#97 - SWP

A sample of 1114 Talc from Whittaker Clark and Daniels was compared with 6232 dry Nytal 300 in SWP Gloss White Rx 471. The 1114 Talc and Nytal 300 evaluated in SWP Gloss White compared as follows for oil absorption and fineness:

	Oil Absorption	Residue 325 Mesh Screen
Nytal 300	32.5	.06%
1114 Talc	54.5	.86%

SWP Gloss White made with the Whittaker Clark and Daniels inert is somewhat higher in viscosity, lower in gloss characteristics and slightly shorter in flow properties than regular SWP made with Nytal 300.

Paint	Inert	Viscosity #3 Cup Fresh	24 Hr.	Grind	Brush	Flow	Gloss
785 S	6232 Dry	25.4"	38"	2-1/2	9	9	9
784 S	1114 Talc	28.8"	47"	2-3/4	8	8	7

Rating: 10 - Perfect 0 - Completely unsatisfactory.

Slightly finer texture and slightly lower consistency characteristics are desired in the #1114 Talc from Whittaker Clark and Daniels.

Exposures 20589-20604 F, C were examined during the month. The purpose of the series was to compare Kem Tinting Colors with regular oil colors, the interest being both in tint retention and durability. Rx 473 SWP Tinting White is used as the base paint, with 4 ounces of Kem Tinting Color added per gallon, and the comparison paints being shaded to an approximate match with oil colors. All tests are on cedar bevel siding, primed with white Rx 450 SWP Undercoater. The left half of each panel is the oil color sample, the right half Kem Tint. The exposures have run six months at Florida vertical south and at Chicago north and south. All panels look generally good, except for dirt and mildew at Florida. There are no appreciable differences between the two halves in gloss, sheen, chalk (very slight) or dirt, and no film failure. Fading is relatively slight on all, and the differences, if any, are as follows:

#97 - Cont.

Color	Florida	Chicago
Red	Same	Kem v. sl. more fade.
Orange	Kem v. sl. more fade	Kem v. sl. more fade.
Ochre	Same	Same
Yellow	Same	Kem v. sl. more fade.
Green	Kem.v. sl. more fade	Kem v. sl. more fade.
Blue	Kem v. sl. more fade	Kem sl. more; yellow tends to "go out."
Brown	Same	Kem v. sl. more fade.
Black	Same	Kem v. sl. more fade.

#97 - SWP

Exposure series 21673-93 CS and F have been prepared to evaluate experimental Kem Tinting Colors. These exposures have been made in the SWP Tinting White formula and in the experimental low pigment volume Intermix White formula. The Kem Tinting Colors were introduced at one and four ounces of color per gallon of white. Comparative tint depths have been prepared by intermixing SWP Winthrop Red with the Tinting White and the Intermix White formula to be used as controls. Names have not been assigned to the new Kem Tinting Colors so they are identified by the prime pigments which they contain, namely: Thio Fast Red, Indo Red, Molybdate Orange and Aqua, a blend of four parts Phthalo Blue with one part Phthalo Green.

A house test was finished during the week of November 7 - 13 at 2233 Marston Avenue, Flossmoor, Illinois; E. W. Russell, owner. This work was done by a professional painter, and considerable time was lost due to his not being available when the weather was suitable. However, the job was finished in excellent weather, which was of major importance because the purpose of this job was to correct a generally bad case of peeling due to moisture. We took no responsibility, but did offer advice from the start. The owner had considerable repair work done and paid the painter for extra work in scraping, caulking, etc. Almost the entire house was primed with Rx 450 SWP Undercoater (after spot-priming) and finished with Rx 471 SWP Gloss White, both new formula. A small area at the back was done with the old formulas. We do not have the spreading rate figures as yet.

Exposures 18783-8 F, C were examined after 12 months' exposure at Florida, vertical south, and at Chicago, north and south. All are cedar bevel siding primed with Rx 450 Undercoater of suitable shade. The purpose of the series is to try to eliminate the microscopic checking usually encountered with SWP light tints on Florida exposure. Rx 471 SWP Gloss White, in which mica has been shown to be effective in reducing checking, is tested as regular and with 7% mica. Rx 474 SWP Chelsea Gray and Rx 478 SWP Geneva Cream are tested similarly, all three control formulas being the most recent cards.

The Chicago results show no failure and no differences due to mica. The Florida panels show a small amount of microscopic checking on the regular tints, as was expected, but it is rather disappointing to note that the mica samples showed almost exactly the same amount. We are not interpreting this too seriously at the present exposure time, but we will be interested in whether or not the apparent ineffectiveness of mica in tints persists through another year or more.

#97 - Cont.

Exposures 18982-98 C, F were examined after 12 months at Florida vertical south and the same at Chicago. Four zinc oxides were compared in (a) Rx 471 SWP Gloss White (lead-containing, with co-fumed leaded zinc in the guide), a mechanical-mix version and (b) in Rx 456 SWP Fume Resisting White (lead-less). The four zinc oxides are: New Jersey Zinc Company's XX-592 and XX-50, and St. Joseph Lead Company's Green Label #17 and #42. Regular cedar bevel siding panels were used, divided into thirds in such a way that:

a. The left 1/3 is the Rx 471 guide, over Rx 450 Undercoater.

b. The center 1/3 is the test paint " " " "

c. The right 1/3 is the test paint self-primed.

The panels have been exposed 12 months at Florida, vertical south, and the same at Chicago. The Chicago panels showed essentially no differences, and none at all due to the different oxides. There were some possibly significant, but not conclusive, differences on the Florida panels. In the Rx 436 type formula (which shows more free chalking and better general clean-up), the St. Joseph samples show some microscopic checking. XX-592 shows the most erosion, particularly noticeable in Rx 456. In general, XX-50 looks best in all respects, by a slight margin. All tests show more mildew than the guides, but this is much more noticeable in the lead-containing formulas.

A progress report on the subject, "Flatting of Exterior Paints Due to Water Sensitivity During Drying," is attached to this monthly report.

#97 - SWP

Exposure series 21673-93 CS and F have been prepared to evaluate experimental Kem Tinting Colors. These exposures have been made in the SWP Tinting White formula and in the experimental low pigment volume Intermix White formula. The Kem Tinting Colors were introduced at one and four ounces of color per gallon of white. Comparative tint depths have been prepared by intermixing SWP Winthrop Red with the Tinting White and the Intermix White formula to be used as controls. Names have not been assigned to the new Kem Tinting Colors so they are identified by the prime pigments which they contain, namely: Thio Fast Red, Indo Red, Molybdate Orange and Aqua, a blend of four parts Phthalo Blue with one part Phthalo Green.

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#97 - Cont.

Exposures 18982-98 C, F were examined after 12 months at Florida vertical south and the same at Chicago. Four zinc oxides were compared in (a) Rx 471 SWP Gloss White (lead-containing, with co-fumed leaded zinc in the guide), a mechanical-mix version and (b) in Rx 456 SWP Fume Resisting White (lead-less). The four zinc oxides are: New Jersey Zinc Company's XX-592 and XX-50, and St. Joseph Lead Company's Green Label #17 and #42. Regular cedar bevel siding panels were used, divided into thirds in such a way that:

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b. The center 1/3 is the test paint " " " "

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A progress report on the subject, "Flatting of Exterior Paints Due to Water Sensitivity During Drying," is attached to this monthly report.

#97 - SWP

Several production batches of Rx 471 SWP Gloss White and tints were rechecked for viscosity after several weeks' storage. The first three batches of SWP Gloss White listed below and the SWP Berkeley Yellow Rx 459 - C 2584 were reported in the September report as being somewhat high in consistency. However, a recheck on these batches 30 days later indicated slightly lower consistencies and satisfactory brushing properties. In general the viscosities appeared to be quite stable on the SWP production made during September and October. Test data are listed in the following table.

Rex No.	Date	Gallons	A. Wt.	Viscosity Fresh	9-22	10-22
471	C 2464 A	2000	13.75	32"	40"	37.6"
"	C 2514	"	13.70	34	39	36
"	C 2574	"	13.98	34	44	40.8
"	C 2794	"	13.80	33	-	45.4
"	C 2784	"	13.65	29	-	34.6
"	C 2734	"	13.72	33	-	38.2
478	C 2504	800	13.80	33	-	33.2
496	C 2644	900	14.15	32	-	30.4
458	C 2584	900	14.20	29	-	33.5
459	C 2584	900	13.96	31	44	37.8
465	C 2574	900	14.00	29	-	32.2
474	C 2644	900	14.15	34	-	34.8

The Vegetable Products Research Laboratory has submitted a sample of non-staining, air-bleached, extracted raw linseed oil MB 9065 to be compared with (1521) raw linseed as an improvement for color, wetting, flow and gloss in SWP. Properties of this oil are as follows:

Color (Gardner, 1933)	9 + (non-staining)
Acid number	2.1
Viscosity (Gardner-Holdt)	B
Specific Gravity at 77° F.	0.938

The sample of MB-9065 was evaluated for color, wetting, brushing, flow and gloss in SWP Gloss White. The paint made with MB 9065 was slightly higher in initial viscosity, equivalent in brushing and flow and appeared to be slightly whiter in the can than the regular SWP made with (1521). However, when the paints were brushed out, the paint made with regular (1521) bleached out to an equivalent brightness in a matter of one or two hours, depending on the available light. There is some question as to the value of this improvement in color. It is suggested that sufficient oil be processed to make a plant batch of SWP at Chicago or Cleveland.

#97 - Cont.

The Vegetable Products Research Laboratory has also submitted a sample of (25 A 23) Lot No. 2785, vacuum-bodied, alkali refined linseed oil made by the acid recycling process, in the Dehydrol stills of the Cleveland Oil Mill. This was made in a manner similar to that employed in the laboratory in the preparation of MB 9273. Properties of this oil are as follows:

Acid Number	2.2
Color (Gardner, 1933)	5 +
Viscosity (G-H)	29-1/5 sec.
Appearance	Clear

The (25 A 23) and MB 9273 were compared with (25 A 22) in SWP Gloss White Rx 471, Card 80 for performance characteristics. The plant batch of (25 A 23) appeared to be equivalent to MB 9273 and similar in performance to the regular (25 A 22). Further performance checks will be made on the SWP being made at Newark and Gibbsboro from the 4000 gallons of (25 A 23) shipped to these points on 10-5-54.

Two of the six remaining house tests were not quite finished in October. Both are primed with Rx 450 Undercoater and may have to go through the winter without a finish coat, since the weather recently has been too cold for painting. The house tests completed in October using the two coat SWP system are:

J. Musil, 12077 Princeton Avenue, Chicago, a repaint test with Rx 450-Rx 471 SWP Gloss White over a previous job of light gray paint on a relatively old bungalow. The owner, who did the painting, noticed considerable improvement in brushing and coverage of the new Rx 450, and some improvement in the case of Rx 471. The finished job showed no differences in gloss or appearance at about one week. The spreading rates, only moderately accurate, are:

New Rx 450,	most of house	- 444 sq.ft./gal.
" " ,	part of south	- 470 " "
Old Rx 450,	" " "	- 460 " "
Old Rx 471,	" " "	- 510 " "
New " " ,	" " "	- 535 " "
" " " ,	most of house	- 505 " "

J. Barclay, 11245 Normal Avenue, Chicago, a rather old bungalow, narrow siding. The test covers Rx 450-Rx 471 with a small area using the old formula of each and the bulk of the house the new formula. The owner was very much impressed by the better brushing of the new Rx 450, and also felt that the new Rx 471 was an appreciable improvement. Both parts looked equally good after drying. The spreading rates, not particularly accurate in this case, are:

#97 - Cont.

Part of south side, old Rx 450	475	sq.ft./gal.
" " " , old Rx 471	545	" "
" " " , new Rx 450	455	" "
" " " , new Rx 471	570	" "
Overall use of Rx 450, new	435	" "

A blister fence is being assembled at the Chicago U.S. 30 Test Station. This will accommodate standard 36" x 6" bevel siding panels and will face east and west to use both faces to greatest advantage.

