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SUPERSEDING
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MILITARY SPECIFICATION

PANELS, INFORMATION, INTEGRALLY ILLUMINATED

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for integrally illuminated information panels.

1.2 Classification. The panels shall be furnished in the following types and classes as specified (see 6.2).

1.2.1 Classes.

Class 1-R. Panels having the background of the front face of the panel finished with black and the integral illumination red.

Class 1-W. Panels having the background of the front face of the panel finished with black and the integral illumination white.

Class 2-R. Panels having the background of the front face of the panel finished with gray and the integral illumination red.

Class 2-W. Panels having the background of the front face of the panel finished with gray and the integral illumination white.

* 1.2.2 Types.

Type III - One piece plastic panels. Panels consisting of one sheet of plastic utilizing MS25010 light assemblies for illumination.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

Note: Type III panels shall be inactive for new design. Qualification for Type III panels will be determined by qualification for Types IV, V, or VI. Type III panels may be updated to Types IV or V by the use of adapter plug MS90335-9 (see 6.8).

Type IV - One piece integrally wired incandescent panels. Panels consisting of one sheet of plastic using MS24367, MS90451, or MS90452 lamps and wiring embedded within the panel.

Type V - Integrally wired, replaceable MS24367, MS24515, MS90451, or MS90452 lamp panels. Panels consisting of one sheet of plastic using replaceable MS24367, MS24515, MS90451, or MS90452 lamps, the panel containing all lampholders, associated wiring and connectors. Alternatively, the lamps may be soldered to a removable printed circuit board recessed so that the circuit board is flush with the back of the plastic panel.

Type VI - Electroluminescent panels. Panels consisting of one sheet of plastic with encapsulated electroluminescent lamps or a combination of EL lamps and incandescent lamps.

*2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

C-F-206	- Felt Sheet, Cloth, Felt, Wood, Pressed
L-P-380	- Plastic Molding Material, Methacrylate
P-C-444	- Cleaning Compound, Solvent, Grease Emulsifying
TT-T-266	- Thinner, Dope and Lacquer (Cellulose Nitrate)
** W-L-111	- Lamps, Incandescent, Miniature

** See 6.12 for cross reference to MS Lamps

MILITARY

MIL-P-116	- Preservation, Methods of
MIL-D-1000	- Drawings, Engineering and Associated Lists
MIL-P-5425	- Plastic, Sheet, Acrylic, Heat Resistant
MIL-L-6081	- Lubricating Oil, Jet Engine
MIL-C-6781	- Control Panel, Aircraft Equipment, Rack or Console Mounted
MIL-H-7083	- Hydraulic Fluid, Nonflammable, Aircraft, Hydrolube
MIL-P-13949	- Plastic Sheet, Laminated, Metal Clad (For Printed Wiring), General Specification for
MIL-M-18012	- Markings for Aircrew Station Displays, Design and Configuration of
MIL-C-25050	- Colors, Aeronautical Lights and Lighting Equipment, General Requirements for
MIL-L-25467	- Lighting, Integral, Aircraft Instrument, General Specification for
MIL-P-13949	- Plastic Sheet, Laminated, Metal Clad (For Printed Wiring), General Specification for
MIL-I-46058	- Insulating Compound, Electrical (For Coating Printed Circuit Assemblies)
MIL-C-55302/108	- Connector, Electrical, Printed Wiring Board General Purpose Male Adapter, Contact Spacing, (.100) Type C
MIL-C-55032/109	- Connector, Electrical, Printed Wiring Board General Purpose, Composite, Receptacle, Contact Spacing (.100) Single Row, Type C

STANDARDS

FEDERAL

Fed. Test Method Std. No. 141	- Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing

FEDERAL (continued)

FED-STD-595 - Color

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-130 - Identification Marking of U.S. Military Property

MIL-STD-143 - Standards and Specification; Order of Precedence for the Selection of

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts

MIL-STD-411 - Aircrew Station Signals

MIL-STD-454 - Standard General Requirements for Electronic Equipment

MIL-STD-704 - Electric Power, Aircraft, Characteristics and Utilization of

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

MIL-STD-810 - Environmental Test Method

MS3338 - Lamp, Incandescent, T-1 Bulb (Based)

MS3498 - Grommets with Screw, Integrally Illuminated Information Panel Mounting

MS24367 - Lamp, Incandescent - Miniature, Integral Lighting

MS24515 - Lamp - Sub-Miniature

MS25010 - Light, Panel - Plastic Plate Lighting

MS25237 - Lamp, Incandescent, Single Contact, Midget Flanged Base (T-1 3/4 Bulb)

MS90335 - Connector, Receptacles, Plug Adapter, El, Embedded, Printed Circuit Board Lamp Lighting Panels

MS90451 - Lamp, Incandescent, T-1 Bulb, Short, Integral Lighting

MS90452 - Lamp, Incandescent, T3/4 Bulb, Integral Lighting

(Copies of applicable documents required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Naval Supply Depot, Code 1051, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of the invitation for bids or request for proposal shall apply:

AMERICAN SOCIETY FOR TESTING AND MATERIALS

D523	Method of test for Specular Gloss of Paint Finishes

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

*3. REQUIREMENTS

3.1 Qualification. Panels furnished under this specification shall be representative of a process which has been qualified through tests on a special panel (see Figure 1). All of the tests described under Section 4 apply to this panel; however, only those tests described under Acceptance Tests are generally applicable to production panels furnished under this specification. Production panels will be of a variety of shapes and sizes and will not resemble the special panel (Figure 1).

3.2 Materials and parts. Except for surface finishing, electrical circuitry, connectors, and sealants, the panels shall be made of transparent plastic in accordance with MIL-P-5425, finish A, or molding compound conforming to L-P-380, Type II, Class 3. The dielectric requirements of L-P-380 are waived. Panels shall be annealed to remove stresses. Under special circumstances panels may be fabricated from other materials subject to approval by the procuring agency.

3.2.1 Color of finishes. Finishes shall conform to FED-STD-595 for the following colors:

Color	Color Number
Black	37038
Gray	36231
White	37875
Yellow	33538

* 3.2.2 Lamps. Types III, IV, and V panels shall employ at least two incandescent lamps and shall be so designed that the failure of any one lamp does not reduce the brightness of the markings by more than the values specified in 3.5.3.

Type IV panels should be restricted to not more than ten lamps. If more than ten lamps are required then a Type V panel design should be used.

Type VI panels may employ one or more EL lamps.

3.3 Selection of specifications and standards. Specifications and standards for all materials and parts, and Government certification and approval of processes and equipment, which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with MIL-STD-143.

* 3.4 Design.

3.4.1 Construction. Panels (Type IV) shall be 0.220 ±0.023 inch thick and shall be 0.047 ±.016 inch smaller in the length and width dimensions than the mounting plate. Electroluminescent lamps shall be contained within and recessed a minimum of 0.050 inch from the rear surface of the panel. Incandescent lamps of the MS24367, MS24515, MS90451, or MS90452 types and associated lamp circuits (except for Type V panels) shall be recessed from the rear surface of the panel and covered with a minimum of 0.020 inch film of non-conductive resin. The resin shall not protrude above the rear surface of the panel. The resin film shall be mechanically and chemically compatible with the panel and lamp circuit materials. Incandescent lamps of the MS24367, MS90451, or MS90452 type and electroluminescent lamps within the panel shall also be protected by a minimum of 0.030 inch of plastic between the lamp and front face of the panel. In Types IV and VI, 28 volt incandescent lamps shall not be embedded within the one piece panels. Type V circuit board panels shall have the circuit board recessed within the plastic panel so that the backs of the plastic panel and the circuit board are flush to 0.010 above flush. The maximum thickness of Type V panels with overflush circuit boards shall be 0.253. The lamps shall be soldered to the circuit board. Any filters used to change lamp chromaticity shall be permanently cemented within the plastic panel. A sufficient number of 2-56 screws to hold all areas of the circuit board flush to the plastic panel shall be provided. Circuit boards shall conform to MIL-P-13949, Type FL-GF031C2/0A2B. The preferred circuit is to leave most of the copper foil intact on the circuit board. The design of the conductor pattern shall provide large areas of solder clad copper separated only by etched non-conducting gaps (0.020 min.) rather than narrow ribbons of copper conductor. The conductor pattern shall have a minimum clearance of 0.050 inches from all circuit board edges, holes, and cutouts except for the electrical connector.

