Received 12-1

HMM	MCH	RKF
JA	JLH	ALR
WEB	CWM	MPR
VG	MAP	GEL
LRH	MRC	RRR
RHB	TJQ	HAH
JCR	GEC	AL
AR	JHM	
JEM	JJM	

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Ref by Bart, for mailing

INTER-OFFICE CORRESPONDENCE

E. J. LAVINO AND COMPANY
DIVISION OF INTERNATIONAL MINERALS & CHEMICAL CORPORATION

TO Report of Call

November 29, 1967

151-Armco

FROM S. W. McCormick

SUBJECT VISIT BY D. J. MURPHY AND S. W. MC CORMICK NOV. 7 & 8, 1967
ARMCO STEEL CORPORATION - MIDDLETOWN, OHIO

Distribution - B. S. Tucker, H. Mitchell, Jr., H. M. Mikami, M. Harnish, V. Gilbert, H. N. Hall, J. N. Herbst, H. A. Marsh, D. J. Murphy, Jr., J. H. Dickson, S. W. McCormick

PLAINTIFF'S EXHIBIT ICM-5

This was the first joint call made to Armco per B. S. Tucker's letter of September 29, 1967. The following Armco personnel were contacted:

C. Knepshield, Senior Buyer
Ted Karchner, Pur. Agent
John Rosenberger, Supt. No. 2 O. H.
Carl Schupert, Masonry Supt.
Chuck Staley, Asst. Plant Supt.
Mac Sample, B.O.F. Supt.
Fred Baines, Masonry Foreman
Art Barker, Masonry Clerk, No. 2 O. H.
Lou Yoder, Ass't. Masonry Supt.
Bruce Baker, Research Engineer

The discussion with purchasing and the operators were mainly on (1) our charges for establishing a warehouse in Houston, (2) Ferrobond 60 with guaranteed hot MOR for roofs, (3) end wall construction practices, (4) port roofs, (5) K-N for door linings, (6) Lofero 90 replacing Lavino Magnesite, and (7) a review of Lavino's Research Department's Report No. 804-5/67-C-1 which related to our laboratory tests on cored and non-cored "LA-1202". The original laboratory progress report was not shown Armco. Instead a special report based on the laboratory results, but with certain modifications, was prepared and used. Salient points of the discussion with Baker were (1) presentation of the coring report which was described and discussed in detail, (2) review of Lavino samples supplied to Armco, Middletown, (3) advised that Lofero 90 is replacing Lavino Magnesite, (4) advised that new physical property data sheets will be issued shortly, and (5) had an extended review of the desired micro-structural features of direct-bonded basic brick.

Desired "LA-1202" Micro-Structure

Bruce elaborated on what he believes is the desired micro-structure of the refractory which will be the successor to direct-bonded basic. He believes the succeeding refractory will be made

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from pre-reacted periclase and chromite grains. Bruce cited H. Mikami's U. S. Patent 3,321,322, the paper "Microstructure of Chromite-Periclase at 1650 to 2310°C" published in 1964 by our R & D, and Union Carbide's U. S. Patent 3,328,183 as being excellent examples of progress in the proper technical direction. The desired end product would have a micro-structure similar to the one shown in Figure 4 of the reference paper where the chromite grains were completely destroyed by firing to 2200°C (3992°F.) with the chromite redistributing itself as exsolution intergrowths in a periclase matrix. Bruce is familiar with all details of the mentioned references and believes Lavino has started an investigation that should be pursued for commercial feasibility. He believes one way to achieve this desirable microstructure is to pre-react chrome ore and periclase grains in a shaft kiln at very high temperatures, and after making the brick, to burn it at a somewhat lower temperature.

A very significant point is that an American supplier (refractory, I presume) has, within the year, shown Schroth and Baker such a product. (He thought it was actually last January.) Armco has not measured the physical properties of a brick of this type (it was not clear why not), but evidentally the supplier informs them that the 2300°F modulus of rupture is in excess of 3000 psi! Bruce did report Armco has determined the following:

PRODUCT	HOT MODULUS OF RUPTURE	
	2300°F	2700°F
Kaiser's Coelex 80	3000 psi	1300 psi
"LA-1204"	2760	447
General's Simultan Sinter (old 5x25)	2600*	>1000

* Our laboratory value for 2300°F MOR is 1200 psi.

Interestingly, Baker recommended the Simultan Sinter NOT be used for O. H. roofs. Also, he noted that the microstructure of Kaiser's Coelex-80 approaches, or somewhat resembles, the microstructure of chrome-periclase brick shown in the previously mentioned Fig. 4. Thus, one and possibly two suppliers are working in this direction.

Cored "LA-1202"

Baker was somewhat stoic as he listened to the review of the report on coring. He noted that he never saw coring on competitive direct-bonded brick, NOR HAD HE FOUND IT IN "LA-1204", and "just couldn't believe this had been occuring all along". He believes that even the most non-observing technician would undoubtedly have noticed the coring. Also, Bruce gave us a photo-micrograph of an interior section (not the surface) of a cored portion of an "LA-1202" brick. In the photo-micrograph (probably 100X) small, bright dots

TAB: E

E.J. LAVINO & CO. INTEROFFICE CORRESPONDENCE, DATED NOVEMBER 29, 1967, PRODUCED IN RESPONSE TO INTERROGATORY NO. 9 AND REQUEST FOR PRODUCTION NO. 26.