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PROJECT NO. 5AG01

FIRE RESISTANT PLASTER AND KILNOISE

REFORMULATION OF KILNOISE

Research Report

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Research Center
Easton, Pa.
May 11, 1973

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INTRODUCTION:

1. The original formula for Kilnoise in acoustical plaster contained 10% chrysotile asbestos.

2. The original formulation had to be changed because

   a. New applications were developed requiring direct application to monolithic concrete.

   b. OSHA regulations prohibited the use of asbestos.

   c. The original formulation did not attain an NRC of 0.50, the minimum requirement, under the new conditions.

Therefore, a research project was initiated in the summer of 1972, with the following goals:

1. Attain an NRC of 0.5.

2. Formulate out the asbestos.

3. Retain as many of the desirable physical properties of the original formula as possible, such as pumpability, whiteness, strength, etc. In order to comply with the OSHA regulations, completion of the project was required by December 31, 1972.

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SUMMARY:

1. An on-site inspection of the Toronto subway tunnel job was carried out.

2. Over 50 formulas were tried on a bench scale in the Easton research lab.

3. Five of the most promising candidates were made up as 500-pound batches at Gibsonburg. These formulas were sprayed and dried at Gibsonburg. Acoustical testing was done at Geiger & Hamme in Ann Arbor, Michigan. All parameters were successfully met except the NRC, which did not achieve the 0.5 minimum required.

4. Some of the formulas in the original series were unperforated and these were perforated after drying and testing in an attempt to raise the NRC to 0.5. This did not achieve the desired results.

5. Five new formulas were mixed at Gibsonburg, sprayed and dried at Donelco, Toronto, Canada, and tested acoustically at Geiger & Hamme in Ann Arbor, Michigan, in December of 1972.

   Two of these formulas achieved the desired NRC of 0.5 and retained enough of the other desirable physical properties of the original formulation to be a viable product.

6. Production of the new formula commenced in January, 1973.

7. All of the original project goals having been met, the project was considered complete and no further work was done.

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CONCLUSIONS:

1. Kilnoise can be formulated without asbestos and achieve an NRC of 0.5.

2. The successful Kilnoise formula contains 20% rockwool, 2% DUPONOL X4 (a foaming agent), and the remainder, type S lime.

3. Basic physical parameters for asbestos-free Kilnoise remain approximately the same as with the original formula.

4. Production costs of the new formula are not significantly different from the original formula.

5. Perforation is still required to attain an NRC of 0.5.

6. Acoustical test results are appended to this report.

7. Laboratory scale experiments and results were not applicable to field conditions and vice versa. Only direction in the broadest sense could be extracted from the lab testing. A reliable and practical lab scale test should be developed.

RECOMMENDATIONS:

1. Additional formulation work should be carried out in an effort to improve the NRC and eliminate the necessity for nail perforating.

2. Due to inconsistencies and poor performance of suppliers of rockwool, a reliable source of this basic raw material should be sought.

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EXPERIMENTAL:

Samples were weighed up on a top-loading balance, dry blended in a paper bag and wet mixed in a small Hobart mixer for 10 minutes. The resulting mixtures were then placed in preparation dishes 4 cm high by 8 cm diameter and allowed to dry at ambient temperature. When dry, the sample was assessed by touch for hardness and visually for foam or bubble formation. The most likely candidates were given field tests made from plant size batches mixed on the equipment at Gibsonburg and sprayed on test panels either at Gibsonburg or Toronto, Canada. The wet mixing and spraying equipment was of commercial size in either case.

The formulations which were field tested are as listed below:

1. Code 110K and Code KX-210A - 10% rockwool, 88% type "S" lime and 2% DUPONOL K-4 foaming agent.

2. Code 130KG - 30% rockwool, 66% type "S" lime, 2% DUPONOL K-4 and 2% type "G" sodium silicate, (added as a hardening agent).

3. Code 140KG - 40% rockwool, 56% type "S" lime, 2% DUPONOL K-4 and 2% type "G" sodium silicate.

4. Code 150KG - 50% rockwool, 46% type "S" lime, 2% DUPONOL K-4 and 2% type "G" sodium silicate.

5. Code KX-220A - 20% rockwool, 78% type "S" lime and 2% DUPONOL K-4.

6. Code KX-220AKS - 20% rockwool, 75% type "S" lime and 5% DUPONOL K-4.

7. Code KX-230AKS - 30% rockwool, 65% type "S" lime and 5% DUPONOL K-4.

In the first field trial, 5 samples were mixed at Gibsonburg but only 4 were tested acoustically at Geiger & Hamme because vandals broke into the warehouse where the sprayed panels were drying and completely ruined one set. The 4 that were tested were Nos. 110K, 130KG, 140KG, and 150KG. None of these were originally nail

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perforated. The results of these tests are attached to the end of this report. Samples 130KG and 140KG were nail perforated after having been fully set in an effort to determine if nail perforation would provide the necessary acoustical adsorption. Although a rise of .10 NRC units was obtained in each case, the increase was still insufficient to yield an NRC of 0.50 which was our goal.

In the third round of testing, 5 sets of panels were sprayed at Donalco in Toronto, Canada. These were Codes No. 130K, 210K, 220A, 220AK5 and 230AK. The wet mixing and spraying went without incident but the temperature in the warehouse was set up too high and the panels dried out too quickly. All but one of these panels were to be perforated (No. 220AK5 was tested unperforated), and the faster than anticipated drying (less than 18 hours), made perforation less than optimally effective in addition to causing cracking and shrinking problems. Two of these formulas attained the goal NRC of 0.50. They were Nos. 130K and 220A. The acoustical test results are also attached to the end of this report.

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Harold Stanley

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Attachments

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