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USACE / NAVFAC / AFCESA / NASA **UFGS-26 56 23.00 40 (November 2008)**

Preparing Activity: NASA **(New)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2009
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SECTION TABLE OF CONTENTS

DIVISION 26 - ELECTRICAL

SECTION 26 56 23.00 40

AREA LIGHTING

11/08

-- End of Section Table of Contents --

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SECTION 26 56 23.00 40

AREA LIGHTING
11/08

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NOTE: This guide specification covers area lighting system requirements for exterior installations and recreational areas.

This specification does not cover all possible methods or requirements for exterior lighting; therefore, designer should add special information required to suit a specific project. Industry publications exist to aid the designer in choosing the best lighting system for the project. One such publication is Illuminating Engineering Society (IESNA) RP-8, RECOMMENDED PRACTICE FOR ROADWAY LIGHTING.

Use UFGS Section 26 09 23.00 40 LIGHTING CONTROL DEVICES for control devices (includes tailoring for exterior lighting).

Use UFGS Section 26 55 53.00 40 SECURITY LIGHTING for security and Closed Circuit Television (CCTV) special lighting.

Use UFGS Section 26 56 13.00 40 LIGHTING POLES AND STANDARDS for pole or standard, including mounting and base accessories of exterior fixtures.

Use UFGS Section 26 56 19.00 40 ROADWAY LIGHTING for roadway and street lighting.

Use UFGS Section 26 56 36.00 40 FLOOD LIGHTING for facility and grounds flood lighting.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are

welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).
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NOTE: TO DOWNLOAD UFGS GRAPHICS

Go to http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.
****

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NOTE: This section contains the following sketches (Graphics) and are available in metric (SI) and U.S. Customary (IP) system dimensions. Sketch titles and style numbers are unchanged for both types. The metric values indicated are a conversion of U.S. Customary (IP) system dimensions.

Do not include list of sketches, or sketches themselves, in project specifications. Use luminaire sketches as details on drawings whenever possible. If special features are required, do not modify sketches, but indicate these changes as notes in fixture schedule. The "XL" style numbers and dates should remain on the drawing details.

Sketch No.	Title
XL-1	Roadway and Area Light
XL-4	Roadway and Area Light
XL-5	Sports and Area Light
XL-6	Area and Street Lighting Cutoff Luminaire
XL-7	Low-Pressure Sodium Area Lighting Luminaire
XL-8	Area Luminaire
XL-9	Round Architectural Post Top Area Light
XL-10	Square Architectural Post Top Area Light
XL-11	Area Light (Vertical Lamp)
XL-12	HID Bollard Luminaire
XL-13 thru 19	Reserved for Future Exterior Luminaires

NOTE: Do not include this index in project specification.
****

****
NOTE: Show the following information on the drawings or specify in the project specifications:

a. Luminaire schedule and indicate pertinent information; i.e., mounting, lamps, ballasts, and voltage.

1. Type of luminaire;

2. Voltage, wattage, and frequency rating required;

3. Accessories required, such as photocell, time switches, and auxiliary lamps;

4. Location of poles or standards;

5. Referenced sketch; and

6. Extent and location of the work to be accomplished and wiring and equipment necessary for a complete installation.

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NOTE: Demolition work that involves disposal of fluorescent and HID lamps and ballasts will require the use of Section 02 84 16 - HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY.

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PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 2129	(2005) Standard Practice for Data Collection for Sustainability Assessment of Building Products

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-9	(2000; Errata 2004; Errata 2005) IES Lighting Handbook

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2007; INT 2008) National Electrical Safety Code
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2003) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ANSLG C78.41	(2006) Guidelines for Low-Pressure Sodium Lamps
NEMA ANSLG C78.42	(2007) Standard for High-Pressure Sodium Lamps
NEMA C78.1381	(1998) Electric Lamps - 250-Watt, 70 Watt, M85 Metal-Halide Lamps
NEMA C78.43	(2007) Standard for Electric Lamps - Single-Ended Metal-Halide Lamps
NEMA C82.4	(2002) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System

UNDERWRITERS LABORATORIES (UL)

UL 1029	(1994; Rev thru Dec 2007) Standard for Safety High-Intensity-Discharge Lamp Ballasts
UL 1598	(2008; Rev thru Nov 2008) Luminaires

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE Std 100.

Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.3 SUBMITTALS

****

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Luminaire drawings[; G][; G, [_____]]

SD-03 Product Data

[Local/Regional Materials

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.]

[Environmental Data]

Energy Efficiency

Luminaires[; G][; G, [_____]]

Lamps[; G][; G, [_____]]

Ballasts[; G][; G, [_____]]

[Auxiliary instant-on quartz system[; G][; G, [_____]]]

[SD-04 Samples

****
NOTE: Samples involve additional shipping cost. Use only for special fixtures or for an item for which a large quantity is required on a project. If samples are not essential to the specific application, delete them.
****

Luminaires[; G][; G, [_____]]

Submit one sample of each luminaire type[, complete with lamp and ballast].[Submit one sample for each item other than luminaires.] Sample will be returned to the Contractor for installation in the project work.

] SD-05 Design Data

Design Data for luminaires[; G][; G, [_____]]

SD-06 Test Reports

Operating test

Submit operating test results as stated in paragraph entitled "Field Quality Control."

SD-08 Manufacturer's Instructions

Mounting Details

Submit instructions prior to installation.

SD-10 Operation and Maintenance Data

Operational Service

Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

1.4 QUALITY ASSURANCE

1.4.1 Drawing Requirements

1.4.1.1 Luminaire Drawings

Include dimensions, effective projected area (EPA), accessories, and installation and construction details. Accompany shop drawings with

photometric data, including zonal lumen data, average and minimum ratio, aiming diagram, and[computerized] candlepower distribution data.

1.4.2 Design Data for Luminaires

****
NOTE: Depending on the ambient brightness of the site surroundings and each lamp's initial lumens, luminaires shall have IESNA full or semi cutoff designation. Maximum initial horizontal illumination at ground level shall be limited to the most current IESNA Lighting Handbook recommendations for exterior luminaires. Designing lighting to reduce light pollution contributes to the following LEED credit: SS8.
****

a. Distribution data according to IESNA classification type as defined in IESNA HB-9.

b. Computerized horizontal illumination levels in lux footcandles at ground level, taken every [3050][6100][_____] mm [10][20][_____] feet. Include average maintained lux footcandle level and maximum and minimum ratio.

c. Amount of shielding on luminaires.

1.4.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory,for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.4 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship, which have been in satisfactory commercial or industrial use for 2 years prior to bid opening under similar circumstances and of similar size. The product is to have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.4.2 Material and Equipment Manufacturing Date

Products manufactured more than [3] [_____] years prior to date of delivery to site are not allowed, unless specified otherwise.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle fixtures, lamps, and all related accessories and other manufactured items in a manner to prevent damage or deformation.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

****
NOTE: Using local materials can help minimize transportation impacts, including fossil fuel consumption, air pollution, and labor.
****

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a [500][_____] mile [800][_____] kilometer radius from the project site, if available from a minimum of three sources.

1.6.2 Environmental Data

****
NOTE: ASTM E 2129 provides for detailed documentation of the sustainability aspects of products used in the project. This level of detail may be useful to the Contractor, Government, building occupants, or the public in assessing the sustainability of these products.
****

[Submit Table 1 of ASTM E 2129 for the following products: [_____].]

1.6.3 Energy Efficiency

****
NOTE: Use Energy Star requirements for all lighting. Design according to IESNA Recommended Practice Manual, Lighting for Exterior Environments. Design according to LEED requirements for credit SS8.
****

****
NOTE: The Energy Policy Act of 2005 requires new buildings to use 30 percent less energy than the ASHRAE 90.1 level. Efficient lighting equipment contributes to the following LEED credits: EA Prerequisite 2; EA1.
****

Comply with National Energy Policy Act and Energy Star requirements for lighting products. [Submit documentation for Energy Star qualifications for equipment provided under this section.]Submit data indicating lumens per watt efficiency and color rendition index of light source.

1.7 WARRANTY

Provide support for the equipment items by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

[1.8 POWER SOURCE

[Use a photovoltaic power source.]

]1.9 OPERATIONAL SERVICE

****
NOTE: Maintenance agreements are standard practice in the building industry. Take-back programs refer to programs in which the product manufacturer "takes-back" scrap material and/or packaging associated with its product. Under a green lease, when the customer no longer requires the use of the particular product or requires an updated model, the manufacturer is obligated to reclaim it and refurbish it or disassemble it for recycling as appropriate. Using one of these manufacturer's services contributes to the following LEED credit: MR2.

