Subject: 16-47-009, Interior Latex Finishes

Contributors: J. G. Kingston, G. Vale, G. Nokken, J. Ziegerer

Objectives: 1. Latex Floor Paint

2. New Quality Ultra Flat

3. New Quality Satin

Summary:

1. Latex Floor Paint

a) The revised formula of Spred Tred with VM-835 and VM-725 has gone into production in 1200 gal. batches in white, grey, and light tan.

b) Deep shades are showing problems on water spotting, color wash off, and thin viscosities. New water dispersible phthalo pigments are being tested to overcome this.

c) New latexes with a harder and more water resistant finish are in early stages of testing.

2. New Quality Ultra Flat

a) Several pigment systems and dispersants were evaluated to overcome a problem of non-uniform color appearance in the new 5100 line. Some progress was made and a modified formula is under way.

b) Staining or discoloration of the 5100 and 5300 line occurs on some surfaces. A number of additives were tried to overcome this problem but it hasn't been entirely eliminated.

3. New Quality Satin

There has been some concern on the polishing and burnishing of the new, high hide, flat Satin. Variations on dispersants, pigments, and latex show only slight improvements without eliminating the problem sufficiently. New work is being started on a low sheen Satin to mask the burnishing and polishing and bring the product more in line with the current Spred Satin.

Discussion:

1. a) Formulas for Y-3800, 01, and 03 were written up for plant trial. This new formula has less peeling or stripping tendency than the previous formula. How-

ever, there is some sacrifice in initial hardness and water resistance. A three to four day dry is needed to obtain the overnight water resistance previously. It is expected that there will be better storage stability in the new formula also. The need for a mixing liquid primer has also been eliminated.

1. b) The use of BL-90 and G-78 dispersions in deep blue and green create low viscosity problems. Dry water dispersible pigment from Koppers were checked in the revised Tred formulas but were found to be too water sensitive. Heliogen Green Toner # 66-3001 from General Aniline shows some possibility, however, and will be checked further.

1. c) Modified styrene acrylates with a harder and more water resistant finish than VM-835 are being tried as sole vehicle for floor finishes. Gliddenb RCR-0308 when used with a solvent for fusion shows some possibilities. Latex # 1230 is another hard latex where solvent film fusion agents may not be needed. There is little experience with these yet.

2. a) To overcome the color problem of touch-ups and lapping in with the new Ultra Flat various approaches were tried. The high viscosity cellosize was replaced with a low viscosity grade with insufficient improvement showing up. At the same time, water sensitivity was increased. Methocel and CMC were no better Protein systems provided better color results but viscosity control and package stability would be a new problem.

Several pigment combinations of W-10, W-16, M-361, W-189, W-247, and calcium carbonates were tried. When Duramite or Carbium ($CaCo_3$) were used in place of W-247 improvements could be obtained but at some sacrifice in hiding and no storage history was available. The retains will be checked at a later date. The old Ultra Flat pigment system with the new vehicle system looked better but field tests showed it was not good enough.

Additional dispersants to the Calgon showed only minor improvements. For this the soaps in the VM-844 were added as extra wetting out agents, also CH-322, 195T24, CH-368, and CH-280.

Replacing VM-844 with other latexes made minor differences in color uniformity. Some made the problem more severe, others showed little or no improvement. Among these were VM-725, VM-851, VM-835, Gen Flo 67 calcium stable latex,

and UBS 7001.

Different types of shading bases were substituted again with no big improvement showing up.

The best improvement with least deviation from standard formula consisted of eliminating the S-131, CH-253, and W-189. Secondly the titanium was dispersed, first in the Calgon and Cellosize with the remaining inerts added as a separate step. This could conveniently be done on a Cowles and provided an added means of getting away from pebble milling. Plant trials were successful and there has been acceptance from the field but further improvements are desired.

