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August 19, 1969

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MARSHALL DEVELOPMENT LABORATORY RELEASE LETTER NO. 2149-B
LUCITE® CUSTOM COLOR INTERIOR ENAMEL 389-291 AND 389-292

RELATED RELEASE LETTERS: RL-2149, RL-2140A, RL-2149-C

PROJECT: 511010

PROPOSAL AND EXTENT OF RELEASE:

This letter proposes divisional release of a medium gloss acrylic latex enamel quality to be used in a "Custom Color" system with colorants produced by Bennett's (Manufacturing) Co. of Salt Lake City, Utah.

This proposal is made at the request of Marketing to expand the qualities available for "Custom Color" to include a water-based enamel to coordinate with the "Lucite" Custom Color Wall Paint.

This letter is an extension of the proposal to purchase and use Bennett colorants for Du Pont "Custom Color" System. The approval of the proposal made in this letter presupposes the approval of the parent Release Letter, 2149.

MANAGEMENT DECISION REQUESTED:

In making its decision, Management should consider the following points:

- (1) Marketing feels that a latex interior enamel is essential to the successful commercialization of the new "Custom Color" System. The current 394-Line Interior Enamel is unsatisfactory for this use.
- (2) Experience with this product is limited to laboratory testing.
- (3) This product uses four new ingredients all purchased from Rohm and Haas. As such, its introduction is anti-simplification.
- (4) The Bulk Mill Cost of this quality is high due to the use of purchased latex and large amounts of surfactants.
- (5) The scale-up results are incomplete.
- (6) Some color can be rubbed from the dried paint surface with soap and a wet cloth.
- (7) The properties of the proposed quality are similar but not identical to those of the factory packaged 394-Line "Lucite" Interior Enamel.

TECHNICAL OPINION:

We favor approval of this proposal upon satisfactory completion of the scale-up batches and one month's stability of the material made in these batches.

The proposed quality produces good color matches to Bennett's chips using their formulas. The appearance and film properties of this system appear comparable to competitive water-based enamels currently available to the consumer.

Although we have no experience with this material outside the laboratory, we believe we have characterized the system thoroughly using the current 394-Line as the control.

The new ingredients are all necessary for the satisfactory performance of the proposed quality and were suggested by Rohm and Haas in a starting formula for use with Bennett's colorants. Attempts to substitute currently used raw materials were unsuccessful.

The cost of this quality has been pared already to bring it more in line with Marketing's price range. The cost may be reduced further when we have developed our analog of the Rohm and Haas latex.

Although scale-up is incomplete, we do not believe there will be any unusual obstacles involved in the alignment of the bases in this quality.

The stability of the laboratory material has been satisfactory one month at room temperature and one month at 120°F.

The color rub off observed with this system has been referred to as "wet crocking". The color rub off is of a degree found in other custom color systems, and therefore, we do not feel that this deficiency will be a source of complaint.

The properties of the proposed 389-Line Custom Color enamel are similar to those of our current 394-Line factory packaged colors. The differences which we see in "in-can" appearance and degree of leveling of a brushed or rolled film are not objectionable but will be perceived by the customer.

Description of Product:

General:

The proposed 389-Line Custom Color Interior Enamel system is composed of two bases, a light and a deep tint (389-291 and 389-292 respectively). These bases are formulated to give color matches to chips in the Bennett's color book when mixed with the prescribed amounts of Bennett's colorant.

The current 394-Line quality was unacceptable for this end use due to an objectionable tack condition of the dried film of paint tinted with the Bennett's colorants. In addition, the 394-Line quality tinted with the Bennett colorant showed some brush sensitivity. The proposed system was developed to eliminate these conditions.

The custom color enamel is based on Rhoplex AC-490, KG-8742, a hard latex recommended by Rohm and Haas for interior enamels. Both bases use the two pigment dispersions developed for the standard "Lucite" Interior Enamel.

Several additional surfactants are added in the letdown; the major one is Triton X-207, KG-8744, which we found necessary for development of the Bennett's colorants. We use a new thickener, Acrysol G-110, KG-8743, which is needed for efficient thickening and best gloss with the new latex.

