

Instruction
Hardware Engineering

No. LMS 9-1

Subject: Painting

APPROVED BY Manager, Hardware Engineering

STATUS Maintenance Revision

PURPOSE Establish painting and inspection requirements for organic finishes and is limited primarily to those finishes required and applied to materiel supplied by this facility. L-3 Communications Corporation, Link Simulation & Training Division (hereafter referred to as Link) personnel involved in finishing Link-manufactured and government-furnished equipment shall utilize this instruction.

AFFECTED FUNCTIONS Hardware Engineering
Manufacturing

REFERENCES MPM PR-39 Color Chips
PCP A6 Adhesion Knife Test
FED-STD-595 Federal Standard Colors

DEFINITIONS Organic finishes. Organic finishes are classified as paints, enamels, lacquers, and varnishes.

INSTRUCTION

1. Requirements

- 1.1 The engineering drawing will specify the exact finish to be applied. This will include cleaning, priming, painting, color, and paint to be used. In the event a drawing specifies a paint or finish in a manner that does not cross reference a Raytheon Manufacturing Process (SF) or finish material (OFM), contact Engineering Standards, Dept. 531, for direction.
- 1.2 Before any priming or painting, all surfaces shall be free from grease, oil, solder flux, weld spatter, sand, rust scale, and other contaminants that might interfere with the application of the finishing material.
- 1.3 Painting shall be done in an area built and operated in accordance with prevailing building code and fire regulations. It will be well ventilated, protected, clean, and dry. All painting equipment shall be properly maintained

and kept free of oil, dirt, scum, residues, etc., and shall be free of moisture just prior to painting. All materials shall be thoroughly mixed and there shall be no stratification or separation of materials during painting operations. Materials shall have the proper consistency as suitable for brush, spray, dip, roll, or other intended means of application. Clean, adequately filtered air shall be used in spray guns.

- a. Time of application paint. The first or priming coat of paint shall be applied as promptly as possible, in any case within 24 hours, after the surface has been prepared for painting unless suitable precautions are taken to ensure that the surfaces remain clean until they are finished. This shall apply particularly in the case of metal parts that have been cleaned and given a surface treatment. Previous coats of paint shall be dry before subsequent coats are applied.
 - b. Primed parts. Primed parts which have been stocked for more than 24 hours will be chemically rejuvenated or sanded and reprimed within 24 hours of final paint application specified on the assembly drawing.
- 1.4 Surfaces that do not require paint for protection, or paint interferes with their functions, shall be masked or otherwise protected during painting as indicated on the engineering drawing. Unless otherwise specified on the engineering drawing, minor paint buildup in plain or tapped holes shall be permissible provided the holes are not completely covered over or plugged with paint. In the case of threaded holes, the thread form shall be readily discernible.
 - 1.5 Dressing operations such as filing, sanding, etc., shall not be acceptable on a part or assembly after it has been finished, except as permitted by drawings.
 - 1.6 Glossiness, texture, and consistency of the finish on painted surfaces shall be uniform and consistent throughout the entire surface.
 - 1.7 When a paint is to be used and there is no corresponding FED-STD-595 color chip, a set of seven (7) color chips shall be prepared immediately upon receipt of the first shipment of the paint prior to painting of production equipment. These chips shall be prepared in accordance with MPM PR-39 and shall be used for color matching and inspection. Quality Assurance shall be furnished a set of seven (7) chips for verification, distribution, and control.

Color chips must never be exposed to strong sunlight and are to be kept in protective envelopes when not in use. Whenever possible, chips should not be out of their protective envelopes for periods longer than 30 seconds. Any noticeable change in the color chips shall be brought to the attention of the Paint Shop foreman or the Quality Assurance Department supervisor so that new chips can be obtained.

1.8 Paints shall be stored in temperatures between 40 8F (4 8C) and 100 8F (38 8C).

1.9 Surface grades.

Paint-finished surface grade. There are three grades of paint-finished surfaces as defined below. The applicable grade shall be determined by one of the following grade criteria and shall be specified on the drawing and operation record.

- a. Grade 1: console grade. Grade 1 finish shall apply wherever appearance of the equipment is of prime importance, such as the front surfaces of consoles and instrument panels. These surfaces shall have no apparent surface imperfections due to painting errors, and no visible defects such as weld or tool marks, when viewed from a distance of approximately four feet (1.22 m). Depressions or protrusions resulting from manufacturing processes shall be blended to a flush condition with surrounding area.
- b. Grade 2: cabinet and equipment grade. Grade 2 finish shall apply to all areas which meet casual eye inspection during normal use of the equipment. This includes, for example, the sides and backs of consoles and instrument panels, the sides and doors of cabinets. Surfaces meeting Grade 2 shall have no surface defect which attracts attention, when not specifically looked for, when viewed from a distance of approximately eight feet (2.44 m).
- c. Grade 3: utility service grade. Grade 3 finish shall apply to areas where appearance is secondary to metal protection. The visible results of normal manufacturing operations, such as welding, riveting, forming, and grinding are acceptable. This grade includes, for example, top, bottom, and inside surfaces of cabinets, cabinet framework, and back of panels. Depressions, protrusions, and surface roughness shall be

acceptable as long as dimensional criteria is met, and there are no viewing distance requirements.