2. b) Two types of staining have been encountered in field application of Ultra Flat (and Y-5370). Over highly alkaline plaster under humid conditions a discoloration shows up. On some cement and concrete block construction a brownish or yellowish stain can occur. In both cases the addition of ½ to 3/4 % of mono ammonium phospate stops the discoloration in laboratory testing. No field trials have been available to fully confirm this. Other agents tried were sodium oxalate, tartrate, benzoate, and carbonate, aluminum sulfate, calcium sulfate.

Other changes in the formula made no improvements including substitution of colloid, changing inerts, adding extra stabilizers.

3. a) To overcome the burnishing and polishing on spot washing of the proposed new flat satin various adjustments were tried with little success. CMC was used to replace cellosize to obtain different orientation properties of the film on drying. Calgon was replaced with Triton X-100, fatty acid amine soaps, water dispersible lecithin and Tamol dispersant. No pronounced change could be obtained.

Soft clays were replaced with magnesium silicates and diatomaceous earth. Coarse calcium carbonates and increased mica were added but showed only minor improvement.

Replacing the VM-844 with harder experimental latexes did help somewhat but materials are too new to warrant a change at this time. Further work to be done.

It was only after changing the inerts and increasing the latex content to develop a low sheen paint that burnishing could be minimized. The sheen masked the polish that develops on rubbing and spot washing. This work is just getting under way.

ELMWOOD RESEARCH CENTER
QUARTERLY RESEARCH REPORT
SECOND QUARTER, 1961

Subject: 16-47-009, Exterior Emulsion Paints

Contributor: J. Watson

Objective: Better Exterior Emulsion Paints

Summary: No change contemplated in primecoat 1-3601 D at the present time. Meanwhile, we are testing all latex primers with special emphasis on cationics.

A short discussion is included which brings the Cowles Dissolver situation up to date, and points out some of our difficulties such as dilatency and poor grinds.

The report concludes with a final report and disposition of 6 year old "portable exposure racks" at Cleveland.

Discussion: 1. Emulsion Primers

Our present No. 2 primer (Y-3601D) has been in production now for two years, and we have learned to live with most of its idiosyncrasies. The most peculiar habit of Y-3601-D is its early pronounced gel-type viscosity. Although this gel is temporary in nature, and apparently quite harmless, it has been a cause for some concern.

We have established that this gel stucture can be essentially eliminated, or at least greatly alleviated, by the addition of acetic acid to control the pH of the fresh paint. In addition to smoothing off this viscosity hump, the adjusted paint maintains a better color and appearance when aged.

On the debit side however, we can show that the acidified primer is less compatible with Spred H. P. topcoats, and that excessive acid additions can cause loss of dry. We are also concerned about can corrosion with acid-side material. We have decided to make no changes in the present Y-3601-D formula until certain policy matters such as color have been settled, and more opinions and reports have been received from the field.

Within the last month, we have exposed two cationic primers on our new "Test House" at Elmwood. The primers are based on our previous plywood exposures, one is a PVAc and the other a cationic version of VM-835.

2. Use of Cowles Dissolver for Manufacture of S.H.P.

As discussed in our last Quarterly Report (pg. C-10) we have tried to verify some of our lab. observations on plant equipment.

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Atlanta and Reading have both made Cowles batches of SHP with varying degrees of success. The conclusions were as follows:

a) Many of the grinds are too dilatent for high speed equipment. Grinds which work in the pebble mill and the lab. Cowles may go solid under the heat and speed of the plant Cowles. To remedy this dilatancy it was nexessary to include all or nearly all of the 195-T-27 solution in the grind. Although this solves the dilatancy problem, it produces a "sloppy" grind which pulsates in the tank.

b) The addition of the CH-380 to the grind containing T-27 causes very little change in the body of the mix.

c) Great care is necessary when adding the ingredients to prevent the dilatent body from stalling the Cowles.

We have also checked several new variations of W-241 (Ruby 400 talc) to see if we could find a grade with less coarse material, but as yet, none have shown much promise.

Subject: Portable Exposure Racks
Final Disposition.

Early in 1956, in an effort to alleviate the chronic and perennial shortage of exposure area, 100 "portable exposure racks" were constructed. These racks were designed to furnish, at a reasonable cost, a variety of exposure surfaces in a portable form.

