HIGHWAY RESEARCH REPORT

COATINGS AND PAVEMENT MARKING MATERIALS 1969 - 1972

INTERIM REPORT

STATE OF CALIFORNIA

BUSINESS AND TRANSPORTATION AGENCY

DEPARTMENT OF PUBLIC WORKS

DIVISION OF HIGHWAYS

MATERIALS AND RESEARCH DEPARTMENT

RESEARCH REPORT

CA-HWY-MR-5135-1-72-28

Prepared in Cooperation with the U.S. Department of Transportation, Federal Highway Administration August, 1972

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TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.
4. TITLE AND SUBTITLE Coatings and Pavement Marking Materials		5. REPORT DATE August 1972
		6. PERFORMING ORGANIZATION CODE 19502-762503 635135
7. AUTHOR(S) Herbert A. Rooney and Thomas L. Shelly		8. PERFORMING ORGANIZATION REPORT NO. CA-HY-MR-5135-1-72-28
9. PERFORMING ORGANIZATION NAME AND ADDRESS Materials and Research Department California Division of Highways Sacramento, California 95819		10. WORK UNIT NO.
		11. CONTRACT OR GRANT NO. D-5-35
12. SPONSORING AGENCY NAME AND ADDRESS California Division of Highways Sacramento, California 95807		13. TYPE OF REPORT & PERIOD COVERED Interim
		14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

Conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration

16. ABSTRACT

The State of California, Division of Highways has continued evaluation of zinc rich primers for use on structural steel. The organic vehicle type described in this report has proven in laboratory and field tests to be essentially equal in durability to the inorganic vehicle type without the sophistication in application and liability to early failure caused by faulty application of the latter.

Formulations have been made for 20-30 second dry to no pick-up heated traffic paints, and specifications of a performance type are being prepared.

Formulations for four types of concrete curing compounds and a rapid dry heavy equipment and truck enamel developed are discussed.

17. KEY WORDS	18. DISTRIBUTION STATEMENT
Zinc primers; traffic paint, rapid dry; curing compounds, concrete; enamel, equipment, rapid dry.	Unlimited

19. SECURITY CLASSIF. (OF THIS REPORT)	20. SECURITY CLASSIF. (OF THIS PAGE)	21. NO. OF PAGES	22. PRICE
Unclassified	Unclassified	42	

HMRT – 1242 (ORIG. 9/72)

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STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY

RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
MATERIALS AND RESEARCH DEPARTMENT
5900 FOLSOM BLVD., SACRAMENTO 95819

Interim Report
Research No. M&R 635135
Federal No. D-5-35

August, 1972

Mr. Robert J. Datel
State Highway Engineer

Dear Sir:

Submitted herewith is an interim research report titled:

COATINGS AND PAVEMENT MARKING MATERIALS

1969-1972

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Very truly yours,

JOHN L. BEATON
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Attachment

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REFERENCE: Rooney, Herbert A. and Shelly, Thomas L., "Coatings and Pavement Marking Materials, 1969-1972", State of California, Materials and Research Department, Division of Highways, Department of Public Works, August 1972, Research Report CA-HY-MR-5135-1-72-28, Federal No. D-5-35.

ABSTRACT: The State of California, Division of Highways, has continued evaluation of the zinc-rich primers for use on structural steel. The organic vehicle type described in this report has proven in laboratory and field tests to be essentially equal in durability to the inorganic vehicle type without the sophistication in application and liability to early failure caused by faulty application of the latter.

Formulations have been made for 20-30 second dry-to-no-pick-up heated traffic paints, and specifications of a performance type are being prepared.

Formula specifications for four types of concrete curing compounds and a rapid dry heavy equipment enamel are discussed.

KEY WORDS: Zinc primers; traffic paint, rapid dry; curing compounds, concrete; enamel, equipment, rapid dry

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ACKNOWLEDGMENT

The authors express their appreciation to the following whose contributions have made this report possible:

1. The Koppers Company and its western representative, Mr. John Gettman, who supplied us the first samples of a phenoxy organic zinc-rich primer, and for their assistance in writing the specifications.

2. Mr. Harry O. Humphrey of District 05 Maintenance Department, who provided assistance for the initial field testing of the phenoxy zinc-rich primer in Salinas, California, on box beam sign repair work.

3. Mr. Truman Burns of the Materials and Research Department staff, who assisted in formulation work on a series of the above paints, and who drafted the final specifications.

4. Mr. Bill Chapman of the Materials and Research Department staff, who performed the necessary coating of panels for testing in the salt spray, directed a field project in 1971 at Leffingwell Creek Bridge in which various zinc-rich coatings were placed for evaluation, and assisted in development of the specification for thermo-applied traffic striping granules.

5. Mr. Eric F. Nordlin, head of the Structural Materials Section of the Materials and Research Department, and his assistant, Mr. Paul Jonas, for the work in introducing the use of the phenoxy organic zinc-rich primers on box beam signs. Their suggestions and evaluations were of great assistance.

6. Mr. Enrico Maggenti of the Materials and Research Department staff, who assisted in applying the new phenoxy organic zinc coatings to portions of box beam signs at Salinas, California.

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7. Mr. Robert W. Ford of the Materials and Research Department staff who helped in developing concrete curing compounds and who prepared the specifications.

8. Mr. Harry C. Ammon of the Equipment Department for his design of the equipment to enable the application of traffic paints at elevated temperatures.

9. Mr. Robert W. Halsey of the Equipment Department for his cooperation in the development of the rapid dry equipment enamel.

This project was performed in cooperation with the U. S. Department of Transportation, Federal Highway Administration, Agreement No. D-5-35.

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California, or the Federal Highway Adminstration. This report does not constitute a standard, specification, or regulation.

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COATINGS AND PAVEMENT MARKING MATERIALS

1969-1972

INTRODUCTION

This is a continuing project on the development and evaluation of coatings, sealants, and pavement marking materials. The report issued in 1969 covered the period 1952-1969, and was exclusively confined to structural steel coatings. Although the major portion of this report is concerned with structural steel coatings, our work on concrete curing compounds, rapid dry traffic paints, and rapid dry highway equipment enamel is also discussed.

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CONCLUSIONS

The California Division of Highways has adopted a completely new coating system for steel structures eliminating lead based primers. The object of the change was to develop a protective coating system that provided long-term durability and protection of the steel from corrosion, not only in marine locations, but in all areas of the state. A desirable side effect has been the elimination of lead and some other objectionable metal compounds from our coating system.

The primer adopted is a single package zinc-rich type based upon a phenoxy resin vehicle, the latter being a condensation product of epichlorohydrin and bis-phenol A. Test results to date show it is essentially equivalent to the inorganic zinc primers in corrosion protection, is simple to apply, and avoids the sophistication of the inorganic types in which any faulty application and/or curing can result in costly failures. For maximum corrosion protection, a vinyl wash primer is applied as an intermediate tie-coat over the organic zinc-rich primer, followed by a vinyl finish coat.

Formula specifications were developed for concrete curing compounds for use on portland cement concrete highways, bridge decks, and New Jersey type median barriers. These specifications comprise two general types. One, which is lowest in cost, is a petroleum hydrocarbon resin type used for highway surfaces. The other is chlorinated rubber types modified with chlorinated paraffins for bridge decks and barrier rails.

Rapid dry-to-no-pick-up traffic paints to be used in apparatus designed by the Equipment Department are being tested. Preliminary testing at 85°C (185°F) indicates no pick-up can be accomplished in 15 to 20 seconds. Rapid dry paint is expected to eliminate the safety hazard of placing traffic cones, and provide economies in the saving of manpower.

Research in the areas described in this report is a continuous process as new and better raw material products are offered by the chemical industry and new concepts of utilizing them are developed.

