

Waukegan IID
September 26, 1966

E. C. Lindstrom - DEQ

**TRIP REPORT - SHARRON STEEL CORPORATION
SUPEREX FURNACE BLOCKS**

On 9-22, I met A. Rainker, District Sales Manager, Pittsburgh District, E. Bland, Salesman, Cleveland area, and S. E. Woolley, Research. Together we traveled to the Sharron Steel Corp. mill at Farrell, Pennsylvania. Lee Wilson Engineering Company, Inc. is installing rectangular-shaped steel annealing furnaces of a new design in a new portion of the Sharron Steel Corp. plant. A total of sixteen furnaces are being built at this time. JM order CI-8210, parts 1 through 8 calling for various sizes of Superex furnace blocks cut to specified rectangular dimensions, were required for this job. These shipments were made in eight parts starting with March 30th and ending with June 9, 1966. Approximately \$30,000 worth of Superex is involved in the total shipments.

This new type Lee Wilson furnace is approximately ten feet high, fourteen feet wide, and fourteen feet deep. The entire front wall is a door which can be raised overhead vertically. The walls are covered with 12" by 18" Superex furnace blocks 4-1/2" in thickness. The ceiling is insulated with two layers of 12" by 12" Superex furnace blocks each 2" in thickness. The side wall blocks are retained by means of a stainless steel pin over which is driven a stainless steel disc approximately 2" diameter which serves to keep the blocks from falling out. The overhead blocks rest on square pieces of steel which are approximately 4" square that support each block at the corners. Therefore, these ceiling blocks are laid-in as a suspended ceiling tile would be. Three furnaces had been dried out and heated to the test temperature prior to our visit. The one furnace which was in operation on this day had gone through approximately six production cycles of actually annealing steel in roll form after its original drying out and test sequence. This furnace, it was reported, had been dried at 400°F for a total of 24 hours by bringing the temperature up to 400°F, running it for eight hours then shutting the heat off over night. The following morning the temperature was brought up to 400°F for the eight-hour period and then shut off. The same procedure was repeated on the third day to make up the 24-hour period at this temperature. At this time, no problems were observed with the Superex lining. Subsequently, this furnace had its temperature increased at approximately 100°F every two hours until the temperature was approximately 1000°F at which time the reducing atmosphere containing approximately 7% hydrogen, and with the remaining nitrogen at a +40 dew point was added into the furnace. Using this reducing atmospheric condition, the temperature was subsequently brought up to 1500°F before being shut down. After this period of firing, the innerface of every side wall block and every ceiling block showed cracks which are in a somewhat random pattern going both horizontally and vertically, forming approximate rectangles of 3" by 4" or thereabouts. The cracks in this furnace are less severe than those in the other two furnaces which we observed. The other two furnaces, however, differed slightly in their initial heating cycles in that the reducing atmosphere was injected at room temperature and retained in the furnace during the entire heating cycles as described previously.

The cracks observed in the faces of these blocks range from hairline to approximately 1/16" opening. The depth of these fractures varies from about 1/8" to 1" into the block. The surface color of the block ranged from light to dark gray. This variation in color may be due to the variation in the amount of silicate which had been absorbed into the surface during the silicating treatment at the plant.

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We met Mr. Bob Hill, Chief Engineer, Lee Wilson Engineering Co., and Mr. Bob Andrews, Lee Wilson Purchasing Agent. Mr. Hill advised us that Lee Wilson wanted JH's recommendation as to how the next furnace should be heated in order to eliminate the cracking which was observed in the Superex. There are at present, five more furnaces ready to be fired up, one of which must be heated starting 9-26 at the latest. All of these five furnaces are required, by Sharron Steel Corp., to be completed by October 1. Mr. Hill also advised us that Lee Wilson had used this same type reducing atmosphere previously in different styled furnaces which used JM Superex furnace blocks with silicated surfaces as lining material without having this type damage occur to the insulation. However, Lee Wilson had never before constructed furnaces which had exposed flat surfaces of individual Superex blocks as large as these side wall blocks in this furnace.

Since the product was produced over several months period from many batches and since the same type product has been used for several years by Lee Wilson for insulating other style furnaces without any problems, it would appear as if the cause of the damage to the lining had to occur from some other exterior action. This could possibly be a factor of the method of heating up the furnace, it could possibly be a factor of the reduction atmosphere, or it could be some other unknown feature at this time.

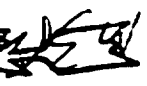
A check of the physical test data at the plant covering the period from 3-4-66 through 6-9-66 indicates nothing which is out of line for Superex furnace block requirements. Shrinkage varied from 1.2 to 1.6%. Density ranged from 21.9 to 24.8 lbs. per cubic foot and percent MBC varied from 1.8 to 8.3. One of the damaged blocks which was removed from a furnace has already been sent to the Waukegan plant. Two additional blocks removed from this same furnace, as well as one piece of a Superex block which had not been installed in the new furnace, were obtained at the job site and will be sent to S. Wooley at Research. In Addition, S. Wooley obtained scrapplings from the surface of the dark colored end of the light colored blocks for spectrographic analysis.

It was agreed that S. Wooley would discuss this situation with various people at the Research Center on 9-23 and advise A. Reinker of any possible suggestions which could be passed on to Mr. Hill at Lee Wilson. While there are many tests which can be performed to see if we could duplicate the conditions that we observed, these tests would take a considerable period of time and could not possibly provide Lee Wilson the answer that they desire for Monday, September 26th.

I have never before observed any cracking of this nature in Superex furnace blocks and, as stated above, all who visited the site could only theorize on possible conditions which may have caused or contributed to the cracking in the Superex furnace blocks which we observed.


C. H. JENDEN

CHJ:jma

cc: A. Reinker - Pittsburg
S. Wooley - Research 
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