NOTE: This is optional for Army and NASA Projects.
****

Coordinate with manufacturer for [maintenance agreement] [take-back program]. Collect information from the manufacturer about [maintenance agreement] [green lease] options, and submit to the Contracting Officer. [Maintenance agreement] [Green lease] for services to reclaim materials for recycling and/or reuse may not be used for landfill or burned. Indicate procedures for compliance with regulations governing disposal of mercury. When such a service is not available, seek local recyclers to reclaim the materials.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Products and materials not considered to be lighting equipment or lighting fixture accessories are specified in[Section 33 71 02.00 20 UNDERGROUND ELECTRICAL DISTRIBUTION,] Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION,[Section 33 70 02.00 10 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND,][and] Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.[Lighting fixtures and accessories mounted on exterior surfaces of buildings are specified in Section 26 51 00 INTERIOR LIGHTING.]

2.2 LUMINAIRES

****
NOTE: Luminaire, ballast, and lamp design and technology have advanced rapidly in recent years; ensure a luminaire is currently available before specifying. Light distribution and brightness

characteristics can be helpful for comparison, selection, and special applications of exterior luminaires. Computer programs for lighting design are available from many sources including IESNA and luminaire manufacturers.

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NOTE: As an exception to what may normally be specified, lenses and refractors of acrylic or polycarbonate plastic should be specified if secondary damage by the breakage of a refractor cannot be tolerated. Some plastic refractors are subject to yellowing and in general are not as desirable as glass refractors. Of the plastics, acrylic plastic refractors offer the most desirable properties. If vandalism is a serious problem, polycarbonate plastic refractors are less susceptible to breakage but are susceptible to yellowing after a relatively short period of time. Other types of plastic refractors are available and should be investigated for special applications. Do not use metal-halide lamps without a tempered glass diffuser.

****

Provide luminaires conforming to UL 1598 as indicated. Provide luminaires complete with lamps of number, type, and wattage indicated. Details, shapes, and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs[, light distribution and brightness characteristics,] and of equal finish and quality will be acceptable as approved. Include copies of manufacturer's mounting details for each type of system.

2.2.1 Lamps

2.2.1.1 High-Pressure Sodium (HPS) Lamps

NEMA ANSLG C78.42. Wattage as indicated. Provide HPS lamps having an average rated life of 16,000 hours (minimum) for 35 watt lamps and 24,000 hours (minimum) for all higher wattage lamps.[Provide 150 watt lamps, if required, as 55 volt lamps.] Provide lamps with Luminaire Efficiency Ratings (LER) as follows:

a. Upward efficiency of 0 percent

    1. 150-399 watts: minimum 58 LER for closed fixture; minimum 68 for open fixture

    2. 400-999 watts: minimum 63 LER for closed fixture; minimum 84 for open fixture

b. Upward efficiency of 1 percent-10 percent

    1. 150-399 watts: minimum 64 LER for closed fixture; minimum 63 for open fixture

    2. 400-999 watts: minimum 82 LER for closed fixture; minimum 89 for

open fixture

3. 1000+ watts: minimum 109 LER for open fixture

c. Upward efficiency of 11 percent to 20 percent

1. 150-399 watts: minimum 78 LER for open fixture

2. 400-999 watts: minimum 94 for open fixture

d. Upward efficiency greater than 20 percent

1. 150-399 watts: minimum 75 LER for closed fixture; minimum 77 for open fixture

[2.2.1.2 Standby HPS Lamps

****
NOTE: In some applications, generally where power interruptions are momentary, standby HPS may be used instead of auxiliary Instant-On Quartz systems. Standby HPS are mogul base only.
****

NEMA ANSLG C78.42. Wattage as indicated. Provide standby HPS lamps having two arc tubes and an average rated life of 40,000 hours (minimum), with hot restart instant lumen output of 8 percent, minimum, of total light output. Provide 150 watt lamps, if required, 55 volt type.

][2.2.1.3 Low-Pressure Sodium (LPS) Lamps

****
NOTE: Use low-pressure sodium where high lamp efficiency is a factor, but color rendition is not.
****

NEMA ANSLG C78.41.

][2.2.1.4 Metal-Halide Lamps

Provide luminaires with tempered glass lens.

