A. B. HOLTON ESQ.
SHERWIN WILLIAMS CO. (CLEVELAND)

S U P P L E M E N T A R Y

TECHNICAL OPERATIONS

- REPORT -

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Series S.53.

Series No.53

SUPPLEMENTARY TECHNICAL OPERATIONS REPORT - SEPT/OCT. 1946.

INDEX

Page	Item No.	Title
1/2	P.43	Matroil & Maisone
2/3	P.54	Tinting Colours
3/4	P.56	Flotation of Pigments
5/6	P.82	Pompeian Super Synthetic Enamel
6/7/8	P.86	Stoving Finishes for Prefabricated Houses.
8/9/10	P.86	Finishes for Prefabricated Houses.
10/11	P.116	Finishes for Rubber
11/12/13	P.117	Kemplastite
13/14/15	P.119	Kemrist Chlorinated Rubber Paint.

Acknowledgment is due to the following, under whose supervision the above-mentioned investigations have been made:-

Mr. W. H. Stitson	Varnish and Development Section.
Mr. R. C. Somerville	Paint Control Section.
Mr. J. K. Barraclough	Dry Colour Section.
Mr. S. E. Francis	Cellulose Section.

(Sgd) H. A. MEENAN

MANAGER
Technical Operations.

7 SUP 052887

Series No.53

MATROIL & MAISONE (P.43.)

by

J. F. WEIS

Incorporation of Cellofas and Bentonite in Maisone formulation to replace some of the glue in present formulation.

Experimental mixings were made cutting the glue content of present formulae from 2% to 1% and incorporating Casein, Bentonite or Cellofas to obtain the necessary condition, without impairing brushing or application properties.

The use of Bentonite necessitates the use of more concentrated Glue-Casein solutions, namely, 20% and 15% respectively, in order to obtain enough water in which to soak the Bentonite and give the condition required during manufacture. This makes the material very difficult to fill and impossible to manufacture in K. Dept., where a thin material is required which will fill easily and set to a satisfactory condition after filling.

Brushing properties of this type of material appeared quite satisfactory when applied on bare plaster. The use of an increased amount of Bentonite imparted poor brushability.

Final formulations used were as follows:-

a) Bentonite Type.

%			
50.75		1135 lbs.	M.625
13.5		342 "	M.8
5.0	(Solid 1%)	112 "	53/274/1 (20% Glue Soln.)
13.5	(Solid 2%)	302 "	53/274/3 (15% Casein)
9.0		200 "	WATER
2.6	(Solid 0.25%)	59 "	53/274/4 (10% H_2O - Bentonite Soln.)
1.0	Solid 0.01%)	1½ "	6699
4.0		90 "	6119

b) Cellofas Type.

%			
50.75		1135 lbs.	M.625
13.5		342 "	M.8
5.0	(Solid 1%)	112 "	53/274/1 (20% Glue)
13.5	(Solid 2%)	302 "	53/274/3 (15% Casein)
5.9		132 "	WATER
5.6	Solid 0.16%)	127 "	53/304/1
1.0	Solid 0.02%)	1½ "	6699
4.0		90 "	6119

7 SHP 952888

Series No.53

MATROIL & MAISONE (P.43.)
(Continued)

Neither formula was adopted since Casein and Cellofas became unavailable.

Series No.53

TINTING COLOURS (P.54.)

by

C. STEVENS

Report on one month's exposure of Chrome Yellows, Hansa Yellow, Cadmium Lithopone tinted with Monastral Blue and Chinese Blue alternatively. Also exposed were Chromium Oxide, Monastral Green and Cobalt Green. The Base used was RX6888 Pompeian Super Synthetic White which had an addition of 10% Zinc Oxide.

This series of tests was made to check the action of Zinc Oxide on the rapid fading of chromes etc., when used as tinters.

Date exposed 7.10.46.

After 1 month's exposure colour and gloss were compared with a masked section of the panels.