#97 - SWP

The Chicago factory has manufactured SWP Gloss White and the light tints on the new formulations, based on 68 C 6 dry leaded zinc for the past several weeks. The new production is satisfactory, with slightly better flow and gloss than the formulation containing 6840 dry and 6822 dry as the leaded zinc. However, the SWP Gloss White has a tendency to be slightly on the low side for viscosity. Therefore, we have found it necessary to replace 50 pounds of 8232 dry Nytal 500 with 50 pounds 8235 dry Micro Valva A to obtain the standard viscosity. The light tint formulations do not require any 8235 dry to increase viscosity. Initial viscosities of tints are actually very slightly high and 1/2% (145) mineral spirits has been added to some production batches. A few of the recent production batches of SWP Gloss White and SWP tints are listed below showing passing weights, viscosities and quantity of thinner added to or omitted from each production batch.

Rx 471 SWP Gloss White - 2000 Gallon Batches

Date Passed	Cap Date	Std. Wt.	Batch Wt.	Viscosity #3 Fresh	Viscosity #3 9-22-54	Days After Passing	Additions	Omissions
9-2-54	2454A	15.86	15.85	33	32-1/2	20	1 Gal. (38Y1)	20 Gal. (151)
9-3-54	2464	15.86	15.64	29	34	19		20 " (151)
9-7-54	2464A	15.86	15.75	52	40	19	1 Gal. (38Y1)	20 " (151)
9-8-54	2514	15.86	15.70	34	39	14		20 " (151)
9-9-54	2514A	15.86	14.00	32	30	14		20 " (151)
9-13-54	2524	15.86	15.87	30	32	15		20 " (151)
9-14-54	2534	15.86	15.98	33	34-1/2	16		20 " (151)
9-14-54	2574	15.86	15.98	34	44	8		
9-16-54	2584A	15.86	15.80	29	39	7		20 gal. (151)
9-20-54	2604	15.86	15.85	31	35	5		20 " (151)

SWP Tints - 900 Gallon Batches

Rx No.	Date Passed	Cap Date	Std. Wt.	Batch Wt.	Viscosity #3 Fresh	Viscosity #3 9-22-54	Days After Passing	Additions
458	9-10-54	2504	14.28	14.12	51	54	15	10 Gal. (145)
465	8-18-54	2254	14.21	14.31	28	26	40	
474	9-13-54	2524	14.12	13.83	28	27	15	13 Gal. (145)
478	8-20-54	2504	14.15	14.01	27	25	35	
459	9-17-54	2584	14.17	13.96	31	44	7	10 Gal. (145)
496	8-20-54	2304	14.13	14.20	34	35	35	12 Gal. (1521)

Rx 458 - SWP Plymouth Green, Card 22
Rx 465 - SWP Colonial Yellow, Card 26
Rx 474 - SWP Chelsea Gray, Card 26 (38 Y 1) Troykyd
Rx 478 - SWP Geneva Cream, Card 23 (151) High flash mineral spirits
Rx 459 - SWP Berkeley Yellow, Card 23 (145) Mineral spirits
Rx 496 - SWP Ivory, Card 56 (1521) Raw linseed oil

#97 - Cont.

The Vegetable Products Research Laboratory has submitted several variations of (25 A 22) Vacuum bodied linseed oil for evaluation in SWP Fume Resisting White Rx 436.

(25 A 22) Lot 2184 - Regular (25 A 22).

MB 7179 - Base oil as Lot 2184 treated with 1/2% fumaric acid.

MB 7185 - Base oil as Lot 2184 treated with 1/2% maleic anhydride.

MB 9244 - Vacuum heat bodied and steam blown to approximately 10 seconds and then air blown to 28 seconds.

MB 9261 - A partial ester produced by reacting pentaerythritol and beta-carboxyanthroquinone. 6.6% of this ester was blended with 93.4% (1527) refined linseed oil, heated and blown with steam to 27-2/5 seconds.

MB 9264 - (1527) vacuum bodied, acid refined and clay bleached linseed.

MB 9268 - Vacuum bodied (1527) without additives (same process as employed in the Dehydrol stills at the Cleveland Oil Mill.)

MB 9275 - Steam stripped (1527) esterified with P.E. and heat bodied under vacuum to viscosity 29 seconds.

These oils were tested in two SWP Fume Resisting White formulas, varying in the use of four gallons of (2539) in one group. They were compared for brushing, flow, gloss, etc. All the paints were similar in flow but varied from fair to good in brushing qualities. MB 7179, MB 7185, MB 9244, and MB 9261 were all rated as inferior to (25 A 22) Lot 2184, MB 9268, MB 9275 and Chicago (25 A 22).

#97 - Cont.

(25A22) Variations in SWP Fume Resisting White Rx 456
Proposed Formula OJ 603 S*

Batch	Oil Tested	(T. Wt. 15.40) A. Weight	Viscosity #5 Fresh	24 Hr.	6 Days	High Shear Poises	Brush	Flow	Gloss
660 S	4 gal. (25A22) (Chicago)	15.38	27.2"	34.8"	31.4"	2.5	8	9	9
661 S	4 gal. (25A22) (Lot 2184)	15.54	28.4	41.4	32.4	2.3	8	9	9
662 S	4 gal. MB 9275	15.48	28.2	37.2	32.6	2.4	9	9	9
663 S	4 gal. MB 9244	15.52	29.8	39.6	33.8	2.6	8	9	9
668 S	4 gal. MB 7179	15.47	33.2	39.6	38	2.8	6	9	9
669 S	4 gal. MB 7185	15.53	34.2	41.2	42	2.8	5	9	9
670 S	4 gal. MB 9261	15.50	34	39.8	44	2.9	7	9	9
671 S	4 gal. MB 9264 O	15.50	33.8	38.4	44	2.7	8	9	9
672 S	4 gal. MB 9268	15.44	32	38.6	44	2.5	8	9	9
	Special Rx 456 Formulation OJ 645 S								
664 S	8 gal. (25A22) (Chicago)	15.58	31.2	34	34	2.4	8	9	9
665 S	8 gal. (25A22) (Lot 2184)	15.53	28	33	32	2.4	9	9	9
666 S	8 gal. MB 9275	15.58	28	31.6	30	2.4	9	9	9
667 S	8 gal. MB 9244	15.56	34.2	40.6	38	2.8	7	9	9
673 S	8 gal. MB 7179	15.41	29.8	-	33.8	2.6	7	9	9
674 S	8 gal. MB 7185	15.48	29.3	-	34.2	3.1	6	9	9
675 S	8 gal. MB 9261	15.45	32.2	-	34.4	2.6	7	9	9
676 S	8 gal. MB 9264 O	15.53	30.4	-	33.8	2.6	8	9	8
677 S	8 gal. MB 9268	15.47	29.2	-	33.8	2.6	8	9	9

*Formula contains 4 gallons (2539) Heat bodied linseed oil

#97 - Cont.

The Vegetable Products Research Laboratory has submitted two raw linseed oils that were processed to improve their color for test in SWP.

MB 9010 - Extracted raw linseed oil bleached with 0.214% benzoyl peroxide similar to (5091) as formerly produced at the Cleveland Oil Mill.

Color (Gardner 1933)	9
Acid Value	2.4
Viscosity (G-H at 75° F.)	1-1/5 seconds

MB 9013 A - Extracted raw linseed oil bleached with sulfur dioxide gas.

Color (Gardner 1933)	6 +
Acid Number	2.8
Viscosity (G-H at 77° F.)	1-2/5 seconds

Paints were made on the Rx 471 formulation using MB 9010, MB 9013 A and (1521) Raw linseed oil as the unbodied oil portion of the vehicle. The paints were checked for brushing, flow, gloss and color characteristics. The SWP Gloss Whites made with these oils are similar in all characteristics. However, the color of the paint made with (1521) was slightly gray, due to iron contamination from the roller mill. Therefore, rub-ups were made on glass to recheck the brightness of the above paints. This test indicated no improvement in color or brightness by the use of MB 9010 or MB 9013 A.

A proposed reformulation of SWP Westchester Gray to utilize the new vehicles for easier brushing has been placed in the factory for production test. If initial production is satisfactory the formula will be sent to Cleveland for distribution.

A total of 12 house tests were either finished in September or were well along toward completion when halted by recent rains. When final reports are completed, the total will be 21 for the season. There are 14 tests of Rx 450 SWP Undercoater - Rx 471 SWP Gloss White, old formula versus new revision with improved brushing, and 7 tests of the same change in Rx 476 SWP One Coat White, some of which also involve comparisons with Rx 450-Rx 471.

A house test was completed in Tinley Park, Illinois; J. B. Bartellotta, owner. This house is a 2-story frame, first repainting since construction 5 years ago. The test involves the old-versus-new Rx 450-Rx 471 comparison as indicated above. The painting was done by the owner, who reported considerably smoother brushing with the new materials, particularly Rx 450. The spreading rate calculations are:

#97 - Cont.

Rx 450, south side only, new formula	450	sq. ft./gal.
Rx 471, " " " " "	445	" "
Rx 450, part of east side, old formula	466	" "
Rx 471, " " " " "	495	" "
Rx 450, entire new formula area	447	" "
Rx 471, " " " "	485	" "

A house test was completed at 12112 S. Edbrooke Avenue, Chicago; A. Sospizio, owner. This is a small bungalow, quite old, which was considered of interest because of the plans of the owner to do a very thorough job of scraping and removing old paint, also caulking and general renovation of the siding. This was done quite carefully and Rx 450 was applied as each part was completed, followed by Rx 471, mostly new formula (as above) but with a sizable section using the old formulas. The owner was quite pleased with the easy brushing of the new Rx 450 and with the good appearance of the two coats when finished. Only the overall spreading rates were readily calculable:

Rx 450, essentially front 2/3, new formula	480	sq. ft./gal.
Rx 471, " " " "	525	" "
Rx 450, " rear 1/3, old formula	465	" "
Rx 471, " " " " "	550	" "

Paint Research Department
December 14, 1954

Pen Research
Project 97

Flatting of Exterior Paints

Due to Water Sensitivity During Drying

To summarize our experience with premature and permanent loss of gloss, we have observed that most air drying film formers are sensitive to wetting during their curing cycles. This sensitivity generally develops at or about the dry-to-touch stage. Its duration varies with the rate of cure and exposure conditions. It disappears before the film cures to a tack free condition.

Films exposed to very fine particles of moisture during this critical period will cure to a substandard gloss because of permanent physical surface distortions. These may occur as wrinkles or in the form of texture resembling the agglomeration that occurs with a vehicle break.

A specific paint composition will develop this sensitivity later and retain it longer when dried at low temperature than when dried under normal conditions. We have observed a situation where the low temperature retardant effect delayed the occurrence of sensitivity in an exterior house paint to the extent that an application at 4:00 PM withstood exposure to 43° F temperature and foggy atmosphere overnight, and then cured to standard gloss when drying conditions improved on the following day. This same paint exhibited its sensitivity to wetting during a critical drying period in our laboratory tests as well as in later exterior exposures when conditions were less fortunate than those described above.

To study this area of sensitivity in paint films under laboratory conditions, we draw films down by means of suitable gauges on Morest hiding power charts. We cut these into approximately 2-1/2" x 4" panels and air dry in 75° F - 50% R.H. controlled atmosphere. Separate 2-1/2" x 4" areas are exposed to moisture by inverting them, at different time intervals during the drying cycle, over a rising mist developed by a moderate discharge of steam against the bottom of a 5 gallon paint container. We have standardized on a 30 second exposure. Each paint area is exposed only once, making it representative of the state of the original drawdown with respect to wetting at that particular point in its drying cycle. A single paint area can take repeated exposures without failing as long as exposures are made before sensitivity develops. We adopted this technique after observing instances of cratering in our paint films due to impact by relatively large particles of water in spray exposure.

J C Weaver
DEC 23 1954

A short chill of panel and film can serve as a fogging technique. Fine droplets of water will precipitate on the cold film surface upon exposure to normal room atmosphere. This technique has an objectionable feature. The possibility exists of introducing varied distortions by chilling at different stages of cure.

We know that a substantial temperature reduction will retard the drying activity of a paint. However, we do not know the extent of this retardant effect nor do we have information relative to possible variations of effect at different stages in the drying cycle.