- 1.10 Touch-ups. Touch-up on cabinets shall be performed when one or two of the blemish conditions specified in Table I occur on any one surface providing the blemishes can be touched up or rubbed out individually. When more than two blemish conditions occur, the surface shall be repainted with the exception of large items such as trailers, cockpits, etc. These items may be repainted in the blemished area only, provided the repainted area blends into the surrounding surface in both color and texture.
2. Quality Assurance Provisions
 - 2.1 Color chips. Color chips corresponding to the exact paint color specified on the engineering drawing shall be used for painting and inspection. Color chips shall be either standard FED-STD-595 chips or chips prepared in accordance with paragraph 1.7. All color chips (both FED-STD-595 chips and Raytheon prepared chips) shall be under the direct control of Quality Assurance. Sets of chips will be completely replaced at two-year intervals or as soon thereafter as practicable depending upon delivery of a new set of chips.
 - 2.2 The requirements defined in paragraph 1.9 and in Table I for the three grades of paint finish shall apply to the final inspection of paint finishes immediately prior to shipping. In-process paint inspection shall be governed by the following:
 - a. When it is known that the item or surface inspected will be repainted prior to shipping (after Test), rejectable defects shall be limited to those defects or painting errors that will not be concealed by the final paint application or cannot be corrected by simple sanding or filling before final repainting.
 - b. Items which will not be repainted prior to shipping shall meet the applicable final finish grade requirements.

Table I Paint Grade Finish Inspection Criteria

BLEMISH	SURFACE GRADE		
	GRADE 1	GRADE 2	GRADE 3
Wrinkling, Running, Over-spray	Not Acceptable.	Not Acceptable.	Acceptable providing there are no breaks at two adjacent surfaces or a break cannot be created by running a finger across the blemish.
Checking	Not Acceptable.	Not Acceptable.	Acceptable providing the blemish does not exceed a two square inch (13 sq cm) area on any one surface.
Abnormal Orange Peel	Not Acceptable.	Not Acceptable.	Acceptable providing the blemish does not exceed a one square inch (6.5 sq cm) area on any one surface.
Blisters	Not Acceptable.	Accept three blisters, each less than .063 inch (1.600 mm) in longest dimension, or two blisters each less than .125 inch (3.175 mm) in longest dimension, in a one square foot area (929 sq cm).	Accept three blisters, each less than .125 inch (3.175 mm) in longest dimension, or two blisters each less than .25 inch (6.35 mm) in longest dimension in a one square foot area (929 sq cm).
Pits, Nodules, Pinholes	Accept a total of three defects less than 0.32 inch (0.815 mm) in longest dimension, per one square foot area (929 sq cm) and no more than two such areas on any one surface.	Accept a total of three less defects than .063 inch (1.600 mm) in longest dimension, per one square foot (929 sq cm) area and no more than two such areas on any one surface.	Acceptable.
Visible results of manufacturing operations (such as welding, forming, grinding).	Not Acceptable.	Acceptable, providing the defect does not attract attention, when not specifically looked for, and does not detract from appearance when viewed from a distance of approximately 8 feet (2.44m).	Acceptable.
Gouge marks, Scratches, Scrapes	Not Acceptable.	Acceptable, providing the primer or base metal is not exposed and does not detract from appearance when viewed from a distance of approximately 8 feet (2.44 m).	Acceptable providing the base metal is not exposed.

2.3 Illumination requirements. The illumination requirements and the illumination order of precedence shall utilize the following ground rules:

- a. Fluorescent illumination will be the normal lighting utilized for observation and inspection of paint color.

- b. Fluorescent illumination shall have the spectral quality of the light from a fluorescent lamp commonly used for home and business lighting of the type designated “cool white”.
 - c. When fluorescent illumination is not available in the area, incandescent lighting will be the acceptable light source for observation and inspection.
 - d. Incandescent illumination shall have the spectral quality of the light from an incandescent lamp commonly used for home and business lighting.
- 2.4 Color inspection. Inspection for color (comparison of the painted surface with its specified, corresponding color chip) shall generally be accomplished under normal manufacturing/inspection area and illumination as specified in paragraph 2.3. However, various types of artificial lighting may react differently on the painted surface and the color chip, creating the impression of minor color variance between the two. If this occurs, natural daylight shall be used as the final determination of the color match. When utilizing natural daylight, do not view the painted surface and color chip in direct sunlight, but use average daylight or a moderate overcast northern sky.
- a. Parts for inspection will be reviewed straight on (not rotated or turned) at approximately eye level height, when a specific viewing distance is specified.
 - b. Inspection shall be conducted to assure that all painted parts meet the requirements of this instruction and the applicable engineering drawings.
- 2.5 Quality Assurance shall be responsible for assuring that the workmanship meets the minimum requirements specified herein.
- 2.6 Adhesion knife tests shall be performed in accordance with the Process Control Manual, Procedure A6.
3. Preparation For Delivery (Not Applicable)

**UNSIGNED HARDCOPY
NOT CONTROLLED**



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4. Notes

- 4.1 This instruction supersedes Silver Spring Working Procedures 20.1 and 52.1, and Sunnyvale Quality Assurance Procedure 587-107.