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MARKING OF GROUND SUPPORT EQUIPMENT, STANDARD FOR

ENGINEERING DEVELOPMENT DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center

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Change Notice 1

KSC-STD-E-0015B, Marking of Ground Support Equipment, Standard For

Walter T. Murphy
Director, Engineering Development

FILING INSTRUCTIONS

Remove pages 1, 2, 7, and 8 and replace with the attached.

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Approved:

Walter T. Murphy
Director of Engineering Development

JOHN F. KENNEDY SPACE CENTER, NASA

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MARKING OF GROUND SUPPORT EQUIPMENT, STANDARD FOR

1. SCOPE

This standard establishes the requirements and methods for marking ground support equipment (GSE) used at the John F. Kennedy Space Center (KSC), NASA.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

Federal

A-A-208	Ink, Marking, Stencil, Opaque (Porous and Non-porous Surfaces)
GG-P-455	Plates and Foils, Photographic (Photosensitive Anodized Aluminum)
O-E-760	Ethyl Alcohol (Ethanol), Denatured Alcohol; and Proprietary Solvent

Military

MIL-I-43553	Ink, Marking, Epoxy Base
MIL-I-46058	Insulating Compound, Electrical (For Coating Printed Circuit Assemblies)
MIL-T-21595	Tape, Pressure-Sensitive Adhesive, Paper, Masking, Nonstaining for Aircraft Painting Applications

2.1.2 Standards.

John F. Kennedy Space Center (KSC), NASA

KSC-STD-164	Environmental Test Methods for Ground Support Equipment

2.1.3 Drawings.

John F. Kennedy Space Center (KSC), NASA

75M50393	Identification Plate, KSC GSE

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Governmental.

American Society for Testing and Materials (ASTM)

ASTM B121	Leaded Brass Plate, Sheet, Strip and Rolled Bar, Specification for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

3. REQUIREMENTS

3.1 General Requirements.

3.1.1 Character Style. - Unless otherwise approved by the design activity, all characters shall be uppercase Gothic, straight line as shown in figure 1. Lowercase characters and Roman numerals shall be limited to special applications where uppercase nomenclature would be ambiguous.

3.1.2 Character Spacing. - The spacing between straight line characters shall be visually balanced.

3.1.3 Character Line Width. - The character line width shall be 1/16 to 1/8 of the character height, except 12.70-millimeter (0.500-inch) characters shall have a line width of 1/10 to 1/12 of character height.

3.1.4 Character Height. - Character height shall be selected from figure 1 and shall be in accordance with the requirements of figure 2.

3.1.5 Word Spacing. - The spacing between words or groups of characters shall be 5/8 to 3/4 of the character height, depending on the characters being separated.

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 IVXLMC

2.54 mm (.100 in)

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 IVXLMC

3.18 mm (.125 in)

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
1234567890 IVXLMC

3.97 mm (.156 in)

ABCDEFGHIJKLMNOPQRSTU abcdefghijklmnopqrstuv
1234567890 IVXLMC

4.76 mm (.188 in)

ABCDEFGHIJKLMNOPQ abcdefghijklmnop
1234567890 IVXLMC

6.35 mm (.25 in)

ABCDEFGH abcdefgh
12345678 IVXLMC

12.70 mm (.50 in)