EXPOSURE NO.	CHROME	BLUE	COLOUR	GLOSS
993/1	Y3608	BY5163	Traction dirty and grey	Good
993/2	"	BY8352	"	
993/3	C1686	BY5163	Traction dirty and blue	"
993/4	"	BY8352	Traction dirty, slightly rank.	"
994/1	C2664	BY5163	Slightly dirty	"
994/2	"	BY8352	Traction dirty	"
994/3	BY8671(ICI)	BY5163	Chrome almost gone, grey and dirty.	"
994/4	"	BY8352	" " "	"
995/1	C2973	BY5163	Dirty	"
995/2	"	BY8352	"	"
995/3	C3103	BY5163	Dirty and blue	"
995/4	"	BY8352	Dirty and brown	"
996/1	Rm137 No Zinc Oxide.	BY5163	Bluish grey	"
996/2	"	BY8352	"	"
996/3	Rm133 No Zinc Oxide.		Traction dirty	"
996/4	LY7890		Grey	Poor
996/5	LY6402		Slightly dirty	Good

7 SUP 052889

Series No.53

TINTING COLOURS (Continued) (P.54.)

EXPOSURE NO.	CHROME	BLUE	COLOUR	GLOSS
997/1	RM137 & Zinc Oxide.	BY5163	Fraction dirty & brown	Fairly good
997/2	RM137 & Zinc Oxide.	BY8352	" "	Fairly good
997/3	RM133 & Zinc Oxide		Fraction dirty	Fairly good
997/4	BY7890 & Zinc Oxide		Grey	Fair
997/5	BY6482 & Zinc Oxide		Slightly dirty	Fairly good

The most interesting points already observable are that Cadmium Lithopone primrose and Cobalt Green are very poor when used in pale tints. Zinc chrome in this series shows no advantage over Lead Chrome, and Lemon Chrome is superior to Primrose Chrome. In those cases when duplicate tests have been conducted with and without Zinc Oxide, only slight differences exist.

Series No.53.

FLOTATION OF PIGMENTS (P.56).

by

J. F. WELLS

Tests were carried out mainly in respect to Danish Facon Grey, but also for general information, with regard to flotation trouble being experienced.

White, Black and Blue bases were ground in Oil Medium (V5929) and Synthetic Medium (SA5291), using the following pigments.

Whites:-	RM.713	Titanium White
	RM.610	Rutile Titanium A.10
	RM.618	Antimony Oxide
	RM.6	Lithopone
	RM.6	Zinc Oxide
Blues:-	RM.112	Ultra Blue
	BY7266	Cobalt Blue
	BY5163	Monastral Blue
	BY8352	Prussian Blue (C2287 Type)
Blacks:-	RM.163	Vegetable Black
	RM.162	Carbon Black
	RM.57	Drop Black Substitute
	RM.58	Drop Black
		Antimony Sulphide

Series No.53

FLOTATION OF PIGMENTS (P.56.)

(Continued)

The White bases were tinted with Blacks and Blues separately, and made into finished enamels of Pompeian and Kemitone Quality. These materials were then brushed over bare steel and undercoating left "ropey" in order to accentuate the flotation, with the following results:-

RM.610	Shows very bad flotation with all Black and Blue pigments.
RM.713	Shows very bad flotation with Ultra Blue and all Black pigments. Cobalt, Monastral and Prussian Blue behave better with this pigment than with RM.610.
RM.618	Shows some flotation, particularly with Ultra Blue, Carbon Black and Drop Black Sub.
RM.8	Gives very good results, except in regard to Carbon Black and Drop Black Sub.
RM.6	Gives very good results, except in regard to Carbon Black and Drop Black Sub., but is difficult to brush in Synthetic Media due to feeding of this pigment with the media.

Conclusion.

For Danish Bacon (and similar requirements) Antimony Oxide is indicated, although in no case was there entire freedom from flotation.

Better results on the whole were obtained with Lithopone and Zinc Oxide, but these are undesirable because of their inferior weathering properties in alkyd media.

For Pompeian Quality tints vegetable Blacks (RM.163 Type) and Drop Blacks (RM.58 Type) are indicated, and also Monastral and Prussian Blue with Zinc Oxide as the white constituent.

Synthetic and Oil Media gave similar results.

It is hoped to make use of the above work, alongside the conclusions drawn bynMr. Crabtree regarding his restricted mobility theory, namely as obtained by the introduction of extenders imparting thixotropy.

F SMP 052891

Series No. 55

POMPEIAN SUPER SYNTHETIC ENAMEL

by

C.STEVENS (P.8.)

