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RESEARCH DIVISION



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CONSOLIDATED MONTHLY REPORT

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MONTHLY REPORT FOR SEPTEMBER 1973

CONSOLIDATED EDITION

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at the Washington Research Center:

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MONO-KOTE PRODUCT IMPROVEMENT (Project 2659)

Shrinkage and cracking of Mono-Kote have been serious field problems remedied only by removal and replacement. Means of circumvention have been found by CPD as follows:

1. Avoid vermiculite fines.
2. Use No. 3 and avoid No. 4 vermiculite.
3. Use higher gypsum ratio.
4. Use Libby in preference to Kearney Vermiculite.
5. Minimum handling to avoid attrition which, of course, gives fines.
6. Add fiberglass (MK-V).

Our role in this program has been to determine the fundamental properties of Mono-Kote components (gypsum plaster or ZOU and vermiculite) and their interaction in Mono-Kote mortars as related to shrink-crack.

The WRC experimental program agreed upon with CPD has been terminated. A final report is being prepared. Following is a summary of findings:

I. ZOU ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ + additives)

1. Three samples - National Gypsum ZOU + water (neat paste) did not crack when cured at 75% R.H. and 75°F.
2. Two samples - U.S. Gypsum ZOU (neat paste) cracked at same condition as (1).

II. ZOU/Vermiculite Mortars (i.e. plus water)

1. Shrink-cracking of MK-IV is inversely proportional to flexural strength of mortars.
2. Average flexural strength of Kearney Vermiculite mortar is greater than Libby.
3. Over-watering gives cracking. Each Mono-Kote with specific vermiculite has an optimum water ratio which when exceeded causes cracking.

4. Water demand of attrited vermiculite mortars is lower than usual, leading to over-watering (and cracking).

III. Vermiculite

1. Libby Vermiculite $1\frac{1}{2}$ to 4 times more attrition resistant compared to Kearney.
2. Little difference in shrinkage of various vermiculites when wetted and dried.
3. Libby No. 3 Vermiculite retains approximately 25% more water than Kearney No. 3. Conclusion - Kearney mix likely to be over-watered at regular water ratio.

(Kraus, Legal)

IMPROVED VERMICULITE EXPANSION (Project 2682)

The objective of this project is improving the yield of vermiculite by chemical treatment of the ore. Work at both WRC and Enoree, South Carolina has shown that Allen ore can be upgraded to expand in a manner similar to the standard Waldrep ore by treatment with 20% diammonium phosphate (DAP) solution. Attempts have been made to reduce raw material costs. It has shown that a 5 $\frac{1}{2}$ % DAP solution plus a surfactant will give substantially equivalent results as the 20% solution. The amount of DAP left as a residue on the vermiculite has been reduced by about 25%.

DAP treatment of Virginia Vermiculite ore has shown that two out of three samples were improved by 5-10%. The third showed a negative effect which is puzzling. Further work is required to resolve this.

A few exploratory tests were made to determine the properties of the Allen chemically treated vermiculite in ZIC and Mono-Kote. The moisture-retention properties of the treated vermiculite are substantially different from the regular Waldrep type. It is not known whether or not this is due to the basic differences in the properties of the Allen vermiculite itself or to the treatment. This will be resolved. The properties of the ZIC and Mono-Kote were substantially the same as normal after the amount of water used in their composition was reduced. A comprehensive RPA is being prepared to cover full development of this process.

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