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EXAMINATION OF NATURAL SAND FROM SPRUCEDALE, ONTARIO

by

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PHYSICAL METALLURGY DIVISION

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SUMMARY

A sample of natural bonded moulding sand from Sprucedale, Ontario, was tested to determine its suitability for foundry use.

The tests, which included the casting of a 3/8 in. plate in grey iron, indicated that the sand could be used for castings that could be made in an Albany No. 0 sand. It gave a rougher casting surface than did Albany No. 0 sand, and had a lower durability.

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(3 tables, 0 illus.)

INTRODUCTION

On June 24, 1958, a sample of natural bonded moulding sand was received from Mr. C. Koynok, of the Typesetting Machinery Company, 81 Peter Street, Toronto 2B, Ontario, for test to determine its suitability for moulding. The accompanying letter stated that the sand, which originated near Sprucedale, in the Parry Sound district, Ontario, has been used successfully to make iron and aluminum castings.

SCREEN DISTRIBUTION

U.S. Screen No.	% Retained
20	0.2
30	0.9
40	1.6
50	5.4
70	9.9
100	14.3
140	11.8
200	10.9
270	8.2
Pan	23.1
A.F.S. Clay	14.0
A.F.S. fineness No.	151

MOULDING PROPERTIES

	Moisture 18.2%	16.6%	14.2%
Permeability	4.4	7.7	11.0
Green Compressive Strength, psi	8.8	8.6	7.2
Green Deformation, in./in.	0.031	0.028	0.025
Green Tensile Strength, oz/sq.in.	4.0	4.0	2.7
Dry Compressive Strength, psi	24	35	23

The sand as received contained 18.2 per cent moisture. The sand felt too dry at 14.2 per cent moisture. The dry compressive strength of the sand is too low for best results.

DURABILITY

Moulding sand loses strength as it is used, because the heat of casting destroys the clay bond by driving off the water of crystallization. Clays differ in their durability, or ability to retain their water of crystallization. A test to estimate the relative durability of the sand was made. The sand was heated for two hours at successively higher temperatures, and retempered and tested between heatings. The test was discontinued at 1200°F, or earlier if the sand was judged unfit for further use. The test was repeated with two samples of Albany No. 0 sand.

Durability Test Results

Temperature °F	Moisture %	Green Compr. Strength, psi	Green Deformation in./in.	Green Tensile Strength, oz./sq.in.	Dry Compr. Strength, psi
Sprucedale Sand (permeability 7.7 at 16.6% moisture)					
Room	16.6	8.6	0.028	4.0	35
400	11.9	6.5	0.019	2.0	8.4
600	12.2	4.4	0.0175	1.1	5.1
Albany No. 0 - A Sample (permeability 5.6 at 11.2% moisture)					
Room	11.2	8.0	0.0275	2.3	23
400	11.2	6.0	0.0245	2.0	50
600	10.2	5.2	0.0235	1.3	33
800	9.4	4.4	0.021	1.1	30
1000	9.4	4.0	0.021	0.5	24
Albany No. 0 - B Sample (permeability 7.0 at 8.6% moisture)					
Room	8.6	16.6	0.0345	25.4	260
400	8.8	13.5	0.0315	14.0	254
600	8.7	13.7	0.0305	12.8	175
800	8.8	10.8	0.033	11.6	251
1000	8.8	9.0	0.031	5.8	165
1200	8.5	5.4	0.0325	3.8	68

The Sprucedale sand was not usable after having been heated to 600°F, because of the combination of low green tensile and dry compressive strengths. However, the low dry compressive strength of the sand heated to 400°F would cause trouble from cutting.

The A sample of Albany sand was unfit for use after having been heated to 1000°F, because of the low green tensile strength. The B sample of Albany No. 0 could have been used after it was heated for two hours at 1200°F.

CASTING TEST

The sample of sand was too small to permit a comprehensive foundry test. However, it was used as a facing to make a mould for a 3/8 in. plate. This was poured in grey iron at 2650°F. Similar castings were made with the samples of Albany sand.

In this test the A sample of Albany No. 0 was the best to mould, in that the gates and sprue were easier to cut than were those for the other two sands. The Sprucedale sand fell between the other two sands in this respect.

The surface of the casting from the Sprucedale sand had a rougher finish than those from the Albany No. 0 A (best) and B samples.

DISCUSSION

These tests should not be taken as an absolute indication of the way the sands would perform in practice. Foundries re-use their sands many times, and the properties change with use. The B sample of Albany O would show up better in use than it did in this test, because the sand became smoother when it was partly burnt out.

The durability of the Sprucedale sand is lower than that of the Albany sand, especially in dry compressive strength. This would cause the sand to cut after it had been used. Its high moisture requirement for initial use would tend to overcome this cutting to some extent, by protecting the sand from the heat.

The importance of the durability factor will depend upon the size of the castings and the pouring temperature. Probably for aluminum, which has a low pouring temperature, the durability would be satisfactory. The low durability would probably be very noticeable with iron, and to a somewhat lesser extent with bronze.

CONCLUSIONS

1. The sample of sand from Sprucedale, Ontario, can be used for aluminum, bronze or iron castings. The low permeability would limit its use to castings which can be made in Albany No. O sands.

2. The durability of the Sprucedale sample is lower than that of the Albany sands.
3. The Sprucedale sand produces rougher surface finish than does the Albany No. 0 sand.

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