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IMPLEMENTATION

All of the specification coatings described in this report, except the heated rapid dry traffic paint, have become the standard materials used by the Division of Highways. Work is continuing on the improvement of the rapid dry traffic paint, and it is expected to be adopted when satisfactory results are achieved.

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STEEL PRIMERS

Research work in the Materials and Research Department beginning in 1964, was concentrated on the development of a series of specifications for the self-cure alkali silicate and ethyl silicate vehicle inorganic zinc primers. This work was prompted by the successful experience with the post-cure alkali silicate zinc-rich primer placed on sections of the Leffingwell Creek Bridge in 1958, a severe marine exposure immediately adjacent to the ocean. Recent inspection shows that after 14 years, this post-cure coating which has provided protection of the steel three times as long as previous conventional coatings is beginning to show loss of adhesion to the steel in areas where it was applied too thickly, and loss of adhesion of the vinyl topcoats in places.

The self-cure systems were investigated because there are no post-cure white reaction products formed on the zinc coated surfaces as occur in the post-cure system. If the reaction products are not removed by water scrubbing or high pressure water spray, the adhesion of topcoats is adversely affected.

Both the self-cure and post-cure inorganic zinc coatings exhibited excellent salt spray performance when tested in the laboratory according to ASTM B-117. The conventional red lead or basic lead silico chromate primers in an alkyd-oil vehicle have consistently had a useful life of about 3-4 years on the bridges in the Leffingwell coastal area. This deterioration was confirmed in laboratory salt spray testing where the coating life was in the order of 500 hours after which severe blistering of the coatings and underfilm corrosion of the steel occurred outward from the scribes on the panels. The inorganic zinc coatings did not blister or show rust creepage after several thousand hours in salt spray. Panels of the inorganic coatings exposed on our coastal test rack at Cambria, near Leffingwell, confirm the excellent durability of the inorganic zinc primers as was shown by the laboratory salt spray tests.

As is the case in some new products or technology, it was discovered that the inorganic zinc primers had some serious limitations which nullified their positive characteristics.

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The decision to abandon their use on California bridges and other steel structures was made when inspection showed serious and moderate failures after a few months of exposure on box beam signs and other steel structures.

The adverse properties or limitations of the inorganic zinc primers, even though such primers when properly applied produce excellent coatings, may be summarized as follows:

1. Two-package systems require complete and proper mixing of the vehicle and pigment in definite ratios just prior to use at the jobsite.

2. Intercoat adhesion is marginal, particularly if the time lapse between coats exceeds certain time intervals.

3. If the dry film thickness is not rigidly controlled, severe mud cracking with resultant loss of adhesion and corrosion can occur when dry film thickness exceeds about 5-6 mils. On flat surfaces, control of film thickness may not be too great a problem. On an irregular surface where there are sharp angles, braces, "hard to get at" areas, etc., it is difficult tor the most skilled spray painters to control film thickness.

4. There is a lack of familiarity of the average painter on contract jobs with the sophistication of the mixing and application process.

5. Weather conditions which cannot be controlled are an extremely important factor. In the case of the ethyl silicate vehicles, sufficient humidity must be present to complete the hydrolysis of the ethyl silicate to produce a proper cure of the coating.

6. In spot repair painting of previously coated structures, the inorganic zinc primers applied to the sandblasted areas will inevitably overspray on to the previously top coated surfaces and not adhere to the latter.

7. There is a tendency to produce a dry spray in hot or windy weather with some ethyl silicate vehicle types.

In cooperation with private industry, the Materials and Research Department published a specification for an organic zinc-rich primer which is essentially equivalent in corrosion resistance to the inorganic types while having none of the

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limitations described above.

The phenoxy vehicle in the organic zinc primer is a condensation product of epichlorohydrin and bis-phenol A, having no terminal epoxide groups. This primer requires no curing agent and is a single package system.

The laboratory formulated many versions of this primer and extensively tested them to determine the correct zinc-to-binder ratio and solvent system.

Extensive field and laboratory testing in marine atmospheres has demonstrated the excellent corrosion protection of this organic zinc coating. Hundreds of overhead sign structures have been coated with this specification coating and there have been no reported failures.

Test panels of several inorganic zinc-rich and a phenoxy organic zinc-rich primers were exposed on a test rack facing the ocean near Leffingwell Creek Bridge in September 1968. As of May 1972, there is no corrosion of the panels.

To provide additional field evaluation, the following coating systems were applied in May 1971 to several spans of the Leffingwell Creek Bridge, which is immediately adjacent to the ocean.

A. Four mils of a phenoxy organic zinc primer corresponding to State Specification 691-80-62, a single package system. The binder in this coating is Union Carbide Phenoxy PKHH Resin. Part of this primer was top coated with vinyl wash primer, State Specification 701-80-52, as a barrier coat followed by 2 mils of vinyl aluminum coating, State Specification 702-80-49. The object of top coating with a vinyl is to determine how much added protection is provided to the organic zinc primer.

B. Four mils of State Specification 702-80-56, a modified inorganic ethyl silicate vehicle-zinc dust system comprising two packages which are mixed in the proper proportions just prior to use. Part of this system was overcoated with vinyl wash primer and two mils of vinyl aluminum.

C. Four mils of an inorganic potassium silicate water based vehicle-zinc dust system comprising two packages which are mixed in the proper proportions just prior to use. Part of this system was overcoated with vinyl wash

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primer and two mils of vinyl aluminum finish coat.

Laboratory testing in 5% salt spray showed steel galvanized at 2 oz. per square foot (1 oz. per side) deteriorated severely in 1000 hours, whereas the organic zinc coated panels had no failure after thousands of hours. The quick deterioration of the galvanizing may be attributed to the rapidity of the sacrificial action of the zinc, whereas the organic coating sacrificed the zinc pigment at a much slower rate, just sufficient to prevent corrosion.

For added protection from corrosion, particularly in marine areas, all zinc-rich coatings should be top coated. In the case of galvanized steel, the adhesion of the top coat is often a problem in the field operations. These limitations are not a problem with either the inorganic or organic zinc primers. For best results, the inorganic and organic zinc primers should be followed by an application of 0.3 - 0.5 mil of vinyl wash primer, State Specification 701-80-52, as a barrier coat. If an alkyd finish coat is used, the barrier coat prevents the degradation of the alkyd by alkali reaction products of the zinc. If a vinyl is used as a finish coat, adhesion of the vinyl is greatly improved on any painted metal surface if it is placed over a vinyl wash primer.

As noted in a previous section, the organic zinc primer described in this report has none of the limitations of the inorganic type. One of its prime virtues is that it can be readily applied by any experienced painter having a knowledge of the proper application of the conventional primers. To maintain the proper zinc-binder ratio during application, the spray pot must be kept in constant agitation. The same is true of all primers. A test panel coated with this organic zinc primer using multiple passes with a spray gun showed no mud-cracking in the resultant 30 mil dry film. The organic zinc primer need be applied only at 3 mils dry film thickness for adequate protection.

Chlorinated rubber top coats are being investigated in lieu of vinyl top coats. If a satisfactory formulation is achieved, there would be a labor and materials saving in top coat application because the average vinyl coating is 17% by volume of solids and a chlorinated rubber coating could be produced at about 35% solids volume. Decisions will be based upon the relative adhesion and water vapor transmission of these systems.

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Panels coated with inorganic and organic zinc primers were diagonally scribed to bare steel when tested in the laboratory salt spray and on the coastal test racks. Rust forming in the scribed line is not serious and the coating should not be judged on this fact. When scribing the test panels, zinc is sometimes pressed into the scribed lines, and with other panels having the same coating, the scribing does not do this. This accounts for one panel having little or no rust in the scribed line and the other having much rust. The criteria for judgment is whether the rust undercuts the coating and proceeds outward from the scribed lines. This is readily determined in the organic zinc primers by removing the primer by immersion in methylene chloride and viewing the bare steel for corrosion creepage.

