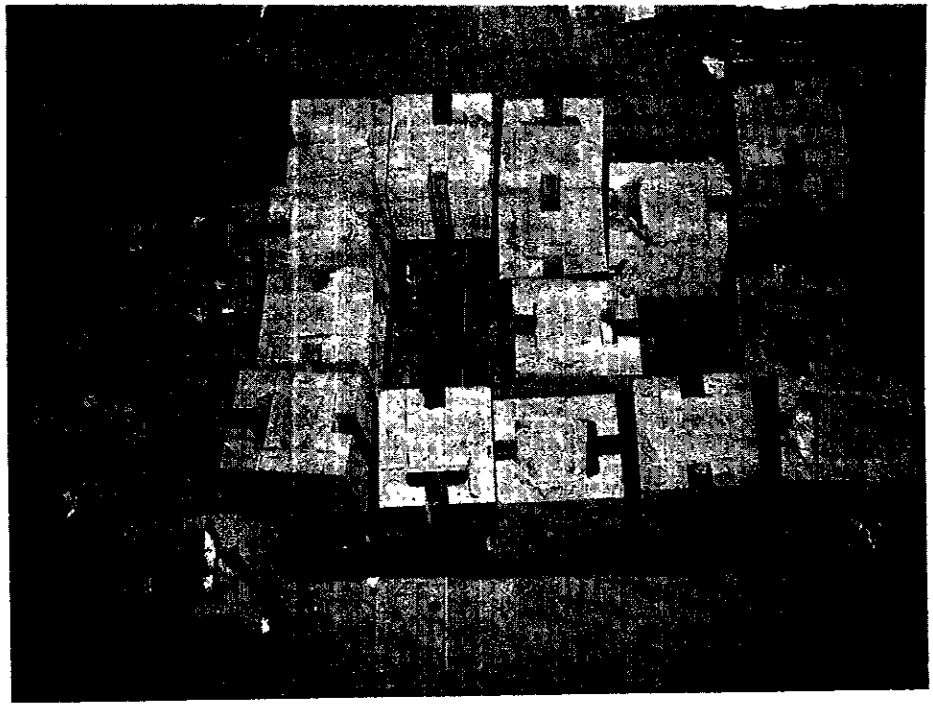
Exhibit II

LOAD AT FAILURE

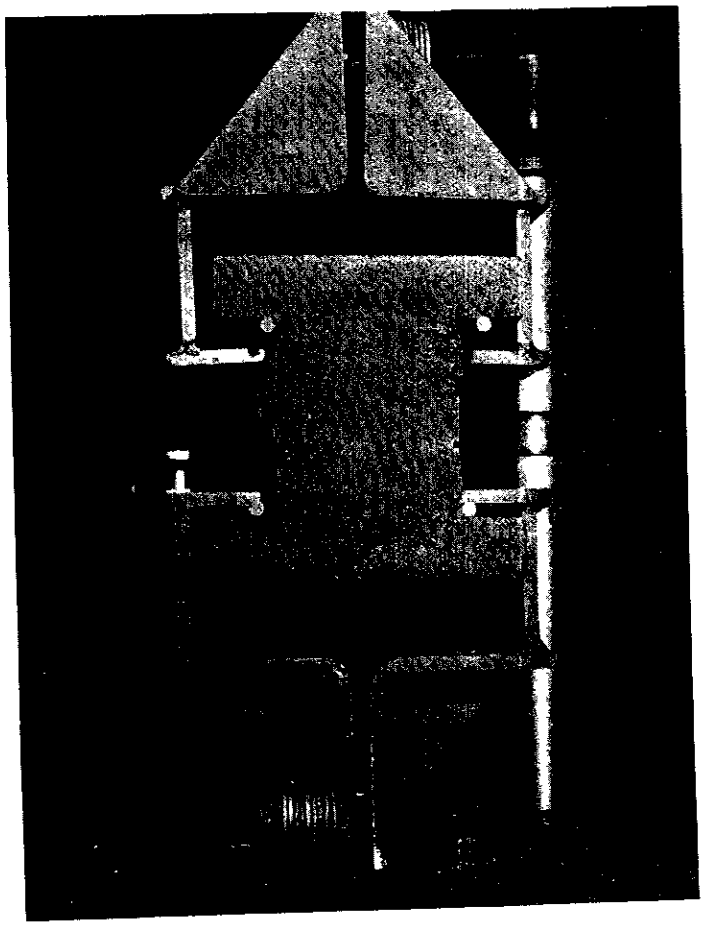
TEST GROUP

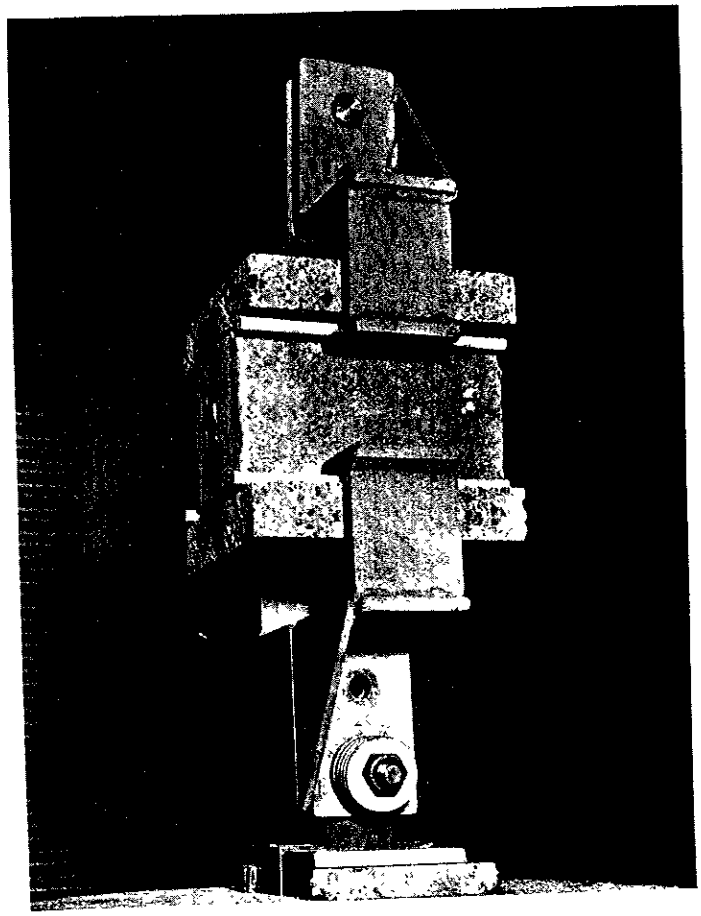
	A		B		C		D		E		F	
	Actual Lbs.	psi	Actual Lbs.	psi	Actual Lbs.	psi	Actual Lbs.	psi	Actual Lbs.	psi	Actual Lbs.	psi
Bond surface as received	1050	46.7	430	39.8	1080	48.0	1020	44.5	1360	72.3	*800	35.1
			210	19.2			*2080	92.3	900	50.8		
			300	27.5					1490	84.2		
Bond surface sandblasted	1630	72.4	650	60.1	1140	50.6	*1250	54.7	1640	71.3	*1300	57.0
	*1500	66.7	400	37.2			*1500	66.8	*2680	119.0	1880	82.5
							*1600	71.1			*1360	59.7

Note: * Failure in block.