The bases are packaged at 28.0% volume solids to achieve a commercially acceptable cost.

Appearance:

The in-can appearance of this quality is different from that of the factory-packaged colors in the standard line. The can viscosity is 20-30KU lower than that of the standard although high shear viscosity is slightly higher.

The proposed formulas have good leveling although not equal to our current 394-Line.

The gloss of the proposed quality (See Table I) is slightly lower than that of the current 394-Line but is still in the semi-gloss range. The gloss decreases with increasing levels of colorant and varies with the colorant; Colorant N gives lowest gloss.

Film Properties:

In general, the film properties of the proposed system are equivalent to the current 394-Line (See Table I). The proposed system is superior in ease of removal of oily stains while deficient in removal of water-based inks. The proposed system is not tacky when tinted with the Bennett's colorants, but some color can be rubbed off a dried film (See below).

Stability (See Table II)

The freeze-thaw stability of both bases is good and equivalent to the standard 394-Line White.

The gloss and pH stability of these products are good with no changes occurring after one month at room temperature.

The viscosity stability of both bases is satisfactory after one month on the shelf and at 120°F.

Color "Rub Off":

When a film of tinted paint is cast from this quality and dried, some color can be rubbed off with soap and water. The rub off or "crocking" does not change the color of the film nor does it recur after the film is washed. The "crocking" increases with the amount of colorant added.

This "crocking" does not occur with our factory shaded "Lucite" Interior Enamel colors.

TABLE I
A COMPARISON OF FILM PROPERTIES
OF "LUCITE" INTERIOR ENAMEL CUSTOM COLOR BASES
VS. FACTORY PACKAGE WHITE

	<u>Model II-A White 394-101</u>	<u>Light Base 389-291</u>	<u>Deep Base 389-292</u>
<u>Scrub Resistance (1000 cycles)</u>			
White only	Pass	Pass	Pass
When tinted (4 oz. F)	No color change	Slight darkening	Slight darkening
<u>Stain Removal (25 cycles)</u>			
Water stains	Good	Fair	Fair
Oil stains	Fair	Good	Good
<u>Tack When Tinted</u>	Severe	None	None
<u>Color Rub Off When Tinted</u>			
1 oz. colorant C	None	V. Slight	V. Slight
8 oz. colorant C	V. Slight	Considerable	Considerable
<u>Brush Sensitivity When Tinted</u>	Slight	None	None
<u>60° Gloss</u>			
Untinted	60	59	57
Plus 4 oz. colorant F	55	55	49
" " " colorant N	50	40	38

TABLE II
A COMPARISON OF STABILITY PROPERTIES OF
"LUCITE" INTERIOR ENAMEL CUSTOM COLOR BASES
VS. FACTORY PACKAGED WHITE

	<u>Model II-A White 394-101</u>	<u>Light Base 389-291</u>	<u>Deep Base 389-292</u>
<u>60° Gloss</u>			
Initial	60	69	57
One month R.T.	60	60	58
<u>pH</u>			
Initial	9.3	9.0	9.0
One month R.T.	9.3	9.0	9.0
<u>Viscosity-Stormer</u>			
<u>Room Temperature:</u>			
Initial (K.U.)	100	62	62
24 hours	115	67	68
One week	115	70	75
Two weeks	116	72	78
Four weeks	116	74	80
<u>120°F</u>			
Four weeks	106	78	82
<u>Viscosity-Brushometer</u>			
24 hours (poise)	.65	.56	.52
One month R.T.	.66	.86	.65
One month 120°F	.51	.89	.69

5 Freeze-Thaw Cycles - All properties unchanged -

COMPETITIVE SITUATION:

Water based enamels in a custom color system are available from Sears, Gildden and PPG in the Philadelphia area. Their bases are mixed with glycol colorants. The initial properties of these systems are good and equivalent to the proposed quality.

The color matches to the chips and to the companion flat Wall Paint in these competitive systems are only fair. The proposed Du Pont system should be better in this respect.