The work on zinc-rich primers was initiated to provide better corrosion protection to steel than that afforded by conventional lead based primers. In addition to providing infinitely greater corrosion protection, the metallic zinc primers are not objectionable from an ecological standpoint since lead and other objectionable metallic compounds are not used.

The California Division of Highways has abandoned future use of all lead based steel primers. In the new Standard Specifications, the coating system will consist of a phenoxy organic zinc-rich primer, vinyl wash primer tie-coat, and vinyl finish coats.

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CONCRETE CURING COMPOUNDS

Concrete curing compounds are essentially paints. Formulations were developed in the laboratory and specifications were written for the following types:

1. White Pigmented Curing Compound Petroleum Hydrocarbon Resin Base, State Specification 721-80-71

   This material is designed for use on portland cement concrete highways. It is very inexpensive and designed to properly cure the concrete with no thought of permanence under traffic after it has performed its essential function. This specification is a revision of a previous formulation containing calcium sulfate extended titanium pigment which is no longer manufactured. The solvent is mineral spirits.

2. White Pigmented Concrete Curing Compound - Chlorinated Rubber Base, State Specification 721-80-100

   This material is designed for use on portland cement concrete bridge decks or other horizontal surfaces. It is a revision of a previous chlorinated rubber formulation which contained a modifying chlorinated triphenyl resin. This resin is no longer manufactured. The new formula is a chlorinated rubber vehicle modified with chlorinated paraffins. This material has greater durability then the petroleum hydrocarbon resin base described in "1" above, and better color retention. Solvents with a lower evaporation rate and a Tag Open Cup Flashpoint over 38°C (100°F) are used in this formulation.

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3. Chlorinated Rubber Concrete Curing Compound, for Concrete Median Barriers and Other Concrete Surfaces, Type I - White, and Type II - Tinted, State Specification 721-80-101

This material is designed for use on portland cement concrete median barriers and other concrete surfaces. It is formulated to prevent runs and sags when used on vertical surfaces and contains faster evaporating solvents. It must be applied by spray equipment of the pressure atomization type, either air or airless.

In Type II, a certain range of gray colors is permitted. The basic formula is the same as Type I except that a small amount of tinting agent is added to the Type I base during manufacture.

4. Clear Chlorinated Rubber Curing Compound, State Specification 721-80-102

This material is designed for use on slope paving, exposed aggregate, or colored portland cement concrete. This material may contain a fugitive dye to assist in securing uniform, adequate coverage.

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TRAFFIC DELINEATING MATERIALS FOR PAVEMENTS

1. Conventional Traffic Paints

Modifications were made in the chlorinated rubber-oleo resinous varnish vehicle types of white and yellow traffic paints to reduce cost by altering the solvent structure to give equal durability when compared to previous specification material. The black and red traffic paints had to be revised because the chlorinated tri-phenyl resins present in the previous specification are no longer manufactured. The black now has the same vehicle as the white and yellow traffic paints, and the red has a styrenated alkyd vehicle.

2. White and Yellow Reflective Thermo-Applied Pavement Striping Granules, State Specification 702-80-29

This striping material consists of granules flame sprayed on the pavement surface to produce a line which will bear traffic in about 15 seconds. This process is primarily used for marking crosswalks and highway legends, and is not designed for center line striping. The specification is a performance type based upon comprehensive laboratory testing which was correlated with field performance. Publication of this specification reduced previous costs about 30-40% for this material. Wear resistance of this type of material is slightly less than conventional traffic paint, but its speed of set and economy of manpower in cross striping operations offsets this disadvantage.

3. White Thermoplastic Traffic Line, State Specification 701-80-31

This is a hot extruded material applied about 1/8-inch to 3/16-inch thick to the road surface. Application temperature is about 205-220°C (400-425°F). By virtue

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of its thickness as an applied line, it has a life varying from 5-7 years.

The specification, revised in 1970, is what is termed a permissive formula and performance specification. The manufacturer may use either our laboratory specified formula, or use his own formula. Either must meet the laboratory performance tests as specified.

4. Rapid Dry Traffic Paint

In cooperation with the Equipment Department, our laboratory is developing a rigid performance specification for a traffic paint which, when applied at about 85°C (185°F), will dry to an ASTM D-711 dry-to-no-pick-up condition in 15 to 20 seconds. The Equipment Department has designed apparatus for this type application. When the project is completed, it should be of tremendous importance both economically and from a safety standpoint. This type of paint will eliminate the need to protect a wet stripe by traffic cones until it will bear traffic. It should only be necessary to have a following vehicle about 300 feet behind the striper. This will result in savings in manpower in placing and retrieving traffic cones, less inconvenience to the public, and greater safety for our maintenance crews.

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OTHER DEVELOPMENTS

For 20 years or more, the Division of Highways' trucks and other heavy equipment were periodically painted with an alkyd enamel, Federal Specification TT-E-489. Although this material is an excellent coating, its long dry time was a great hindrance to the Equipment Department. A rapid dry styrenated alkyd formula was developed which dries in 20-25 minutes so that the equipment can be moved out of the paint area and, if necessary, placed in use. The resultant saving in the use of the laboratory formula was approximately $5.00 per gallon compared to the cost of a proprietary rapid dry enamel used periodically by the Equipment Department, and an undetermined amount in terms of time saved by being able to put equipment back into service much more quickly.

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APPENDIX

ZINC-RICH PRIMER, ORGANIC VEHICLE TYPE

State Specification 721-80-62

April 1972

SCOPE

This specification covers a one-package, thermoplastic organic zinc-rich primer whose mechanism of dry is that of solvent release. It is intended for use only on open steel structures exposed to the air. Surface preparation of the steel must be by blast cleaning as described herein. It is not intended for use in confined spaces such as the interior of tanks, silos, or similar structures because of explosion and possible toxic hazards unless proper precautions are followed as prescribed by the Division of Industrial Safety.

This coating is intended for application by brushing or spraying either conventional or airless. Because of rapid drying characteristics, best surface appearance is obtained by spray.

APPLICABLE SPECIFICATIONS

Federal Test Method Standard, latest revision.
American Society for Testing and Materials, latest revision.
Military Specification, latest revision.
State Specification, latest revision.

MATERIALS

The raw materials for use in the paint formula shall conform to the specifications designated by Federal serial number or paint material code number hereinafter specified. Subsequent amendments to the specifications quoted shall apply to all raw materials and finished products. No "or equal" substitution for any specified material shall be made without written consent of the Engineer.

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The thinner portion of the paint specified shall, in addition to complying with specification requirements, comply with all air pollution control rules and regulations within the State of California in effect at the time the paint is used. All containers of paint shall be labeled to indicate that the contents fully comply with said rules and regulations.

Paint shall be homogeneous, free of contaminant and of a consistency suitable for use in the capacity for which it is specified. Finished paint shall be well ground and the pigment shall be properly dispersed in the vehicle according to the requirements of the paint. The dispersion shall be of such nature that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Any settlement of pigment in the paint shall be a thoroughly wetted, soft mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sidewise manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency. The manufacturer shall include in the paint the necessary additives for control of sagging, pigment settling, leveling, and other qualities of a satisfactory working material. The paint shall possess satisfactory properties in all respects which affect its application and curing.

The color of Type I, shall have a red tint not lighter than that of the Standard Color Chip No. 42. There shall be no evidence of incompatibility when one volume of the thinner described under "Application of Coating" is mixed with four volumes of the paint.

REQUIREMENTS

Composition of Paint:

Pigment Ingredients
(62.3 Wt. Percent Min.)

	Specification	Type I, Red Tint	Type II, Gray
		Parts by Weight of Pigment	
Zinc Dust	TT-P-460, Type I[1]	95.0 Min.	95.0 Min.
Red Iron Oxide[2]		1.5 Max.	
Zinc Oxide	TT-P-463, Type I, Grades A or B		1.5 Max.
Thixotropes and Additives		3.5 Max.	3.5 Max.

