

PRIMERS APPLIED TO METALLIC SUBSTRATES

GM4356M

1 SCOPE. This specification covers the procedure and general requirements for technology approval of primer paint materials. Additional testing and any exceptions to the requirements detailed in this specification are noted in the individual primer's respective 998XXXX. Included are the requirements for:

- . Product Information
- . Performance
- . Compatibility
- . Processability

1.1 The paint materials covered in this specification are of the following categories:

Type I: General body primer surfacer is intended for application over ELPO prior to topcoat or thin film chip resistant primer used without primer surfacer prior to topcoat.

Type II: Leading edge chip resistant primer used as augmentation to primer surfacer. It is intended for use on leading edges of the body, such as the hood or roof to provide enhanced protection against chipping.

Type III: Lower body chip resistant primer used as augmentation to primer surfacer. It is intended for use on lower areas of the body, such as the rocker panels to provide superior heavy duty protection in areas prone to excessive chipping.

1.2 Primers covered under this specification may be applied as liquids or powders. Typically they are sprayed over ELPO or other primers applied to metal or plastic.

1.3 Once qualified and approved to a 998XXXX, additional criteria may be required prior to release of any primer material into a plant.

A. The primer must be evaluated for plant specific material compatibilities if the materials currently used in the target plant are different from those used to approve the technology. See Form 2 and 3 for typical checklists.

B. The primer must be evaluated for plant specific process capabilities if the process limits are outside of those evaluated during qualification.

C. The actual color of the primer used has to be approved prior to release. The primers can be gray, color keyed, or color specific. Color keyed primers are coordinated with a family of topcoats and are usually gray, white, or red. Each color specific primer is matched to or harmonized with a specific topcoat color and could be used in place of the topcoat on interior surfaces.

D. Performance on finished parts must be demonstrated per GM4350M.

E. Validation testing of specific combinations of approved plastic substrate, paint material, and processing on plastic parts (APOPS) must be completed as required.

2 REFERENCED STANDARDS.

GM4298M	GM9828P
GM4348M	GM9832P
GM4350M	ASTM D1125
GM4352M	ASTM D1186
GM4353M	ASTM D1474
GM4364M	ASTM D1475
GM4465P	ASTM D1895
GM9011P	ASTM D1921
GM9071P	ASTM D1928
GM9125P	ASTM D2196
GM9163P	ASTM D2369B
GM9501P	ASTM D2697
GM9505P	ASTM D3451
GM9508P	ASTM D3960
GM9509P	ASTM D4212
GM9534P	ASTM E70
GM9661P	

3 PRODUCT INFORMATION.

3.1 The GM engineer responsible for technology qualification shall be contacted prior to test initiation. All data submitted for technology qualification must be identified with the supplier's name and date. Prior to any testing, the supplier must submit a letter detailing the purpose of the submission and description of the primer technology, a Material Safety Sheet (MSDS) for the new submission and key data for evaluating environmental impact. When color approval is required the Color Keyed/Color Specific primer film build must be at .8 mil over standard gray ELPO. If better hiding is needed because of plant specific requirements, then the hiding requirements have to be defined and evaluated. Lab testing equipment used for measurements must be identified. A summary of the Product Information required is shown on *Form 1 - Product Information*. Items that do not apply to a specific technology type will be indicated by *N/R* (not required). Additional information may be required for unique technologies. Specifics will be established per discussion with the responsible engineer at the onset of test initiation.

3.1.1 Physical Constants. Data on all physical constants must be provided as formulated and as sprayed, if different. All reducing solvents used in the technology approval must be identified.

3.1.2 Health and Environmental Review. The supplier must provide a Material Safety Data Sheet and a Product Data Sheet at test initiation for a GM review of potential plant impact. The technology will be identified by a specific reference *FID* number. Modification made for individual plant implementations will be identified by a suffix to the material code and a different *FID* number.