It may be significant that wetting by extremely fine droplets is most effective with respect to the distortion of gloss in laboratory tests. Exposed films always appear foggy or hazy when wet, never uniformly wetted by a continuous film. This suggests that the films are mainly hydrophobic, yet possess hydrophilic points or microscopic areas on which water may collect as droplets. Films in their critical states might therefore take moderate immersion in water without being sensitized if the surface tension of the water is sufficient to maintain film integrity in contact with the paint surface and bridge the sensitive points. We have not checked this. We merely observe this as a possibility based on our evaluation of past studies. The concept of hydrophobic areas interspersed with hydrophilic areas supplies a basis for a mechanism that might explain the flatting effects.

Sensitivity to wetting develops about the time a film becomes dry to touch. Most of the solvent has evaporated at this point. Its pigment content has assumed its characteristic packing. This will be a close packed arrangement that will produce shear and stress lines upon application of mechanical force. The vehicle too has become concentrated. It has developed its characteristic gel structure and may respond to mechanical disturbances by showing strain and stress lines in areas that are disturbed.

When fine droplets of water precipitate on points of polarity in such a semi-rigid gel system, a portion of the water may be imbibed by the polar component in the polymerizing resin gel. A local swelling will develop with the result that a substantial local hydraulic pressure is built up. When this pressure becomes greater than the films' inherent structural forces, it will overcome them by raising the swollen polar component above the normal film surface. This will establish lines of stress and shear radially about and down into the film from the center of the polar mass. A film distortion by this mechanism will appear textured or agglomerated, as a very flat finish, and should be more permeable than its standard counterpart formed by a normal cure.

This same mechanism could produce a cratered distortion if the imbibition of water by the polar mass occurred while the system possessed a degree of plasticity. The overall thickness of such a film would increase in proportion to the volume of swelling. With the setting of this film, craters could develop from shrinkage occurring with the dehydration of the swollen polar masses. This distortion should effect moderate gloss reduction and should leave the film with standard permeability. Should the forces set up by the shrinking areas become greater than the structural forces of the film proper, ruptures would occur, gloss would be much reduced, and permeability would be increased above standard. This type of distortion would tend to establish geometrical design.

Previous studies of hazing on cured films has shown very clearly that the presence of water as such on the film surface is a prerequisite to haze formation. Also that significant amounts of free water may be deposited upon dry films under properly selected conditions from a water phase free atmosphere.

In these studies, haze was precipitated on cured films by exposing them to atmosphere fouled alternately at 15 minute intervals with sulfur dioxide and ammonium hydroxide vapor. Panels were mounted on a surface with its temperature controlled to maintain a constant increment above the dew point of the exposure atmosphere throughout a 5 hour exposure period.

It was clearly demonstrated that dry films do not accept the fouling agents. They retain their full gloss in spite of repeated exposures. By reducing the film temperature to dew point differential progressively through a series of exposures, the conditions that will precipitate atmospheric vapor as water on the film surface are determined. Under these conditions, the fouling agents are absorbed by the water on the film surface where they combine to form ammonium sulfite and eventually ammonium sulfate which remains as a hazy residue. The cold wall technique establishes a local high relative humidity zone at the film air interface.

Most films studied become wettable by this technique at film temperature to dew point differentials of from 5 to 7 degrees Fahrenheit. The temperature of the exposure atmosphere is insignificant.

The most haze resistant vehicle thus far studied is our soya glycerol phthalate alkyd (3962). Enamels prepared from it resisted haze formation until their temperatures were reduced to within 2 degrees of the dew point.

This demonstrates the existence of a water vapor adsorption potential that varies in magnitude with respect to different cured films. It is also possible that this applies to curing films as well. It is a convenient mechanism for explaining the flatting of paint films by wetting during the drying cycle under milder exposure conditions than we normally associate with this effect.

A practical experience with the flatting of gloss finishes under these conditions is a case in point. Paint and enamel films were applied to exterior surfaces at lower temperatures than we normally consider in line with good painting practice. Relative humidity conditions ranged from moderate to very high, but precipitation did not occur. The first areas painted dried to full gloss, areas painted later dried flat and areas applied still later again developed full gloss.

These are milder conditions than those of our previous reference to the fresh film that was exposed to cold foggy atmosphere over night, which then dried to full gloss when conditions improved on the following day. In these, the first areas painted dried past their critical periods before conditions favorable to wetting had occurred. A subsequent area was in the dry-to-touch or water sensitive stage when the cooler night air reduced the film temperature and its differential with respect to the dew point of the atmosphere. This precipitated water on the drying film surface by the adsorption potential mechanism causing that area to dry flat. Areas of still later application apparently experienced retarded drying activities because of early exposure to lower temperatures. This delayed the occurrence of their dry-to-touch or water sensitive period until the following day. At that time rising temperature increased the film temperature to a dew point differential sufficient to secure the film against wetting by the adsorption mechanism during its critical period. These areas dried to standard gloss.

An examination of the conditions prevailing at the time of this erratic gloss behavior places them in the range where precipitation of water occurred on dry films in our haze exposure cabinet.

Date		Temp.	Per Cent R.H.	Dew Point	Differential
October 25	4:00 PM	52°F	55	44.5°F	6.5°F
October 26	4:00 AM	39°F	89	37.25°F	1.75°F
October 30	High	55°F	63	48.5°F	6.5°F
October 30	Low	47°F	90	45.5°F	1.5°F
November 1	High	55°F	85	52.5°F	2.5°F
November 1	Low	49°F	97	48.5°F	0.5°F

Dew point values were determined by reference to psychrometric charts. The differentials between actual temperatures and dew points indicate the possibility of wetting the curing paint films in the absence of rain or fog on October 25, 26 and 30 and November 1.

In general, we have observed that all paints, enamels and lacquers are subject to loss of gloss by surface distortions through wetting during critical periods in their drying cycles. The occurrence of sensitivity will advance and its extent will diminish with acceleration of the drying rate of a film. Increased film thickness tends to retard the rate of drying and reverses drying acceleration effects. It also adds further complications by stimulating wrinkling effects. Flat films possess this sensitivity, but it is difficult to observe because of the absence of change in gloss characteristics.

CJC:ls

C J Christensen

#97 - SWP

Several production batches of Rx 471 SWP Gloss White and tints were rechecked for viscosity after several weeks' storage. The first three batches of SWP Gloss White listed below and the SWP Berkeley Yellow Rx 459 - C 2584 were reported in the September report as being somewhat high in consistency. However, a recheck on these batches 30 days later indicated slightly lower consistencies and satisfactory brushing properties. In general the viscosities appeared to be quite stable on the SWP production made during September and October. Test data are listed in the following table.

Rex No.	Date	Gallons	A. Wt.	Viscosity		
				Fresh	9-22	10-22
471	C 2464 A	2000	13.75	32"	40"	37.6"
"	C 2514	"	13.70	34	39	36
"	C 2574	"	13.98	34	44	40.8
"	C 2794	"	13.80	33	-	43.4
"	C 2784	"	13.65	29	-	34.6
"	C 2754	"	13.72	33	-	38.2
478	C 2504	800	13.80	33	-	33.2
496	C 2644	900	14.15	32	-	30.4
458	C 2584	900	14.20	29	-	33.5
459	C 2584	900	13.96	31	44	37.8
465	C 2574	900	14.00	29	-	32.2
474	C 2644	900	14.15	34	-	34.8

The Vegetable Products Research Laboratory has submitted a sample of non-staining, air-bleached, extracted raw linseed oil MB 9065 to be compared with (1521) raw linseed as an improvement for color, wetting, flow and gloss in SWP. Properties of this oil are as follows:

Color (Gardner, 1933)	9 + (non-staining)
Acid number	2.1
Viscosity (Gardner-Holdt)	B
Specific Gravity at 77° F.	0.938

The sample of MB-9065 was evaluated for color, wetting, brushing, flow and gloss in SWP Gloss White. The paint made with MB 9065 was slightly higher in initial viscosity, equivalent in brushing and flow and appeared to be slightly whiter in the can than the regular SWP made with (1521). However, when the paints were brushed out, the paint made with regular (1521) bleached out to an equivalent brightness in a matter of one or two hours, depending on the available light. There is some question as to the value of this improvement in color. It is suggested that sufficient oil be processed to make a plant batch of SWP at Chicago or Cleveland.

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The Vegetable Products Research Laboratory has also submitted a sample of (25 A 23) Lot No. 2785, vacuum-bodied, alkali refined linseed oil made by the acid recycling process, in the Dehydrol stills of the Cleveland Oil Mill. This was made in a manner similar to that employed in the laboratory in the preparation of MB 9273. Properties of this oil are as follows:

Acid Number	2.2
Color (Gardner, 1933)	5 +
Viscosity (G-H)	29-1/5 sec.
Appearance	Clear

The (25 A 23) and MB 9273 were compared with (25 A 22) in SWP Gloss White Rx 471, Card 80 for performance characteristics. The plant batch of (25 A 23) appeared to be equivalent to MB 9273 and similar in performance to the regular (25 A 22). Further performance checks will be made on the SWP being made at Newark and Gibbsboro from the 4000 gallons of (25 A 23) shipped to these points on 10-5-54.

Two of the six remaining house tests were not quite finished in October. Both are primed with Rx 450 Undercoater and may have to go through the winter without a finish coat, since the weather recently has been too cold for painting. The house tests completed in October using the two coat SWP system are:

J. Musil, 12077 Princeton Avenue, Chicago, a repaint test with Rx 450-Rx 471 SWP Gloss White over a previous job of light gray paint on a relatively old bungalow. The owner, who did the painting, noticed considerable improvement in brushing and coverage of the new Rx 450, and some improvement in the case of Rx 471. The finished job showed no differences in gloss or appearance at about one week. The spreading rates, only moderately accurate, are:

New Rx 450,	most of house	- 444	sq.ft./gal.
" " ,	part of south	- 470	" "
Old Rx 450,	" " "	- 460	" "
Old Rx 471,	" " "	- 510	" "
New " " ,	" " "	- 535	" "
" " " ,	most of house	- 505	" "

J. Barclay, 11245 Normal Avenue, Chicago, a rather old bungalow, narrow siding. The test covers Rx 450-Rx 471 with a small area using the old formula of each and the bulk of the house the new formula. The owner was very much impressed by the better brushing of the new Rx 450, and also felt that the new Rx 471 was an appreciable improvement. Both parts looked equally good after drying. The spreading rates, not particularly accurate in this case, are:

#97 - Cont.

Part of south side, old Rx 450	475	sq.ft./gal.
" " " , old Rx 471	545	" "
" " " , new Rx 450	455	" "
" " " , new Rx 471	570	" "
Overall use of Rx 450, new	435	" "

A blister fence is being assembled at the Chicago U.S. 30 Test Station. This will accommodate standard 36" x 6" bevel siding panels and will face east and west to use both faces to greatest advantage.

#97 - SWP

Considerable time was devoted to the reformulation of SWP Gloss White and light tints. Proposed formulas for SWP Gloss White - Rx 471, SWP Tinting White - Rx 475 and formulas for the six SWP light tints, Rexes 496, 478, 485, 459, 458 and 474 were revised to use 18 M Leaded Zinc, 68 C 6 dry and formulas were sent to Cleveland for distribution.

SWP Westchester Gray Rx 477 has been revised to use 68 C 6 dry as the leaded zinc with the introduction of (27 A 7) and (27 C 7) in the vehicle to improve stability and package condition.

	Raw Material Cost		
	Pigment	Vehicle	Total
SWP Westchester Gray Rx 477 Proposed Formula - OJ 604 S	$69.71	$90.33	$160.04
SWP Westchester Gray Rx 477 Card 19	$67.55	$95.11	$162.66

Initial production will be made at Chicago and formulas will be distributed by Cleveland after the first production has been checked for performance.

SWP Fume Resisting White was increased in hiding and the vehicle was revised to use part maleated oil (27 A 7) and vacuum bodied (25 A 22) as the bodied oil portion of the formula. However, due to the low gloss obtained with the above oils, it became necessary to use some heat bodied linseed (2539) in this particular formulation.

Due to the lower gloss properties of (25 A 22) the Vegetable Products Research Laboratory has prepared several variations of (25 A 22) for our inspection.