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Composition of Paint (Continued)

Vehicle Ingredients
(37.7 Wt. Percent Max.)

	Specification	Parts by Weight of Vehicle
Polyaryl Ether[3]		19.0
Ethylene Glycol Monoethyl Ether Acetate	MIL-E-7125	66.8
Toluene	TT-T-548	14.2

The average particle size of the pigment shall not exceed 9 microns as determined by the Fisher Sub-Sieve Sizer. The Red Iron Oxide must first be ground into a portion of the vehicle to provide a Hegman grind sufficient to produce the specified color of the finished paint.

Infrared Characteristic
Curve of Primer Vehicle

When dried upon a potassium bromide disc, a film of the primer shall have infrared absorption maximums at the same wavelengths and to the same relative degree as that shown by the attached curve.

The composition of the extracted zinc dust pigment shall match the X-ray diffraction curve on file at the Materials and Research Department of the Division of Highways.

The necessary additives to prevent gas formation in the containers during storage shall be incorporated into the formulated paint.

[1]Except the metallic zinc content shall be 95 percent by weight minimum.

[2]Fe_2O_3 98.5% minimum; oil absorption, 21; fineness through 325 mesh screen, 99% minimum; and specific gravity, 5.15.

[3]A polyhydroxy polyalkaryl polyether of the following properties:

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Specific Gravity	1.18
Viscosity of 40% solids in methyl ethyl ketone, Brookfield RVF, 20 rpm No. 5 spindle	5500 to 7700 cps
Reduced viscosity (0.2 g/100 ml dimethylformamide)	0.4 to 0.6
Ultimate tensile strength	9000 to 9500 psi
Ultimate tensile elongation	50 to 100%
Softening temperature	212°F
Bulking value	9.83 lb. per gal.

The paint shall, in addition to the preceding composition, conform to the following table of requirements:

Characteristics of Paint:

Volatiles at 105°C, percent by weight	28 - 32
Weight per gallon, pounds	17.2 - 18.0
Viscosity, KU at 77°F	100 - 120
Metallic zinc, percent by weight of extracted pigment by Federal Test Method No. 141, Method 7221	90.2 min.
Dry time at 77°F, 50% relative humidity, 6 mil wet thickness:	
Set to touch, hours	3/4 max.
Dry hard, hours	5 max.
Storage Life, years	1 min.

Properties of Cured Coating

When applied to a plate glass panel with a 6 mil gap clearance Doctor Blade and cured for 15 days at 77 ± 5°F and 50 ± 5% relative humidity, the coating shall have the following property:

Pencil Hardness	B min.
Color (For Type I Only)	not lighter than Standard Color Chip No. 42

When applied by air or airless spray to a minimum dry film thickness of 1.5 mils on sandblasted steel having an anchor profile pattern of one to 1.5 mils, the mixed paint shall completely wet the surface of the steel with no evidence of dry spray particles or sagging.

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When applied to a wet film thickness of 6 mils on a metal panel corresponding to Federal Specification QQ-S-636, the panel being previously cleaned by sandblasting to produce a one to 1.5 mil anchor pattern, and cured for 15 days at a relative humidity of 50 ± 5% and tested according to the Conical Mandril Test, Federal Test Method Standard No. 141, Method 6222, there shall be no loosening of the film above the point of the longest continuous crack.

When a steel panel is sandblasted to white metal and coated with 3 - 4 mils dry film thickness of this coating and cured for 15 days at 75°F and 50 ± 5% relative humidity and diagonally scribed to expose bare steel, there shall be no underfilm corrosion on the surface of the panel extending beyond the scribed lines after 1000 hours when tested according to ASTM Designation B-117.

APPLICATION OF COATING

The paint shall be thinned, using a power agitated stirrer, with not exceeding one volume of a mixture of 82% by volume of ethylene glycol monoethyl ether acetate and 18% by volume toluene to 4 volumes of paint prior to use to produce a smooth uniform coating.

After thinning and thorough mixing, the primer shall be strained through a 30-60 mesh screen or double layer of cheesecloth. There shall be no undispersed agglomerates of zinc pigment remaining in the paint after mixing.

Steel surfaces shall be blast cleaned according to Section 59-2.02 of the Standard Specifications prior to application of this paint.

After blast cleaning the anchor pattern shall be a minimum of 1-1/2 mils deep in a dense and uniform pattern of depressions and ridges.

Blast cleaning and painting will not be permitted when the relative humidity exceeds 85% as measured at the site of operations.

All paint shall be applied by spray methods except that areas inaccessible to spray application shall be brushed.

Coated surfaces which are damaged, faulty, or abraded, and all exposed uncoated surfaces shall be cleaned by sandblasting and spot painted with this primer after erection

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and before application of the specified top coats.

First coat over cleaned steel surface shall be Type I, Red Tint. Second coat shall be Type II, Gray. If additional coats are required, they shall be alternating Type I and Type II.

An agitated pot containing the paint shall be mandatory in all spray painting or brush application work. The agitator or stirring rod shall reach to within two inches of the bottom of the spray pot and shall be in motion at all times during paint application. Such motion shall be sufficient to keep the paint well mixed. The paint shall be stored in a cool place.

Complete instructions for use shall be included with each container of paint.

Whenever painting operations are interrupted, the zinc-rich primer remaining in the fluid hose shall be expelled from the hose. Spray equipment which is used for application of zinc-rich primer shall be thoroughly cleaned at the end of each work day with the thinner described under "Application of Coating."

Prior to application of the finish coats, except for the fayed surfaces, all surfaces painted with zinc-rich primer shall be treated with vinyl wash primer conforming to the provisions in Section 91-2.07, "Pretreatment, Vinyl Wash Primer" (State Specification 701-80-52), of the Standard Specifications. The zinc-rich primer shall be cured for at least 24 hours before application of the vinyl wash primer. The vinyl wash primer shall be applied in such a manner as to produce a wet film as the spray contacts the surface. It shall completely and uniformly cover the underlying surface.

The first finish coat shall be applied over the pretreatment vinyl wash primer in not more than 72 hours.

PATENTS

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work, and agrees to indemnify and save harmless the State of California and its duly authorized representative from all suits at law or action of every nature for, or on account of the use of any patented materials, equipment, device or processes.

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MANUFACTURING AND PACKAGING

The finished paint shall be furnished in new 5-gallon, round, nontapered steel containers of not thinner than 24 gauge metal. The containers shall have lug type crimp lids with ring seals and be equipped with ears and bails. The containers shall meet U. S. Department of Transportation Hazardous Materials Shipping Regulations. The container must be lined if necessary so as to prevent attack by the paint. The lining must not come off the can as skins.

No finished paint shall be used until at least 7 days have elapsed from the date of its manufacture.

All containers of paint shall be labeled showing the exact title of the specification, State Specification number, manufacturer's name, date of manufacture, State lot number, and manufacturer's batch number.

Precautions concerning the handling and the application of paint shall be shown on the label of paint and solvent containers in accordance with the Construction and General Industry Safety Orders of the Division of Industrial Safety, Department of Industrial Relations, of the State of California.

INSPECTION AND TESTING

This material shall be inspected and tested in accordance with State Specification 691-80-475, or as otherwise deemed necessary and all tests shall be performed according to ASTM, Federal Test Method Standard No. 141, or methods designated by the Materials and Research Department of the Division of Highways. X-ray diffraction, X-ray emission, infrared and other instrumental methods of analysis will be permitted when so designated by the Materials and Research Department.