Tests carried out on Pompeian Super Synthetic Berkeley Green Finishing Enamel RX0883 taken from stock and thinned 5% and 10% with (571) (86) and (414) respectively.

Large steel panels were brushed out to check brushing, flotation, drying gloss etc.

	Brushing	Flotation	Gloss	Drying
1. 5%(571)	Free brushing	Slight	Sleepy	4 - 6 hrs. Slight surface clam.
2. 10%(571)	More free than 5%	Colour sl.deeper Little more than on 5% (571)	Sleepy	4 - 6 hrs. Fair surface clam
3. 5%(86)	Not as free as 5%(571)	Moderate	Fairly bright	4 - 6 hrs O.K.
4.10%(86)	More free than 5%(86) not equal to 10%(571)	Little more than on 5%(86) Colour little deeper	Fairly bright	4 - 6 hrs very slight surface clam
5. 5%(414)	almost equal to 5%(86)	More than on 5%(86)	Best gloss	4 - 6 hrs O.K.
6.10%(414)	almost equal to 10%(86)	Most general flotation Colour deeper	Best gloss	4 - 6 hrs V.sl.surface clam
7.Straight P.S.S.	Enamel sticky	V.slight	good	O.K. 4 - 6 hrs

No change made to standard formulae as a result of these tests. Nevertheless the value of employing either (86) or (414) in prewar Kemitone Brushing and Spraying thinners is substantiated although a lowering in cost by the use of petroleum distillate (571) needs further investigation.

Series No. 53

POMPEIAN SUPER SYNTHETIC ENAMELS

by

C.STEVENS (P.82)

Tests have been carried out on Pompeian Super Synthetic Enamels Black, Green and White substituting all the SA 5291 by an equal amount of SA5341 which is SA5291 made on Pentaerythritol. Various blends have also been tried namely

90% SA5291	10% SA5341	
50% SA5291	50% SA5341	
90% SA5339	10% SA5481	SA5339 SA5391 made on Paralac 11W & 15W)

The straight enamels and also the blends have been exposed both on roof and in the "Atlas" Weatherometer having been applied on steel panels treated as follows:

1 coat Grey Primer R.4102
1 coat P.S.S. Undercoating
1 coat Enamel

All straight enamels and blends gave satisfactory gloss and finish. No rivelling was apparent at time of exposure.

STOVING FINISHES FOR PREFABRICATED HOUSES

by

(P.86)

D.E.SEAR

Red Oxide primer S.6934 to C.S.2351

Further work has been done in connection with the above material, following a complaint that the paint was gelling in a dip tank.

In a previous report it was stated that the oxide in the formulation, IR804 was highly acidic. Tests were therefore made to determine whether this defect was the cause of the instability of the primer.

Series No. 53.

STOVING FINISHES FOR PREFABRICATED HOUSES

(Continued)

(P.86)

Washing tests

500 gms. of RM94 were boiled up twice with 4 litres of water and filtered, dried and the pH checked. After the treatment the pH was still too low. After treatment with 10% of ammonia followed by boiling and washing the pH was finally increased to 7.2 as against 2.8 for the untreated pigment.

Samples of B6934 were then ground in a ball mill using washed and unwashed RM94. Results are tabulated below.

In an attempt to confirm the adverse affect of acidity on stability some titanium dioxide normally having a pH of 7.6 was treated with 0.4% conc. H_2SO_4 to reduce the pH to 2.78 and after drying, this, together with the untreated pigment were used as replacements for the oxide in B6934.

Accelerated stability tests in open containers at 25°C were performed on these grindings and the following results obtained:-

	Washed RM94	Unwashed RM94	Acidified RM713	Untreated RM713
pH of pigment	7.2	2.80	2.78	7.6
Viscosity of unthinned paint Seconds F.C.4/ 25°C	43	59	165 (thixotropic)	82
Viscosity after thinning before test	25	26	28	27
Viscosity after 11 days on test	300	600 approx	66	175

Conclusions

The results confirm that a reduction in the acidity of RM94 would greatly improve the stability of paints in which it was used.

In the case of the titanium dioxide tests, the expected thickening with the acid pigment was completed during grinding, and did not continue during the stability test.