MB 7179 as (25 A 22) but 1/2% Fumaric Acid

MB 7185 " " " 1/2% Maleic Acid

MB 9244 " " " (Vacuum bodied to 10 seconds; (air blown to 28 seconds.

The Vegetable Products Research Laboratory has also prepared a benzoyl peroxide treated linseed oil MB 9010 similar to the old (5091) for evaluation in SWP, to determine if a less staining type of oil would meet our requirements for better color.

These oils will be evaluated and reported in our next monthly report.

#97 - Cont.

The Chicago Varnish-Resin Laboratory has prepared samples of malseated linseed (27 C 8) and (27 A 7) from the same batch of bodied oil to determine if the thinner used, (5027)-(151) in the first instance and (348)-(145) in the second, has any effect on the final paint viscosity. The two laboratory batches of SWP Gloss White made with (27 C 8) and (27 A 7) initially were similar in brushing, flow and consistency characteristics. (Actually on aging the (27 C 8) batch dropped in viscosity as of 9-13-54.)

Rx 471 Paint	Oil Under Test	Viscosity #5 Fresh	5 Days	17 Days	Brushing	Flow
611 S	(27 C 8) Body S -	27.2"	50.2"	27.4"	Good	Good
612 S	(27 A 7) Body S	28.2"	50.2"	29.8"	Good	Good

House tests scheduled for completion toward the end of August were not completed because of the unusually rainy weather. A test on the house of Mr. E. Stenquist, in a rural area near South Holland, Illinois, was completed. The purpose was a routine comparison of the old formulas of Rx 450 SWP Undercoater and Rx 471 SWP Gloss White against the revised formulas with improved brushing, with special interest in spreading rates. Essentially all the painting was done by the owner, a moderately experienced amateur painter. The paint measurements were accurate enough, but the house was rather difficult to measure up and calculate accurately. The resulting spreading rates are (sq. ft. per gallon):

	North	South	East	West	Total
Rx 450, old				465	465
Rx 450, new	460	470	457		463
Rx 471, old				520	520
Rx 471, new	535	550	522		529

#97 - SWP

Work has continued on the reformulation of house paints to eliminate the regular heat bodied linseed oils such as (2539), (2536) and (510) by a replacement with (25 A 22) and (27 A 7). The Chicago Varnish Resin Laboratory has submitted a variation of the vacuum bodied (25 A 22) coded CTV 8816 and a linseed alkyd (38 C 25) for inspection and test.

CTV 8816 Glyceryl-maleate-linseed vehicle. Body - 30 sec. A. V. - 6.2. Color - 7. Solids - 100%.

(38 C 25) Linseed-Glyceryl-P.A.-alkyd varnish. Body - 28 sec. Sp. Gr. - 1.022. A. V. - 6.2. Color - 11.

These oils were compared with (25 A 22) in the Fume Resisting White Rx 436 for general performance but gave no improvement in gloss over (25 A 22).

Panels 21080-21115 C, F were prepared during the month, all cedar beval siding panels for exposure at Chicago north and south and Florida south only. All the tests of Rx 471 SWP Gloss White are tested over both the old and new formulas (vehicle change) of Rx 450 Undercoater. The Rx 471 tests include: (a) regular stock batches of both old and new type formulas, (b) tests of certain bodied linseed oils considered for possible use in the new vehicle, including OKO-S 57, MB 5715 and MB 5724 in combination with the (27 A 4) and (25 A 22) as currently used. Two tests each of Rx 465 Colonial Yellow and Rx 474 Chelsea Gray, regular versus the MB 5724-(25 A 22) combination, are also involved in the series.

Panels 21221-21279 C, F were prepared during the month for exposure in Chicago and Florida. They cover Kem Tinting Color additions to various SWP tints and colors representing sixty one intermediate colors.

Panels 21289-96 C, F were prepared during the month for exposure in Chicago and Florida, covering comparisons of Harshaw's Sun Yellow Ti-Tint pigment 80 A 14, Hansa Yellow 12105 and chrome 12150 in SWP Tinting White and Intermix White.

Continuing reports on house tests, as started in last month's report:

(a) J. L. Patrick house, Chicago, repaint job on an old house recently remodeled, siding painted only once previously. This owner complained of excessive chalking of the SWP used previously. Our test, therefore, consisted of two parts: (a) Rx 450 Undercoater old versus new type formula and (b) Rx 471 SWP Gloss White on a minor control area versus a blend of 50/50 Rx 471/Rx 473 SWP Tinting White. In the Rx 450 comparison, the new formula spread at 432 square feet per gallon and the

#97 - SWP

old at 420. The finish coat special blend went on at 492 sq. ft. per gal. (this paint was 100% new type vehicle); the regular Rx 471, which was of the old vehicle type and on an area rather difficult to measure, figured to very nearly the same rate. This job was done by professional painters, and they commented very favorably on the brushing and hiding of both the new type formulas.

(b) Frank Ward house, 228 Maple Lane, Thornton, Ill. This is a relatively old house, 1-1/2 story, with siding in good condition. The work was done by the owner, who stated that he liked the working qualities and hiding of the new formulas considerably better than the old. Most of the house was done with Rx 450, C 1604 Undercoater - Rx 471, C 1114 SWP Gloss White (new), and about half of one side with Rx 450, C 1274 - Rx 471, C 494 (old). Some of the variation in spreading rates shown below may be due to inaccuracy of measurement, but the pattern seems to be of interest:

	Rx 450	Rx 471
North, all new	466 sq. ft. per gal.	600 sq. ft. per gal.
South, " "	445 "	578 "
East, " "	430 "	520 "
West, new	415 "	485 "
West, old	419 "	535 "
Total, new	439 "	546 "

(c) M. E. Budgall house, 18400 Riegel Road, Homewood, Illinois. This house is about 4 years old, first repaint job, old finish in good condition except for dirt. The work was done by a painter who was formerly a professional for several years. He expressed a slight preference for the brushing of the new formula Rx 450 and somewhat more pr ference for the new Rx 471. Most of the house was done with the new formulas, about 1/6 with the old. Spreading rates:

	Rx 450	Rx 471
North, all new	423 sq. ft. per gal.	456 sq. ft. per gal.
South, " "	409 "	436 "
East, " "	445 "	485 "
West, new	424 "	467 "
West, old	470 "	498 "
Total, new	425 "	461 "

#97 - Cont.

(d) Mrs. E. Granath house, Steger, Illinois. This is a new house, strictly rectangular and very small, with low walls. Good quality redwood siding was used and the painting was finished within a week after the siding was put on. The work was done by relatives, who had had some house painting experience. About one-half the house was done with the old formulas of Rx 450-Rx 471 and one-half with the new. The finished job looked quite satisfactory, with the old system apparently slightly glossier, but a little less white (lower hiding or thinner films). However, the report on the work itself, which was not observed by us, indicates that the painters were not quite as well pleased with the new Rx 450 as with the old. The paint seemed to be rather thin at first, but seemed to thicken after an hour or so after opening. This effect was not noted with Rx 471. The spreading rates were easy to calculate, but are probably affected by inaccurate measurements of the paints actually used: new primer, 483 sq. ft. per gallon, old primer 472; new finish coat 520 and old finish coat 511.

#97 - SWP

The Vegetable Products Research Laboratory has submitted three vacuum bodied linseed oils, MB 7445, MB 7449 and MB 7465 for evaluation in SWP as variations of (25 M 22). They may be manufactured more economically than (25 A 22) in the Dehydrol stills. The characteristics of these oils were:

MB 7445 - Vacuum bodied (44) containing 0.25% beta-chloranthraquinone and esterified with 0.55% pentaerythritol. Viscosity G-H 29". Acid Value - 2.6. Color 4 - 5.

MB 7449 - Vacuum bodied (44) pentaerythritol esterified. Viscosity G-H 27". Acid value 2.1. Color 4 - 5.

MB 7465 - (44) esterified during the vacuum bodying process with one addition, in the original oil before heating, of a partial ester of pentaerythritol and (44), bearing 9.1% P.E., in an amount such as to provide 1.0% P.E. in the total oil and ester mixture. Viscosity G-H 27". Acid Value 2.5. Color 5.

Experimental paints made with these oils were tested for brushing, flow, gloss and drying characteristics against SWP Gloss White made with (25 A 22). The results of the tests indicated that MB 7445 and MB 7449 are somewhat deficient in gloss and flow. MB 7465 produced the lowest consistency paint with gloss characteristics similar to (25 A 22). Due to the high consistencies obtained on laboratory batches of SWP made with the new oils we would suggest that sufficient MB 7465 be made for a small plant batch of Rx 471 if the Oil Mill can show a substantial increase in their yields as compared with (25 A 22).

Paint No.	Oil Tested	Viscosity #5 Fresh	Viscosity #5 5 Days	Brush	Flow	Gloss	High Shear Poises
502 S	(25 A 22)	47"	57.8" + 1/8 cup	8	8	9	3.0
504 S	MB 7445	45.8"	50.8" + 1/10 cup	7	8	8	2.7
505 S	MB 7449	46"	55.5" + 1/7 cup	8	8	8	2.5
506 S	MB 7465	56"	47.8"	8	9	9	2.8

The Chicago Varnish-Resin Department submitted a low vacuum heat bodied and air blown linseed oil CTV 8767 for test in SWP as a replacement for (25 A 22). It had a body of 29", an acid value of 4.4 and color 12. It was compared with (25 A 22) in SWP Gloss White Rx 471 and in SWP Fume Resisting

#97 - Cont.

Rx 436. CTV 8767 has slightly higher gloss characteristics than (25 A 22). However, a further improvement in gloss characteristics is necessary to obtain a standard gloss for SWP Fume Resisting White Rx 436. The Varnish-Resin Department has agreed to make other variations of (25 A 22) using maleic with and without an air blow on the oil. Work will be continued on this investigation.

SWP Westchester Gray Rx 477 was revised to use the new oils (27 A 7) and (25 A 22). Reports were received from Chicago and Newark on rechecks of batch samples that the present formula has a tendency to decrease in viscosity on storage. The elimination of (25 A 4) from this formula will improve the package stability. The Chicago and Newark factories were requested to make plant batches of Rx 477 when the new oils are available. If production made on the proposed revision is satisfactory, Cleveland will be requested to send the new formula to all plants.

Exposures 21001-21010 CS, CN, F were prepared during the month. All are cedar beval siding, primed with Rx 450 Undercoater. The tests cover the use of several extenders sent in for evaluation in Rx 471 SWP Gloss White: (a) Nytal 54 G and 500 KU 84; (b) Visco #1742 XX Talc; Visco #1728 Talc and Hy-Vis #1440 Talc from Whittaker-Clark-Daniels and (c) Lakefield Nepheline Syenite from Great Lakes Foundry Sand Company.

Considerable time was spent on house tests during the month, including some on which much of the work was done during the previous month and others on which results will not be available until the July report. Primarily because of the vehicle change in Rx 450 SWP Undercoater and Rx 471 Gloss White, we desired a considerable number of house tests this year, spreading rates being our main concern. Late in April a bulletin asking for prospects was posted throughout the Kensington plant. Nearly 100 responses were received, and about 70 houses were inspected. After some delay due to unavailability of the new Rx 450, some tests were started late in May. We expect continued activity through July and August, especially since several prospects are waiting for the revised formula of Rx 476 One Coat White. A few jobs will be held back for fall painting. Following are the completed tests to date:

F. Gangash house, Dolton, Ill. Porch and patio addition. Using new Rx 450 and Rx 471 only. Spreading rates: 478 sq. ft. per gallon for Rex 450, 520 sq. ft. per gallon for Rx 471.

W. Haas, Chicago, new garage. Using both old and new Rx 450-Rx 471. Very favorable comment on the new formulas on mixing and brushing. Spreading rates: 506 sq. ft. per gallon for Rx 450, 542 sq. ft. per gallon for Rx 471, with no measurable differences in amounts used of the old and new formulas.

