PLAINTIFF'S EXHIBIT
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TECHNICAL REPORT NO. 167
Investigation No. 1 - Progress Report No. 2

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COMPETITIVE SURVEY
READY MIX JOINT CEMENT PRODUCTS

Objective:

To evaluate the ready mix products being marketed by our competitors in order to assess the competitive position of Georgia-Pacific ready mix products.

Procedure:

Samples of our strongest competitors in each sales area were shipped to Tigard by plant personnel. Upon their arrival, each sample was placed in an unmarked numbered container to assure objectivity of the tester involved. The samples were then subjected to a series of 19 quantitative tests in order to test performance as thoroughly as possible.

Number values were used as much as possible in an effort to describe performance.

CONCLUSIONS

The G-P products tested were generally equal to or better than most of the competitive products. A conclusion on each property tested follows:

Viscosities: Our current shipping viscosity of 580 ± 20 for hand mix is close to ideal.

Bonds: This property appears to be quite satisfactory. Noted is an improvement in several competitors' cold bond, since the last competitive survey was completed.

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Sanding: Sanding properties are probably adequate at all plants. Improvements could probably be made at some plants. However, this could result in bond deterioration and loss of water resistance.

Cracking: Room cracking appears to be competitive. Fan cracking needs improvement.

Open Time: This property appears to be satisfactory. One Milford sample had an unusually long open time. This variation and other abnormalities would indicate a possible double loading of water retention agent in this batch.

Water Resistance: No need for improvement was noted.

Reflection: (brightness) Our products show an average performance that would require additional cost to improve.

Wet Density/% Solids: Our products would appear to be acceptable. Generally, these two properties are fairly complicated. All the products tested were in the same general range and being proportional to the viscosity.

Contains Asbestos: Five of the 28 products did not contain asbestos. These are regarded as inferior to the asbestos products because of poorer working properties and unstable viscosity.

Filler Type: Four U.S.G. samples contain a blend of gypsum and limestone. Perhaps economics and/or performance has required this switch. Also, three of the "Blends" are asbestos free.

Adhesive System: Although only one sample contained starch, it is known that several other small companies are presently using starch and/or a starch-vinyl combination.

Boric Acid: This is the only property in which we are not competitive. However, the important thing is that we now recognize this deficiency.