The racks surviving at the Cleveland Plant are in such a poor condition that they can serve no further use, and are being destroyed.

This report is an effort to record any information and conclusions available from these surfaces.

Spred House Paint Candidates

A series of 12 complete racks were painted as follows; 3 racks Silver Smoke, 3 racks Coralin, 3 racks Timberlin, and 3 racks White. Each rack was painted with 6 different polymers, B-60-K VM-725, Graft polymer, Lytron X-680, Cationic X-2590, and Glide-On (81-900).

One rack of each color was exposed in Cleveland. After 5 years exposure the general situation is this, the first three polymers (B-60-K, VM-725, and Graft) are almost completely gone from all wood surfaces. The failure is probably erosion, no evidence of checking, cracking, or peeling. On the primed wood areas, the other three polymers look good with X-680 showing more erosion than the other two. On the self-primed areas, only Glide-On looks satisfactory.

Rack 1 C exposed 1/8/54
4 paints XM-53205 (an early Glide-On), Gelvatex Y-1800, and XM-53028 (styrene-butadiene)

This rack was almost bare; nearly all the paint had weathered and eroded off.

Rack 2C
4 PVAc paints exposed 1/8/54
Smoke Gray, Coralin, Bamboo, and Spec. Blue.

All paints are good on vert cedar, grain cracking on self-primed areas.

450 surfaces fair over primer only.
Glazed Transite fair to good
Red Bricks good.
Cement Bricks - poor.

Rack 3C exposed 4/18/54
4 colors of Glide-On (Y-3501, 2, 3, 4) self-primed and over Y-1851. Self-primed areas have the first coat reduced 1:1 with Y-3520.

On vertical cedar all look very good, red bricks all look very good. Even the 45° exposure on cedar looks good. Yellow pine badly cracked.

Rack 4C exposed 4/18/54
4 Glide-On colors (Y-3505, 6, 8 and 9) same schedule as rack 3C.

All colors look good on vertical cedar, Aquamarine(Y-3508) is the poorest of the four. Red bricks look good, cement bricks poor. 45° exposure good over primer poor self-primed.

Rack 5C exposed 4/18/54
4 Glide-On colors (Y-3507, 10, 11 and 12)
same schedule as rack 3.

All colors look good on vertical cedar, Y-3512 (Victoria) is poorest. Self-primed areas poor. Glazed Transite - good.

Rack 6C not found.

Rack 7C exposed 8/1/54
4 paints, Gelvatex Fern, Y-3502, Endurance 1856, Gold Bond.
Vertical Cedar.
A - poor self-primed good primed area
B - very good self-primed and primed
C - very good self-primed -eroded primed
D - poor both areas.

Rack 8C exposed 8/1/54
4 paints Y-1050, Y-3500, Cook and Dunn,
and Benj-Moore. (all white)

All self-primed areas completely gone.
Paint C is best of group on vert cedar.
A and C look good on red brick.
B and D look poor on red brick.
All transites are quite poor.

Rack 9C exposed 9/12/54
This rack exposed 4 paints over 2 primers. The paints are Y-1800, GL-64260A, Y-1867, and Y-3500. The two primers involved are Y-1851 and Y-3416.

All areas with Y-3416 as primer have failed miserably regardless of topcoat. Over the Y-1851, some paint remains, Y-1867 slightly better than Y-1800, the other two slightly poorer and about equal.

Rack 10C exposed 9/12/54
Similar to rack 9C but 4 paints were exposed over 3 primers. The paints were Palm Green Ext. Pliolite, Turf Brown Ext Pliolite, Tobacco Brown End., and Desert Grown Glide-On. The primers are Y-1851, Y-3500 1:1 Y-3520, and Y-3416.

Under the Pliolite paints the Y-3500 is very poor and the Y-3416 is poor. On the other areas Y-3416 is poorest. The Tobacco Brown looks good.

Rack 11C and 12C exposed 11/22/54 Glid Tints added at the rate of 4 oz. per gallon to 9 samples of Glide-On, also 1 sample of Y-1804 and Y-1217 shaded the same way. 1 area Y-3525 unshaded.