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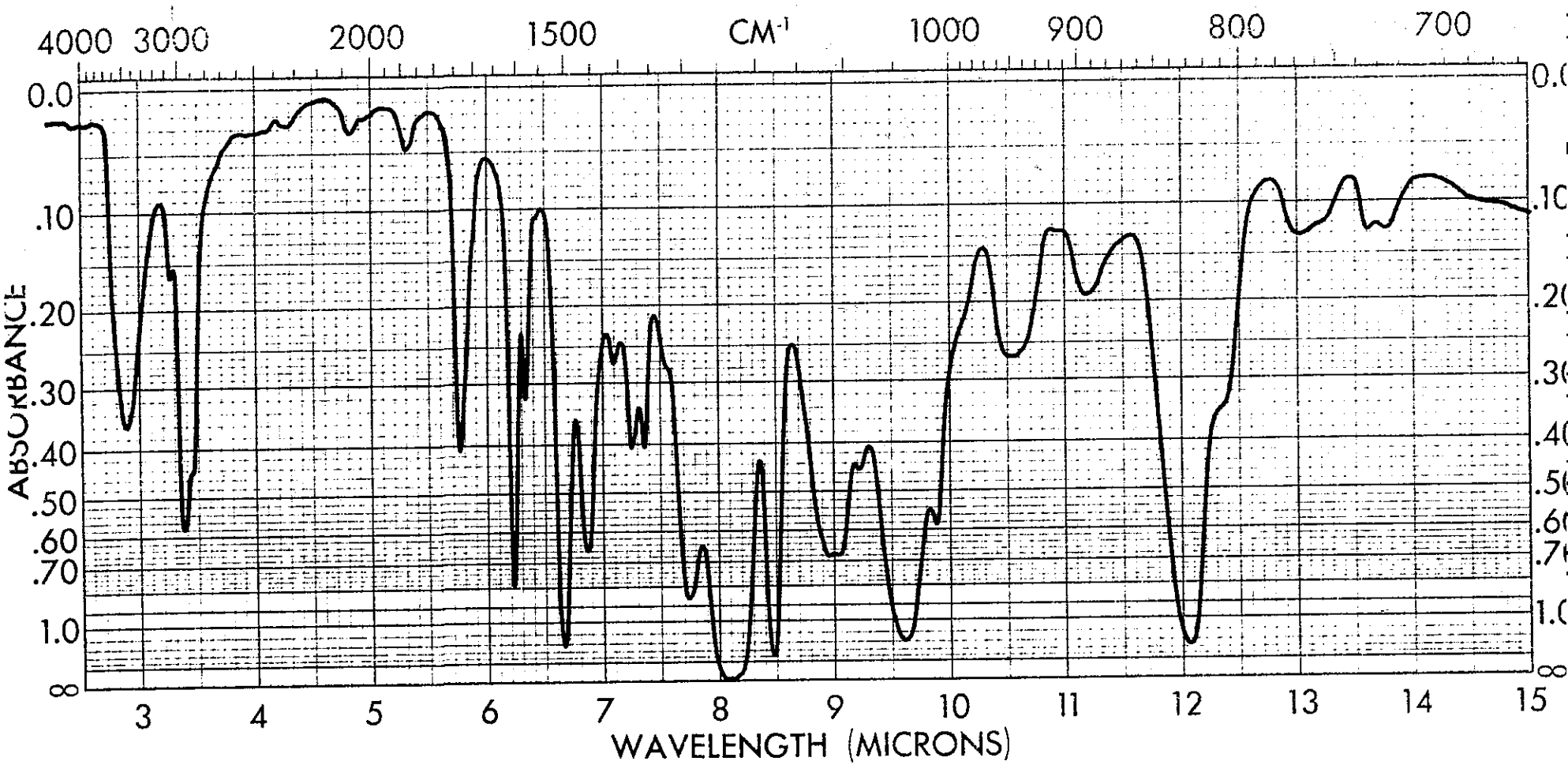

INFRARED CURVE OF STATE SPECIFICATION 721-80-62

VEHICLE SOLIDS

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY

RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
MATERIALS AND RESEARCH DEPARTMENT
5900 FOLSOM BLVD., SACRAMENTO 95819

CHLORINATED RUBBER PAINT FOR CONCRETE BARRIERS AND OTHER CONCRETE SURFACES

State Specification 721-80-101

April 1972

Type I - White
Type II - Tinted

This specification covers a readymixed chlorinated rubber paint for use on portland cement concrete median barriers, and other concrete surfaces when so specified.

This paint shall be applied using power operated atomizing spray equipment. When applied to new construction, the paint may be used as a concrete curing compound immediately after removal of the forms. The surface to be painted shall be free of dust, grease, or any foreign material. Runs, sags, thin areas, skips or holidays in the applied paint shall be evidence that the paint application is not satisfactory.

The paint shall remain sprayable at temperatures above 40°F. It shall not be diluted or altered in any manner after manufacture. At the time of use, the paint shall be in a thoroughly mixed condition, with the pigment uniformly dispersed throughout the vehicle. If the paint has not been used within 120 days after the date of manufacture, the Engineer may require additional testing before use to determine compliance with requirements.

An anti-settling agent or combination of anti-settling agents shall be incorporated in the paint to prevent caking and excessive settling of the pigment in the package. The total amount of anti-settling agent used shall not exceed 10.0 pounds per 100 gallons of the paint. The dispersion shall be of such nature that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Any settlement of the pigment shall be a thoroughly wetted soft mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the

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sidewise manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency. The manufacturer shall include in the paint, the necessary additives for control of sagging, pigment settling, leveling, or other requisite qualities of a satisfactory working material. The paint shall possess satisfactory properties in all respects which affect its application and curing.

The paint shall conform to the requirements in Section 7.1.01K, "Air Pollution", of the Standard Specifications.

The paint shall be packaged in new, round, nontapered 5-gallon steel containers of not thinner than 24-gauge metal. Five-gallon containers shall be well sealed with ring seals and lug type crimp lids. The lining of the containers shall resist the solvent of the paint, permitting no skins to be loosened into the body of the paint. Each container shall be labeled with the manufacturer's name, State Specification number, batch number, and date of manufacture. The containers shall meet U. S. Department of Transportation Hazardous Materials Shipping Regulations or Regulations of the Motor Carrier Safety Section of the California Highway Patrol. The label shall also warn that the paint shall be well stirred before use.

Precautions concerning the handling and the application of paint shall be shown on the label of paint and solvent containers in accordance with the Construction and General Industry Safety Orders of the Division of Industrial Safety, Department of Industrial Relations, of the State of California.

All containers of paint shall be labeled to indicate that the contents fully comply with all rules and regulations concerning air pollution control in the State of California. Paint shall be sampled by the Engineer at the source of supply and/or at the jobsite.

Type I, White

Composition:

Pigment Ingredients	Lbs./100 Gals.
Titanium dioxide, TT-P-442, Type III or IV	234.2

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Composition (Continued)

Type I, White

Vehicle Ingredients	Lbs./100 Gals.
Chlorinated Paraffin, MIL-C-429, Type 1 (43% Cl_2)	61.8
Chlorinated Paraffin, MIL-C-429, Type II (70% Cl_2)	61.8
Chlorinated Rubber[1]	154.8
Normal Butyl Acetate, TT-B-838	414.6
Toluene, TT-T-548	91.2
Epoxy Resin[2]	1.6

Characteristics of Paint:

Pigment by weight of paint, percent	21.7	Min.
Titanium dioxide by weight of pigment, percent	90	Min.
Volatiles by weight of paint, percent	50.5	Max.
Fineness of grind, Hegman	5	Min.
Viscosity at 77°F, KU	65	Max.
Reflectance (for Type I only)	75	Min.
Drying Time, on concrete:		
Set to touch, hours at 77°F	2	Max.
Dry through, hours at 77°F	4	Max.
Water Retention, grams net loss at 24 hours[3]	6	Max.

Type II, Tinted

Type II shall have the same composition and characteristics as Type I except it shall be tinted with light fast tinting pigments to match Federal Standard No. 595A, Colors 26559, 26595, or 26622.