QUICK REFERENCE COMPARISON CHART

REFER TO GLOSSARY FOR EXPLANATION

CODE	MFG. AREA OBTAINED	"A" VISCOSITY	"B" VISCOSITY	ROOM BOND	COLD BOND	HUMID BOND	CORNER BEAD BOND	"A" SANDING	"B" SANDING	CRACKING ROOM	CRACKING FAN	OPEN TIME	WATER RESISTANCE	DEFLECTION	DENSITY	SOLIDS	CONTAINS ASBESTOS	FILLER TYPE	ADHESIVE SYSTEM	BORIC ACID STABILITY
1	G.P. MARIETTA	715	480	100	100	100	fair	49	43	1	4	25	good	82	13.54	64.3	yes	L.S.	V	POOR
2	NATIONAL-GRAND RAPIDS	480	250	100	90	100	good	25	26	2	4	25	good	76	13.39	63.7	yes	L.S.	V	EXCL.
3	RAPID- GRAND RAPIDS	960	610	100	75	100	Excl	50	60	2	6	20	Fair	78	13.92	66.9	yes	L.S.	V	Excl
4	U.S.G. - GRAND RAPIDS	580	360	100	100	90	Fair	33	33	1	2	28	Poor	64	13.28	63.7	yes	* *	V	Excel
5	FLINTKOTE - WILM.	985	500	100	100	100	Fair	33	38	2	3	26	Good	79	14.02	66.9	yes	L.S.	V	FAIR
6	G.P. - MILFORD	695	410	100	100	100	Fair	56	48	1	5	24	Good	73	14.22	67.9	yes	L.S.	V	POOR
7	NATIONAL - BLUE RAPIDS	710	410	100	70	100	Good	22	23	2	6	26	Excl	76	13.74	65.2	yes	L.S.	V	Excl
8	BLUE CHIP - ACME	715	400	100	100	70	Good	17	14	2	2	27	Poor	73	13.45	63.4	yes	L.S.	*	Excl
9	WEL-COTE - ACME	470	255	100	100	100	Good	14	30	5	6	30	Excl	75	13.65	66.2	yes	L.S.	V	Excl
10	KAISER - WILM.	560	290	100	100	100	Excl	27	33	1	2	28	Excl	79	12.47	59.9	yes	L.S.	V	Excl
11	QUALITY - WILM.	660	260	100	85	90	Fair	40	43	2	2	24	Good	82	13.71	67.2	yes	L.S.	V	Good
12	HI-BOND - SIGURD	760	460	100	20	100	Excl	42	18	4	5	24	Excl	73	13.30	64.6	yes	L.S.	V	Excl
13	NATIONAL - BUCHANAN	580	480	100	10	100	Good	38	44	2	5	25	Good	83	13.55	66.1	yes	L.S.	V	Good
14	G.P. - ACME	500	293	100	100	100	Good	21	22	1	1	25	Excl	73	12.59	65.3	yes	GYP.	V	Poor
15	NATIONAL - WILM.	600	280	100	30	100	Excl	43	40	3	4	30	Good	83	13.67	66.4	yes	L.S.	V	Excl
16	G.P. MILFORD - WILM.	490	330	100	80	100	Good	44	28	4	6	55	Fair	77	12.86	58.4	yes	L.S.	V	Poor
17	U.S.G. - WILM	540	310	100	100	100	Fair	21	30	1	4	24	Excl	76	13.55	66.9	NO	* *	V	Fair
18	SUPRO - SIGURD	500	290	100	5	95	Excl	39	36	1	2	30	Good	80	13.77	66.2	NO	L.S.	V	Excl
19	G.P. - ACME	550	370	100	100	100	Good	19	28	3	2	24	Fair	74	12.65	63.4	yes	GYP.	V	Excl
20	U.S.G. - BUCHANAN	610	250	100	30	100	Fair	23	23	2	4	24	Excl	76	13.44	67.4	NO	* *	V	Fair
21	U.S.G. - BRUNSWICK	620	345	100	80	100	Good	24	24	2	3	28	Excl	76	14.00	67.5	yes	L.S.	V	Excl
22	SUPRO TOPPING - SIGURD	660	290	100	0	75	Good	58	51	1	1	15	Excl	83	13.75	69.9	NO	L.S.	V	Good
23	G.P. TOPPING - ACME	540	360	100	0	50	Fair	32	38	2	1	24	Good	73	12.71	62.4	yes	GYP.	V	Poor
24	U.S.G. - CHICAGO	800	510	100	100	100	Good	22	30	4	6	32	Fair	75	13.21	62.9	yes	L.S.	V	Excl
25	G.P. - CHICAGO	670	500	100	100	100	Good	27	30	4	5	26	Excl	77	13.61	65.2	yes	L.S.	V	POOR
26	RAPID - SAGINAW	815	505	100	10	100	Excl	66	67	4	3	26	Fair	78	13.99	67.5	yes	L.S.	V	Excl
27	U.S.G. - BALTIMORE	640	260	100	0	100	Good	24	32	1	1	22	Excl	76	13.66	68.7	NO	* *	V	Poor
28	G.P. - AKRON	660	470	100	100	95	Good	19	28	2	6	29	Excl	77	13.37	64.3	yes	L.S.	V	Poor

* - STARCH

* * - LIMESTONE AND GYPSUM

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BORIC ACID STABILITY

A direct benefit of this competitive survey was the recognition of a boric acid stability problem. It was found that our R.M. products, which contain polyvinyl alcohol, are not compatible with wallboard that contains boric acid.

This reaction i the combination of hydroxyl ions from the alcohol and the boron ion. This results in a coagulation of the joint cement resembling extremely fast drying or short open time. The reaction was found to be directly proportional to the amount of alcohol and boric acid present.