An organic protective coating in accordance with MIL-I-46058 shall be applied to the conductor side of the circuit board after installation of the lamps and connector. The coating shall cover all exposed metal parts but not the glass envelopes of the lamps. The conductors shall be free from contamination such as corrosion, stains and solder flux before coating.

* 3.4.1.1 Electrical connectors. Type IV and VI panels utilizing one electrical circuit shall use the MS90335-7 plug assembly. Type V panels utilizing one electrical circuit shall use the MS90335-8 plug assembly. All panel types which have multiple electrical circuits shall use the MIL-C-55302/108/109 connector. For new design, the MIL-C-55302/108/109 may be used for all types. The connector shall be mounted so that the electrical circuitry of the panel is disconnected from the power source by removal of the panel. The connector mounting provisions shall not protrude beyond the rear surface of the panel or circuit board.

The MS90335-8 plug assembly, when soldered to the circuit board shall be capable of withstanding a force of 15 pounds applied to the collar of the assembly in a direction perpendicular to the board.

3.4.1.1.1 Connectors. Connectors of the MS90335 type as used in qualification panels and production panels as defined in this specification shall meet all dimensional and other requirements of MS90335.

3.4.1.1.2 Grommets. Grommets of the MS3498 type as used for production panels as defined in this specification shall meet all dimensional and other requirements of MS3498.

* 3.4.1.2 Connector location. A cross (+) approximately 0.08 inch by 0.08 inch shall be located on the front surface of the panel approximately above the electrical connector; except when required nomenclature interferes with the marking, the cross (+) shall be located as close as possible to the electrical connector. The cross (+) shall be of a white color over the opaque surface and shall not be illuminated. Where practical, the connector should be located at the center of the panel.

* 3.4.1.3 For Type IV and VI panels, if all of the lamps and lamp circuits are not visible from the back of the panel, a white line shall be applied to the rear surface of the completed panel indicating the location of the lamp circuit. Areas occupied by the lamps shall be marked in a similar manner with a cross-hatched or solid white area. The type and number of lamps used in Type IV, V, and VI panels shall be marked on the rear surface of the panel or circuit board in such a way as not to interfere with the lighting.

* 3.4.1.4 Lamp circuit. The lamp circuit shall consist of conductive material with a resistivity not greater than pure copper (20°C) with a minimum cross sectional area of 254 circular mils. All conductor circuit material shall be soldered to the lamp leads and the electrical connector. Soldering shall be in accordance with MIL-STD-454. EL lamps shall operate from a 115-volt, 400-cycle

power source in accordance with MIL-STD-704 (Category B). Incandescent lamp circuits shall operate from a 5-volt power source. All lamps shall be connected in parallel terminating in an electrical connector. When special circumstances require the use of a 28-volt lamp power source, the first construction option shall be 28-volt based lamps removable from the front of the panel. A second option would be 5-volt lamps arranged in series-parallel circuits and soldered to a separate circuit board. Configurations using 28-volt unbased lamps soldered to a circuit board or embedded are unacceptable.

3.4.2 Mounting. The panel shall be designed to permit removal without disturbing components thereof, except for knobs, lampholders and hold-down fasteners.

* 3.4.2.1 Fasteners. Fasteners shall consist of 6-32 machine screws. A fastener for each 8 square inches of surface area shall be provided. No fewer than two screws shall be used. The panel shall have provisions, such as MS3498 grommets, to prevent it being crushed by the screws. Spacing symmetry of the fasteners shall be such as to minimize warpage affecting the operation of the controls.

3.4.2.2 Movement. Movement of the panel shall not expose any lighted area not normally exposed when the panel is correctly installed. When marks on a knob or knob skirt and marks on the panel are required, any movement of the panel shall not change the position of markings so as to exceed the tolerance required for proper interpretation of the control.

3.4.3 Finish.

* 3.4.3.1 Surface coating. Except for the markings, those areas required for lighting functions, and the circuit board in Type V panels; all surfaces of each panel shall be coated with the same opaque material of the color specified in 3.4.3.2 for the background of the front of the panel.

3.4.3.2 Colors. The background of the front side of each black panel shall be finished with black. The background of the front side of each gray panel shall be finished with gray. The markings on each panel shall be finished with white, except prominence stripes, which shall be finished with yellow. The external finish of any lampholder and attaching hardware shall correspond to the background color of the panel excluding circuit board.

3.4.3.3 Marking. The markings on the panel shall conform to MIL-M-18012. The marking shall not be deeper than 0.005 inch. All markings shall be sharply defined and readable when viewed at any angle up to and including 60 degrees from the normal to the plane of the front face of the panel.

3.4.3.4 Contrast of finishes. The daylight contrast between markings and background on the panel shall be determined with the panel lighting system inoperative. Contrast (C) is defined as:

$$C = \frac{B_2 - B_1}{B_1}$$

where B_1 is the average brightness of the background immediately surrounding the marking and B_2 is the average brightness of the marking. The contrast value determined shall be at least 9 for black panels and 2.5 for gray panels.

* 3.4.3.5 Gloss. The gloss of the background of the panel shall not exceed 5 units when measured by the American Society for Testing Materials Standard Method D523 (60°).

* 3.5 Illumination. Each Type III panel shall meet the specified illumination requirements with MS25237 lamps operating at 0.034 ±0.02 spherical candela installed in each lampholder. Each Type IV and V, Classes 1W or 2W, shall meet the specified brightness requirements and shall incorporate lamps MS24367-715AS15, MS90451-7152AS15 or MS90452-7153AS15. Each Type IV and V, Classes 1R or 2R shall meet the specified brightness requirements and may incorporate any of the lamps specified above or lamps MS24367-683AS15, and MS24367-713AS15. Each Type IV and V panel shall meet the specified brightness requirements with the lamps operating at 5.0 ± 0.05 volts. When 28-volt MS24515 lamps are used, brightness requirements shall be met at 28.0 ± 0.15 volts. Each Type VI panel shall meet the specified brightness requirement with the lamps operating at 115 ± 5.0 volts, 400 ± 20 Hz. Except for Type VI panels, all lamps shall be operated from DC power for test purposes.

* 3.5.1 Brightness characteristics.

3.5.2 Color. The lettering, numbering, and (except for yellow prominance markings) the marking of the plastic lighting panel shall be white in daylight when the lighting units are not energized. When the lighting units are energized the colors shall be as follows:

* 3.5.2.1 White illumination - Type III, IV, V and VI. The light transmitted through the white markings of the panels shall meet the chromaticity requirements for Instrument and Panel Lighting White, Type 1(g) of MIL-C-25050.

3.5.2.2 White illumination (USAF) - Types IV, V, and VI. The light transmitted through the panel markings and all elements illuminated by the panel shall fall within the chromaticity limits of x = .440 ± 0.020, and y = 0.405 ± 0.020 when the lighting system is operated at 4.5 ± 0.075 volts measured at the

panel connector. (For Type VI panels the connector voltage shall be 115 ± 1.2, 400 Hz). Illuminated yellow markings shall meet the requirements of Aviation yellow of MIL-C-25050.

3.5.2.3 Red illumination. The color of the illuminated markings shall be no paler or yellower than Instrument and Panel Lighting Red of MIL-C-25050.

* 3.5.3 Brightness of markings. The brightness of all markings on the panels and associated knobs, dials, etc., when illuminated by the integral lighting system only, shall be as follows:

Panel Type	Color of Light	Brightness of Marking (Footlambert)
III	Red	0.6 ± 0.4
	White	3.0 ± 2.0
IV, V, and VI	Red	1.0 ± 0.5
	White	2.0 ± 1.0
IV, V, and VI (USAF)	White	1.0 ± 0.5

3.5.3.1 When illuminated legends which are of a warning, caution, or advisory nature taking their activation signals from some sensor separate from the lighting system power, appear in the integrally illuminated plastic information panel, the brightness requirements of MIL-STD-411 shall apply to these elements.