Series No.53

STOVING FINISHES FOR PREFABRICATED HOUSES

(Continued) (P.86)

Reformulation of B.6934

Several oxides have been tested by the Dry Colour Department as possible replacements for RM94. Deanox U90 from Morris Ashby was finally selected as the best all round alternative, having a pH of 6.2.

Blanc fixe in the B.6934 was also replaced by whiting since this was considered to impart greater stability and to give less trouble with settling. In this respect the formula has been brought into line with the off white primer B.6342.

The revised formula is now:-

210 lbs	Deanox U90	
170 "	RM25	Whiting
58 "	RM27	China clay
54½ galls	V.7365	
20 "	(458)	
15 "	(571)	

Theoretical yield ≃ 100 galls.

This formula was tested to CS2251 and found to be satisfactory in all respects. Gloss was slightly lower than the present material and stability was good after ageing in a closed drum for 7 weeks.

An accelerated stability test in an open container at 25°C showed no sign of gelation or deterioration of film forming properties after one week. Viscosity increased from 34 to 59 seconds.

FINISHES FOR PREFABRICATED HOUSES

by

P. BARRETT (P.86)

D.D.F.B. 109

(2) Exposures

Six mediums were made up into finishing enamels, applied on wood over present-day primer and undercoat, and exposed in the lamp. E.P.Nos 971 - 976 Exposed for 250 hrs.

The six mediums were:- SA5453, Paralac 16X, Paralac 11X, SA5239, SA5291, and SA5341.

After exposure, the present-day medium SA5453 showed a marked

inferiority, being low in gloss and showing bad rain-spotting. SA5291 was about equal to SA5338 on both counts.

The best medium for gloss was Paralac 16X, but it showed a tendency to fine blistering along the grain.

The two next best were SA5341 and Paralac 11X.

(2) Water Absorption.

All the mediums used in making the mixings for the above exposures were also tested for water absorption by the method given in Specification 2X17.

For the purposes of this test each varnish was reduced to 2 poises and 1% V4031 and 1% V3906 were added.

Results in order were, SA5341 4.6%; Paralac 11W 4.9%; Paralac 16X 5.9%; SA5291 8.3%; SA5239 9.8%; SA5338 17.7%.

Paralac 11W was used in these tests in place of 11X as it was considered more suitable.

(3) Action.

In view of the general superiority of Paralac 11W, it was decided to try to match it with a Berger product. A probable formula was evolved from such information as was available, and this formula was found to be very close to that of SA5072, although SA5072 has a much lower viscosity and higher acid value than Paralac 11W.

Complete systems of Primer, Undercoat and Finishing were ground on Paralac 11W, 16X and SA5072, and these are now under test.

Meanwhile attempts are being made to increase the viscosity and decrease the acid value of SA5072 to something nearer the figures for Paralac 11W, while reducing the cooking time of 5 hours which is at present required, as this presents production difficulties.

The reduction of acid value seems to be obtainable by using a good CO_2 blow, while the increase in viscosity is being sought by replacing part of the Fatty Acids with Stand Oil V4201. Results here are not yet sufficiently complete to be conclusive.

(4) Application Schedule.

Some confusion is still being caused by lack of information as to the precise application schedule which the Blackburn Aircraft Co. is using, particularly as regards the drying time allowed for the primer DDFB107.

Tests were put in hand to find out how much the final finish is affected by recoating interval variations.

Series No.53

FINISHES FOR PREFABRICATED HOUSES

(Continued)

One half of a wooden panel was coated with primer ES6262 and 22 hours later the other half was coated in the same way. After a further 2 hours two coats of undercoat were applied all over the panel with a ½-hour interval between coats. One coat finishing enamel was applied after a further 2 hours.

Where the primer had been dried for only 2 hours immediate lifting occurred along the grain on application of the finishing coat. This became less apparent when the enamel had dried. The gloss on this system was higher than that in which the primer had dried for 24 hours, but was inferior to that obtained by allowing each coat of primer and undercoat to dry for 24 hours.

The panel referred to above has been placed on exposure on the roof to see whether the lifting observed affects the weather resistance. EP No.1004; Date exposed 10.10.46.

Series No.53

FINISHES FOR RUBBER (P.116.)

by

J. DALE.

Vulcaprene A.C.
Vulcafur V.S.C.

A new solvent mixture was advocated by I.C.I. Ltd. (suppliers of the above material) to overcome brushing and spraying difficulties encountered with the original solvent formula included in their original notes.