E. Glasscock, Chicago, new garage. Systems as preceding, except that the finish coat is not Rx 471, but Rx 473 Tint Base shaded to approximately Rx 496 Ivory. Again favorable comment on new formulas. Spreading rates:

Old Rx 450, 548 sq. ft. per gallon		Old Rx 471, 423 sq. ft. per gallon	
New " 422 " "		New " 498 " "	

J. Chaps, Dolton, Ill., repaint on a fairly new house. Since the new formula was available only in limited quantity at the time, only a small area was done with new Rx 450-Rx 471. The spreading rates were:

Old Rx 450, 511 sq. ft. per gallon		Old Rx 471, 560 sq. ft. per gallon	
New " 527 " "		New " 591 " "	

The following tests are under way; old versus new Rx 450-471:

M. Budgell, Homewood, Ill., first repaint on a 2-story house.

F. Ward, Thornton, Ill., repaint, old house.

J. Bartellotta, Tinley Park, Ill., first repaint on a 2-story house.

E. Standquist, South Holland, Ill., repaint, old house.

J. Patrick, Chicago, repaint, old house but remodeled and with siding painted only once previously.

#97 - SWP

The Chicago Varnish-Resin Department has submitted three samples of (27 A 4) maleated, heat bodied and air blown linseed oil, taken at various intervals during the cook, with viscosities of 140, 185 and 240 (standard) seconds. The oils were used in conjunction with (25 A 22) vacuum bodied linseed in proportions required to obtain satisfactory paint viscosities. The Varnish Department has also submitted an air blown (515) type oil CTV 8761 to be compared with (25 A 22). CTV 8761 has a body of 26 seconds, acid value of 5.7 and color of 6.

The experimental work to date indicates that a high bodied oil (5' 54") will be required to obtain easy brushing and good flow in SWP. However, the Varnish Department was requested to heat body the base oil to 50 to 55 seconds instead of 69 seconds and then blow to a body of 5 minutes 54 seconds. The increase in blowing time may give better wetting, better flow and lower paint viscosity. This oil will be evaluated and reported on at a later date.

Paint Rex 471	Actual Weight (T 14.22)	Gallons (27 A 4) and Viscosity	Gallons (25 M 2) and Viscosity	Viscosity #5 Fresh	Viscosity #5 5 Days	Brush	High Shear	Flow	Gloss
424 S	14.22	7 (240")	12 (26")	24.0"	31"	9	2.4	8	7
426 S	14.24	7-1/2 (185")	11-1/2 (28")	25.0"	30"	7	2.5	8	7
418 S	14.25	11-1/2 (140")	7-1/2 (28")	25.4"	27.6"	5	5.2	8	7
427 S	14.18	7 (240")	CTV 8761 12 (26")	26"	30"	6	2.9	8	8

The Vegetable Products Research Laboratory has submitted two vacuum bodied linseed oils MB 7417 and MB 7427 for evaluation in SWP. The two oils are variations of (25 A 22), formerly (25 M 2). MB 7417 is a new vacuum bodied linseed oil similar to (25 A 22) except that the base oil is raw extracted oil and very lightly refined with caustic soda. It is unbleached and unrefrigerated and represents a grade of treated raw oil that the Vegetable Products Research Laboratory believed could be processed satisfactorily in their continuous vacuum bodying equipment. MB-7417 has a viscosity of 28 seconds, an acid value of 1.6 and a color of 6-7.

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MB-7427 is a beta chloranthraquinone catalyzed vacuum bodied linseed oil based on (44). The purpose in submitting this oil was to determine any merit it may have toward reducing the present excessive cost of vacuum bodying in the Dehydrol stills at the Oil Mill. The most recent yields from that operation have been about 88-1/2%, which involves too high a cost to bear at the present differential of five cents over raw linseed. MB 7427 has a viscosity of 28.6 seconds, an acid value of 2.5 and a color of 5 plus.

The experimental paint made with MB 7417 has good brushing and flow properties. The initial paint viscosity is slightly low and the color is very slightly yellow. The high shear on the fresh paint is 2.4 poises. MB 7427 produced paint that was somewhat high in viscosity, slightly sticky in brushing and somewhat low in gloss and flow characteristics. There may be some question on the very slightly yellow cast imparted to the paint due to the MB 7417. However, sufficient MB 7417 should be made to make a factory batch of SWP in order to check the color of production made with this oil. There is no interest in MB 7427 due to the lower gloss and flow properties obtained with this oil in SWP.

Exposures 17712-25 F, C were examined during the month, consisting of a group of four quite unrelated tests put out in the usual manner at Florida for 15 months vertical south and 15 months at Chicago north and south. Most of the series is taken up with competitive flat paints presented to the trade for exterior use. These are tested against regular SWP house paint of the appropriate colors as control, and also against S-W Flat-Tone. Other tests, below, are self-explanatory.

(a) Armstrong's Flat, Dutch Kraft (Grand Rapids Paint and Enamel Co.) and S-W Flat-Tone, all in both white and shaded green, show some interesting contrasts. With one exception, there has been surprisingly little increase in film failure during the second 6-8 months, and all seem more durable than would be expected, especially with respect to erosion at Chicago. The exception is Flat-Tone Spring Green, which shows bad cracking. The chalking is not excessive. All the greens show very bad chalk mask fading, and at Florida the entire group shows bad mildew, though not necessarily more than the regular SWP greens used as guides.

(b) No choice due to the use of basic Mg and Al Rosin Amine D soaps (at 10 pounds) as surface active agents in Rex 471 SWP Gloss White. The paints look smooth and clean.

(c) Enterprise Wonder White #452 shows up fairly well so far, but at Florida it is not only quite susceptible to mildew but also shows appreciable microscopic checking.

#37 - Cont.

(d) Protexa-Wall seems very durable at Chicago and no more susceptible to dirt than SWP. However, at Florida there is one development which may become serious - a streaky effect (horizontal) which looks like bleeding. Protexa-Wall is a very heavy material, believed to be based on an acrylic resin. It is supplied by Krylon Corporation, Paterson, N. J., and is applied by spraying one coat with a very coarse nozzle.

#97 - SWP

The Chicago factory has manufactured approximately 40,000 gallons of SWP on the new easy brushing formulation. This production has excellent brushing and flow characteristics. Batches made during April on the new formulation are listed below.

During the month, batches of SWP Ivory Rex 496, SWP Chalsea Gray Rex 474 and SWP Colonial Yellow Rex 465 were made on the new formulation. The new tint base formula, however, will require some modification in PVC and vehicle composition to adjust for tinting colors and tinting bases. In the initial batches no adjustment was made for the added color so all high shear readings are slightly higher and the brushing properties are not quite equal to the SWP Gloss White. Cleveland has been requested to make the required adjustment in PVC to correct for the added tinting color in the light tints before the formulas are distributed.

SWP Production at Chicago (New Formula)

Date	Gallons	A. Wt. (T. Wt. 14.24)	Added (151) per 100 gal.	Viscosity #3 Fresh	Viscosity #3 Days Shown	High Shear in Poises
					8 days	
C 914	2000	14.20	1/2%	52"	55"	2.5
					7 days	
C 914 A	1100	14.20	0	52	54.6"	2.6
					7 days	
C 924	1100	14.12	1/2	28	29"	2.2
					7 days	
C 924 A	2000	13.97	1/2	54	54.6"	2.5
					6 days	
C 924 B	"	14.22	0	51	52.1"	2.6
					6 days	
C 994	"	14.10	1	30	29.2"	2.4
					3 days	
C 1024	"	"	1	28	27"	2.4
					2 days	
C 1024 A	"	14.18	1-3/4 (145)	51	33.6"	2.5
					10 days	
C 1034	"	14.14	1/2	51	55.8"	-
			(1/2 (151)		8 days	
C 1044 A	"	14.05	(1 (145)	52	51.6"	2.5
					3 days	
C 1044	"	14.01	2%	52	29.2"	-
					5 days	
C 1054	"	14.16	1% (145)	29	31"	2.5
Rex 496		(T 14.41)			6 days	
C 974	900	14.55	1-1/2%	30	29.2"	3.0
Rex 465					3 days	
C 1034	900	14.16	3% (2702)	51	32.0"	2.6
Rex 474					2 days	
C 1024	1100	14.41	0	29	26.2"	2.7

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#97 - Cont.

Work will continue on the reformulation of SWP to improve flow and gloss. Working with the individual oils used as the entire bodied oil portion of the vehicle of Rex 456 SWP Fume Resisting White, the (27 C 8) maleic treated bodied and blown oil produced good flow and gloss, whereas the vacuum bodied oil (25 M 2) gave low body, poor flow and low gloss. The initial work suggests that we should investigate the possibility of using higher amounts of a modification of (27 C 8) or the base oil (27 A 4) at lower viscosities in higher amounts to permit a reduction of the volume of (25 M 2), provided the brushing qualities can be maintained.

Samples of (27 A 4) will be taken at various intervals during the cook to supply oils having approximately 2, 2-1/2, 3, 3-1/2 and 4 minutes for experimental study. The Chicago Varnish Plant and the Cleveland Linseed Oil Mill will both submit samples for inspection.

Another possibility is to try to improve the wetting characteristics of (25 M 2) without loss of its contribution toward easy brushing. (25 M 2) will be given a slight terminal air blow to see whether we obtain the desired improvement in wetting without loss of brushing qualities. The Varnish Department is trying to make (25 M 2) using a slight vacuum and a vigorous blow with inert gas to simulate vacuum bodying. They will try to cut off the heat bodying at elevated temperature with blowing with inert gas at some point short of the standard viscosity for (25 M 2), then drop the temperature and finish with a slight air blow.

The R. T. Vanderbilt Company has submitted three micas for our inspection. The submitted samples were compared with our regular micas as 7% of the total pigment in SWP Gloss White Rex 471.

Old Dry No.	New Dry No.	% Residue 325 Mesh Screen	
2264	6253	10%	Water ground mica
2307	6252	12%	Dry ground mica
-	62 C 2	0.5%	" " "
Vanderbilt Mica	No. 2	1-2%	" " "
" "	No. 5	5-6%	" " "
" "	No. 12	11-13%	" " "

2264 dry — Alsibronz Special #12 Mica - Franklin Mineral Products

2307 dry - AA Mica, Thompson Weinman

62 C 2 - 4 X Mica, Mineralite Sales Corp.

#97 - Cont.

The various experimental paints were ground at the same mill adjustment and the finished paint was checked for body, brushing, flow, grind and gloss characteristics.

Rex 471 Paints	Mica	A. Wt. (T. Wt. 14.24)	Grind	Viscosity #3 24 Hr.	Brush	Flow	Gloss
398 S	62 C 2	14.19	3 H	45.2"	8	9	8
399 S	2307 dry	14.22	3 H	54"	8	8	7
400 S	2264 dry	14.22	2-1/2 H	62.2"	6	6	6
401 S	Mica #2	14.17	3 H	57.6"	6	6	6
402 S	Mica #5	14.24	2-1/2 H	60.8"	6	6	6
403 S	Mica #12	14.21	2 H	62"	5	5	6

All experimental paints are high in viscosity, apparently due to the high relative humidity at the time of grinding and the moisture content of the various pigments used in the test paints.

Panels 20742-91 C, F, K, O were prepared and exposed during the month, a total of 240 cedar bevel siding panels for exposure at Chicago, north and south, and Florida, Coffeyville and Oakland south only. These cover the recent revision in Rex 450 Undercoater and SWP White and tints made to improve brushing. Five formulas of Rex 450 are involved (as well as self-primed work):

1. Card 39, with Calite and leaded zinc.
2. Card 41, zincless, with Calite.
3. Card 47, zincless, no Calite.
4. Proposed formula, zincless.
5. " " with leaded zinc.

Each of these are used with two Rex 471 SWP Gloss Whites, Card 75 current production and the proposed formula. The Undercoater formulas numbered 3, 4 and 5 (also self-primed work) are used also with (a) Rex 436 Fume Resisting White, (b) SWP Tint Base and (c) Intermix (low PVC) White, all being current versus proposed, and (b) and (c) being used both as white and tinted to Colonial Yellow.

Exposures 15461-70 F, C were examined after 24 months at Florida vertical south and 26 months at Chicago north and south, all cedar bevel siding primed with Rex 450 Undercoater. The tests are designed to improve flow, gloss and uniformity of production of Rex 477 SWP Westchester Gray. The variations are:

#97 - Cont.

