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USACE / NAVFAC / AFCEA UFGS-16553N (September 1999)  
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Preparing Activity: NAVFAC Replacing without revision  
NFGS of same number and date

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 22 December 2004

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### SECTION 16553N

#### SURGICAL LIGHTING FIXTURES

09/99

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NOTE: This guide specification covers the requirements for surgical lighting fixtures and similar related specialities.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of 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).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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NOTE: This guide specification shall be used in conjunction with additional design guidance supplied for that particular project.

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NOTE: The following information shall be shown on the project drawings:

1. Lighting fixture schedule.
2. Lighting fixture wiring diagram.

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: Issue (date) of references included in

project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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

ASTM INTERNATIONAL (ASTM)

ASTM E 308 (2001) Computing the Colors of Objects by Using the CIE System

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ST 20 (1992; R 1997) Dry-Type Transformers for General Applications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2005) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 544 (1998) Medical and Dental Equipment

## 1.2 RELATED REQUIREMENTS

Section 11700 GENERAL REQUIREMENTS FOR MEDICAL AND DENTAL EQUIPMENT, Section 16050N BASIC ELECTRICAL MATERIALS AND METHODS, Section 16402 INTERIOR DISTRIBUTION SYSTEM, apply to this section with the additions and modifications specified herein.

## 1.3 DESIGN REQUIREMENTS

### 1.3.1 Lighthouse Illumination Level

Lighthouse shall produce a minimum of [80,000 lux] [7440 footcandles] [\_\_\_\_\_] of illumination when measured at 1070 mm 42 inches from the face of the light.

### 1.3.2 Color Temperature

Correlated color of the lightbeam shall be between 3,500 degrees and 6,700 degrees Kelvin after filtration, as measured on the ASTM E 308 chromaticity diagram.

### 1.3.3 Shadow Reduction

Lighting system shall provide a minimum level of 10 percent of the unshadowed level when measured inside and at the bottom of a tube 50 mm 2 inch in diameter, and 76 mm 3 inch long, from a distance of 1070 mm 42 inches when the beam is obstructed by a disk 254 mm 10 inch in diameter, 580 mm 23 inches above the operating table, and normal to the axis of the tube. Paint inside of tube with flat black.

#### 1.3.4 Beam Temperature

Radiant heat energy in the light beam 1070 mm 42 inches below the lighthouse shall not exceed 25,000 microwatts per square centimeter at maximum intensity in the light pattern.

#### 1.3.5 Pattern Size

Smallest pattern size in the focal range shall be a minimum of 150 mm 6 inches. Pattern size shall be adjustable by either raising and lowering the unit or through operation of a focus control which changes the pattern size without movement of the unit.

#### 1.3.6 Current Leakage

A maximum of 0.1 milliamperes, as measured between the metal parts and ground.

#### 1.4 SUBMITTALS

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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. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. 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 Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for

the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation drawings; G

SD-03 Product Data

Light fixtures; G

Controls; G

Surgical Light Transformer; G

SD-07 Certificates

Installation report

Design requirements

Certify that the equipment has been properly installed, adjusted, and tested, and that each surgical light fixture meets the provisions of the paragraph entitled "Design Requirements."

SD-10 Operation and Maintenance Data

Light fixtures, Data Package 5

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

1.5 QUALITY ASSURANCE

1.5.1 Installation drawings

Submit shop drawing for each specified lighting fixture to include the following:

- a. Mounting detail for the lighting fixture[, transformer and control] assembly.
- b. Wiring diagrams indicating the internal wiring for each item of equipment, the interconnections between the items of equipment and connections to normal and emergency power in the building. Manufacturer's catalog data may be submitted for internal wiring description.

1.6 DELIVERY, STORAGE, AND HANDLING

Package each lighting fixture and protect in accordance with the manufacturer's instructions.

## PART 2 PRODUCTS

### 2.1 LIGHT FIXTURES

#### 2.1.1 One Lighthouse

One lighthouse, ceiling mounted on a single extension arm assembly. Lighthouse shall rotate within a clearance circle of 4720 mm 15 1/2 feet and the lighthouse center describes a circle 3810 mm 12 1/2 feet when fully extended. Center of lighthouse adjustable vertically from 1190 mm 3 feet 11 inches to 2250 mm 7 feet 4 1/2 inches above the floor.

#### 2.1.2 Two Lighthouses

Two lighthouses, ceiling mounted on a dual extension arm assembly. One lighthouse mounted on the shorter arm and the other lighthouse mounted on the longer arm to enable the outer lighthouse to pass by the inner lighthouse without interference. Outer lighthouse shall rotate within a clearance circle of 4720 mm 15 1/2 feet and the lighthouse center describes a circle 3810 mm 12 1/2 feet when fully extended. Center of the lighthouse shall be adjustable vertically from 1190 mm 3 feet 11 inches to 2250 mm 7 feet 4 1/2 inches above the floor.