The new solvent formula consisting of Xylol : Solvesso : Methyl Ethyl Ketone 1:1:2 by weight, was used as under:-

A medium was made as follows:-

Vulcaprene AC	= 35 gms.	
(240)	= 35 gms.	Allowed to stand in contact
Sextone	= 25 gms.	for 46 hours with occasional
(433)	= 50 gms.	stirring.

The viscous fairly clear medium thus produced was used in the following paint formula:-

Zinc Ox.	= 4 gms.
Titanox (RCHT)	= 4 gms.
Whiting	= 12 gms.
Medium	= 125 gms.

F SHP 052897

Series No.53

FINISHES FOR RUBBER (P.116.)

(Continued)

This was ground in a pebble mill 72 hours, thinned with 80 gms of the solvent mixture (240): Sextone (433) 1:1:2 by weight. 5 gms of Vulcafor V.C.C. were added, stirred in and the paint brushed out on rubber. A slight tendency to pull on the brush was noticed although not so bad as on the original solvent mix.

The paint was thinned with the new solvent mix to 10% solid and sprayed on to rubber at 35 pounds air pressure. No cobwebbing resulted but care was needed to prevent bad runs.

Films produced whether brushed or sprayed showed excellent flexibility, but, although adhesion was good in the main body, the film could still be worked up at the edges.

The new solvent mixture does not have any noticeable effect on the drying time.

The I.C.I. claim that it is a better solvent mixture than that originally suggested has been substantiated.

Series No.53.

KEMPLASTITE (P.117)

by

D. E. STAR

Present position.

Large quantities of Kemplastite have been made during recent months. The bulk of production is White and and White base for tints, and these have given little trouble as regards gloss when ground in a pebble mill for about 40 hours.

In the case of colours, however, there has been considerable trouble with haziness and poor gloss. Grinding for periods up to 120 hours has not entirely eliminated this defect.

Also, there have been complaints that stoved films were insufficiently hard. The present medium SA5334 was adopted in place of SA5307 some months ago after consideration of the production difficulties of the latter medium. The possibility of the hardness of SA5334 being inferior was reconsidered.

Preparation of Media.

One pot each of SA5307 and SA5334 was made to the present standard formulae, which were both centrifuged hot, portions of uncentrifuged varnish being set aside for laboratory tests.

P SLIP 052898

Series No.53

KEMPLASTITE (P.117.)

(Continued)

	SA5334/512	SA5307/1143
Manufacture	Held 1 hour 40 mins at 500°F.	To std schedule. Held 5 mins at 575°F then hosed down.
Visc of 50% of solids in (240)	30 poises /25°C	36 poises /25°C.
Visc of medium in standard thinners	2.75 " "	22.7 " "
Acid value of solids	37.8	23.4
Colour of varnish	4	6
Solids " "	50.05%	46.12%

After cooking the beads of the two media were similar both being tough and showing a fracture when cold. The bead for SA5334 was slightly softer particularly when warm.

A small amount of gelatinous material was removed by centrifuging, the quantity being somewhat greater in the case of SA5334.

Laboratory grinding trials.

Small ball mill batches of Deep Lapis Kemplastite SA3519 were made under identical conditions using centrifuged and uncentrifuged SA5334 and SA5307. Gloss was excellent and hardness satisfactory in all cases and there was little or no difference between the enamels in this respect.

Works trials.

Works grindings under identical conditions were then made on the two centrifuged batches in a 300 gallon porcelain mill. The material chosen was Royal Blue Kemplastite SA3614 since this has given considerable trouble with haziness in the past.

The grinding time given was 44 hours in each case. The charge was 33 gallons for the SA5307 batch and 38 gallons for the SA5334 batch, both to make 100 gallons.

After grinding both batches were completed and centrifuged at the rate of 30 gallons per hour (output of twin centrifuges). Both gave a somewhat hazy film, though rather better in this respect than recent production.

An increase of 50% extra medium was then made on both batches and they were recentrifuged.

In each case a film of good gloss and hardness was obtained, the batch made on SA5307 being slightly superior in both respects.

Series No.53

KEMPLASTITE (P.117.)

(Continued)

Conclusions.