OJ 605 P Rex 477 Card 13, guide.

OJ 766 P Using 250 lb. 2304 dry= as inert, 9 gal. (213) blown linseed oil.

OJ 717 P Using 500 lb. 2304 dry.

OJ 718 P Using 500 lb. 513 dry=.

OJ 758 P Using 500 lb. 2304 dry, and 16 gal. of (4106) alkyd.

OJ 696 P Using 2140 dry Titanox RC for 2174 Ti-Pure R-610, and 512 dry Nytal 500 as inert.

OJ 697 P Same but 566 dry mineral whiting for 512 dry at equal volume.

OJ 695 P Similar to 605 P but 54 lb. of 2174, 400 lb. of 512, with some Rheotol and (798) non-break linseed.

OJ 896 P Pigment as 766 P except using 20 dry Mg silicate; 20 gal. OKO M-17 oil.

OJ 898 P Pigment same; 20 gal. OKO M-37.

Rex 477, C 651 stock, formula as guide.

=2304 Sierra's Mistron HG-75 Mg silicate, very fine.

513 Sierra's T-075, less fine than HG-75, but finer than 20 dry.

The report at one year stated that several formulas showed improvement over the regular (guide) in durability but that none were good enough in clean-up and resistance to fading to rate as appreciably better all-around. At two years, a fairly clear-cut case with regard to durability is seen in the Florida panels. The pigment changes, except 696 P and 697 P, using 2140 dry, are an improvement on the regular as regards checking, although none are entirely free of it. The two OKO oil tests also show more checking than the guide. However, fading and clean-up again introduce contradictions into the general evaluation. The guide and the four tests cited above stand out as good in color so that their appearance rating is better than those showing more checking. The sample using (4106) seems surprisingly poor in color retention. The Chicago tests show no film failure. 696 P and 697 P, with 2140, look best because of good color retention. The (4106) sample seems fair. The samples rather poor in color are C 651 stock and OJ 717 P. The OKO samples look relatively good.

#97 - Cont.

Exposures 15934-58 F, C, F, K were examined during the month, with a full report being sent to the technical mailing list and to the St. Joseph Lead Company, with whom we have cooperative exposures on this subject. Because of this coverage and the availability of extra copies of the report, no attempt is being made here to present the paints and results in detail. Florida tests, the usual cedar beval siding with regular guide, are reported at 24 months, Chicago and Coffeyville tests at 30 months. The general formulations involved are Rex 471 SWP Gloss White, Rex 436 Fume Resisting White and St. Joseph's submitted lead-free house paints. Both Rex 450 Undercoater and self-primed systems are tested. The following zinc oxides are compared: American Zinc's Azo ZZZ-35 and ZZZ-55, New Jersey's Horsehead XX-592, XX-505 and XX-50, and St. Joseph's Green Label #17, #40 and #42. Only a few cases show notably good or poor performance. A brief summary:

1. XX-592 definitely chalky and tends to check.

2. XX-50, XX-503 slight checking tendencies, ZZZ-55 and #17 even less.

3. ZZZ-35 best, #40 and #42 nearly as good in durability and clean-up.

4. St. Joseph leadless paints show somewhat more mildew and dirt than Rex 436.

Panels 16166-70 F, C were examined after two years' exposure at Florida vertical south and 30 months at Chicago north and south, all cedar beval siding primed with Rex 450 Undercoater. The Florida tests are being retired. As mentioned in somewhat more detail in our report of January 19, 1953, these tests cover samples of Silicone Oil C from Plaskon as made up into 20% siliconated linseed oil by the Resin Research Department and used to replace all (2)-(1521) and (510)-(2537) linseed oils in Rex 471 SWP Gloss White of early 1951. Since these oils increased the rate of drying, samples with reduced metallic driers were included for comparison. The Florida tests show a heavy pattern of microscopic checking, which was incipient at one year. Although the appearance is as good as that of the guide, the test paints, regardless of the drier content, are certainly inferior to the regular Rex 471 guide from a durability standpoint. The Chicago panels show essentially the same thing. The checking is not as serious as at Florida, but there is a definite difference in dirt collection, favoring the regular.

Exposures 18820-53 F, C were examined after approximately 6 months at Florida vertical south and at Chicago north and south. All the tests involved are on new cedar beval siding and part are also tried as repaint work, using regular Rex 450 Undercoater in all cases. The purpose is to try to improve SWP Tint Base with respect to (a) tendency to check at Florida by incorporating mica, and (b) tendency toward mildew growth by adding fungi-

#97 - Cont.

cides. Besides the regular tint base, the low PVC Intermix formula is also tried with a limited number of variations. All formulas are tested both as white and as shaded to Westchester Gray, with Rex 471 SWP Gloss White as a guide on the whites. The mica used is at 7%.

There is no film failure and no chalking except on the Rex 471 guide. There is no fading of any importance. The gloss retention varies, but the only striking differences are in the low gloss of Rex 471 and the high gloss of the Intermix. Probably the only clear-cut conclusion of any value at present is that the fungicides tested are not doing a satisfactory job; in fact, even at the higher levels some show no effect at present. The agents tried are Dowicide 6 at 7 cents per gallon, Super Ad-It at 7¢ and 14¢ and phenyl mercury oleate at 7¢ and 14¢.

#97 - SWP

The Paint Research Department has made several reports in the last few months on the reformulation of SWP to improve brushing and flow. Various maleinized, heat bodied and blown oils were prepared by the Vegetable Products Laboratory, such as MB 5715, for our inspection. The MB 5715 type oils were used in conjunction with OKO S 57 vacuum bodied linseed to improve the brushability of our exterior house paints. The OKO S 57 type linseed oil and MB 5715 have been manufactured in tank car quantities and have been given the assignments (25 M 2) and (27 A 4) respectively.

In order to check the general performance of the plant production of (25 M 2) and (27 A 4) the two oils were used in combination with the laboratory samples such as MB 5715 and the OKO S 57 linseed as shown in the following chart. In all cases, regardless of the oils used in our test paints, we obtained standard viscosities and brushing characteristics, which indicated plant production of the oils was identical to the laboratory samples.

	Sample	Body	Acid Value	Color
MB 5715	Laboratory sample	Z' 54"	9.9	10 +
(27 A 4)	Tank Car	Z' 54"	8.4	11
OKO S 57 Linseed	A-D-M Oil	Z- to Z+	1-3	4-6
(25 M 2)	As above but S-W production	Y-Z	2.0	4

Rex 471 Paints	Bodied Oils Used With (2) Raw Linseed Oil		T Wt.	A Wt.	Viscosity #3 Fresh	3 Days	5 Days	Brushing	High Shear
Rex 471	Maleinized, bodied oil	Vacuum bodied linseed							
505 S	MB 5715	(25 M 2)	14.26	14.27	25"	34.8"	34"	Very good	2.4
507 S	MB 5715	OKO S 57	"	14.24	26"	34"	33.6"	"	2.4
508 S	(27 A 4)	(25 M 2)	"	14.26	28"	33"	32.6"	"	2.2
509 S	(27 A 4)	OKO S 57	"	14.26	27"	34.6"	31.8"	"	2.6
Tint Base 506 S	MB 5715	(25 M 2)	14.51	14.47	27"	32.2"	32"	"	2.6

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#97 - Cont.

The Chicago factory has manufactured six plant batches of SWP Gloss White on the new easy brushing SWP formulation. The new production has excellent brushing and flow characteristics.

Date	Gallons	A. Wt.	(5027) Added per 100 gal.	Viscosity #5 Fresh	24 Hr.	Days Shown	High Shear in Poises
C 844 B	1100	14.24	0.5	27.2"	30"	28.6" (8 days)	2.2
C 884	1125	14.18	1.5	28.2	28.8	29 (4 days)	2.2
C 894	1100	14.21	-	28	28	-	2.3
C 894 A	2000	14.24	-	28	27.8	-	2.4
C 894 B	1100	14.26	-	30	29	-	2.4
C 904 A	2000	14.28	0.25	29	-	-	2.4
C 904	1100	14.22	-	29	-	-	
C 904 B	1210	14.10	-	27	-	-	2.4

Work will be continued on the reformulation of SWP Fume Resisting White Rex 456, SWP Tinting White Rex 475, SWP One Coat White Rex 476 and SWP Westchester Gray Rex 477 to improve brushing by the use of (27 A 4) and (25 M 2).

A preliminary evaluation of (25 M 2) vacuum bodied oil was made in the experimental oil-alkyd low PVC intermix white formulation. It was found that all of the oil used in the formula could be replaced with (25 M 2) without adversely affecting application characteristics. High shear viscosimeter ratings show the two paints to be the same at 1.95 and 1.93 poises, respectively. An additional and perhaps more interesting feature of the paint made with the (25 M 2) oil is the fact that tack is materially reduced compared with the regular formula. This suggests the investigation of this material for use in the low pigment volume trim paints.

The Dispersion Laboratory has supplied a series of shading bases in which the color is dispersed in gelled mineral spirits. These have been compared with Kem Tinting Colors as well as with fluid oil colors for the shading of SWP tints (see report of February, 1954 for Kem Tinting Color evaluation). Some difficulty was experienced in incorporating these colors in the SWP tint base by simple manual stirring. Tests at 1 - 5 minutes stirring always favored the Kem Tinting Color and the fluid oil color for ease of dispersion. Quantitative additions of color prove an equal color strength development after a five minute shaking period whether the color is introduced as Kem Tinting Color or the Dispersion Laboratories gelled solvent bases.

#97 - Cont.

Tests of the pregelled bases in odorless flat enamel were more successful than those in SWP Tinting White. For this application no difficulty was experienced with any of the shading bases for ease of incorporation, uniformity, color strength development.

In the February report a reference was made to tests being run on three inerts from Whittaker, Clark and Daniels - #1742 Visco XX Talc, #1726 Visco Talc and #1440 Hy-Vis Talc. The three special talcs were compared with Nytal 300 in SWP for viscosity, brushing, flow and gloss. The #1742 Visco XX and 1726 Visco talcs are quite similar to Nytal 300 in all respects. The #1440 Hy-Vis produces higher viscosity and somewhat shorter flow and lower gloss than standard.

				Viscosity #5				
Batch	Inert	T. Wt.	A. Wt.	Fresh	5 Days	Brush	Flow	Gloss
295 S	Nytal 300	14.60	14.72	20.2"	25.8"	Good	Good	Good
296 S	#1742 Visco XX	"	14.72	19.8	23	Good	Good	Good -
297 S	#1440 Hy-Vis	"	14.75	24	51.5	Good	Good -	Good -
298 S	#1726 Visco	"	14.69	22	25	Good	Good	Good

Panels 20650-69 F, C were prepared for exposure at Florida and Chicago to determine the range of chalk resistance of non-chalking rutile titanium oxides supplied by the principal producers, including Titanium Pigment Corporation, du Pont and Calco. All are tested in SWP tint base tinted to Chalsea Gray and Colonial Yellow and most were also tested in the low PVC Intermix White formula tinted to the same shades.

Panels 15150-2 F, C were studied during the month. The purpose of this series was to compare regular (2) linseed oil with a sample extracted at the S-W Oil Mill by the hexane solvent process. The analysis and other characteristics of this oil, as well as the properties of paints made from it, are very closely similar to those of (2). All tests are cedar beval siding, primed with Rex 450 Undercoater. All have been exposed 4 years, Florida vertical south and Chicago north and south. All tests show good durability; however, the Florida panels passed through a period of heavy mildew growth. No significant differences in the performance of these two oils have been seen throughout the exposure.

Panels 15280-91 F, C were examined during the month, after approximately two years' exposure at Florida vertical south and at Chicago north and south, all cedar bevel siding. The samples tested compare regular linseed type formulas of Rex 450 Undercoater and Rex 471 SWP Gloss White with variations of each containing 25%, 40% (bodied portion only) and 100% of safflower oil. Each test is also duplicated using about 1/2 gallon of Rheotol to increase flow.

#97 - Cont.