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3.1.3 UV Transmission. For Type I and II exterior primers only, samples must be prepared with primer alone at minimum film build and target bake and tested per GM9534P. The wavelength range is 300 to 700 nm and the scale is 20%. There must be no more than .1% T @ 360 nm and .5% T @ 400 nm. If the requirement causes a significant increase in P/B and/or cost, then the system would need to be evaluated for UV requirements. The system is defined as the primer and all the appropriate BC colors with clear that will be applied over the primer color in question. The system would have to pass the above specification at these target film builds.

Primer	.8 mil DFT
Basecoat	20% below Target DFT
Clearcoat	Half of Target DFT

This approach allows maximum protection of the ELPO yet flexibility when cost becomes an issue.

3.1.4 Smoke Characteristics. The material's tendency to smoke during processing shall be reviewed in comparison to current production materials. Any significant differences must be evaluated per GM9828P prior to plant implementation.

3.1.5 Odor Characteristics. The material's odor shall be reviewed in comparison with current production materials, based on solvents and/or potential cure volatiles. Any significant difference must be evaluated per GM9832P prior to plant implementation.

3.1.6 Formulating Range. The formulating range of any ingredients such as resins, crosslinkers, catalysts, additives, etc. that will be varied in production batches to accommodate plant to plant variations, seasonal variations, or any other day to day variation must be specified at the time of submission. Any deviation beyond this formulating range can only be made with the approval of NAO Paint Engineering.

3.1.7 Infrared Fingerprint. The supplier must provide infrared data to document the fingerprint of the recommended formula. All materials subsequently supplied under the designated specification/material code must correspond to the reference spectrum when compared under the same conditions.

4 PERFORMANCE REQUIREMENTS. The primer system tested on the panels shall be representative of the production-intent primer system and processing. Refer to *Form 2 - Performance* for the tests and required values. Appropriate 998XXXX material specifications shall be referenced for any exceptions to laboratory and/or field testing requirements.

4.1 PANEL PREPARATION.

4.1.1 Test Substrates. ACT Electrogalvanized Steel shall be used as test substrate. Variations to this may be requested by the responsible GM Paint Engineer or the supplier.

1.2 Film Thickness. The film thickness range (minimum/maximum) and target shall be recommended by the supplier.

This range must be within the range specified in the 998XXXX. All other coating layers shall be applied at their target film builds for testing.

4.1.3 Bake Conditions. The target time and temperatures for bake shall be provided by the supplier and defined per the appropriate 998XXXX. A typical *Bake Schedule* for primer surfacer testing is shown below:

TYPICAL PRIMER SURFACER BAKE SCHEDULE

Bake Conditions	Time	Temperature
Target	25 minutes	Target
Low	20 minutes	Target -5.5°C (-10°F)
High	90 minutes	Target 13.9°C (25°F)

4.1.3.1 All test panels shall be baked in direct gas-fired ovens, unless specified otherwise by the GM paint engineer.

NOTE: Bake time refers to the amount of time the panel is exposed to the specified temperature after it has reached that temperature. Acceptable bake conditions are those in which appearance, performance, and glass bonding requirements are met.

4.1.4 Sample Size. The number of samples will be agreed upon by the responsible GM Paint Engineer and the supplier prior to the start of testing. All substrates, pretreatments, and coating layers shall be fully identified with source, product code, batch number, bake description, and film build.

4.1.5 Controls. Comparison with a proven commercial system or other system selected by the GM Engineer is to be used to demonstrate compliance and will be used in all tests except windshield bonding.

4.1.6 Conditioning. Coated test panels shall be aged for a minimum of 72 h at room temperature, unless otherwise indicated by the test method.

4.2 APPEARANCE. The primer coating on samples shall be smooth and uniform: Free of sags, craters, or other surface defects. Appearance specifications shall be referenced for specific requirements: GM4348M (Painted Parts Appearance), GM4353M (Primed Parts Appearance), and GM4364M (Painted Body Appearance).