TABLE OF COMPOSITION:

"Lucite" Custom Color Interior Enamel

	Light Base 389-291	Deep Base 389-292	
H-506, Tap Water	172.69	187.31	
KG-8743, Acrysol G-110	25.00	20.00	(1)
KG-8742, Rheplex AC-490	376.08	377.61	
548-961, TiO ₂ dispersion	286.00	121.00	
548-980, Aluminum Silicate Dispersion	-	85.00	
H-727, Tamol 850	2.93	2.93	(2)
KG-8744, Triton X-207	18.76	27.90	(3)
KG-8745, Triton X-114	0.63	0.63	(3)
H-224, Butyl Cellosolve	23.00	23.00	
G-747, Nopco Antifoamer	0.50	0.50	
H-550, Propylene Glycol	103.00	105.62	
G-782, Balab Defoamer	0.50	0.50	
TOTAL	1009.00	952.00	

- (1) Thickener
- (2) Anionic surfactant
- (3) Nonionic surfactant

REPRODUCIBILITY:

One 100 gallon scale-up batch of both bases have been made in Philadelphia semi-works. Both were satisfactory on load for all properties.

CONTINUING LABORATORY WORK:

We will assist Production in alignment of these bases. We will continue to characterize the performance of this new quality. We are now placing special emphasis on long term stability with and without colorant.

In addition, we anticipate work to lower cost by developing a new Du Pont latex to replace the purchased Rhoplex AC-490.

COST INFORMATION:

The following data was generated by the laboratory computer "FORCOST" program and is for guidance only.

	<u>Cost per 100 Gallons</u>	
	<u>Light Base</u>	<u>Deep Base</u>
	<u>389-291</u>	<u>389-292</u>
Bulk Mill Cost	\$200	\$168
Cost at standard fill*	187	147

*15/16 light base, 7/8 deep base

The Bulk Mill cost of 394-101 "Lucite" Interior Enamel is \$183 per 100 gallons.

MANUFACTURING PROBLEMS:

Strict attention to equipment cleaning procedures is required for this product. The procedure to be used is no different than that currently recommended for existing emulsion paints. Failure to adequately clean equipment may adversely affect gloss or rheology, especially if the product becomes contaminated with materials such as thickeners LN (G-1144). Excess amounts of Triton X-207 (KG-8744) will have the same effect.

Color matching of the deep base requires at least five coats with a 60 rod. with a thirty minute bake between coats.

TOXICITY OR OTHER HAZARDS:

There are no toxic materials in this quality.

LABEL INFORMATION:

New labels will be required for this product.

SIMPLIFICATION:

Approval of this proposal will introduce four new ingredients into plant inventory.

PATENT INFORMATION:

There are no currently known patents which would interfere with the manufacture and sale of the proposed light and deep color bases formulated with latex supplied by Rohm and Haas and recommended for use in interior enamel formulations. Purchase of the latex AC-490 from Rohm and Haas is recognized as providing freedom to use the latex in paint formulations according to the supplier's recommendation without royalty payment to Rohm and Haas under any of their patents that may embrace the latex or the latex paint.

CONFIDENTIAL INFORMATION:

The information contained in this letter is classified "For Du Pont Use Only".

FORMULA CARDS:

Formula cards for 389-291 Light Base and 389-292 Deep Base are attached to Production and Research copies of this proposal.