#### 2.1.3 Track Mounted Light Fixtures

[Single-track system with one or more lighthouses] [or] [dual-track system with one or more lighthouses] per track. Lighthouses are suspended from a carriage which rides in track [or tracks] mounted in the ceiling. Steel suspension tube shall have sufficient length for cutting to the proper length at installation.

##### 2.1.3.1 Light Ceiling Tracks

Ceiling tracks shall have end closures finished to match the fixture and shall have an opening in bottom a maximum of 50 mm 2 inches wide extending the entire length of track to receive the part of the carriage that moves inside the track. Provide each track with insulated duct enclosing two copper bus bars, and a grounding path. Provide tracks with all the necessary components for mounting, and provide for sliding, nonsparking electrical contacts and current-conducting components within the track.

##### 2.1.3.2 [One] [and] [Two] Lighthouse[s]

Lighthouse shall rotate within a clearance circle of 2800 mm 9 feet 2 inches and the lighthouse center describes a circle 1900 mm 3 feet when fully extended. Lighthouse center shall be adjustable vertically from 1200 mm 3 feet 11 inches to 2200 mm 7 feet 2 inches above the floor.

##### 2.1.3.3 Fixture on Two Parallel Tracks

Two lighthouses; twin track mounted; including two parallel, 2745 mm 9 foot long, surface-mounted fixed tracks, each with a lighthouse and carriage.

##### 2.1.3.4 Fixture on Single Lighthouse Track

Single lighthouse; short track mounted; including a 1370 mm 54 inch long, surface-mounted fixed track with a lighthouse, and carriage.

#### 2.1.4 Components

UL 544; The surgical lighting fixtures shall be specifically design for use in surgical operating rooms.

#### 2.1.5 Electrical Characteristics

120 volts, 60 Hz, single-phase, three-wire grounded circuits.

#### 2.1.6 Lamp

[Quartz halogen] [\_\_\_\_\_] enclosed by heat-absorbing filter. Lamp shall be color corrected and heat filtered and shall have a minimum lifespan of 500 hours. Furnish one spare lamp with each lighthead.

#### 2.1.7 Suspension Systems

Mount each lighthead on a counterbalanced arm that can rotate 6.28 rad 360 degrees horizontally and can provide both vertical and horizontal adjustments. Fixture shall be controllable from both inside and outside the sterile field and shall move in a free, smooth, and silent manner throughout its range of maneuverability without drifting, regardless of position. [In systems with multiple arms attached to the same mount, each individual arm and lighthead shall operate independently and shall be mounted so that each individual arm and lighthead can be positioned outside the sterile area, can bypass each other and be raised, and can be lowered and rotated.]

#### [2.1.8 Movement Limits

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**NOTE: Include this paragraph where flammable anesthetics are used.**  
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Provide lighthead with stops which shall prevent surgical light from being lowered less than 1520 mm 5 feet above the finished floor.

#### ]2.2 CONTROLS

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**NOTE: Designer should coordinate with User for the number of controllers required and indicate this information on the drawing.**  
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[Recessed] [or] [Surfaced] mounted. Include circuit breaker, an on/off switch located outside the sterile field, and a pilot light. Controls shall have a continuously variable intensity control range from the maximum lux footcandle rating of the lighting fixture to a minimum of 60 percent of the maximum lux footcandle rating of the lighting fixture. Include a radio frequency suppressor. Provide time-of-use meter to determine when to replace the lamp. Provide control units with electrical plug connections designed to allow eased of service or replacement.

#### 2.3 SURGICAL LIGHT TRANSFORMER

NEMA ST 20, [\_\_\_\_\_] VA, 120 V, 60 Hz primary, 22.8 V - 24 V, 60 Hz secondary.



## PART 3 EXECUTION

### 3.1 INSTALLATION

Section 11700 GENERAL REQUIREMENTS FOR MEDICAL AND DENTAL EQUIPMENT, and NFPA 70. Install lighthead in accordance with the approved installation drawings and submit installation report for each lighthead.

#### 3.1.1 Wiring Methods

Provide conduit and wiring in accordance with Section 16402 INTERIOR DISTRIBUTION SYSTEM.

##### [3.1.1.1 Outlet Box

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**NOTE: Delete this paragraph if lighthead intensity control is surface mounted.**  
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Provide three-gang outlet box 75 mm 3 inches depth for recessed mounted intensity control. Install box 1525 mm 5 feet from finished floor to center line of box.

##### ]3.1.2 Surgical Light Transformer

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**NOTE: Locate transformer so that the maximum length of wires shall not exceed 9144 mm 30 feet from transformer to the lighthead.**  
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Provide [mounting bracket] [seismic anchoring] for the transformer. Mount transformer on the [ceiling] [wall, 1525 mm 5 feet, minimum, from finished floor].

### 3.2 FIELD QUALITY CONTROL

#### 3.2.1 Inspection

Examine each item visually for conformance to the requirements of this section.

#### 3.2.2 Tests

Upon completion of installation, conduct an operating test to demonstrate that each surgical lighting fixture meets the requirements of this section.

-- End of Section --