3.5.4 Brightness maintenance.

* 3.5.4.1 Types IV and V for white light. In the event of a lamp failure, the brightness of any marking depending on the incandescent lamps for illumination shall not be reduced below 0.5 footlambert at rated voltage for IPL white and 0.2 fl for USAF white.

3.5.4.1.1 Types IV and V for red light. A lamp failure shall not reduce the brightness of any marking depending on the lamps for illumination below 0.15 footlambert at rated voltage.

3.5.4.1.2 Type V front relampable. When MS24515 or MS3338 based lamps are used with hardware permitting replacement of the lamps from the front face of the panel, the lamp out illumination requirements do not apply.

* 3.5.4.2 Type VI. White electroluminescent panels shall be capable of providing a minimum brightness of 0.5 footlambert after 1200 hours of continuous operation at rated voltage in an environment of 70°F and a relative humidity not to exceed 80 percent.

* 3.5.4.2.1 Type VI. Red electroluminescent panels shall be capable of providing a minimum brightness of 0.3 footlambert after 1200 hours of continuous operation at rated voltage in an environment of 70°F and a relative humidity not to exceed 80 percent.

* 3.6 Identification of product. The panels shall be marked for identification in accordance with MIL-STD-130. The minimum identification data shall be as follows but need not be in the same order or all located in one area of the panel:

(a) Stock number (FSC 6220)

(b) Panel manufacturer's name and process designation

(c) Panel manufacturer's Part No.

(d) Month and year of manufacture

The identification data shall be marked on the back of each panel in such a manner as not to interfere with lighting or mounting.

* 3.7 Interchangeability. All parts having the same panel manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of MIL-D-1000 shall govern changes in the manufacturer's part number. All Type V panel circuit boards of the same manufacturer's part number shall be physically and dimensionably interchangeable without requiring any light balancing or toning of the plastic panel or circuit board within the limitations imposed by the intensity tolerances of the MS lamps used.

3.8 Performance. The panels shall perform satisfactorily when subjected to the test requirements specified in Section 4.

3.9 Workmanship. The panels shall be uniform in quality and free from irregularities which would adversely affect their appearance or serviceability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all

inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

* 4.2 The inspection and testing of internally illuminated panels shall be classified as follows:

(a) Qualification tests. Qualification tests are those tests performed on sample panels made in accordance with Figure 1 of this specification and submitted for qualification of a manufacturer's process.

(b) Acceptance tests. Acceptance tests are those tests performed on individual production products or lots which have been submitted under contract to determine conformance of the products or lots with requirements set forth in the specification prior to acceptance.

* 4.2.1 Qualification testing. A sample for qualification testing shall consist of six panels of a given manufacturer's part number, which shall conform to Figure 1. In addition, ten samples of the MS90335 plug assembly as used with qualification test panels shall also be furnished with the qualification panels. These samples shall be inspected for the dimensional, finish, and performance requirements of MS90335. However, if the MS90335 Plug Assemblies have been previously qualified, a Certification of Qualification may be submitted in lieu of samples. One of the Type IV panels shall have individual leads or connectors for each lamp brought out of the rear surface of the panel. Samples, along with evidence in the form of a test report showing that the process being submitted has met the requirements of the specification, shall be forwarded to the testing laboratory designated in the letter of authorization from the activity responsible for qualification (see 6.3), and the panels shall be plainly identified by securely attached, durable tags with the following information:

PANEL, INFORMATION, INTEGRALLY ILLUMINATED
Type and Class
Manufacturer's process identification

Submitted by (name of manufacturer) (date) for qualification tests in accordance with MIL-P-7788E under authorization (reference letter authorizing tests)

NOTE: These panels may be tested to destruction and are not returnable.

Qualification approval shall extend for a three year period, except that requalification will be required at any time the vendor moves his plant to a new address. The vendor will be allowed four months from the date of his move

to submit qualification panels made at his new location.

* 4.2.1.1 *Tests*. The qualification tests shall consist of all of the tests of this specification, as described under 4.4, except Arrangement of Controls 4.4.10, and shall be performed in the order shown below:

No. 1

(a)	Examination of Product	4.4.1
(b)	Circuit Continuity	4.4.14
(c)	Insulation Resistance	4.4.15
(d)	Solvents and Fluids - Lacquer Thinner	4.4.2
(e)	Accelerated Weathering	4.4.3
(f)	Altitude	4.4.7
(g)	Humidity	4.4.4
(h)	Temperature	4.4.5
(i)	Surface Endurance	4.4.6
(j)	Contrast	4.4.9
(k)	Illumination	4.4.12

No. 2

(a)	Examination of Product	4.4.1
(b)	Circuit Continuity	4.4.14
(c)	Insulation Resistance	4.4.15
(d)	Solvents and Fluids - Engine Oil	4.4.2
(e)	Accelerated Weathering	4.4.3
(f)	Altitude	4.4.7
(g)	Humidity	4.4.4
(h)	Surface Endurance	4.4.6
(i)	Contrast	4.4.9
(j)	Illumination	4.4.12

No. 3

(a)	Examination of Product	4.4.1
(b)	Circuit Continuity	4.4.14
(c)	Insulation Resistance	4.4.15
(d)	Solvents and Fluids - Hydraulic Fluid	4.4.2
(e)	Accelerated Weathering	4.4.3
(f)	Salt Spray	4.4.8
(g)	Temperature	4.4.5
(h)	Surface Endurance	4.4.6
(i)	Contrast	4.4.9
(j)	Illumination	4.4.12

No. 4

(a)	Examination of Product	4.4.1
(b)	Circuit Continuity	4.4.14
(c)	Insulation Resistance	4.4.15
(d)	Solvents and Fluids - Grease Cleaning Compound	4.4.2
(e)	Accelerated Weathering	4.4.3
(f)	Humidity	4.4.4.
(g)	Surface Endurance	4.4.6
(h)	Contrast	4.4.9
(i)	Illumination	4.4.12

No. 5 and 6 (Control)

(a)	Contrast	4.4.9
(b)	Color of Light	4.4.11
(c)	Illumination	4.4.12
(d)	Failed Lamp (6 only)	4.4.16
(e)	Gloss	4.4.13

In the event of a failure of one of the panels subjected to any one of the qualification tests, control sample No. 5 shall be tested accordingly to the sequence in question. If control sample No. 5 fails, the entire qualification test lot shall be rejected and the process shall be declared unsatisfactory. If both control samples pass the test sequence, the process shall be declared satisfactory. Failure of more than one sequence of tests shall result in disqualification.

* 4.2.2 Acceptance tests. The acceptance of production panels shall be subject to Group A and Group B tests.

* 4.2.2.1 Group A tests. Group A tests shall consist of the following:

(a)	Examination of Product	4.4.1
(b)	Arrangement of Controls	4.4.10
(c)	Color of light	4.4.11
(d)	Insulation Resistance	4.4.15
(e)	Illumination	4.4.12
(f)	Contrast	4.4.9

In addition, the panels may be subjected to any other tests specified herein which the procuring activity considers necessary to determine conformance to this specification. Panels submitted for Group A acceptance shall have met the following requirements before submission:

(1) The process employed shall have passed the qualification tests.

(2) Three copies of the drawings showing layout, components to be illuminated by the panel, dimensions, details of marking, and types of knob used on controls shall have been submitted to, and approved by, the procuring activity.

(3) The illumination test facility to be employed for illumination tests shall have been approved by the activity responsible for qualification (6.5).