11C		primed area
A	Red Oxide	good
B	Ferrite Yellow	good
C	Chrome Yellow	all gone
D	Blue	eroded

11C cont.	primed area
E Phthalo Green	good
F Burnt Sienna	good

12C	
A Toluidine	very little color left
B B-110	good
C Raw Umber	good
D Y-3525	poor condition grain crack
E Y-1804	good eroded
F Y-1217	good

The tinted paints are all better than the Y-3525 by itself. Color retention good except for Chrome Yellow.

ELMWOOD RESEARCH CENTER
QUARTERLY RESEARCH REPORT
SECOND QUARTER, 1961

Subject: # 16-56-009, Exterior Emulsion Paints

Contributor: J. M. McLaughlin

Objective: Better Exterior Emulsion Paints Through the Following Studies

Summary:

1. A further cost reduction in Spred Glide-On by using lower cost inert pigments appears practical. Panels have been exposed in the Weather-O-Meter and outside.

2. Glidden's R-88 may replace DuPont's W-170 in Spred House Paint.

3. Predispersed Slips of TiO_2 manufactured at Baltimore have been tested in Spred House Paint. Although these slips at present contain a few undesirable characteristics, it is felt that work should continue on such a product.

4. A new defoamer for Spred House Paint and Spred Glide-On is nearing approval. It should reduce foaming problems.

Discussion:

1. Low Cost Inert Pigments for Glide-On
A new Glide-On formula has been recently issued with a reduction in cost of 30 - 35 ¢ per gallon, without a reduction in durability, and in fact, an increase in hiding. We are now attempting to further reduce the cost by the use of lower priced extender pigments. Some of these extender pigments show promise, and have been exposed in the white formula, in the Weather-O-Meter and at the Elmwood Test Racks.

2. R-88 in Amine-Free Spred House Paint
R-88 was substituted for W-170 in the new Spred House Paint Formula. The initial viscosity as well as the accelerated viscosity was equal to standard W-170. Panels have been exposed in Cleveland and New Orleans, and if their characteristics, (such as chalk, dirt retention, cracking, etc...) are equal to W-170, then we will re-issue formulas containing Baltimore TiO_2.

3. TiO_2 Slips in Spred House Paint
Baltimore has proposed a very new and revolutionary idea in packaging TiO_2. They make a slurry of TiO_2 @ 70 % N.V. using Calgon as the dispersant. We received a sample of both Rutile and Anatase slips and checked them out in Spred House Paint. This is a new approach to the old time consuming problem of the grinding of dry titanium in a given formula.

It is felt that this is just one of the many uses where a product of this type might be applied. It is even quite feasible to foresee a paint which would require absolutely no grinding. With the right combination of TiO_2 slips, and some of the new "stir-in" inert pigments, this product could become a reality. While checking the slips in Spred House Paint, it was found that all the physical characteristics in the manufacture of the paint were equal to those of Spred House Paint using dry TiO_2. Also the initial and accelerated viscosities were on par with the standard. However, a slight hiding deficiency was noted in the paint containing the slips, and a Green Reflectance Check was made on the Colormaster.

Contrast Ratio results were:

Dry TiO_2	.950
Slips	.943.

A problem exists in the fact that the dispersant for the slips is Calgon. These slips could not be used in any latex paints containing ammonia and a source of magnesium, such as talc. In plant production of such paint we would expect to find crystals of magnesium ammonium phosphate. This problem could possibly be eliminated by the substitution of Victamide or other dispersants for the Calgon.

4. Glide-On and Spred House Paint Defoamer

New Glide-On and Spred House Paint formulas containing a new defoamer manufactured by Hercules Powder Co. are nearing approval. This defoamer is Hercules 357 which is unusual due to the fact that it is quite effective in various types of latices. The Glidden Code No. for this product is CH-447.