SA3334 can be made to give an entirely satisfactory result when used in Kemplastite if the correct procedure is used in the manufacture of both the paint and medium.

To further check the results of SA5334 and SA5307 five batches of each are being made under controlled conditions and these will be tested in works production of Kemplastite.

The relative inefficiency of the works centrifuge as compared with the labratory model has again been demonstrated.

Series No.53

KEMRIST CHLORINATED RUBBER PAINT (P.119.)

by

F. WELLS

Performance tests were carried out on White and tinted KEMRIST Paints using Grade "D" Alloprene Chlorinated Rubber (High Viscosity), the material at present available as a replacement for prewar Grade "B" (Low Viscosity).

Z.38 Medium	250 lbs Alloprene Grade "D" ex I.C.I. 85 galls. (458) H/F Naptha.
Z.39 White	190 lbs. RM.713 Titanium White 60 galls. Z.38. 12 " Carreclor. 10 " (458) H/F Naptha. 12 " (16) American Turps.

The White Finishing Enamel was then tinted with the various pigments to check comparative results.

i.e. Shade produced:-

Stone Colour	RM.61 Yellow Ochre RM.742 Ferrite Yellow
Pale Yellow	C2664 Hansa Yellow
Pale Green	C597 Lime Green reduced with Blanc Fixe RM133 Chromium Oxide C2664 Hansa Yellow BY8692 Monastral Blue reduced with Blanc Fixe
Light Red	RM97 Synthetic Spanish Oxide RM93 Synthetic Scarlet Oxide C2058 Helio Red
Pale Blue	BY8692 Monastral Blue reduced with Blanc Fixe

F SUP 052900

Series No.53

KEMPSIT CHLORINATED RUBBER PAINT (P.119.)

(Continued)

Chemical Resistance Tests were carried out by brushing one coat of material on tin plate, air drying 24 hours, then placing small amounts of testing solution on the panel for 24 hours. The panels were then cleaned and examined. The Summary of the results obtained is as follows:-

Alkali Resistance	10% Caustic and Caustic Pellet Colour retention very good in all cases, films quite intact although softened slightly.
Acid Resistance	30% Hydrochloric. Films and colour retention quite satisfactory. 10% Sulphuric Acid. Films and colour retention quite satisfactory. 10% Nitric Acid. Colour retention satisfactory, but films blistered slightly. 100% Sulphuric also 50% Nitric Acid destroyed both films and colour which is to be expected from acids of this concentration. Nitric Acid. All films and colour retention quite satisfactory.
Solvents	Petrol (569). Colour retention quite good. Films brittle due to petrol dissolving Cereclor from films. White Spirit (23). Films satisfactory. Colour retention very good except in case of Hansa Yellow, which is partially removed by this solvent. Alcohol (454). Films satisfactory. Colour retention very good except in cases of Hansa Yellow, Lime Green and Helio which are partially removed by this solvent. Xylol (240)) All films removed Ethyl Lactate (431)) immediately by Carbon Tetrachloride) these solvents.
Oils	Mineral Oil (42). Colour retention very good, films softened slightly but intact. Castor Oil (197). All films badly softened and easily removed. Linseed Oil (1). All films entirely removed.

Series No.53

KEMRIST CHLORINATED RUBBER PAINT (P.119)

(Continued)

General conclusions on above results.

Resistance to Acids and Alkalies very good, except in cases of high concentration.

Contact with fairly strong solvents should be avoided, and in the cases of Helio and Lime Green - Alcohol, and Hansa - Alcohol and White Spirit should be avoided.

Resistance to mineral oils is satisfactory.

Practical Tests.

Spraying. Present formulation (i.e. 2.39) is unsatisfactory for spray applications.

Brushing. One coat application of this material gives quite good results, but where a 2 coat finish is required the application of the second coat is extremely difficult on large surfaces, due to strong solvent action of second coating, softening previous coat even after air drying for one week. Addition of drying oils or varnishes, although improving recoating time, reduce the resistance properties of the film considerably. The use of undercoating for this material is still being investigated as the strong solvent action of the Kemrist is again causing trouble.

Attempts to use the substandard grade Alloprene "D" in Kemrist type formulae are only partially successful. Gloss is not good and two coat work is not satisfactory because Alloprene "D" is the wrong grade for spray. The subject will be reopened when better grades become available.