4.2.2.1.1 Sampling procedure. One sample of each control panel shall be furnished with three copies of approved layout drawings. Mounting of lights, controls, and the panel shall be as required on the finished panel. Controls, except for components which are to be illuminated, may be dummies, but their size, shape and marking shall be as required by the drawing. The information panel shall be attached to a mounting plate as in the actual installation. Samples shall be forwarded to an approved testing activity, plainly identified by securely attached, durable tags marked with the following information:

PANEL, INFORMATION, INTEGRALLY ILLUMINATED
Manufacturer's Part Number
Submitted by (name of contractor) (date)
for acceptance tests in accordance with MIL-P-7788E as specified in (indicate contract or order number, or authorizing letter).

(a) This panel may be tested to destruction and shall be in addition to the quantity specified in the contract or purchase order.

(b) Complete panels with actual working components may be submitted if desired.

(c) Manufacturers of the MS90335 receptacle, shall submit ten samples of each dash number for which qualification is desired. These samples shall be inspected for compliance to the material, finish, dimensions, and performance requirements of MS90335.

(d) Manufacturers of MS3498 grommets as used for production panels shall submit ten samples for each dash number for which qualification is desired. These samples shall meet all material, finish, and dimensional requirements of MS3498.

4.2.2.1.2 Illumination certification.

Level A - Under this level the illumination test facility certifies that the panel complete with all illuminated controls complies with the illumination requirements specified herein.

Level B - Under this level the illumination test facility certifies that the panel less the full complement of illuminated controls complies with the illumination requirements specified herein.

Final acceptance of illumination tests shall be based on certification under Level A.

* 4.2.2.1.3 Luminance measurements. Comparison of photometric brightness measurements by approved illumination test facilities should take into account tolerances inherent in the light measurement technique prescribed herein. For example, where the panel manufacturer certifies the illumination as being within the limits shown under Column "M" below, then the procuring activity shall accept the panels, provided his approved illumination test facility measures the brightness as being within the limits shown under column "P". In any event, the required brightness ratio as specified in 3.5.2 shall not be exceeded.

Color of Light for Type IV and Type V Panels	"M" Footlamberts	"P" Footlamberts
Red/White (USAF)	0.5 to 1.5	0.47 to 1.58
White	1 to 3.0	0.95 to 3.20

* 4.2.2.2 Group B tests. The group B tests shall consist of the following tests and such additional tests as are considered necessary by the Inspector to insure conformance to this specification.

(a)	Examination of Product	4.4.1
(b)	Surface Endurance	4.4.6

Group B except for (a) above tests are potentially destructive tests and should only be invoked when there is good reason to suspect that the quality of the process used is different than the process for which the manufacturer was qualified. For example, the surface endurance test will always mar the finish of the panel but the scratch may not be of sufficient depth to warrant failure of the panel. Nevertheless the aesthetic appearance of the panel will be effected and rework will be required.

4.2.2.2.1 Sampling procedure. A random sample shall be selected from each inspection lot and inspected for acceptance in accordance with the inspection level requirements of MIL-STD-105 as follows:

(a) Examination of Product. The sample(s) shall be selected in accordance with MIL-STD-105, Inspection Level S-1, AQL of 1.0 percent defective.

(b) Surface Endurance. The sample(s) shall be selected from each inspection lot in accordance with MIL-STD-105, Inspection Level S-3, acceptance number 0. The sample size shall be based only on the applicable sample size code letter corresponding to Inspection Level S-3.

The above two tests may be performed on the same sample(s).

4.2.2.2.2 Inspection lot. An inspection lot shall consist of all panels of the same type produced under essentially the same manufacturing conditions and submitted for inspection at the same time. The unit of product as defined in MIL-STD-105 shall be one panel.

4.2.2.2.3 Resubmitted inspection lot. Paragraph title "Resubmitted Lots" of MIL-STD-105 shall apply except that a resubmitted inspection lot shall be inspected by the contractor under the supervision of the Government Inspector using tightened inspection. Where the original acceptance number was zero, a sample size represented by the next higher sample size code letter shall be chosen. Before resubmitting, full particulars concerning the cause of previous rejection and the action taken to correct the defects found in the inspection lot shall be furnished by the contractor to the cognizant contracting office.

4.3 Test conditions.

4.3.1 Ambient temperature. Unless otherwise specified, all tests of this specification shall be performed at room temperature.

* 4.3.2 Light measurements. All light measurements shall be made in a dark surrounding. Ambient luminance shall not exceed 0.1% of luminance of the test sample. The photometer shall be calibrated by a certified testing laboratory to establish the necessary correction factors for red light luminance and color limit measurements.

4.4 Test methods.

* 4.4.1 Examination of product. Each of the sample panels selected in accordance with 4.2.2.2.1 shall be examined to verify compliance with this specification. Examination shall be conducted as specified in Table I. Any panels in the sample containing one or more defects shall be rejected and if the number of defective panels in any sample exceeds the acceptance number for the sample, the lot represented by the sample shall be rejected.

4.4.2 Solvents and fluids.

4.4.2.1 Apparatus. The following materials shall be used:

(a) Lacquer Thinner - TT-T-266.

(b) Engine Oil (Grade 1010) - MIL-L-6081.

(c) Grease Cleaning Compound - P-C-444.

(d) Hydraulic Fluid - MIL-H-7083.

(e) Felt Pad - C-F-206, Classification 12R1 or 12R2.

4.4.2.2 Procedure. A felt pad 1/4 inch thick and of the same outside dimensions as the panel (Figure 1 or 2, as applicable), shall be saturated with the fluid as required under 4.2.1.1. The felt pad shall then be placed on the front face of the panel and held down by a uniformly distributed force of 1.5 pounds for one minute. At the termination of this time, the felt pad shall be removed from the panel and a clean, lint free, dry cloth shall be used to wipe the face of the panel dry. The panel shall then be examined for evidence of surface coating softening, tackiness, or of the transfer of pigment from the opaque coating to the white markings, or vice versa. Evidence of one or more of these conditions shall be cause for rejection. The gloss of the panel shall not be increased above the maximum value allowed by this specification.

4.4.3 Accelerated weathering.

4.4.3.1 Apparatus. The apparatus shall consist of an accelerated weathering chamber as described in Fed. Test Method Std. No. 141, Method 6152.

4.4.3.2 Procedure. The panel shall be exposed to the radiation from the carbon-arc for a period of 150 hours in accordance with Fed. Test Method Std. No. 141, Method 6152. After exposure, the panel shall be visually compared to a similar unexposed panel. If discoloration of the indicia has occurred, contrast measurements shall be made to determine that the panel meets the specification contrast requirements. Failure to meet minimum contrast requirements shall be cause for rejection.

4.4.4 Humidity. The panels shall be subjected to ten cycles in accordance with Procedure I of MIL-STD-810.

4.4.5 Temperature.

4.4.5.1 Apparatus. The apparatus shall consist of two chambers of sufficient size to allow installation of the panel so that all portions of the panels can be subjected to a temperature which does not vary more than +2°C. One chamber shall be capable of maintaining a temperature of 65°C (85°F). The second chamber shall be capable of maintaining a temperature of +85°C (+185°F). During these tests the humidity in the chambers shall be that which would normally result from heating and cooling the ambient air, and no attempt shall be made to control the humidity except that at temperatures over 71°C (160°F) the humidity shall not exceed 50 percent. This shall be a non-operating test.

4.4.5.2 Procedure.

(a) The panel shall be placed in a chamber maintained at -65°C (-85°F) for one hour. It shall then be removed from the cold chamber and placed as rapidly as is practicable (within 3 minutes) in an oven whose temperature is maintained at +85°C (+185°F) for one hour. This procedure shall be repeated four times.

(b) The panel shall then be cooled naturally and examined. There shall be no evidence of crazing, surface coating deterioration, or discoloration of the marking which reduces the contrast below 9 or 3 for black and gray panels.

4.4.5.2.1 Lamps within the panels subjected to temperature tests shall not be operated in ambient temperatures above 71°C.