Subject: # 16-47-009, Exterior Emulsion Paints

Contributors: Earl Saville

Objectives: To Improve Flow of Spred House Paint
To Evaluate Fungicidal Properties of Reactive Pigments

Summary:

1. Fair to good shelf viscosity has been obtained with alkali soluble acrylic thickeners. However, the viscosity has not been stabilized against violent agitation or storage at high temperature for long periods.

2. Filming aids with alkali soluble acrylic thickeners were evaluated.

3. A series of alkali soluble acrylic thickeners made by the Resin Emulsion Laboratory were evaluated. The viscosities in the systems tested were too high.

4. The amount of ammonium hydroxide with Rhoplex T-123 thickener does not seem to be too critical.

5. Paints were made with Busan 11 M-1 as part of the pigment. Lytron X-684 was required for emulsion stability.

6. Paints were made with zinc oxide as part of the pigment. Lytron X-684 was required for emulsion stability.

Discussion:

As reported in the Fourth Quarterly Research Report, 1961, (C-21) the viscosity of paints thickened with Rhoplex T-123 is influenced by the amount of thickener, the pH, the solids content, the type or types of surfactants and the latex. Generally speaking, the paints made with a mixture of Alipal CO-436, Tamol 731, and RCR-09001B have become too heavy. The paints made with Victamide, Surfynol TG, and Tamol 731 generally have increased in viscosity the first two months and then have held a stable viscosity for the next 6 to 7 months. However, it must be noted there have been exceptions and some paints with the Victamide system have increased in viscosity.

Severe agitation or shaking of paints made with alkali soluble acrylic thickeners (Rhoplex T-123 et al) causes the gel structure to break down and the recovery rate is very slow. Work is in progress to reduce the thixotropy of the paints. It might be necessary to prohibit shaking of this type of paint.

Heat stability tests, 140°F. for two weeks have indicated an increase in viscosity but did not adversely affect the leveling properties.

Mr. Visger, Resin Emulsion Laboratory, made a series of alkali soluble acrylic emulsions; 1214-1, 1214-3, 1214-4, and 1214-5; as replacements for Rhoplex T-123. Substitution on an equal weight basis produced high viscosities and the paints were not usable. A reduction in the amounts of thickener latex has given satisfactory viscosity levels to date but the paints seem "short" and the leveling is slightly inferior.

The influence of the amount of ammonium hydroxide on the viscosity of Rhoplex T-123 was checked by using 1.0, 2.0, 3.0, 4.0, 5.0 and 6.0 # per 100 gallons of paint. The pH increased with increasing amounts of ammonium hydroxide but there was no significant differences in the viscosity or gel characteristics.

The affects of filming aids or solvents were determined by substituting 15 pounds of the solvent for water in the hundred gallon formula. Pine oil, Butyl Cellosolve, Butyl Cellosolve Acetate, Butyl Carbitol Acetate, n-hexyl Cellosolve, and n-Hexyl Carbitol destroyed the gelling power of Rhoplex T-123 and there was no viscosity increase.

Loral 20 (n-octyl alcohol) gave good initial viscosity, however it has dropped slightly on aging.

Hexylene glycol and ethylene glycol reduced the amount of gelling as compared to water. Hexylene glycol gave a lower viscosity than ethylene glycol.

None of the above filming aids appears to have improved the water resistance. The comparison was made by immersing drawdowns on glass in water.

Reactive Pigments in Spred House Paint:

Busan 11-M1 Buckman Laboratories Inc.

Busan 11 was tested in a Lytron 680 formula by replacing part of the titanium dioxide and talc and all of the Al-Sil-Ate W. The pigment flocculated and the paint became solid in three days.

Lytron X-684 was substituted for X-680. This paint was slightly better but has become heavy and unusable.

Daxad 30 and Igepal CO-630 as dispersants for Busan 11 and Lytron X-684 has had fair to good viscosity stability to date with no noticeable flocculation.

Zinc Oxide

X-505, Zinc Oxide, New Jersey Zinc Sales Co., was checked using tetra potassium pyrophosphate and Daxad 30 as the dispersants with Lytron X-684. There has been a 30 Ku increase in viscosity but the other properties still seem satisfactory.