[a. Double-ended, 70 watt, conforming to NEMA C78.1381]

[b. Single-ended, wattage as indicated, conforming to NEMA C78.43]

Provide lamps with Luminaire Efficiency Ratings (LER) as follows:

a. Upward efficiency of 0 percent

1. 150-399 watts: minimum 41 LER for closed fixture

2. 400-999 watts: minimum 53 LER for closed fixture; minimum 59 for open fixture

3. 1000+ watts: minimum 77 LER for closed fixture

b. Upward efficiency of 1 percent-10 percent

1. 150-399 watts: minimum 56 LER for closed fixture

2. 400-999 watts: minimum 62 LER for closed fixture; minimum 64 for open fixture

3. 1000+ watts: minimum 88 LER for open fixture

c. Upward efficiency greater than 20 percent

1. 150-399 watts: minimum 62 LER for closed fixture; minimum 77 for open fixture

2. 400-999 watts: minimum 65 LER for closed fixture

]2.2.2 Ballasts for High-Intensity-Discharge (HID) Luminaires

Provide ballasts conforming to UL 1029 and NEMA C82.4, with constant wattage autotransformer (CWA) or regulator, high power-factor type (minimum 90 percent). Provide single-lamp ballasts which have a minimum starting temperature of minus 30 degrees C. Provide ballasts:

a. designed to operate on voltage system to which they are connected.

b. constructed so that open circuit operation will not reduce the average life.

Provide HID ballasts with a solid-state igniter/starter with an average life in the pulsing mode of 10,000 hours at the intended ambient temperature. Igniter case temperature is not to exceed 90 degrees C.

[2.3 AUXILIARY INSTANT-ON QUARTZ SYSTEM

****
NOTE: Specify auxiliary quartz system or standby HPS lamps for luminaires where the extinguishing of HID lamps caused by momentary power interruptions is unacceptable for safety or security reasons.
****

Provide UL listed, automatically switched instant-on[150][250]-watt[quartz][_____] lamp, with quartz lamp which comes on when the luminaire is initially energized and immediately after a momentary power outage, and remains on until HID lamp reaches approximately 60 percent light output. Quartz lamp wiring is to be internal to ballast and independent of incoming line voltage to the ballast.[Provide instant-on quartz system for each HID fixture.][Provide instant-on quartz system as indicated.]

]2.4 EQUIPMENT IDENTIFICATION

2.4.1 Manufacturer's Nameplate

Provide each item of equipment with a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent is not acceptable.

2.4.2 Labels

****

NOTE: Labeling of lighting components is an inexpensive and effective method for helping facilities personnel properly operate and maintain the lighting systems. Use labels which are easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Refer to the FEMP guidelines for lighting at http://www.eere.energy.gov/femp/technologies/eep_lighting_guidance.cfm**.**

****

Provide labeled luminaires in accordance with UL 1598 requirements, clearly marked for operation of specific lamps and ballasts according to proper lamp type. Note the following lamp characteristics in the format "Use Only [_____]":

a. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.

b. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.

c. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.

d. ANSI ballast type (M98, M57, etc.) for HID luminaires.

e. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

Make markings related to lamp type clear and locate to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Provide ballasts with clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.5 FACTORY APPLIED FINISH

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NOTE: This paragraph covers only the basic painting requirements for most electrical equipment. Include any special finishes for high or low temperatures and corrosive atmospheres.

****

Factory apply painting system to electrical equipment which as a minimum, meets the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Provide electrical installations conforming to IEEE C2, NFPA 70, and to the requirements specified herein.

3.1.1 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.[Mount switch on or beside each luminaire when switch is provided in cast weatherproof

aluminum housing with swivel arm.][Set adjustable window slide for [_____] lux [_____] footcandles photocell turn-on.]

3.1.2 GROUNDING

Ground noncurrent-carrying parts of equipment including[metal poles,] luminaires, mounting arms, brackets, and metallic enclosures as specified in Section[33 71 02.00 20 UNDERGROUND ELECTRICAL DISTRIBUTION][33 70 02.00 10 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND]. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.1.3 FIELD APPLIED PAINTING

****
NOTE: Use and coordinate paint and coating requirements with Section 09 90 00 PAINTS AND COATINGS when provided in the job. When requirements are beyond what is specified in Section 09 90 00 PAINTS AND COATINGS specify the requirements in this paragraph.
****

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting is as specified in Section 09 90 00 PAINTS AND COATINGS.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test in the presence of the Contracting Officer to show that the equipment operates in accordance with the requirements of this section.

-- End of Section --