4.4.6 Surface endurance.

* 4.4.6.1 Apparatus. The apparatus shall consist of a device which must apply a vertical load of 1000 grams to the point of a needle held at an angle of 45 degrees to the horizontal. The apparatus shall hold the panel in a horizontal position and shall allow the panel to pass horizontally under the needle in a rapid manner. The line scratched on the panel shall lie in the vertical plane containing the axis of the needle. The direction of movement of the panel relative to the needle shall be in the direction of the point. Figure 2 shows the general form of the equipment. The steel needle shall have a right conical point having a vertex angle of 16 to 20 degrees and a spherical tip with a radius of 0.002 to 0.0025 inch. A needle may be used for only one pass unless it is carefully checked to insure that its dimensions are within the limits indicated in Figure 2. See 6.6 for needle sources.

* 4.4.6.2 Procedure. The test shall consist of one pass of the needle along the maximum possible unobstructed distance on the front face of the panel. This pass shall include a minimum of one marking character. Except for the point of needle penetration at the beginning and end of the pass, the needle shall not break the surface so as to cause light leakage from the panel or destroy the legibility of the characters.

4.4.7 Altitude. The plate shall be tested in accordance with Method 105 of MIL-STD-202 for 30 minutes at an altitude of 100,000 feet (0.32 inches Hg).

4.4.8 Salt spray. The panel shall be tested in accordance with Method 101 of MIL-STD-202 for 26 hours.

4.4.9 Contrast.

* 4.4.9.1 Apparatus. The measuring apparatus shall consist of a suitable photometer and light source (Figure 3).

* 4.4.9.2 Procedure. The front of the panel shall be perpendicular to the line of sight of the photometer. The panel shall not be energized. Illumination of the panel shall be provided by a uniform diffuse artificial illumination (See Figure 3). The luminance of the markings and of the background adjacent to these indicia shall be measured to determine the contrast between the background and the indicia (3.4.3.4).

4.4.10 Arrangement of controls. The panel shall be examined to determine that the controls and their arrangements are in accordance with the applicable drawings or as specified by the procuring activity.

* 4.4.11 Color of Light (Class 1-R and 2-R) The color of the red light emitted by the panels shall be determined for each of several markings on the panels as follows: the photometer shall be focused on the marking. A reading (R_1) shall then be taken. One National Bureau of Standards Type No. 3215 Filter shall then be placed in the optical path between the panel and the meter. A second reading (R_2) shall then be taken. The ratio of R_2 to R_1 shall be greater than or equal to the value of the IPL Red Limit as determined from the calibration curve of the photometer (see 4.3.2). The IPL limit may also be determined by the method described in MIL-L-25467.

* 4.4.11.1 Color of light (Class 1W and 2W). The color of the white light emitted by the panels shall be determined for each of several markings on the panels. The particular method of measurement will be dictated by the special qualities of the materials and components used to produce the emergent white light. When incandescent lamps operated at specific color temperature values

are used in conjunction with nearly neutral white paints then the photometer may be used in a red-blue ratio method to determine the color temperature of the emitted white light. When the emitted white light is produced by electroluminescent lamps or incandescent lamps filtered to raise their apparent color temperature then the color of the light must be measured by a four filter photometer/colorimeter or by spectroradiometric methods. Either of the latter two instrumentation methods and associated procedures should be certified to accuracies within ± 0.005 x ± 0.005 y.

When disputes arise from measurement correlation differences between vendor and the procuring activity, rejection must be based upon measurements of the next higher order of accuracy as follows:

1. Red-Blue Ratio Method(Not acceptable for USAF white light)

2. Four Filter Photometer/Colorimeter

3. Spectroradiometric

4.4.12 Illumination. The panel shall be tested for compliance with all subparagraphs of 3.5.

* 4.4.12.1 Apparatus. The measuring apparatus shall consist of a suitable photometer which meets the parameters defined in 6.5.

* 4.4.12.2 Procedure. The front surface of the panel shall be perpendicular to the line of sight of the photometer. The lamps shall be aged and tested and shall be operated as specified on the applicable MS drawing. Tests shall be conducted in a dark room. The luminance of indicia on the panel and markings on illuminated knobs which are required for proper interpretation of the knob function shall be measured to determine compliance with specification requirements. Minimum and maximum luminance values shall be measured. Maximum and minimum marking luminance shall first be determined visually by reducing the panel lamp voltage until the dimmest markings visually disappear. Continue to reduce the voltage until the brightest markings visually disappear. Return the panel to test voltage and photometrically measure the luminance of the brightest and dimmest markings, as determined by the above visual inspection, using the measurement points of Figure 4 as a guide. The luminance values to be reported shall be an average of three measurements for each character, except that no single measurement may be more than 20 percent above or below the specification limits for luminance.

4.4.13 Gloss.

4.4.13.1 Apparatus. The apparatus shall consist of the equipment as specified in the American Society for Testing and Materials Standard, Method D523.

* 4.4.13.2 Procedure. The procedure shall be as specified by the American Society for Testing and Materials Standard, Method D523 (60° geometry). A sufficient number of readings shall be taken to enable a valid record to be made. This test, because of measurement area requirements, may not be applicable to all production panels.

4.4.14 Circuit continuity - Types IV and V.

4.4.14.1 Procedure. The panel shall be energized and visually examined to determine that each lamp is illuminated. The current comsumption shall also be measured and shall be within the limits as specified by the applicable MS drawing for the lamps used in the panel.

4.4.15 Insulation resistance - Types IV, V and VI.

* 4.5.15.1 Procedure. The panel shall be fastened to a conductive metal backplate having minimum dimensions equal to those of the panel. The backplate shall have clearance holes for all electrical connectors. A potential of 500 volts AC, 60 Hz. shall be applied between the backplate and all pins on the connector for 60 seconds. A potential of 500 volts DC shall then be applied between the backplate and each of the pins on the connector. The leakage current measured at 500 volts DC shall not exceed 50 microamperes.

* 4.4.16 Failed lamp - Type IV qualification panels only. The lamps shall be de-engergized at random locations on the test panel having individual leads or connectors brought out of the rear of the panel for each lamp. While a lamp is de-energized, the brightness of markings depending partially on the de-energized lamps for illumination shall be measured and shall meet the requirements of 3.5.3.

5. PACKAGING

5.1 Preservation and packaging.

5.1.1 Level A. The panels shall be preserved in accordance with MIL-P-116, Method III, and packed in accordance with MIL-STD-794. Unit quantities shall be as specified by the procuring activity.

5.1.2 Level C. The panels shall be preserved and packed in accordance with the manufacturer's commercial practice.

5.2 Packing and marking.

5.2.1 Packing. Packing shall be in accordance with Levels A, B, or C or MIL-STD-794 as required (6.2).

5.2.2 Marking. Interior and exterior containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The panels covered by this specification are intended for use on control and instrument panels for aircraft, ground, and shipboard applications. Panels for installation in aircraft should conform to MIL-C-6781 whenever possible.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Type and class of panels, and the quantity of each required.

(c) Level of packaging and packing required.

(d) Whether red or white light is required when the lighting units are energized.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the qualified manufacturer is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Naval Air Systems Command, AIR 533D4, Department of the Navy, Washington, D.C. 20360.

6.3.1 Samples. It is to be understood that upon receipt of the Letter of Authorization, Qualification Test panel (Figure 1) samples will be furnished at no cost to the Government, and that the manufacturer will pay the transportation charges to and from the designated point where tests are to be made. In the case

of failure of the sample or samples submitted, consideration will be given to the request of the manufacturer for additional tests only after it has been clearly shown that changes have been made in the product which the Government considers sufficient to warrant additional tests.

* 6.4 Mounting devices. Grommets for mounting production panels shall be in accordance with MS3498.

* 6.5 Illumination test facilities. The manufacturer must have Naval Air Systems Command certification of his ability to make accurate illumination measurements of the markings of panels covered by this specification. Request for authorization to obtain test facility approval should be addressed to the Commander, Naval Air Systems Command, AIR 533D4, Department of the Navy, Washington, D.C. 20360, the activity responsible for qualification, with a copy to the Commander, Wright-Patterson Air Force Base, Ohio. Equipment required and procedures for making the required illumination measurements should be as specified. It is to be understood that upon receipt of the letter of instruction on procedures for obtaining the test facility approval, samples required for comparison and all test equipment required to conduct tests will be provided at no cost to the Government and the manufacturer will pay all transportation costs for test samples required. The following equipment represents the minimum required for a test facility. This facility is required for manufacturers of panels procured under this specification.