The Florida panels are being retired at two years because of hail damage. For the same reason, it is difficult to rate durability with any accuracy. Microscopic checking on the tints gives some indication of favoring the 100% safflower formulas. The only clear indication regarding safflower so far is that it does show more fading than linseed in the tints, and in most cases this is also accompanied by poorer clean-up. All the whites look very good. There seem to be no differences due to Rheotol in durability, but it seems to slow up chalking and therefore clean-up. On the other hand (considering also Chicago tests), this retardation of chalking may be of some value, since it slows down erosion also. There seems to be no effect on dirt or on fading of tints at either location.

Panels 15511-25 F, C were examined after two years in Florida and Chicago, covering tests of polyvinyl methyl ether from General Aniline and Film Corporation as a plasticizer in SWP Gloss White. A 50% solution in xylene was used, in various amounts from 1/2 to 16 gallons per hundred. Use of the higher amounts leads to checking in Florida.

Panels 15422-4 F, C were examined after two years' exposure in Florida and 27 months in Chicago. The test is in SWP Gloss White, where a linseed-Dow vinyl chloride-vinylidene chloride latex mixture was substituted for the regular bodied oil portion of the vehicle. There was some evidence of incompatibility and some retardation of drying. However, the exposure results have been substantially identical during the two years. The Florida panels are being retired because of hail damage.

Exposures 16171-9 F, C were examined after two years at Florida and at Chicago vertical south, all cedar bevel siding primed with Rex 450 Undercoater. The tests cover SWP Tint Base as of early 1951, Paintercraft Tint Base and a special formulated for Mr. Holton by Cleveland Technical Service. All carry leaded zinc and 21.74 dry R-610 TiO_2 in similar amounts. The Paintercraft adds a little 2140 dry RC, but its extender is all 20 dry Mg silicate, the same as that of SWP. The special is a little lower in 21.74 and carries roughly 100 pounds each of 20 dry, basic carbonate white lead, half-hydrate $CaSO_4$ and bi-hydrate $CaSO_4$. All are tested as shaded to Plymouth Green, Colonial Yellow and Westchester Gray.

In a report at one year, SWP tint base was rated as somewhat better in appearance than the other, also a checking tendency was noted on the special formula. Florida results at two years show quite conclusively that the special formula is subject to much more checking than the others; the Chicago tests also show some microscopic checking on the special. The picture with respect to fading, dirt and appearance is not so clear. The special in Plymouth Green seems slightly poorest at Florida and definitely poorest at Chicago, partly due to fading and partly to dirt. In Chelsea Gray, generally speaking, it is very little if any poorer in appearance than either of the

#97 - Cont.

others. In Colonial Yellow it looks equal to the regular, better than the Paintercraft. It appears, therefore, that the calcium sulfate-basic carbonate white lead combination does not do anything exceptional to appearance characteristics and may lead to durability difficulties.

Panels 16240-2 F, C were examined after two years' exposure in Florida and Chicago. They compare Clay Black MR-107 from E. S. Dickerson against lampblack and extender in SWP Westchester Gray. The tests in general are about equal in performance, but the Florida panels show some tendency toward microscopic checking when MR-107 is used.

#97 - SWP

An investigation has been in progress on the reformulation of SWP to increase viscosity by the use of higher consistency inerts. The following materials have been investigated:

Grade 510 Talc	Eastern Magnesia Talc Co.
Special Nytal 300 84 KU	R. T. Vanderbilt Co.
Experimental Nytal 54 G	"
Visco #1726	Whittaker, Clark and Daniels
Hy-Vis #1440	" " "
Visco XX	" " "

The Whittaker, Clark and Daniels inerts are in the process of testing and a report will be made next month. The Grade 510 Talc and the two Nytals submitted for test gave somewhat higher consistencies than the regular 512 dry Nytal 300. However, the brushing, flow and gloss characteristics are somewhat below standard. Some adjustment may be required in the vehicle to improve the flow, gloss and brushing properties if these inerts are used in SWP.

SWP Gloss White - Rex 471

Batch	Inert	T. Wt.	A. Wt.	Viscosity #5 Fresh	Viscosity #5 24 Hr.	Flow	Gloss
270 S	200# 512 dry	14.60	14.64	24"	26"	Good	Good
271 S	200# Grade 510	"	14.65	51"	53.2	Short	Fair
272 S	200# Nytal 54 G	"	14.69	27"	30"	Good-	Good
273 S	200# Nytal 300 KU84	"	14.66	29.8"	32"	Good-	Good-
274 S	(150# 512 dry (50# Grade 510	"	14.61	27.2"	29.4"	Good-	Good-

SWP Tint Base Formulations

275 S	125# 512 Using 2140	14.70	14.78	22"	23.5"	Good	Good
276 S	125# Grade 510 Using 2140 dry	14.70	14.75	24"	27"	Good-	Fair +
277 S	300# 512 dry Using 2174	14.58	14.60	24.2"	26.8"	Good-	Good-
278 S	300# 510 Talc Using 2174	14.58	14.66	55.2"	54.2"	Very short	Fair

#97 - Cont.

In the January report a reference was made to the use of MB 5724 (duplication of MB 5201 and MB 5715) in SWP Gloss White. The Vegetable Products Research Laboratory submitted four gallons of MB 5724 which was used in conjunction with OKO S 57 vacuum bodied linseed oil and (2) raw linseed oil to obtain the optimum brushing properties for SWP. A definite improvement was made in the brushability of SWP by the use of these oils. Formula 205 SS was developed and submitted to management. It shows improved brushing, better flow and gloss and a lower raw material cost than the present SWP Gloss White. A comparison with the Card 71 and Card 75 formulations is made in the following table:

	Rex 471	Rex 471	Proposal
Card or Exp. No.	71	75	205 SS
PVC	35.7%	35.6%	34.7%
Total oil	408 lb.	411 lb.	408 lb.
Bodied oil	19 gal.	14.5 gal.	19 gal.
Zinc oxide	51.5%	51.5%	51.5%
Hiding (Holley units)	19,800	19,800	18,450
High shear	5.7 poises	3.0 poises	2.4 poises
Raw material cost			
Pigment	$102.07	$104.35	$97.35
Vehicle	72.61	74.17	78.02
Total	174.68	178.52	175.37
Differential with card 71	-	+ $3.84	+ 0.69

The suggested revision for Rex 477 SWP Westchester Gray using Bentone 34 gel BI 72 is now in effect. Cleveland has found BB 10 to be satisfactory for control of color flooding. Production made with pregelled Bentone will be checked for package condition and stability on storage.

#97 - Cont.

A series of tints has been prepared to evaluate Kem Tinting Colors for use in exterior house paints. Portions of batch C 2953 of Rex 475 SWP Tinting White were shaded with each of the Kem Tinting Colors at a concentration of four ounces of color per gallon. Each of these shades was then matched using the same pigments dispersed in the conventional fluid oil color vehicle system. All colors mixed in well, and no flooding or floating was experienced in these formulations. Viscosity characteristics are given in the following table as seconds on the No. 5 S-H orifice. For comparison, the Rex 475 base paint C 2953 had a viscosity of 28 seconds and weighed 14.62 pounds per gallon.

Kem Tinting Color 4 oz./gal.				Fluid Oil Color Match		
Paint	Tint	Wt./Gal.	Viscosity	Paint	Wt./Gal.	Viscosity
RB 4563	Rex 67400	14.66#	29 sec.	RB 4575	14.66#	30 sec.
4564	67401	14.67	29	4576	14.80	29
4565	67402	14.69	28	4577	14.75	29
4566	67403	14.66	28	4578	14.84	30
4567	67404	14.67	29	4579	14.78	31
4568	67405	14.70	29	4580	14.76	30
4569	67406	14.66	29	4581	14.78	30
4570	67407	14.66	29	4582	14.69	30

It will be noted from the above that the Kem Tinting Color has had little effect on paint viscosity. It is believed that the viscosity increases related to the oil color additions are due to loss of solvent during the shading operation to match their Kem Tint counterparts. These paints have been exposed at Chicago north and south and Florida south only and are identified as series 20589-20604 CS, CN and F.

Panels 20535-51 C, F were prepared during the month on cedar beval siding for exposure at Chicago and Florida, vertical south. The tests consist of 5 coats each of the bodied linseed oils mentioned in the January report on page 24, the purpose being to test the durability of these heat-bodied oils without pigmentation. Six samples of CTV-8357 and seven of CTV-8360 are tested. Both are SO_2 treated oils, but the latter was cooked with a maximum draft to simulate vacuum bodying. (2) raw linseed oil is used as a guide, and (44) refined linseed and (510) bodied linseed are included among the tests.

#97 - Cont.

Panels 20571-88 C, F, K were prepared for exposure at Chicago north and south, and south vertical at Florida and Coffeyville, all cedar beval siding panels. Chicago panels are repeated using Rex 450 Undercoater shaded gray as well as white. The basic formula is Rex 471 SWP Gloss White Card 70 which is used as the guide. The tests cover the micas listed below, all submitted by Franklin Mineral Products except 62 C 2, which is the regularly used mica at present. All are used at 7% on the pigment weight.

62 C 2	4 X mica from Mineralite Sales Corp.
Alsibronz #51	stearate coated, intended for latex use.
" #52	stearate coated, similar.
" #45	resin coated, intended for house paints.
" #50	silicone-compatible coating

A special test covers the use of Alsibronz #45 pre-wet by grinding with (510) bodied linseed oil alone before incorporating it into the paint.

Exposures 13553-6 F, C were reported on during the month. The purpose was to evaluate Conophor oil in Rex 471 SWP Gloss White of early 1949, with both raw and heat-bodied Conophor oil replacing the (2) and (510) linseed oils. The oil has an iodine value of 200 or better and a linolenic content of about 65% of the component acids of its mixed glycerides. A sample was obtained through Mr. L. E. Wakeford, of Lewis Berger and Sons. The panels are cedar beval siding, primed with Rex 450 Undercoater, which is used both as white and shaded gray to emphasize erosive tendencies. The Florida panels were retired at 36 months, vertical south, while the Chicago panels continued on test to approximately 4-1/2 years, north and south. The special paint compared favorably with the regular in the usual laboratory checks. At Florida, the special oil showed a tendency to chalk and erode somewhat faster than the regular; this resulted in a cleaner and better appearance. The Chicago exposures, which usually show up even relatively small differences in erosion, do not show any differences in this or any other characteristics throughout the exposure. Therefore, this oil may be rated as equivalent to linseed for use in Rex 471.

Panels 17751-68 F, C were examined after 12 months' exposure at Florida vertical south and 15 months at Chicago north and south. All are cedar siding panels primed with Rex 450 Undercoater. The general purpose was to determine the effect of varying amounts of chalk resistant titanium in white and tints. Rex 471 SWP Gloss White, Rex 473 SWP Tinting White and blends of each were tested as indicated below. du Pont's Two Purpose Outside White was included as an example of competitive efforts along this line.

#97 - Cont.

OJ 754 Q. Rex 471, card 66, 1403 anatase TiO_2 and 2132 RC HT rutile titanium calcium.

OJ 755 Q. Rex 475, card 2, all 2140 RC HT rutile titanium calcium.

- du Pont Two-Purpose Outside White, T-187-040-0351.
Analysis: Ti-Mg 48%, zinc oxide 32%, silicates 20%; oil vehicle.

The above used both as white and as tints.

OJ 913 Q. Blend of 25% Rex 471/75% Rex 475, as above.

OJ 914 Q. Blend of 50% " /50% " "

OJ 915 Q. Blend of 75% " /25% " "

These blends tested only as tints.

The Florida panels were retired because of the preponderance of mildew growth on all tests except the Rex 471, in which case the anatase TiO_2 resulted in good self-cleaning. The main conclusion at present is that none of the other paints are satisfactory in a climate where mildew is a problem, and that the next move should be to incorporate a fungicide. The du Pont sample behaved very much the same as Rex 475 in all respects, and was therefore judged not suitable for use as a white because of poor self-cleaning. As noted in previous series, Rex 471 is too chalky to allow satisfactory color-retention in tints.

The tint bases, including blends, and the du Pont sample showed some checking at Florida. The Chicago tests continue because it is felt that they will give more information on the clean-up of ordinary dirt. At present, the chalk rub-off and the amount of dirt follows very closely what would be expected from the amount of chalk-resistant titanium used. The du Pont sample again is more acceptable as a tint than as a white.