[1]Chlorine, percent	65 - 68
Viscosity, 20% in Toluene, Centipoises at 25°C	9 - 14
Specific Gravity	1.555 to 1.565
Index of Refraction	1.550 to 1.560

A 25% concentration in toluene shall show no haziness or turbidity, and when stored for one week at 77°F, shall not corrode the tin plate in a covered tin-coated can.

[2]Liquid, Color 5 Max. (Gardner); Viscosity, 100-160 poises at 25°C.; Epoxide Equivalent, 180-200.

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[3]Test Method No. Calif. 534, except that the compound shall be applied at a rate of one gallon per 300 square feet.

SAMPLING AND TESTING

All tests will be conducted in accordance with the latest test methods of the American Society for Testing and Materials, Federal Test Method Standard No. 141, and methods in use by the Laboratory of the Division of Highways.

The vendor shall furnish a complete formulation record of his manufacturing process to the Materials and Research Department.

PATENTS

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work, and agrees to indemnify and save harmless the State of California, and its duly authorized representative from all suits at law or action of every nature for, or on account of the use of any patented materials, equipment, devices, or processes.

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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
MATERIALS AND RESEARCH DEPARTMENT
5900 FOLSOM BLVD., SACRAMENTO 95819

CLEAR CHLORINATED RUBBER CONCRETE CURING COMPOUND

State Specification 721-80-102

June 1972

This specification covers a clear, chlorinated rubber base curing compound for use on slope paving, colored portland cement concrete, or other portland cement concrete surfaces as required. If specified, the compound shall be tinted with a fugitive dye which will cause the compound to be distinguishable on the concrete surface for at least 4 hours after application, but shall become inconspicuous within 7 days after application.

The rate of application of the clear, chlorinated rubber base curing compound, at any point, shall be one gallon per 200±50 square feet and the average rate of application shall be one gallon per 200±25 square feet, when tested by the Engineer in accordance with Test Method No. Calif. 535. Power operated spraying equipment for application of curing compound shall be equipped with an operational pressure gage and means of controlling the pressure.

The curing compound shall be applied to the concrete following the surface finishing operation immediately after the moisture sheen begins to disappear from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any delay in the application of curing compound, which could result in any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting free standing water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

Curing compound shall remain sprayable at temperatures above 40°F. It shall not be diluted or altered in any manner after manufacture. If the compound has not been used within 120 days after the date of manufacture, the Engineer may require

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additional testing before use, to determine compliance to requirements.

Curing compound shall conform to the requirements in Section 7-1.01K, "Air Pollution", of the California Standard Specifications.

The curing compound shall be packaged in clean 55-gallon steel barrels or round 5-gallon steel containers. Barrels shall be filled in a manner that will prevent skinning. 5-gallon containers shall be well sealed with ring seals and lug type crimp lids and of not thinner than 24 gauge steel. The lining of the containers shall resist the solvent of the curing compound, permitting no skins to be loosened into the curing compound.

The containers and labels shall meet U. S. Department of Transportation Hazardous Materials Shipping Regulations or Regulations of the Motor Carrier Safety Section of the California Highway Patrol.

Each container shall be labeled with the manufacturer's name, State specification number, batch number, and date of manufacture.

Each container of curing compound shall be labeled to indicate that the contents fully comply with all rules and regulations concerning air pollution control in the State of California.

Curing compound may be sampled by the Engineer at the source of supply and at the jobsite.

Composition:

Ingredients	Lbs./100 Gals.
Chlorinated Paraffin, MIL-C-429, Type I (43% Cl_2)	67.2
Chlorinated Paraffin, MIL-C-429, Type II (70% CL_2)	67.2
Chlorinated Rubber[1]	168.4
Ethylene Glycol Monoethyl Ether Acetate, MIL-E-7125	269.9
Mineral Spirits, TT-T-291, Type II, Grade A	269.9
Epoxy Resin[2]	2.1
Soya Lecithin	8.4

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Characteristics of Finished Material:

Weight per gallon in pounds at 77°F	8.3 Min.
Volatiles, by weight, percent	65.1 Max.
Viscosity at 77°F, KU	60 Max.
Drying Time[3]	
Set to touch, hours at 77°F	2 Max.
Dry through, hours at 77°F	4 Max.
Water retention, grams net loss at 24 hours[4]	6 Max.
Appearance on tinplate after drying when sprayed at 30 to 40 psi, through an atomizing nozzle.	No bubbles or pinholes

[1]Chlorine, percent	65 - 68
Viscosity, 20% in Toluene, Centipoises at 25°C	9 - 14
Specific Gravity	1.555 to 1.565
Index of Refraction	1.550 to 1.560

A 25% concentration in toluene shall show no haziness or turbidity, and when stored for one week at 77°F, shall not corrode the tinplate in a covered tin-coated can.

[2]Liquid, Color 5 max. (Gardner), Viscosity 100-160 poises at 25°C, epoxide equivalent 180-200.

[3]Federal Test Method Standard No. 141, Method 4061, .003-inch wet film thickness on glass panel.

[4]Test Method No. Calif. 534, except that the compound shall be applied at a rate of one gallon per 300 square feet.

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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
MATERIALS AND RESEARCH DEPARTMENT
5900 FOLSOM BLVD., SACRAMENTO 95819

RAPID DRYING STYRENATED-ALKYD ORANGE EQUIPMENT ENAMEL

STATE SPECIFICATION 711-80-151

February 1971

CLASSIFICATION:

This specification covers a ready mixed high grade styrene-modified synthetic alkyd enamel for use in refinishing automotive equipment. This enamel is for use where rapid air drying is necessary.

APPLICABLE SPECIFICATIONS AND OTHER REFERENCES:

Federal Specifications, latest revision
Federal Test Method Standard No. 141, latest revision.
California State Specifications, latest revision, including XXX-80-475. XXX indicates year and revision number of that year.

DESCRIPTION:

This specification is intended to specify paint that will meet service requirements for highway construction and maintenance. All properties listed below must be maintained for one year after acceptance. The paint must be used within one year after acceptance.

Paint shall be homogeneous, free of contaminant and of a consistency suitable for use in the capacity for which it is specified. Finished paint shall be well ground and the pigment shall be properly dispersed in the vehicle according to the requirements of the paint. The dispersion shall be of such nature that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Any settlement of pigment in the paint shall be a thoroughly wetted soft mushy mass permitting the complete and easy vertical penetration of a paddle. Settled

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pigment shall be easily redispersed, with minimum resistance to the sidewise manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency. The manufacturer shall include in the paint the necessary additives for control of sagging, pigment settling, leveling, drying, drier absorption and skinning or other requisite qualities of a satisfactory working material. The paint shall possess satisfactory properties, in all respects which affect its application and curing.

REQUIREMENTS:

Composition:

Pigment Ingredients

	Specifications	Lbs./100 Gals.
Chrome Yellow, Medium	TT-P-346, Type III	155.0
Molybdate Orange	TT-P-410	80.9

Vehicle Ingredients

Styrenated Alkyd[1]		520.0
Normal Butyl Acetate	TT-B-838	39.0
Ethyl Benzene		17.0
Aliphatic Thinner[2]	)	117.0
Driers	TT-D-643 and anti-) skinning agent)	

An anti-settling agent, not more than 8 pounds total per 100 gallons, shall be used to prevent hard settling and caking of the pigment in the containers.

[1]A short oil extended glyceryl phthalate alkyd copolymerized with styrene monomer. Volatile content, 49-51 percent; viscosity (Gardner-Holdt), R-U; pounds per gallon, 7.6-7.8; color, Gardner 1933, 4 max.; acid number, 8 max.; phthalic anhydride on nonvolatile, 21 percent minimum; percent vegetable oil, 36 percent approximate on nonvolatile; resin or rosin modifiers, none; solvent system to comply with all air pollution rules in State of California; mineral spirits tolerance, 200 percent.

Styresol 13-655 or equal meeting the above requirements may be used.