4.3 TESTING. All testing is to be conducted per *Form 2*.

5 COMPATIBILITY REQUIREMENTS. The primer must demonstrate compatibility with a typical, approved representative of each category of material with which it interfaces. The demonstration must include performance over a typical range of process conditions. Examples of these materials are topcoats, plastic primers, sealers, etc. When a target plant is selected at test initiation, the technology qualification will be done with that plant's specific materials and will include plant-

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specific process windows if processing is outside of the typical norm.

5.1 Details of the testing and the process variables required are listed in *Form 3*.

6 PROCESSABILITY REQUIREMENTS.

Processability includes development of charts for various parameters that affect performance and long-term durability, establishment of key process control limits (bake, film build, application parameters), and understanding the impact of the material on plant facilities, such as booth cleaning and water treatment. A summary of information required is on *Form 4*.

6.1 CURE CHART. The supplier must furnish complete information regarding the effect of bake time and temperature on all appearance, durability, and glass bonding characteristics. The supplier must select the target bake, time and temperature, at which all requirements will be met. Variations may occur through different heat-up rates of substrate and differing times in the oven due to scheduled or unscheduled line stoppages and associated process controls. The minimum bake latitude for surfacers and anti-chips is a 19°C (35°F) range in temperature from minimum time up to 90 minutes. A bake chart with explanation of expected results outside bake parameters is required. All test panels used to generate the cure chart must be reviewed with the appropriate GM engineer.

6.2 KEY PROCESS CONTROLS. For technology and plant specific approval, the relationships among parameters that have a significant effect on appearance, transfer efficiency, durability, etc., must be evaluated. Items may be added or deleted by the appropriate engineer.

6.3 CIRCULATION STABILITY. The supplier must demonstrate that the primer performance will not degrade under typical, normal production use. Pertinent information, such as flow velocity required to maintain suspension or redisperse settled pigment must be provided prior to loading the system.

6.4 VISCOSITY STABILITY. The supplier must demonstrate the relationship of viscosity with changes in temperature.

6.5 POT LIFE. For two-component materials suppliers must provide relationships of temperature, humidity, and time after mixing that the primer can be sprayed without adversely affecting appearance and durability.

6.6 STORAGE STABILITY. The supplier must furnish data on the time allowed in storage at a range of ambient conditions without any deleterious effects on paint performance. The minimum storage stability time is 6 months.

6.7 WATER TREATMENT. The supplier must furnish a recommendation for compounds to be used in treating the spray booth water wash system. Any special denaturing materials or processes must be noted.

6.8 BOOTH CLEANING. The supplier must furnish a recommendation for maintaining cleanliness in the spray booth. This includes coatings for booth walls and a recommended procedure for maintaining grate cleanliness.

6.9 PURGE, CLEANING AND REDUCING SOLVENTS. All solvents required for the entire primer process must be specified and documented. Solvents must meet all Federal and local odor, toxicity and disposal requirements.

6.10 MIX RATIO CHECK. For two-component material, the effect of deviation from recommended ratios should be demonstrated up to a variation of $\pm 25\%$. The performance attributes to be studied are appearance, adhesion, chip, hardness, and 1000 h QUV, all with topcoat. There should be no adhesion loss, drop in chip rating, color shift of topcoat, or loss of adhesion after humidity and QUV testing.

6.11 HUMIDITY/TEMPERATURE WINDOW. A humidity/temperature window for application must be generated for all waterborne primer surfacers.

6.12 RECLAIM. Test reclaimed powder primer surfacer for processability, appearance and film properties.

7 SUBMISSION PACKAGE. Two submission packages shall be prepared for distribution. One package should be prepared for GM NAO Paint Engineering and the other for documentation retention to insure corporate product compliance with GM standards. Exposure and accelerated weathering test panels shall be retained by the supplier and be available for review as long as the product is in production. The submission packages shall contain a submission letter, panel preparation data, test data, product data sheet and key process control information. The package shall be dated and signed by the responsible Paint engineer, acknowledging that the test results met this specification.

8 GENERAL INFORMATION. This specification was originated in January 1988. The latest revisions include:

Rev	Date	Description
B	3/96	Update current practices
C	10/96	Editorial Corrections