6.5.1 Test equipment requirements.

* 6.5.1.1 Photometer. Each test facility shall have photometric equipment capable of measuring luminance and color according to the following specifications:

(a) Measured spot size - 0.004" to 0.007".

(b) Focus - no less than 4" from front of lens.

(c) Minimum full scale sensitivity 0.1 footlambert.

(d) Stability: ±2% zero and sensitivity drift over 8 hour period after 15 minute initial warmup.

(e) Polarization error: 1% maximum.

(f) Viewing system: must locate spot being measured with maximum error of 0.002".

(g) Unit shall have digital readout with a resolution of no less than 0.1% of full scale.

(h) It is desirable that the unit should have a fixed focus lens system with a capability of inserting two 2" square filters into the optical path.

(i) Colorimetric trim:

(1) Maximum Correction IPL Red Light (3215 Red vs. 2856 Kelvins) - ± 10% of Filter Transmittance.

(2) 4-Filter Tristimulus Colorimetric Capability - Maximum error for any Blackbody (lamp) Color Temperature: ± 0.005 x and y from 1800 to 2856 Kelvins when calibrated at 2856K for an ambient temperature excursion of 70°F ±5°.

(j) Yearly certification that the photometric equipment meets all of the above parameters is required.

6.5.1.2 Test equipment (electrical).

* 6.5.1.2.1 Voltmeters DC.

(a) Digital readout (4 full digits minimum).

(b) Ranges 0-20, 0-120 (minimum ranges).

(c) Accuracy ±0.05%

* 6.5.1.2.2 Ammeter.

(a) Digital readout (4 full digits minimum).

(b) Range 0-5 ampere (minimum range).

(c) Accuracy 0.07%.

Note: Suitable shunts may be used with the voltmeter above.

* 6.5.1.2.3 Power supply DC (for panel operation).

(a) Range: 0-30 volts minimum.

(b) Current: 0-5 ampere.

(c) Regulation: 0.05% line, maximum ripple 2mV RMS.

* 6.5.1.2.4 Power supply DC (for Standards)

(a) Range 0-130 volts (min.).

(b) Current 0-5 ampere (min.).

(c) Regulation: .02% line.

(d) Max. Ripple: 10mV RMS.

6.5.1.3 Test equipment (standards with National Bureau of Standards traceability.

* 6.5.1.3.1 Photometric.

* (a) Horizontal intensity and color: Three 500-watt incandescent lamps, medium bi-post basing, calibrated for horizontal luminous intensity shall be maintained. At least one of these lamps shall have a color temperature calibration curve to cover the range of 1800K to 2856K when used with an appropriate difuser. This lamp and at least one of the luminous intensity standards shall be re-calibrated yearly. or after 100 hours of use whichever occurs first.

* (b) Opal glass diffuser: One opal glass diffuser calibrated for luminous directional transmittance is required.

NOTE:

Standards of luminance and color temperature may be substituted for (a) and (b) above, provided that their accuracy is equivalent to that expected of the system described in paragraphs (a) and (b). If the system is self-powered, then the Standard DC power supply described in 6.5.1.2.3 may be deleted. If a self-contained calibration system is provided then the requirements of 6.5.1.4.2 may also be deleted. Recalibration shall be based upon the manufacturers recommendations for usage but shall be performed at least once yearly.

(c) Red filters: At least one Type NBS3215 filter is required.

(d) Chromaticity reference filters: One set of colored reference filters with data for checking the colorimetric accuracy of the photometer is required. (U.S. Navy Marine Engineering Laboratory, R&D report 91/66 of May 1966.)

6.5.1.4 Dark room facilities.

* 6.5.1.4.1 Dark room. A room designed to provide a dark environment per 4.3.2 shall be provided. The room shall be of sufficient size to provide adequate working area for personnel when all of the equipment required for a test facility is contained in the room. The room shall be temperature controlled to provide a 70°F ±5° ambient.

* 6.5.1.4.2 Photometric bench. A photometric bench for supporting and aligning the photometer and photometric standards shall be provided. The minimum length of the bench shall be 9 feet. Accessories for use with the bench shall include a means for supporting and positioning of the lamp standards, a means for supporting the opal glass, and adequate light baffles to exclude extraneous light.

* 6.5.1.4.3 Positioning device. A device for positioning the photometer and panels in a correct relationship for photometric/colorimetric measurements of the panel shall be provided. The device should provide for both vertical and horizontal movement of either the photometer or the panel.

* 6.6 Test equipment sources. The following list of equipment sources is intended to cover only those special items called for in this specification which are not readily available. Other items are considered to be available from multiple sources or capable of in-house fabrication.

* 6.6.1 Needles. Needles for the Surface Endurance test are available from the NAFI. (See 6.10)

* 6.6.2 Chromaticity reference filters. The Marine Engineering Laboratory Reference Filters may be obtained from:

(a) Hoffman Engineering Corporation
183R Sound Beach Avenue
Old Greenwich, CT 06870

(b) U.S. Naval Ship Research and Development Lab.
Annapolis, MD

* 6.6.3 Red filters (Type 3215). National Bureau of Standards Type 3215 Red Limit Filters may be obtained from:

Hoffman Engineering Corporation
183R Sound Beach Avenue
Old Greenwich, CT 06870

* 6.7 Laboratory personnel. Each test facility shall have at least one person who can demonstrate that he is knowledgeable of all of the specialized technical measurement requirements of this specification and should be prepared to demonstrate all of the measurement procedures at any time the test facility is inspected. Evidence of completion of specialized instruction in display illumination measurements for aerospace vehicles is desirable.

* 6.8 Adapter plug MS90335-9. This adapter plug has been designed to allow the conversion from Type III lighting panels which utilize the MS25010 light assemblies to either Type IV or V panels. The plug replaces the MS25010 and is screwed into either the MS25010A or MS25010B receptacles located in the control panel box. Any one of the receptacles located in the panel may be used for the adapter insertion. The adapter now provides an electrical connection to the MS90335-7 or 8 plugs which are used in the Type IV and V panels respectively. This conversion allows complete updating of the illumination for all Type III panels without modification of any kind to the control panel box.

6.9 Mockup. A mockup of the lighting panel display should be provided as required by the Procuring Activity.

* 6.10 Measurements. Any question as to acceptability of lighting measurements should be referred to:

Naval Avionics Facility
6001 East 21st Street
Indianapolis, IN 46218
Metrology Division
Code 430

6.11 "Component parts". "Component parts" are defined as switches, rheostats, and other controls mounted on the mounting plate and requiring lighting by the information panel.

* 6.12 Cross reference from MS documents to W-L documents.