Figure 1. Letter Style and Sizes

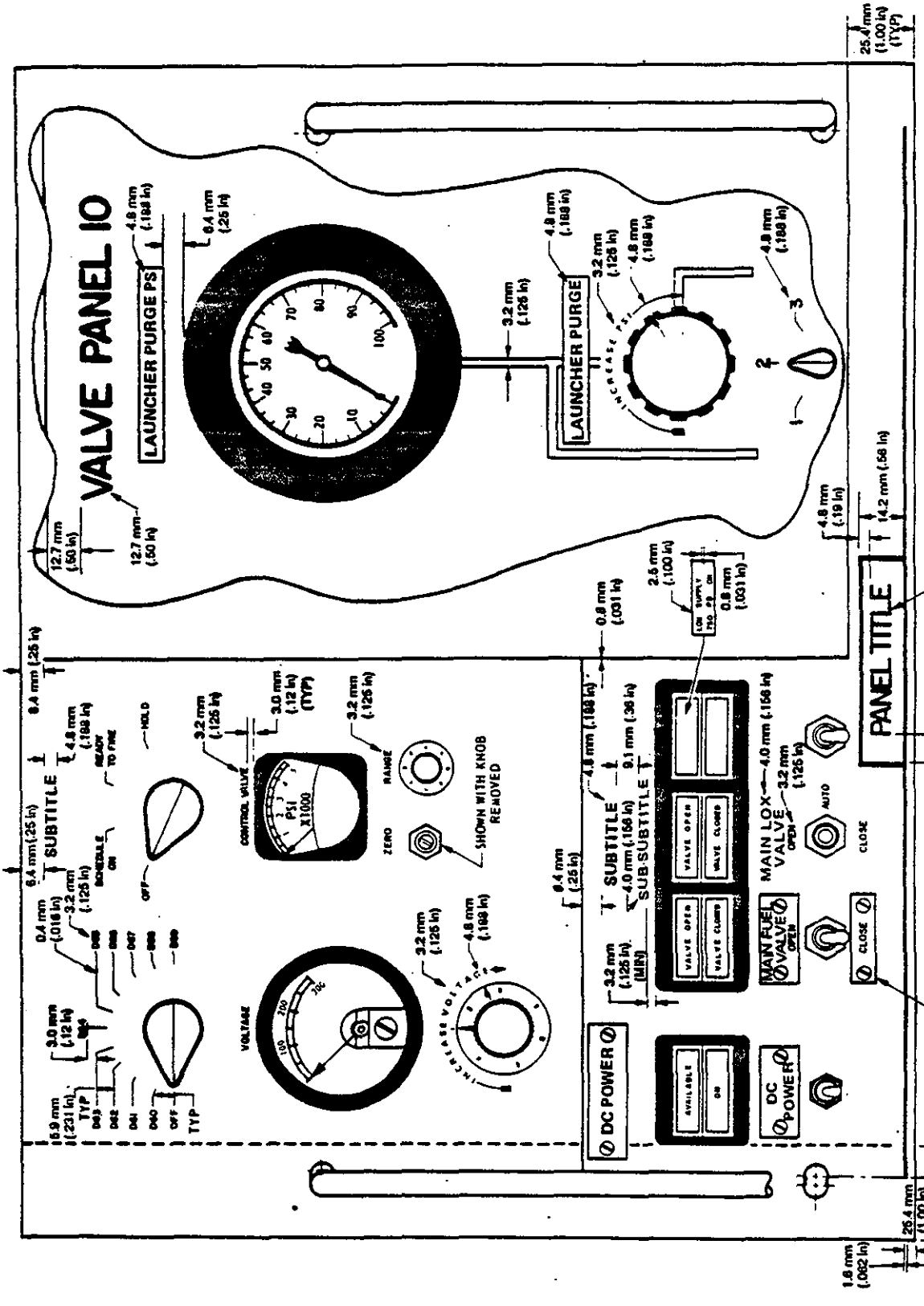

Figure 2. Sample Panel

3.1.6 Tolerances. - Tolerances shall be ±0.25 millimeter (±0.01 inch) on three-place decimals and ±0.76 millimeter (±0.03 inch) on two-place decimals.

3.1.7 Colors. - Unless otherwise specified, character color shall be black with a light colored background and white with a dark colored background. Warnings for personnel safety shall be red. For legend lights, black filler shall be used on white and amber engraved lenses and white filler shall be used on red and green lenses.

3.1.8 Permanency and Legibility. - The marking shall be as permanent as the normal life expectancy of the item to which it is applied, and legibility shall be of the quality required for ready readability and identification. The marking shall be capable of withstanding the environmental requirements specified in this standard.

3.1.8.1 Temperature. - The markings shall be capable of withstanding temperatures of minus 62 degrees Celsius (°C) to plus 125 °C.

3.1.8.2 Salt Spray. - The markings shall be capable of withstanding the salt spray conditions specified in KSC-STD-164.

3.1.8.3 Humidity. - The markings shall be capable of withstanding humidity conditions specified in KSC-STD-164.

3.1.8.4 Fungus. - The markings shall not support the growth of fungus and shall be capable of meeting the requirements of KSC-STD-164.

