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COMPARATIVE PERFORMANCE PROPERTIES OF VINYL ASBESTOS TILE MADE WITH UCC SG-100 AND "CAREY" 7TS3 ASBESTOS

for

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INTRODUCTION

Performance properties of UCC SG-100 asbestos have been compared with those of "Carey" 7TS3 in a low binder level vinyl asbestos tile composition. The "Carey" 7TS3 asbestos has been used at a level of 12% of the total batch while SG-100 has been formulated at 8.8 and 9.[illegible]%. Binder level for all compositions has been maintained at 19.5% in accordance with this customer's current formulation objectives. The lower levels of SG-100 evaluated reflect the superior reinforcing value of this fiber and are consistent with proven commercial practice.

As per the advice of Flintkote, critical performance properties receiving special attention in this study include: "fiber value retention" of Banbury mixed tile compositions, fiber binder level requirements, tile hot strength and water sensitivity. Comparative formulation costs are also provided.

DISCUSSION

J. A. Sweeney of the Los Angeles plant recently reported that VA tile formulations were being revised in order to replace the old standard Hills asbestos with "Carey" 7TS3 fiber. It was suggested that UCC SG-100 CALIDRIA Asbestos be considered as an alternate for the "Carey" fiber. Because of the concerns expressed by the Flintkote Company, the following tile properties were evaluated as a function of SG-100: fiber value retention during Banbury mixing, processing hot strength, fiber binder requirements and tile water sensitivity.

It was also learned that the newly revised formulations will be maintained at 19 1/2% binder and 12% asbestos. Using these formulation constraints, tile performance data have been generated and reported for SG-100 and "Carey" 7TS3 formulations. These formulations, as well as the old Hills asbestos standard proprietary formulation, are detailed in Table I. Table II lists the performance data developed for these tile compositions. Tile processing conditions are shown in the Appendix.

RESULTS

Comparative impact resistance, hot tensile strength, accelerated oven shrinkage and Brabender equilibrium torque values shown in Table II indicate that SG-100 fibers do not degrade and lose their reinforcing value when Banbury processed. This confirms reports based upon many years of commercial tile usage. The lightness and the tinctorial potential of all fibers investigated are approximately equivalent based upon the measured Y_{ICI} brightness readings determined for corresponding tile samples. Except for the Hills asbestos containing formulations, the hot tensile strengths of these compositions are roughly equivalent. The superior hot tensile strength of the latter is expected since it contains not only 12% asbestos but, in addition, is reinforced with 9% talc plus 1.6% added binder.

Brabender equilibrium torque values of SG-100 containing stocks are slightly lower than those determined for the "Carey" 7TS3 counterparts. However, since they contain approximately 75% and 81% of the asbestos formulated in the "Carey" counterparts, these small differences again reflect the effective reinforcing value of the SG-100 fiber.

The 3 day water expansion data listed in Table II represent average values and ranges determined at two reference points using two specimens of each formulation. Within the precision limits of the test method, all formulations except possibly compound # 62A show approximately equivalent expansions and are generally within acceptable limits. Although the average expansion value of compound # 62A is higher than the other tile formulations tested, its magnitude is considered acceptable and lower than most commercial tiles tested similarly.

Due to its lower delivered cost and reduced required usage level, SG-100 affords a significant raw material savings. For example, comparative costs provide in Table I result in the following potential savings:

Formulation:	"Carey" 57B	SG-100 56D Bags	SG-100 56D Bulk	Hills Asbestos 70B
Cost, $/lb.*	.0705	0.0673	0.0668	.0781
Savings, $/lb. vs. "Carey"	-	0.0032	0.0037	-
Savings, $/lb. vs. Hills	.0076	0.0108	0.0113	-

*Pound cost used rather than square foot cost due to specific gravity discrepancies caused by unavoidable occluded air in prepared laboratory tiles.

CONCLUSIONS

1. Banbury processing of tile formulations made with SG-100 asbestos has been shown not to degrade this fiber. This is consistent with commercial tile production experience.

2. SG-100 fiber used at appropriate levels produces tile having hot tensile strengths equivalent to those determined for "Carey" asbestos containing tile.