MS ITEMS	W-L-0111		Q.P.L.
MS24515-682AS15	W-L-00111/26	**	QPL-W-L-00111-1
MS24515-685AS15	W-L-00111/27	**	"
MS24515-714AS15	W-L-00111/28	**	"
MS24515-718AS15	W-L-00111/29	**	"
MS25237-327	W-L-00111/1		"
MS25237-328	W-L-00111/3		"
MS25237-330	W-L-00111/5		"
MS25237-338	W-L-00111/6		"
MS94451-6802AS15	W-L-00111/15		"
MS94451-6832AS15	W-L-00111/16		"
MS94451-7132AS15	W-L-00111/17		"
MS94451-7152AS15	W-L-00111/18		"
MS90452-6803AS15	W-L-00111/19		"
MS90452-6833AS15	W-L-00111/20		"
MS90452-7133AS15	W-L-00111/21		"
MS90452-7153AS15	W-L-00111/22		"
MS24367-680AS15	W-L-00111/30	**	"
MS24367-683AS15	W-L-00111/31	**	"
MS24367-713AS15	W-L-00111/32	**	"
MS24367-715AS15	W-L-00111/33	**	"

** Except that the MSC tolerance shall be ±15%

* 6.13 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - AV
Navy - AS
Air Force - 11

Preparing Activity:
Navy - AS

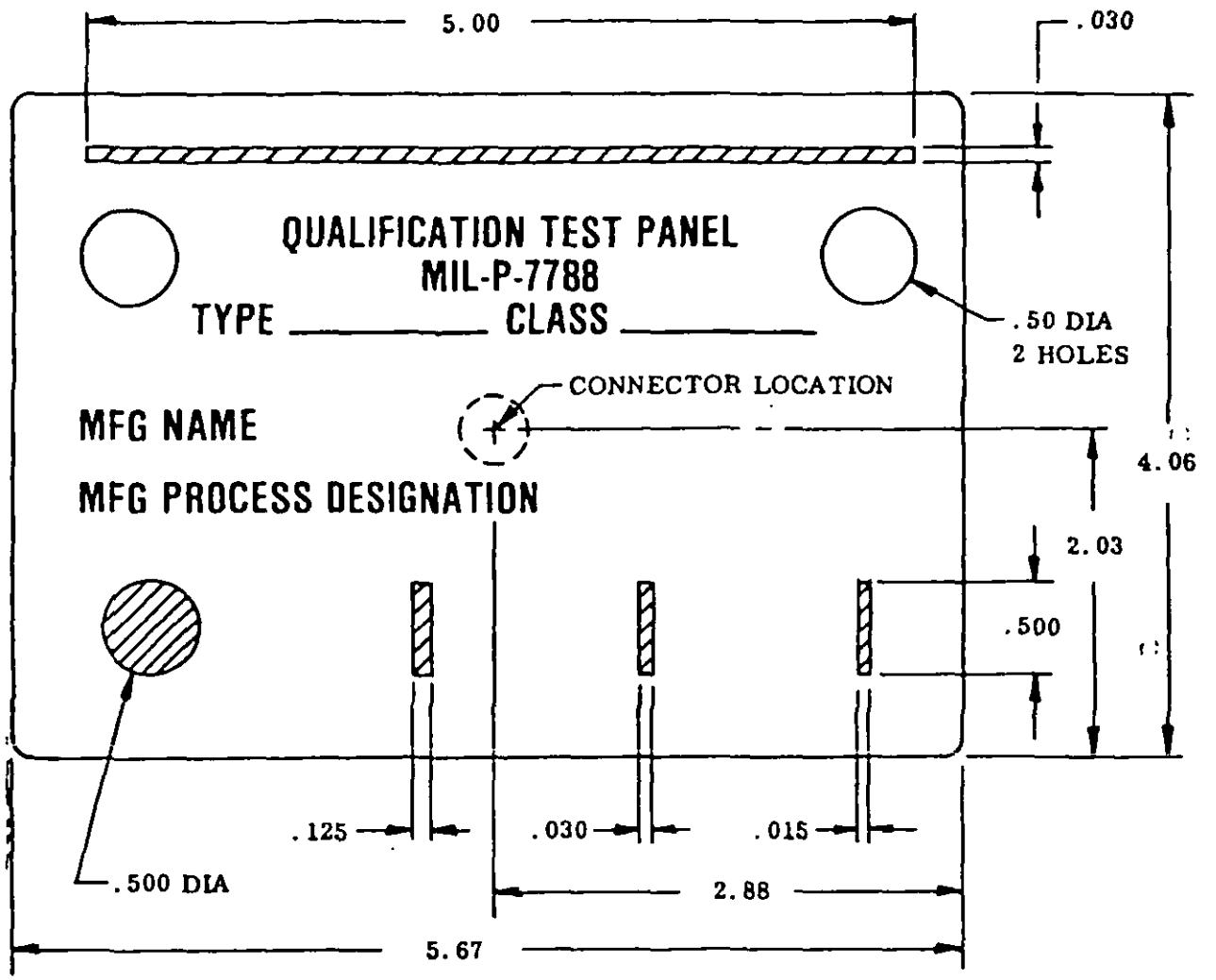
(Project No. 6220-0257)

Review activities:
Army MI
Navy MC, SH
Air Force 11, 99

* NOTICE: Reviewer/user information is current as of date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.

TABLE I. Classification of defects in accordance with MIL-STD-105.
(see 4.4.1)

Categories	Defects
Critical	None defined.
Major: 101	Panel not complete; component parts missing.
102	Type of finish not as specified or chipped or peeled or area of no film or thin film affecting serviceability or appearance.
103	Panel dimensions not within tolerance.
104	Design characteristics not in accordance with the specified requirements.
105	Any components not fabricated of the specified material or the type material authorized in the approved sample.
106	Panel markings not located as specified; not legible; data incomplete.
107	Corrosion of electrical connector.
108	Faulty workmanship which would impair the function of the panel.
Minor: 201	Faulty workmanship which would not impair the function of the panel.



DWG TOLERANCE ON DIMENSIONS ±0.005"

WHITE TRANSLUCENT AREA.

NOTES: ALL LETTERS AND NUMERALS SHALL BE 5/32" HIGH AND IN ACCORDANCE WITH 3.4.3.4.

ON TYPE IV PANELS LAMP LOCATIONS AND CIRCUIT SHALL BE MARKED ON THE REAR OF THE PANEL IN ACCORDANCE WITH 3.4.1.3.

FIGURE 1. Qualification sample, Type IV, V, and VI panels, all classes.
(see 3.1, 4.2.1 and 6.3.1)