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[2]Color, Saybolt	+30
Specific Gravity at 60°F	0.7450 - 0.7550
Flash Point, TCC °F	22 - 24
Doctor Test	Negative
Corrosion Test	O.K.
Aniline Point	100 - 120
Kauri-Butanol Value, CCS	41 - 44
Aromatic Content (Toluene), % by volume	9 maximum
Refractive Index at 20°C	1.4146 - 1.4180

DISTILLATION:

Percent Distilled	Temperature, °F
Initial Boiling Point	204 - 205
5%	209 - 210
10%	210 - 211
20%	211 - 212
30%	213 - 214
40%	214 - 216
50%	216 - 218
60%	217 - 220
70%	218 - 223
80%	222 - 227
90%	226 - 235
95%	232 - 242
Dry Point	252 - 255

Color of pigment raw material shall be such that the color of the paint will match Color Chip No. 60 (State Specification 681-80-450).

Small variations in the ratio of the specified amounts of Chrome Yellow Medium and Molybdate Orange pigments will be allowed to obtain color match provided the total specified pigment weight is not changed.

CHARACTERISTICS:

Weight per gallon, in pounds	9.1 minimum
Pigment by weight of paint, percent	24.8 minimum
Volatiles by weight of paint, percent	47.4 maximum
Viscosity, KU	70 maximum
Drying Time: Set to touch, minutes	10 maximum
Dry hard, minutes	30 maximum
Fineness of grind, Hegman	7 minimum
Color: To match State Specification 681-80-450	No. 60

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Characteristics (Continued)

Gloss, 60° at 48 hours	60	minimum
Settling of the dispersed pigment of 100 mil of enamel in a 100 mil stoppered graduated cylinder after 24 hours standing, supernatant liquid, mils	5	maximum

An infrared curve of the vehicle, vacuum dried on a sodium chloride disc, shall have infrared absorption maximums at the same wave lengths and to the same relative degree as that shown on the attached curve.

Spraying properties shall be satisfactory.

MATERIALS:

The raw materials for use in the paint formula shall conform to the specifications designated by Federal serial number or paint material code number hereinafter specified. Subsequent amendments to the specifications quoted shall apply to all raw materials and finished products. No "or equal" substitution for any specified material shall be made without written consent of the Engineer.

The thinner portion of the paint specified shall, in addition to complying with specification requirements, comply with all air pollution control rules and regulations within the State of California in effect at the time the paint is used.

MANUFACTURING AND PACKAGING:

The finished paint shall be furnished in containers meeting Interstate Commerce shipping standards, having a capacity of not more than 6 gallons each, unless otherwise specified in the special provisions or purchase order. The container must be lined if necessary so as to prevent attack by the paint. The lining must not come off the can as skins.

No finished paint shall be used until at least 7 days have elapsed from the date of its manufacture.

All containers of paint shall be labeled showing the exact title shown on specification, State Specification number, manufacturer's name, date of manufacture, State lot number, and manufacturer's batch number.

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Precautions concerning the handling and the application of paint shall be shown on the label of paint and solvent containers in accordance with the Construction and General Industry Safety Orders of the Division of Industrial Safety, Department of Industrial Relations, of the State of California.

All containers of paint shall be labeled to indicate that the contents fully comply with all rules and regulations concerning air pollution control in the State of California.

The label shall also state the paint may be thinned at the rate of three volumes of paint to one volume of normal butyl acetate or other approved lacquer thinner just prior to use by the purchaser.

SAMPLING AND TESTING:

Unless otherwise permitted by the Engineer, paint shall be sampled at the place of manufacture and tested by the Engineer and application will not be permitted until the paint has been approved by the Engineer.

An unopened container of each batch of finished paint shall be furnished to the Engineer at the jobsite for testing. Check samples of finished paint as being applied will be taken at intervals as determined by the Engineer.

All tests will be conducted in accordance with the latest test methods of the American Society for Testing and Materials, Federal Test Method Standard NO. 141, and methods in use by the Laboratory of the Division of Highways.

PATENTS:

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work, and agrees to indemnify and save harmless the State of California, and its duly authorized representative from all suits at law or action of every nature for, or on account of, the use of any patented materials, equipment, devices, or processes.

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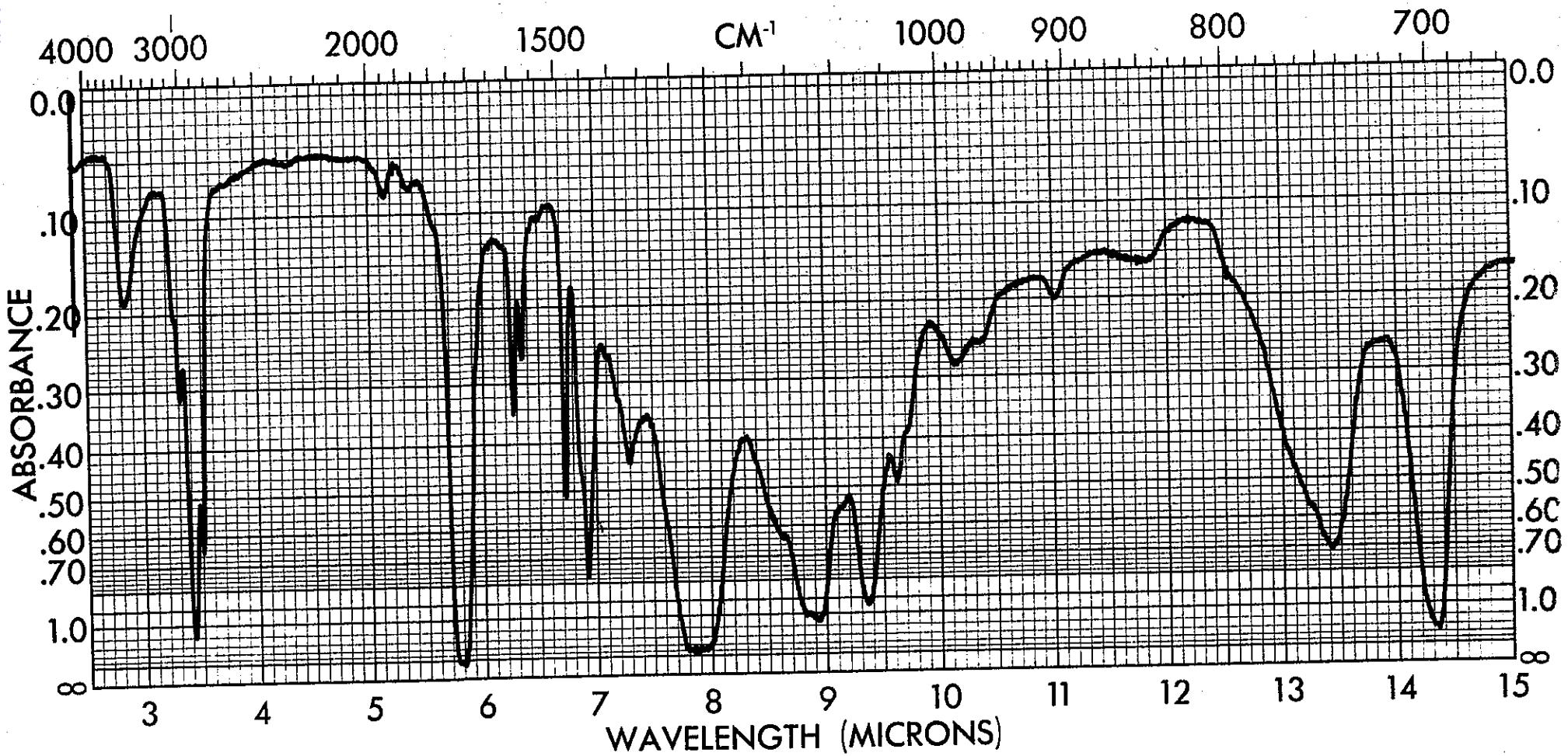

INFRARED CURVE OF STATE SPECIFICATION 711-80-151

VEHICLE SOLIDS

(All revised.)