#1 General View





#2 & #3 Detail of Clamp Specimen Ready for Testing

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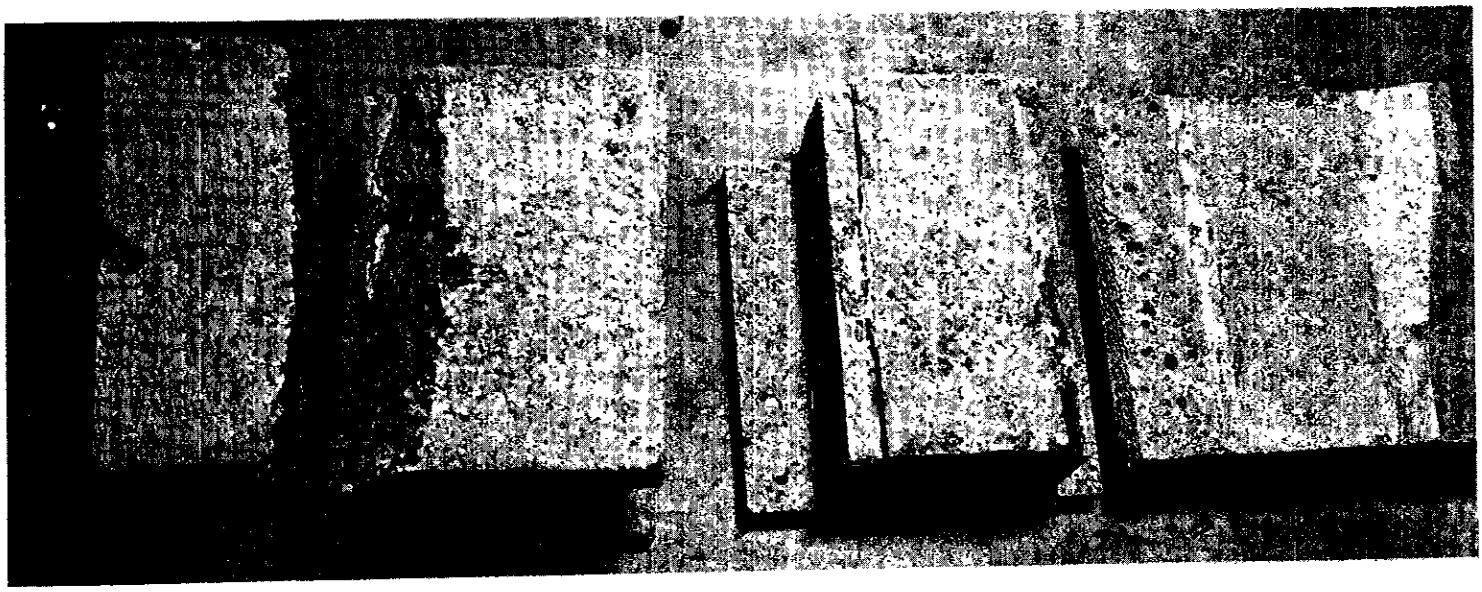
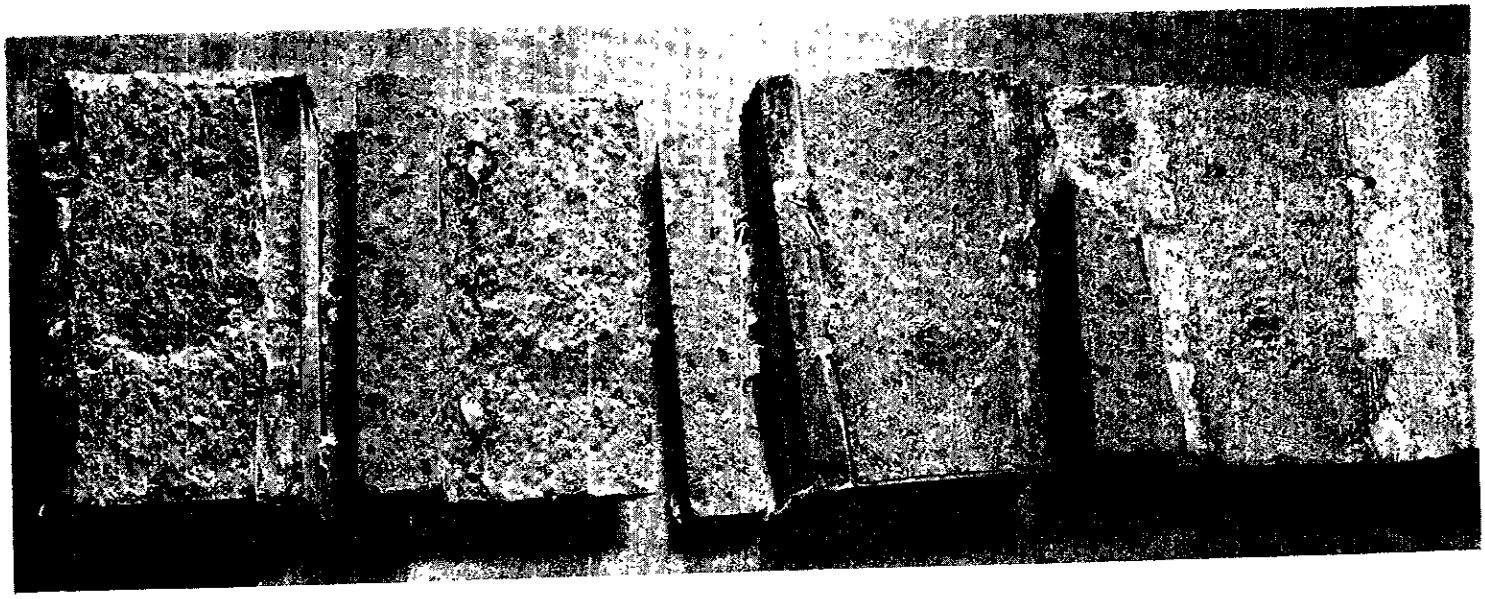


#4 Typical View of Breaks



#5 Typical View of Breaks

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