3. When properly adjusted for its fiber value, SG-100 formulated tile has binder requirements equivalent to "Carey" 7TS3.

4. The water sensitivity of tile made with SG-100 fiber is about equivalent to that determined for its "Carey" asbestos counterpart. This is particularly true at the low levels of asbestos used in this evaluation.

5. Adoption of SG-100 asbestos as a replacement for "Carey" 7TS3 fiber has been shown to effect substantial savings in formulation costs.

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TABLE I

FORMULATIONS AND COSTS

Notebook 1555

Formulation, %	"Carey" Asbestos		SG-100		Hills Asbestos
Page	57A	57B	56D	62A	70B
JM 7R	-	-	-	-	11.92
"Carey" 7TS3	11.97	11.97	-	-	-
SG-100	-	-	8.77	9.65	-
40 Mesh Limestone	67.34	67.34	70.54	69.66	56.88
Mistron Talc	-	-	-	-	9.04
VSJD	11.28	11.39	11.60	11.60	12.49
"Amoco" 18-240	2.99	2.99	2.99	2.99	3.21
DOP	3.94	3.83	3.62	3.62	3.88
EPO	.37	.37	.37	.37	.40
Petroleum Wax	.22	.22	.22	.22	.24
Stearic Acid	.23	.23	.23	.23	.23
"Mark" 140	.66	.66	.66	.66	.71
TiO_2	1.00	1.00	1.00	1.00	1.00
Total	100.0	100.0	100.0	100.0	100.0
% Binder	19.5	19.5	19.5	19.5	21.
% Asbestos	12	12	8.77	9.65	11.92
$/lb.	.0705(1)	.0705(1)	.0673(2) .0668(3)	.0675(2) .0670(3)	.0781
Determined Sp. Gr.	2.0415	2.0415	2.0340	2.0535	2.012
$/ft.² @ 1/16"	.0468(1)	.0468(1)	.0445(2) .0442(3)	.0451(2) .0447(3)	.0511

Note:

(1) "Carey" delivered in bags $ 112/ton
(2) SG-100 delivered in bags $ 74/ton
(3) SG-100 delivered in bulk $ 64/ton

.0467
.0445
.0023

TABLE II

TILE PHYSICAL PROPERTIES

Notebook 1555

Formulation	"Carey" 7TS3		SG-100		Simulated Hills Asbestos
Page	57A	57B	56D	62A	70B
1 Min. McBurney	10.3	9.4	9.0	8.1	8.0
Average No. Impacts	1.6	1.6	1.3	1.6	0.7
Y_{ICI}	46.3	47.5	47.5	47.3	47.1
1/2 hr. Oven Shrink, 180°F (1)	17.7	16.0	27.5	17.5	14.5
22 hr. Oven Shrink, 180°F (1)	24.7	23.2	35.2	26.5	28.7
Tensile Strength, psi, 180°F	21.7	24.7	19.0	22.4	38.9
% Elongation, 180°F	27.8	29.7	29.9	21.8	15.8
3 Day Water Expansion (2)					
Average	9.0	7.3	8.5	12.5	7.0
Range	8-25	4-9	5-11	11-14	5-9
Brabender Equil. Torque, (3) - 152°C	1175	1210	1100	1140	1270

Note:

(1) Oven Shrinkage @ 180°F, mils/6 inch, machine direction
(2) Water Expansion, mils/6 inch, across machine direction
(3) Brabender Torque - 60 RPM, Bowl 150°C, diced tile, 100 gms, # 6 roller head

APPENDIX

TILE PROCESSING CONDITIONS

Banbury -

Batch Size -	4300 gms
Ram Pressure -	40 psig
Rotor Cooling -	40 psig water
Rotor Speed -	56 RPM
Drop Temperature -	150°C

Mix Mill -

8 in. x 16 in. two roll mill

Front Roll -	115°C, 75 fpm
Back Roll -	135°C, 65 fpm
Sheet Thickness -	0.125 inch

Calender -

8 in. x 16 in. inverted L, four roll

Calender Speed -	20 fpm
Top Roll -	65°C
Middle Roll -	55°C, Gap for .080 inch sheet
Bottom Roll -	50°C, Gap for .065 inch sheet