CROSS REFERENCE:
Emulsion Paints
Protein Free Emulsion Paints
Speed Easy
Explosives - CMC

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MEMORANDUM REPORT NO. M-209

IMPROVED WATER RESISTANCE OF EMULSION PAINT FILMS INCORPORATING CROSS LINKING AGENTS AND COLLOIDAL ALUMINA

Experiments have been completed evaluating (1) Aerotex 605 (American Cyanamid) as a crosslinking agent for CMC in a protein free emulsion paint and (2) colloidal alumina as an auxiliary film former in the present Wesco Speed Easy formula.

Conclusions:

The incorporation of Aerotex 605 produces no improvement in the wet erosion resistance of the protein free formula. The wet erosion resistance of the present Wesco Speed Easy formula can be improved by a factor of 5 times by incorporating colloidal alumina sol into the paste.

Description and Evaluation of Aerotex 605

Two basic protein free formulas were made up, one with methyl cellulose as the water phase colloid, the other with carboxy methyl cellulose as the water phase colloid. The test paints were modifications of the above, wherein 5 and 10% of the colloids were replaced by an equal weight of Aerotex 605 (solids basis). (Note: Aerotex 605 is a water soluble melamine formaldehyde resin obtained from the American Cyanamid Company.)

After 7 days air dry the paints were tested in the Gardner M-105 Washability Machine with the following results:

Code	Colloid	% Colloid Replaced by Aerotex 605	Strokes before failure
P-385-P-94196	Methyl Cell.	-	46
P-385-P-94197	" "	5	31
P-385-P-94198	" "	10	14
P-385-P-94199	CMC	-	8
P-385-R-26000	"	5	6
P-385-R-26001	"	10	9

All of these paints brushed poorly due to rapid set up. There was some evidence that Aerotex 605 in the MC formula does permit longer lapping time.

Evaluation of Colloidal Alumina:

Amounts of the colloidal alumina aqueous sol were incorporated into the Wesco Speed Easy paste as per the table below. After seven days air dry the paints were tested in the Gardner M-105 Washability Machine with the following results:

Code	% of Solid Al_2O_3* Present Based on Solid Protein	Strokes before failure
385-100 (B-30755)	--	8
P-385-R-26002	41%	57
P-385-R-26003	20.5%	51
P-385-R-26004	10.25%	54

* Introduced as a 6.2% Al_2O_3 solution.

Small scale brushing tests indicated that increasing amounts of Al_2O_3 resulted in progressively poorer brushing characteristics.

It was noted that the colloidal alumina did not produce a bodying effect in the paint as was the case with colloidal silica. (See FFD 1502 and 1502).

Apparently the colloidal alumina functions similarly to other inorganic film forming materials which we have previously investigated such as colloidal silica and aluminum acetate.

Recommendations:

(1) Aerotex 605: It is doubtful if any improvement that would result in a protein free formula from the use of a crosslinking agent such as Aerotex 605 would warrant any further expenditure of research time. However, it should be classified with other materials such as ammonium alginate and carboxy methyl cellulose which we have used to improve lapping time in emulsion paints.

(2) Colloidal Alumina: If additional parts are approved for the fundamental Speed Easy project, colloidal alumina should be considered for further evaluation on the basis of the improved water resistance resulting from its use. It would be preferable to colloidal silica in a protein containing paint because a bonding agent need not be present to prevent bodying.

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References:

Aerotex 605 - Letter - Dorman McBurney to J. W. Iliff, dated 10/31/47

Colloidal Alumina - Letter - H. M. Stark to Stuart Graves, dated 10/22/47

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