Eagle Picher # 417 Zinc oxide was tested using Victamide and Igepal CA-619 as the dispersants with Lytron X-684. This paint is still in satisfactory condition.

Subject: # 16-56-009, Exterior Emulsion Paints

Contributor: J. Sainsbury

Objective: Evaluation of the Dramatone tinting system and a new defoamer for Spred House Paint and Spred Glide-On.

Summary:

1. Dramatones in Spred House Paint and Spred Glide-On. An evaluation of a new series of Dramatones from California Ink produced excellent dispersion of all colors.

2. A tinting white formula for Spred House Paint is being considered. This will be used for tints and intermixes.

3. M-367 defoamer in Y-3500 has been replaced with CH-447 (Hercules 357).

4. Revised Y-3600 line (VM-830) formulas have been re-issued. These formulas will serve as alternates for VM-835 formulas.

5. The effect of sodium tripoly-phosphate as a deflocculant dispersant of titanium dioxide in Y-3525 has been evaluated.

Discussion:

Dramatones - Dispersion of a new series in S.H.P. and S.G.-O. (Spred House Paint and Spred Glide-On.)

The California Ink Co. has recently provided us with samples of a series of Dramatones based on a new vehicle. Testing of Dramatones in Spred Glide-On and Spred House Paint for dispersion, by adding $\frac{1}{4}$ oz. of Dramatone to $\frac{1}{2}$ pt. of paint (4 oz./gal.), and shaking for 3. min. on a red Devil Paint Shaker, produced perfect dispersion of all colors.

As a result of the above evaluation exterior exposure panels have been prepared for Cleveland and New Orleans of the Dramatones in Spred Glide-On.

A recommendation will be made regarding the use of Dramatones in Spred Glide-On as soon as sufficient exposure data has been collected.

Exposures of Dramatone in Spred House Paint are being delayed pending an approval of a tinting white for the Spred House Paint line.

Spred House Paint - Tinting White for Dramatones and Intermixes.

A tinting white formulation to add to the Spred House Paint line is currently being considered. This paint would basically be the current Y-3600 formula at 40 PVC (Y-3600 is 50 PVC) with a reduced TiO_2 level.

Two main advantages would be gained by the introduction of a tinting white:

1.) The chalking level of the intermixed colors would be held to a minimum, as would Dramaton mixes.

2.) We would have a white house paint with a reduced chalking level, which would be useful in areas where a lesser chalking white than Y-3600 might be desireable.

Spred Glide-On - Defoamer Change

The entire Y-3500 line formulas have been reissued replacing Ba-Lab Bubble Breaker (M-367) with Hercules 357 (CH-447) defoamer.

The rather severe foaming problem during manufacture and application of Spred Glide-On should be eliminated by this change.

Spred House Paint - Formula Changes - Revision of VM-830 Formulas

The Y-3600 line formulas containing VM-830 latex (Lytron X-680) have been brought up to date and reissued. These formulas will serve as alternates wherever VM-835 (Glidden-Latex) is not available. Colloid 619 defoamer has been replaced by Hercules' 357 (CH-447) in these formulas.

In the near future the Y-3600- VM-835 formulas will be reissued replacing Colloid 619 with Hercules 357.

Spred Glide-On-Dispersion of Titanium Dioxide

A study of the use of sodium tripolyphosphate in Spred Glide-On as a deflocculant-dispersant to determine the most advantageous level from the standpoint of optimum dispersion of the TiO_2 has been carried out.

Several grinds were made using various amounts, up to twice the current level being used in Y-3525, to determine its effect on the general dispersion of the pigments, TiO_2 in particular.

Initially, no difference was noted in paints made with the various levels of sod. tripolyphosphate with the exception that if less than 2/3 the Y-3525 formula level is used, dispersion is poor with a resultant loss in hiding.

We will continue to check these paints periodically for possible flocculation during storage.

With the advent of high speed dispersing equipment replacing pebble mills, it has become very evident that it is necessary to examine the raw materials in our formulas more critically to determine their effect under various grinding conditions at varying amounts. We hope to do more work in this area as time permits.