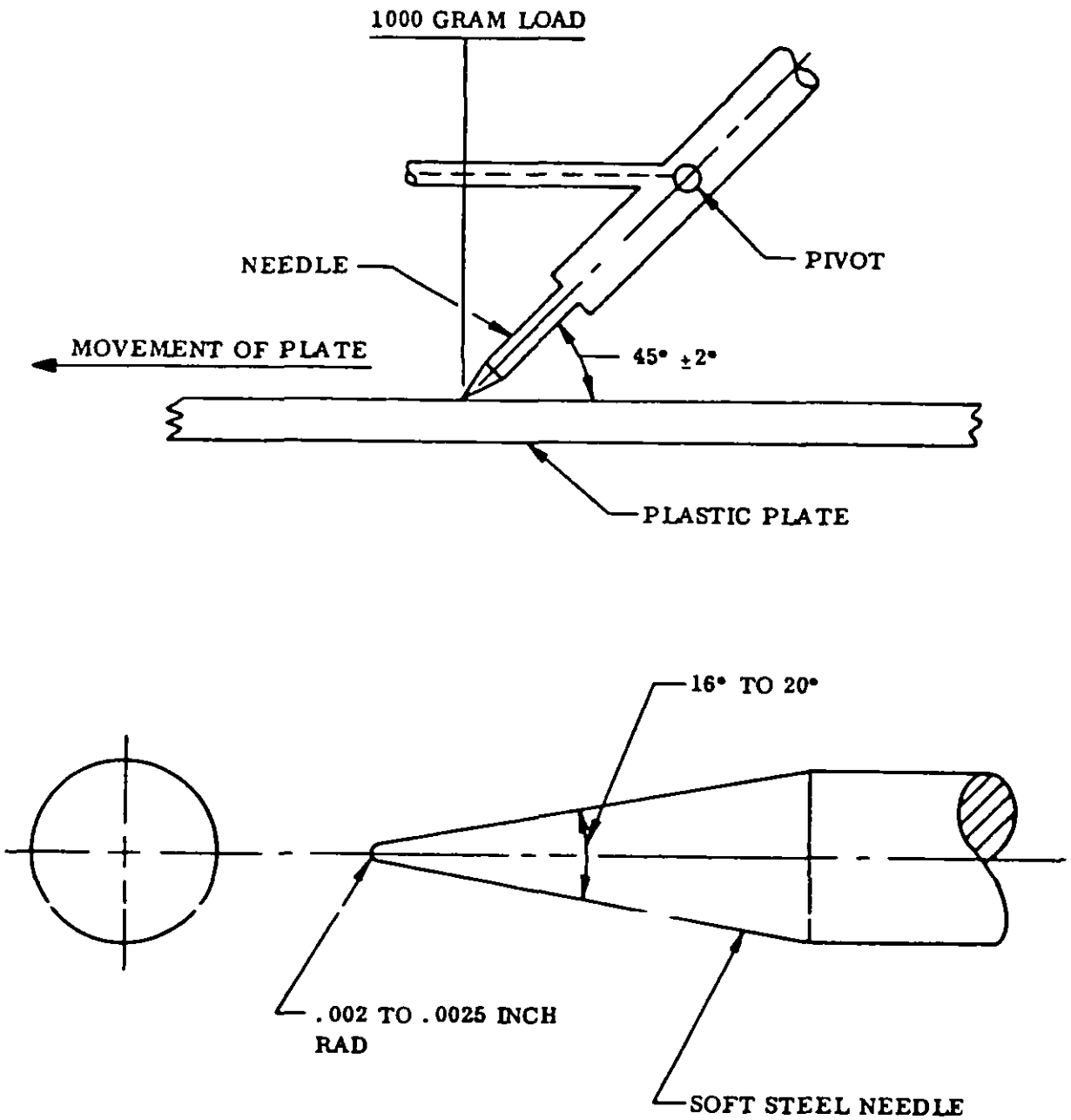
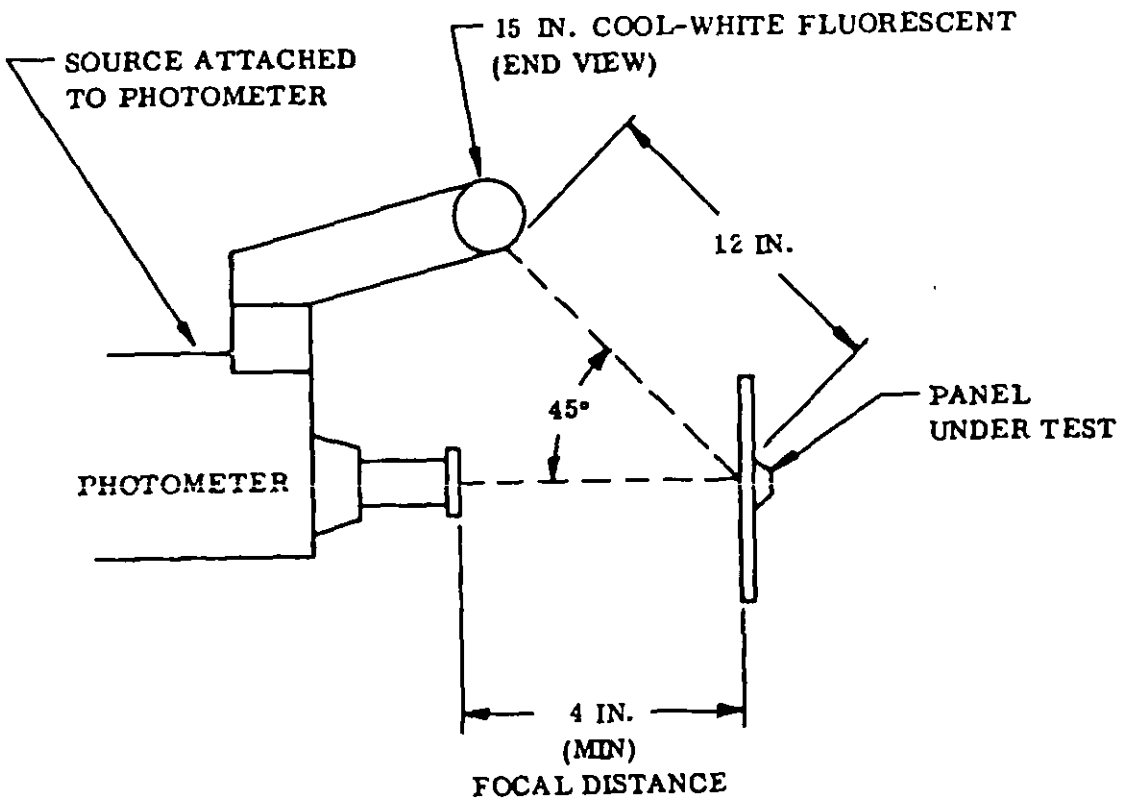
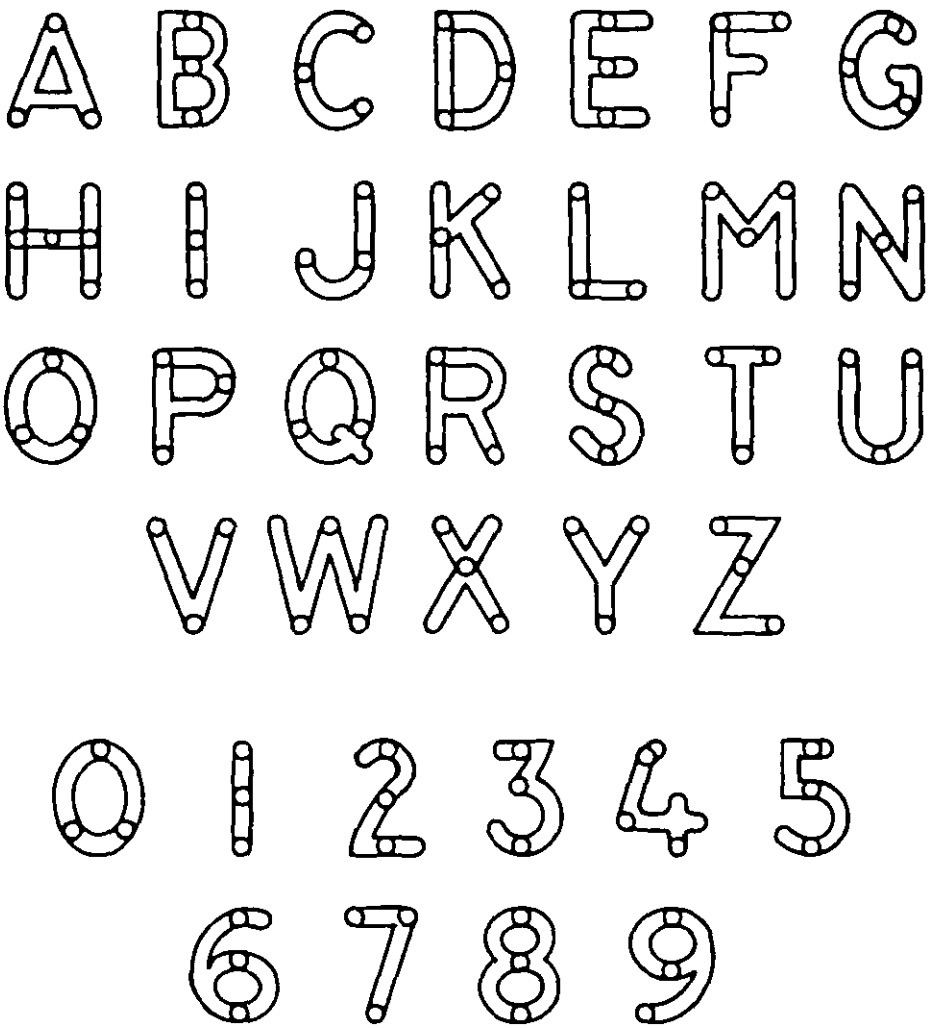


FIGURE 2. Surface endurance test apparatus.
(see 4.4.6.1)



ILLUMINANCE AT PANEL IS APPROXIMATELY
50 FOOT CANDLES.

FIGURE 3. (see 4.4.9.1 and 4.4.9.2)



POINTS FOR CHARACTER LUMINANCE MEASUREMENTS

NOTE: Variations may be necessary for other type fonts.

FIGURE 4. (see 4.4.12.2)

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

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(Fold along this line)

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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