#97 - SWP

The Resin Research Department has prepared a gallon sample of magnesium Rosin Amine D soap RD 7659 for evaluation in safflower oil paints. It has the following properties: solids - 86%, M.P. - 400° F., solvent - (4046). This soap was compared with RD 0851, a Rosin Amine D magnesium soap previously submitted for evaluation.

Paints were made using safflower oil with and without two pounds of RD 7659 and RD 0851. The magnesium Rosin Amine D soaps improved the gloss and flow but retarded the drying characteristics.

Paint	Oil	Soap	Brushing	Flow	Gloss	Drying Set	Drying 24 Hr.
206 S	100% Linseed	None	Good	Good	Good	6 hr.	Good Sl. tack
201 S	100% Safflower	"	Good -	Short	Low	6 hr. 10 min.	" "
176 S	" "	RD 7659	Good	Good	Good	11 hr.	Def. tack
177 S	" "	RD 0851	Good	Good	Good	11 hr.	Def. tack

Work has continued on reformulation of SWP to increase viscosity by use of a higher consistency inert and by use of a Bentone 34 base. Eastern Magnesia Talc Company has submitted a sample of their experimental Grade 510 Talc for evaluation in SWP. 510 Talc has an oil absorption of 57.4 and 0.13% residue on the 325 mesh screen. Work to date indicates that two gallons of Bentone 34 Base or 50 to 75 pounds of a high consistency inert will be required to increase the viscosity of SWP to an optimum brushing consistency. Work will continue.

Westchester Gray Rex 477 Card 18 has a tendency toward low initial viscosity and to drop somewhat in viscosity during storage. Bentone 34 base LL 372 (experimental number) has been used to increase viscosity. Proposed revision 180 S was sent to Cleveland for distribution.

The Vegetable Products Research Laboratory has submitted four gallons of MB 5724, special bodied linseed oil, for brushing tests in SWP. MB 5724 is a duplication of MB 5201 and MB 5715. It was prepared from extracted raw linseed oil, SO_2 catalyzed, heat-bodied, and reacted with 0.5% of maleic anhydride to a viscosity of 69 seconds and an acid number of 8.8. It was then treated with 0.0526% lead and 0.0013% manganese, as the naphthenates and, finally, air-blown at 175° F. to a G-H viscosity of 3 minutes 54 seconds at 77° F. It has an acid value of 9.8 and 10-11 color (Gardner, 1933).

#97 - Cont.

MB 5724 was checked for brushing characteristics in SWP. Our experimental work indicates that optimum brushing properties are obtained with this oil when used in conjunction with OKO S 57 linseed oil and raw linseed oil.

Series 20440-75 CS, CN, F was prepared during the month for exposure at Chicago, north and south vertical, and Florida, south vertical. Several batches of bodied linseed oils developed by the Varnish-Resin Laboratory were tried in Rex 471 SWP Gloss White. Each oil was tested as the normal 40% replacement of (510) bodied linseed and also as 100% bodied oil, in which case the resulting high body was corrected by the addition of thinner. The spreading rates were calculated on an equivalent solids basis, to give equal film thicknesses. The oils tested may be classified into two groups: (a) CTV 8557, heat-bodied with sulfur dioxide catalyst followed by an inert gas purge, and (b) CTV 8560, the same but with a maximum draft used in the stack to simulate a vacuum-bodied OKO type oil. Further variations consist merely of several samples taken from each cook at intervals. This resulted in six samples of CTV 8557, ranging from 10 to 81 seconds in viscosity, and 7 samples of CTV 8560, from 13 to 61 seconds.

Exposures 20495-20504 CS, CN, F were prepared during the month. These panels are being exposed at Chicago, north and south vertical, and at Florida, south vertical. This series is a supplement to the preceding series (20440-75), in that the oil involved is bodied in the same manner; however, it is safflower oil instead of linseed. CTV 8588 is the basic bodied oil, bodied with SO_2 plus inert gas purge. Eight samples of varying viscosity, from 10 to 205 seconds were taken from the cook at various intervals. In preparing the paints these oils were blended with suitable amounts of (15 C 5) non-break safflower oil to adjust body, rather than using thinner.

The following exposure series were examined during the month:

1. 14609-16 F, C. 36 months Florida south vertical, 39 months Chicago south and north vertical. SWP Gloss White variations substituting Nytal 500 and Nytal 400 for 20 dry magnesium silicate. On cedar over 450 Undercoater shaded gray to emphasize erosion. Results show very few differences. In Chicago, where erosion is the only failure, 20 dry is favored slightly over either Nytal, also in clean-up. Florida tests favor Nytals slightly in clean-up, Nytal 500 slightly superior in durability, Nytal 400 showing definitely worse checking and cracking than 20 dry. Chicago panels retired, Florida exposures continued.

#97 - Cont.

2. 14855-60 F, C. 36 months Florida south vertical, 34 months Chicago south and north vertical. Persolite P-IVR substituted both at equal weight and volume for 20 dry in SWP Gloss White Rex 471 and Colonial Yellow Rex 465. In Chicago Persolite showed slightly better clean-up and more erosion, with more fading in the tint. In Florida the Persolite white seems to hold more dirt, probably mildew, and about equal chalk-mask on the tint but better "show through" color. Chicago tests retired, Florida tests continue as Persolite seems to have definite possibilities.

3. 15038-41 F, C. 30 months south vertical Florida and 35 months south vertical Chicago. Tests of (510) heat bodied linseed oil, with and without SO_2 catalyst, in SWP Gloss White, made with 20 dry and 512 dry. No differences observed.

4. 15437-41 F, C. 24 months Florida south vertical and 28 months Chicago south and north vertical. Comparing 2295 dry Azo ZZZ-35 zinc oxide, 2059 dry N.J.Z. XX-505, 1707 dry N.J.Z. XX-50, and Eagle Picher's #416 zinc oxide in Rex 456 SWP Fume Resisting White. Previous ratings showed some minor differences in clean-up, but not significant because of general contradictions at the different locations. The Florida panels at present show no differences. Although it is not likely that we will ever get valid durability data, because of past hail damage, we are continuing the exposure. The Chicago results are also very closely alike. 1707 and #416 seem very slightly more free-chalking, but 1707 is the only one to show consistently better clean-up, and the margin is very slight. All are generally satisfactory so far.

5. 15506-10 F, C. 24 months vertical south Florida and 26 months south and north vertical Chicago. Substitution of P.E. esters for the bodied linseed oil (510) in SWP Gloss White, including AV-1101 PE soya ester from Vegetable Oil Products Research Laboratory, RC 7465 PE soya ester and RC 7470 PE linseed ester from Resin Research. Very little choice so far. The PE soya esters seem to chalk a little less freely but this is not accompanied by any poorer clean-up.

6. 15568-80 F, C. 24 months vertical south Florida, 26 months vertical south and north Chicago. High iodine oils, tung-fortified low saturate content and special soya oils bodied and substituted for the bodied linseed (510) portion of the SWP Gloss White vehicle. The specific oils include:

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(a) RC 6571, Aliphat 16 A-PE ester, 20% tung modified.
(b) RC 6574, Aliphat 16 A-Glyceryl ester, 20% tung modified.
(c) RC 6575, Neofat 19, C 20 fish oil acids, glyceryl ester.
(d) RC 6560, Bodied safflower, 20% tung.
(e) RC 6561, Aliphat 16 A, Glyceryl ester.
(f) RC 6562, Aliphat 16 A, PE ester.
(g) IN 828 Propane refined soya.
(h) RC 6519 Swift's propane refined soya.
(i) RC 6545 (1275) soya.
(j) RC 6756 Styrene and (3019) Dehydrol 12 minutes.
(k) RC 6775 Styrene and (3019) Dehydrol 25 minutes.

RC 6575 produced severe checking in Florida and some checking at Chicago. The rest are substantially equal at two years. Minor comments would be that (h), (i), (j), (k) in Florida show the most dirt collection by a slight margin but this is reversed in Chicago. Safflower-tung (d) does well in both locations and (g) is also clean at Chicago.

7. 15650-4 F, C. 24 months south vertical Florida and south and north vertical Chicago. Comparing special bodied oils RC 8103 SO_2 bodied soya with traces of Epon and RC 8104, same but not Epon for bodied linseed (310) in Rex 471. The first year's results showed nothing significant, possibly slightly better gloss but more dirt on all tests than on guides. At two years there is no failure at either location, except a very slightly greater incipient erosion on all tests at Chicago; this is not verified by any record of more free chalking. The Florida panels actually rate exactly alike in all respects. The Chicago panels show the possibility of a very slight improvement in clean-up of all test paints, as compared with the guide.

8. 16048-115 F, C and 16502-25 F, C. Two years Florida and Chicago, except six months for supplementary series. These were put out as a cooperative project with the Pigment Division of du Pont. The deviations from normal performance are so rare that it is not worth while going beyond a very general description in this report. The paints included are based on Rex 471 SWP Gloss White and Rex 436 Fume Resisting, using blends of du Pont's titanium pigments FF, YCR, R 610 and R 27; also several tint bases shaded to Rex 465 Colonial Yellow and Rex 474 Chelsea Gray, using (a) R 60 with magnesium silicate, (b) R 610 with same and (c,d) R 60 and R 610 with calcium carbonate. du Pont prepared paints in both whites and tints comparing similar titanium contents and also featuring comparisons of (a) our bodied oil against theirs, (b) calcium carbonate in whites as well as tints, (c) mechanical mixture as well as co-fumed leaded zinc and (d) their TT-P-25A type zincless primer.

#97 - Cont.

A great deal of information on minor trends continues to be learned from this series. The only trends approaching major importance are: (a) dirtiness in du Pont's white using calcium carbonate, (b) the same in most formulas carrying R 27, (c) good clean-up with larger proportions of FF anatase titanium, (d) better resistance to chemical fading of du Pont's tints, but not necessarily less chalk-masking or dirt and (e) better color with $CaCO_3$ than with magnesium silicate, but more serious checking.

9. 16158-65 F, C. 24 months vertical south Florida, 22 months vertical south and north Chicago. Comparing Laminar (ground oyster shells) from Laminar Calcium Corporation against 2507 dry AA mica, supplementing 20 dry magnesium silicate in Rex 471 SWP Gloss White Card 62. At one year, there was no failure and little if any choice between the regular and special paints. At two years there is slight failure in the form of scattered cracks on the repaint work at both locations. However, no choice can be made between the Laminar and mica, and the regular is very closely similar. All look alike, clean and white.

10. 16160-5 F, C. 24 months vertical south Florida and 22 months south and north vertical Chicago. Comparing regular (2) raw linseed oil in SWP Gloss White versus AVM-65 unbodied linseed extracted by the mixed solvent process in the Vegetable Products Research Laboratory. Also regular (510) bodied linseed versus a special made from the same (44) alkali refined linseed except that the bodying was done without first refrigerating and bleaching the (44). At one year it was reported that all the paints looked very closely alike. At two years, the only difference is very slightly more dirt on the special (510), at Florida. At Chicago, there is no choice whatever. As mentioned before, this similarity in performance is more or less to be expected, since the substitution of special oil is only partial in each case.

11. 17920-7 F, C. 12 months south vertical Florida, 14 months south and north vertical Chicago. Comparing Rex 10 Farm, Ranch and Plantation White with Rex 471 SWP Gloss White Card 65 and Rex 456 SWP Fume Resisting White Card 19. Rex 10 Card 9 carries no lead, contains 150 pounds 2059 dry zinc oxide, 200 pounds 2132 dry titanium calcium, with the balance extender, the vehicle having linseed oil plus 21 gallons of (6107) maleic rosin linseed varnish. The paints are exposed on both cedar and white pine, both self-primed and over 450 Undercoater. Rex 456 tends to be a little whiter and cleaner than Rex 471 at this stage; neither shows any film failure. Rex 10 looks definitely poor in all cases, mainly because of dirt collection and mildew. Although very slow in chalking, it is low in gloss. It shows serious checking at all locations, and serious cracking and even flaking on Chicago south panels. The durability on cedar is hardly satisfactory, and certainly not on white pine.