3.1.8.5 Sand and Dust. - The markings shall be capable of meeting the sand and dust requirements of KSC-STD-164.

3.2 Detailed Requirements.

3.2.1 Silk Screening. - The silk screening process shall be in accordance with the fabricating facility's normal silk screening methods, provided that the methods used are approved by the procuring organization, and shall be permanent and legible in accordance with this standard.

3.2.1.1 Materials. - The silk screening materials shall be compatible with the background surface, shall be prepared so that legibility will be retained under normal conditions, and shall be capable of being removed from the materials without damage to the surface finish. When the surface is finished with enamel or lacquer, the silk screening paint shall be a synthetic, flexible, waterproof, baked enamel designed and prepared especially for silk screen applications and shall be equal to NAZ DAR Company 59-000 series enamel screen ink. Epoxy base materials shall be applied on epoxy-compatible surfaces only.

3.2.1.2 Adherence. - Thoroughly cured markings shall not be removable by the application and stripping of masking tape as specified in MIL-T-21595, but the markings shall be capable of being removed by other means without damage to the surface finish.

3.2.1.3 Coating of Characters. - If specified on the individual design drawings, ink characters shall be covered with a clear, room drying compound in accordance with MIL-I-46058.

3.2.1.4 Workmanship. - The final markings shall be free from ragged edges, wrinkles, scratches, unbalance of characters, excess marking material, mesh markings, and air bubbles.

3.2.2 Engraving. - Engraving of front panels and terminal boards is used where permanency of marking is required and changes are not likely to occur. The engraving shall be permanent and legible in accordance with the requirements specified in this standard.

3.2.2.1 Engraving Layout. - Nomenclature, lines, and other markings shall be located in accordance with figure 2 or the applicable design drawing. Machine accuracy of location, centering (unless otherwise dimensioned on drawing), and balance of characters shall be the criteria for good workmanship.

3.2.2.2 Reverse Engraving. - Where transparent material is engraved on the rear side, reverse copytype must be used.

3.2.2.3 Cutter. - A 60-degree, v-type cutter or a laser cutter shall be used to engrave nomenclature and thin lines. To prevent excessive depth using the v-type cutter, broad lines shall be engraved with a truncated cutter (ground off tip).

3.2.2.4 Engraving Depth. - For the specified line width, the depth of the groove shall not exceed one half of the material thickness.

3.2.2.5 Filler. - After engraving, the grooves shall be filled with an approved oilbase monogram filler.

3.2.2.6 Workmanship. - The final markings shall be free from sharp or ragged edges, unbalance of characters, nonuniform line width, double engraving, and smearing of the filler.

3.2.3 Rubber Stamping. - Rubber (ink) stamping is confined to identifying detailed parts and components and aids in the assembly and troubleshooting of equipment. No rubber stamping shall be used for marking on front panels or racks. Stamping shall be permanent and legible in accordance with the requirements of this standard.

3.2.3.1 Character Location. - Identifying drawing and dash numbers of detailed parts shall be stamped in the locations specified on drawings. When no location is shown and for "short sign" identification of components, characters shall be placed on the part or on the mounting structure as near as possible to the component. The marking shall be visible after assembly.

3.2.3.2 Cleaning Agent. - The surface to be stamped shall be thoroughly cleaned.

3.2.3.3 Characters. - Characters shall conform in style and spacing to the general requirements specified herein. Unless otherwise specified, the character height shall be 3.18 millimeters (0.125 inch).

3.2.3.4 Ink. - Unless otherwise specified, the design organization shall designate use of one of the following ink types:

a. A-A-208

b. MIL-I-43553

3.2.3.5 Coating of Characters. - Where ink, as specified in A-A-208, is used, the characters shall be covered with a clear, room drying compound in accordance with MIL-I-46058.

3.2.3.6 Workmanship. - Rubber stamping shall be free of excessive ragged edges, closed characters, excessive ink, and shall be legible.

3.2.4 Stenciling. - Stenciling, as well as rubber stamping, is used in identifying detailed parts and components, and shall be capable of meeting the environmental requirements of this standard. Stenciling may also be used to identify jacks and plugs on backs of chassis or patch racks. At no time shall stenciling be used for marking on front panels or racks.