It is felt that the above instability has resulted in a loss of sales to hand applicators where repeated application is a common practice. Sales in the Southeast and Western states were not as affected apparently due to lower usage of boric acid present and to the fact that the majority of applicators use "machine tools".

Below is listed the boards which contain boric acid on their surface from the board survey conducted at Tigard:

3 U.S.G. from Lovell
4 G-P from Buchanan
#14 Celotex from Sigurd
#28 U.S.G. from Blue Rapids
#31 U.S.G. from Blue Rapids
#34 Republic from Acme
#36 Texas Gypsum from Acme
#37 G-P from Grand Rapids
#38 U.S.G. from Grand Rapids
#39 National from Grand Rapids
#40 Grand Rapids Gypsum from Grand Rapids

Possible sources for the boric acid in wallboard are the Kraft used in board paper and the board core. Also, one manufacturer is known to treat the surface of some fire rated board for flamespread control.

A solution for this stability problem is presently under study.

GLOSSARY OF TEST CONDUCTED

ADHESIVE SYSTEM: Determination by microscopic examination.
V - Vinyl
* - Starch

BONDS

Room Bonds conducted at 70°F with 50% RH. Tapes were cut and pulled 24 hours after application.

Humid Bonds were exposed to 90°F with 90% RH for 24 hours before being cut and pulled.

Cold Bonds were exposed to 40°F at 80° RH and were pulled after 24 hours.

Value is expressed as percent of area covered by paper fibers after pulling tapes.

Corner Bead Bonds were checked by applying the samples to a corner bead, then after a drying period the edge of the bead was hit several times with a hammer.

Poor - no bond, mud falls off all along bead and board surface.
Fair - bonded, but excess loss beyond point of impact.
Good - bonded, loss of mud only at point of impact.
Excellent - bonded, only small loss of mud at point of impact.

BORIC ACID STABLE: All samples were applied to board which had been treated with a boric acid solution. Value explanation as follows:

Excellent - no reaction observed.
Good - only very slight reaction after several passes.
Fair - slight reaction, but workable.
Poor - completely unworkable because of reaction.

CONTAINS ASBESTOS: Determination by microscopic examination. Asbestoslike fibers present would give yes value.

CRACKING

Two types of tests were performed to determine a sample's resistance to cracking.

Fan Test: Samples were laid down in a wedge using a standard shim. These were then dried quickly by a fan with controlled air velocity, humidity and temperature.

Room Test: Samples were laid down in a wedge using a standard shim. These were allowed to dry at room temperature and humidity.

The values reported were obtained by comparing the extent of cracking on each sample to the photos used in plant testing procedure #37.

DENSITY: Weight of each product as received in lbs./gal.

FILLER TYPE: Microscopic examination
L.S. - Limestone
Gyp. - Gypsum
* * - Gypsum and limestone

H_2O RESISTANCE

This test is used to indicate the rewettability of the samples, once dried. Value explanation is as follows:

Poor - complete rewetting and resoftening of the joint cement.
Fair - almost complete rewetting and resoftening.
Good - substantial rewetting, but joint cement remained hard.
Excellent - only slight rewetting.

OPEN TIME

The value expressed represents the time in minutes from application to a point at which the sample became unworkable with a six inch knife.

REFLECTION

Applied samples were tested using a photoelectric reflection meter. Results are in reflective value only, though generally, whiteness gives a higher value.

SANDING

Samples were tested at two consistencies. The high viscosity (A) represents the mud as received. The low viscosity (B) was again modified by the addition of water until an average 300 BU was reached. All tests were performed on a Gardner straight line abrasion machine. Values expressed represent material loss during a standard 20 strokes.

A value above 50 would indicate very easy sanding properties. A value below 30 would indicate hard sanding properties.

SOLIDS

Values recorded represent the solids portion of each product.

VISCOSITY

All samples tested according to plant testing procedure #109 using a "Visco-Corder" at 79 RPM. Values recorded are in Brabender Units.

Viscosity "A" Results obtained from samples as received. Readings taken after the instrument had stabilized at a given reading.

Viscosity "B" Readings were taken after the addition of 5% water by weight.