MARSHALL DEVELOPMENT LABORATORY

PC Bremenstuhl

PHILIP C. BREMENSTUHL

PCB/emv

APPROVED

N. Pappas

DATE

Aug 21, 1968

101	CODE	389	291	NAME	"LUCITE" C.C. INT. ENAMEL LIGHT BASE		DATE	82069	
202	CUST.	CONSUMER PAINTS			LOC.		REC. A.D.	WILM TRADE	
203	END USE	INTERIOR			TYPE	TEMP	COLOR	WHITE	
204	PRGM	P C BREMENSTUHL/FRH			R.L.L.	2149-B	N.B.A.P.	9381-177	
205	REVISION	P C BREMENSTUHL/CLH			Q.DIST.	CEFLMPS	PLANT	PHILA-DL	
206	PREV. R.	394-H-8702 6-3-69-T			T.C. DIST.	CMPS	APPR.	CWS-WFG	
307	Q.P.I.	ASSIGN PERM. CODE FOR 394-H-8702							
208	Q.T.R.				QAL STD.	389-291-P		QOL STD.	SEE TESTING INFO
309	I	VISCOSITY TM-9-1 60-63 0-8 HOURS AFTER ADDITION OF 548-961							
310	N	63-68 KU 8-24 HOURS AFTER ADDITION OF 548-961 PH TM-243-A							
311	T F	9.2-9.4 // GLOSS DRAWDOWN TM-338-B USING .0056 MIL DOCTOR							
312	E O	BLADE ON 5X7 INCH CLEAR GLASS. FORCE DRY 90 MINS. X 120 DEG							
313	S R	F. COOL 15 MINS. CHECK 60 DEG GLOSS TM-204-F 50 MIN.							
314	T M	COLOR = STANDARDIZE COLORIMETER TO PORCELAIN STD. 1-X001-7							
315	I A	CALCULATE VS.DRYPLATE STANDARD TO BE SUPPLIED BY FORMULATOR							
316	N T	ZONE C // TINTING STRENGTH = TO BE RUN BY FORMULATOR.							
	G I								
	O								
	N								
420	VOL. SOL.	280 %			FIN. VOL.	209 %		WT. SOL.	405 %
321		COMPUTER PROGRAMMED							
322	O	NOT TO BE USED FOR OTHER THAN EXPERIMENTAL PURPOSES UNTIL							
323	T I	RELEASE LETTER IS APPROVED //							
	H N								
	E F								
	R O.								
	25								

529	CODE	389	291	NAME	"LUCITE" C.C. INT. ENAMEL LIGHT BASE	DATE	82069
230	PREP MAN				USE	SEE TESTING INFO	FIN.
231	CONT.	H-1			QAL. WT.	1009 ±0	QOL. INFO. +150L
		INGREDIENT	Q	SC	ALT. Q	ALT. SC	
632	I	CAUTION-THIS IS A WATER PAINT. DO NOT CONTAMINATE WITH OIL					
633	N A	RESIN OR SOLVENT. AVOID UNNECESSARY AGITATION //					
	G U						
735	R F	H	506		169	69	
736	A H		284	55	3	00	
737	D KG		8743		25	00	
638	J T	ADD IN ORDER MIX 10 MINS. //					
739	E U	KG	8742		376	08	
640	N R	STOP MIXER ADD WITHOUT FREEFALL					
741	T I	548	961	*	286	00	
642	S G	ADD RECORD TIME ON BATCH CARD //					
743	A H		727		2	93	
744	D KG		8744		18	67	
745	M KG		8745		0	63	
746	Q H		224	52	23	00	
747	I G		747		0	50	
648	U R	ADD IN ORDER WITH MIXING. *AGITATE					
649	N E	DISPERSION BEFORE USING //					
	T C						
751	S I	H	550		103	00	
652	A O	ADD SLOWLY WITH MIXING OVER A					
653	N N	10 MIN. PERIOD //					
754	D S	547	5630		-TRA	CE-	
755	W		247		-TRA	CE-	

756		548	961		-TRA	CE-	
757		548	980		-TRA	CE-	
758	KG		8742		-TRA	CE-	
759	H		506		-TRA	CE-	
660	SHADE AND TEST FOR ALL PROPERTIES						
661	SEE TESTING INFORMATION //						
662	INCREASE VISCOSITY WITH 1 LB KG-8743 FOR EACH 2 KU INCREASE						
663	PER 100 GALLONS DESIRED// DO NOT PROCEED TO NEXT STEP						
765	C		702		0	50	
667	ADD WHILE MIXING // MIX 10 MINS.						
768		TOTAL			1009	00	

N42516.01

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70	TO INCREASE TINT STRENGTH	1.0 G UNIT ADD	
71	14.7 LBS/100 GALLONS OF	548-961	82.30
72		H-506	17.70
73			100.00
74	TO DECREASE TINT STRENGTH	1.0 G UNIT ADD	
75	95.2 LBS/100 GALLONS OF	548-980	14.04
76		KG-8742	53.38
77		H-506	32.58
78		TOTAL	100.00