3.2.4.1 Character Location. - Identifying drawing and dash numbers of detailed parts shall be stamped in the location specified on drawings. When no location is shown and for "short sign" identification of components, characters shall be placed on the part or on the mounting structure as near as possible to the component. The marking shall be visible after assembly.

3.2.4.2 Cleaning Agent. - Prior to stenciling, surfaces shall be thoroughly cleaned.

3.2.4.3 Characters. - Characters shall conform in style, spacing, and general requirements. Unless otherwise specified, the character height shall be 3.18 millimeters (0.125 inch).

3.2.4.4 Ink. - Unless otherwise specified, the ink shall be MIL-I-43553.

3.2.4.5 Stencils. - Marking stencils shall be made from ASTM B121, alloy 4, half hard, brass sheet, 0.38 millimeter (0.015 inch) thick.

3.2.4.6 Spray Guns. - Ink shall be sprayed with an air or airless spray gun or airbrush system as appropriate for the project.

3.2.4.7 Workmanship. - Stenciling shall be free from ragged edges, closed characters, excessive ink, and shall be legible.

3.2.5 Die Stamping. - Die stamping shall be used in identifying detail parts and components, except in cases where parts are susceptible to deformation. In cases of this nature, die stamping shall not be used and an alternate method, with approval of the responsible design organization, shall be employed. Die stamping shall be permanent and legible in accordance with the requirements of this standard.

3.2.5.1 Filler. - Filler is not required when die stamping, unless specified by the responsible design organization.

3.2.5.2 Coating of Characters. - When specified on drawings (for permanence on parts stamped over an applied finish), characters shall be covered with a clear, room drying compound in accordance with MIL-I-46058.

3.2.6 Photoetching. - Photoetching shall be used for the fabrication of identification plate blanks in accordance with GG-P-455. The manufacturer of the equipment may choose to photoetch the final nomenclature in order to produce a more professional appearance. Photoetching, in accordance with GG-P-455, may also be used for other applications that are not required to utilize a specific marking method as specified in this document.

3.2.7 Hot Stamping. - Hot stamping shall be used exclusively for marking plastic identification plates, tags, and tapes. Unless otherwise specified, all characters shall be 3.18 millimeters (0.125 inch) in height and shall conform to all other character requirements of this standard.

3.2.8 Identification Plates. - Metal identification plates, as defined in 75M50393, shall be die stamped employing a flat-type die [the die impressions shall not exceed a depth of 0.25 millimeter (0.010 inch)]. Stamping on aluminum foil, adhesive-backed identification plates, as defined in 75M50393, shall be accomplished utilizing a typewriter.

3.2.9 Welding. - For large steel or aluminum structures where identification plates are not appropriate, welding shall be utilized for marking. The identification characters shall be sized appropriately for each application. A minimum of 6-millimeter (1/4-inch) weld size shall be used for all letters and numbers.

3.2.10 Cast or Forged. - Characters on castings or forgings shall be raised or depressed 0.25 millimeter (0.01 inch) to 3.18 millimeters (0.125 inch) on nonmachined surfaces. Character size shall be specified on the drawing.

4. QUALITY ASSURANCE PROVISIONS

The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to KSC that are covered by an inspection or quality control plan as required by the provisions of the contract or procurement document. Inspection and test records shall be kept complete, and upon request, made available to the procuring activity or its designated representative in accordance with the provisions of the contract or procurement document. The procuring activity, or its designated representative, reserves the right to perform any or all of the inspections set forth in the specification to assure that the end item conforms to the prescribed requirements.

5. PREPARATION FOR DELIVERY

Not applicable.

6. NOTES

6.1 Intended Use. - This standard is intended to establish uniform engineering practices and methods of marking ground support equipment for identification at the John F. Kennedy Space Center, NASA.

6.2 Definitions. - For the purpose of this standard, the following definitions shall apply.

a. Character Lines. - The individual marks forming the character.

b. Character Line Width. - The width of individual marks forming the character.

c. Character Location. - The placing of a group of characters in respect to boundaries of components or edges of equipment.

d. Straight Line Characters. - Characters containing no serif (i.e., sans serif) with the exception that Roman numerals shall be serifed.

NOTICE. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said

drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any right or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

NASA - John F. Kennedy Space Center

Preparing Activity:

John F. Kennedy Space Center
Electronic Systems Division
Engineering Development Directorate