(To be used in all projects with portland cement concrete which may be cured by using curing compound.)

(ADVANCE COPY)

Materials-C15
4-17-72

8-2.____ PIGMENTED CURING COMPOUND METHOD.--Section 90-7.01B, "Pigmented Curing Compound Method," of the Standard Specifications is superseded by the following provisions:

Surfaces of the concrete which are exposed to the air shall be sprayed uniformly with White Pigmented Curing Compound--Petroleum Hydrocarbon Resin Base (State Specification 721-80-71) or White Pigmented Curing Compound--Chlorinated Rubber Base (State Specification 721-80-100), at the option of the Contractor. 2

The rate of application of the Petroleum Hydrocarbon Resin Base type, and the Chlorinated Rubber Base type, at any point, shall be one gallon per 200 ± 50 square feet and the average rate of application shall be one gallon per 200 ± 25 square feet, when tested by the Engineer in accordance with Test Method No. Calif. 535. Power operated spraying equipment for application of curing compound shall be equipped with an operational pressure gage and means of controlling the pressure. 3

The curing compound shall be applied to the concrete following the surface finishing operation immediately after the moisture sheen begins to disappear from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any delay in the application of curing compound, which could result in any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," of the Standard Specifications, shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting free standing water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound. 4

All curing compounds shall remain sprayable at temperatures above 40° F. They shall not be diluted or altered in any manner after manufacture. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. If the compound has not been used within 120 days after the date of manufacture, the Engineer may require additional testing before use, to determine compliance to requirements. 5

An anti-settling agent or combination of anti-settling agents shall be incorporated in the curing compound to prevent caking and excessive settling of the pigment in the package. The total amount of anti-settling agent used shall not exceed 8.0 pounds per 100 gallons of the curing compound. The dispersion shall be of such nature that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Any settlement of pigment shall be a thoroughly wetted soft mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sidewise manual motion of the paddle across the bottom of the container, to form a smooth uniform product 6

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of the proper consistency. The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, or other requisite qualities of a satisfactory working material. The curing compound shall possess satisfactory properties, in all respects which affect its application and curing.

Curing compound shall conform to the requirements in Section 7-1.01K, "Air Pollution," of the Standard Specifications. 7

The curing compound shall be packaged in clean 55-gallon steel barrels or round 5-gallon steel containers or shall be supplied from a suitable storage tank located at the jobsite. Each 55-gallon barrel shall be equipped with a built-in agitator having 2 sets of blades; one at the bottom, and the second, midway between top and bottom of container, and shall have removable lids and airtight band fasteners. On-site storage tanks shall be kept clean and free of all contaminants. Each tank shall have a permanent system designed to completely redisperse any settled material without introducing air or any other foreign substance. Barrels shall be filled in a manner that will prevent skinning. Five-gallon containers shall be well sealed with ring seals and lug type crimp lids. The lining of the containers shall be of a character that will resist the solvent of the curing compound and will not permit skins to be loosened into the body of the curing compound. Each container shall be labeled with the manufacturer's name, State Specification number, batch number, number of gallons and date of manufacture. The containers shall meet U. S. Department of Transportation Hazardous Materials Shipping Regulations or Regulations of the Motor Carrier Safety Section of the California Highway Patrol. The label shall also warn that the curing compound shall be well stirred before use. When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels. 8

Curing compound may be sampled by the Engineer at the source of supply and at the jobsite. 9

White Pigmented Curing Compound--Petroleum Hydrocarbon Resin Base (State Specification 721-80-71) shall conform to the following provisions: 10

COMPOSITION:

Pigment Ingredients	Lbs./100 Gals.
Titanium Dioxide, TT-P-442, Types III or IV	60.8
Whiting[1]	88.5
Mica[2]	30.8

Vehicle Ingredients	
Petroleum Hydrocarbon Resin[3]	322.0
Mineral Spirits TT-T-291E, Type II, Grade A	343.3

CHARACTERISTICS OF FINISHED MATERIAL:

Pigment by weight, percent	20.5	Min.
Weight per gallon in pounds at 77° F.	8.3	Min.
Volatiles, by weight, percent	41.6	Max.
Viscosity at 77° F., K.U.	64	Max.
Fineness of grind, Hegman	5	Min.
Daylight Reflectance, percent (ASTM: C 309)	60	Min.
Dry Time on concrete:		
Set to touch, hours at 77° F.	2	Max.
Dry through, hours at 77° F.	4	Max.
Water Retention, grams net loss at 24 hours[4]	6	Max.

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1
Oil Absorption (Spatula) - 13.1
Surface area, square centimeters per gram ------ 4000

Particle Size Distribution	Percent by Weight Below Indicated Size
Micron Diameter:	
44 (325 mesh)	100.0
40	97.0
30 (450 mesh)	84.0
20 (625 mesh)	60.0
15	42.4
12.5	35.0
10 (1250 mesh)	30.0
7.5	24.0
5	18.0
4	15.0
3	12.0
2	8.5
1	4.0

2
Apparent density, 14 pounds per cubic foot maximum; sieve analysis, percent retained on Nos. 140 and 325 sieves, no exact requirement other than that the curing compound must comply with all requirements; moisture, 0.5% maximum; grit, 0.5% maximum; potassium oxide equivalent 7-11%; X-ray diffraction curve shall agree with curves on file with the Materials and Research Department for muscovite mica.

3
Specific gravity 0.93 - 1.12; softening point (ASTM: D 36) 200-230° F.; Color (Gardner) 13 max.; iodine number Wijs 180 max.; acid number 0-2; saponification number 0-2. Type of resin selected must be such that viscosity of resin in mineral spirits will provide a curing compound meeting viscosity requirements.

4
Test Method No. Calif. 534, except that the compound shall be applied at a rate of one gallon per 250 square feet.

White Pigmented Curing Compound--Chlorinated Rubber Base (State Specification 721-80-100) shall conform to the following provisions: 11

COMPOSITION:

Pigment Ingredients	Lbs./100 Gals.
Titanium Dioxide, TT-P-442, Types III or IV	100.0
Vehicle Ingredients	
Chlorinated Paraffin, MIL-C-429, Type II, (70% Cl_2)	66.0
Chlorinated Paraffin, MIL-C-429, Type I, (43% Cl_2)	66.0
Chlorinated Rubber[1]	165.4
Ethylene Glycol Monoethyl Ether Acetate, MIL-E-7125	265.0
Mineral Spirits, TT-T-291E, Type II, Grade A	265.0
Epoxy Resin[2]	2.0

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CHARACTERISTICS OF FINISHED MATERIAL:

Pigment, by weight, percent	9.7	Min.
Weight per gallon in pounds at 77° F.	9.1	Min.
Volatiles, by weight, percent	58.1	Max.
Fineness of grind, Hegman	5	Min.
Viscosity at 77° F., K.U.	64	Max.
Daylight Reflectance, percent (ASTM: C 309)	60	Min.
Drying Time, on concrete:		
Set to touch, hours at 77° F.	2	Max.
Dry through, hours at 77° F.	4	Max.
Water Retention, grams net loss at 24 hours[3]	6	Max.

[1]

Chlorine percent	65-68
Viscosity, 20% in Toluene, Centipoises at 25° C.	9-14
Specific Gravity	1.555 to 1.565
Index of Refraction	1.550 to 1.560

A 25% concentration in toluene shall show no haziness or turbidity, and when stored for one week at 77° F., shall not corrode the tin plate in a covered tin-coated can.

[2]

Liquid, color 5 max. (Gardner), viscosity 100-160 poises at 25° C., epoxide equivalent 180-200.

[3]

Test Method No. Calif. 534, except that the compound shall be applied at a rate of one gallon per 300 square feet.

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