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USACE / NAVFAC / AFCEC / NASA **UFGS-11 27 13 (April 2006)**

Preparing Activity: NAVFAC **Replacing without change UFGS-11475 (August 2001)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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04/06

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SECTION 11 27 13

RADIOGRAPHIC DARKROOM EQUIPMENT
04/06

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NOTE: This guide specification covers the requirements for radiographic darkroom equipment.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

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

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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NOTE: On the drawings, show equipment covered by this section and the relationship to adjacent work.

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NOTE: To avoid repetition, general requirements common to other medical and dental equipment sections are in Section 11 70 00 GENERAL REQUIREMENTS FOR MEDICAL AND DENTAL EQUIPMENT.

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PART 1 GENERAL

1.1 REFERENCES

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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 Reference Identifier (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.

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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 A480/A480M	(2020a) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM A568/A568M	(2019a) Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM D2665	(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

1.2 RELATED REQUIREMENTS

Conform to Section[s] 11 70 00 GENERAL REQUIREMENTS FOR MEDICAL AND DENTAL EQUIPMENT[,] [.]" [23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS][,][.]" [and] [26 20 00 INTERIOR DISTRIBUTION SYSTEM.] Provide final utility connections and utility service to equipment.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal

items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification 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

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NOTE: Delete items that are not used. Add any additional items requiring detail drawings.
****

Film-Loading Bin

Cassette Transfer Box Cabinet

Processor, X-Ray Film, 90 seconds

Developing Tank, X-Ray

SD-03 Product Data

Film-Loading Bin

Cassette Transfer Box Cabinet

Illuminator, 1 Panel Recessed

Illuminator, 1 Panel Surface

Illuminator, 2 Panel Recessed

Illuminator, 2 Panel Surface

Illuminator, 8 Panel With Desk

Illuminator, 8 Panel Recessed

Illuminator, 4 Panel Recessed

Illuminator, 4 Panel Explosion Proof

Processor, X-Ray Film, 90 seconds

Developing Tank, X-Ray

SD-10 Operation and Maintenance Data

Film-Loading Bin, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Cassette Transfer Box Cabinet, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 1 Panel Recessed, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 1 Panel Surface, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 2 Panel Recessed, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 2 Panel Surface, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 8 Panel With Desk, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 8 Panel Recessed, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Illuminator, 4 Panel Recessed, Data Package 1 plus wiring Diagrams and Control Diagrams; G[, [_____]]

Illuminator, 4 Panel Explosion Proof, Data Package 1 plus wiring diagrams and control diagrams; G[, [_____]]

Processor, X-Ray Film 90 seconds, Data Package 3; G[, [_____]]

Chemical Automatic Mixer, Data Package 3; G[, [_____]]

Developing Tank, X-Ray, Data Package 3; G[, [_____]]

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum Alloy

ASTM B221M ASTM B221, equivalent in ultimate tensile, yield, and shear strengths to Alloy 6063-T5 or 6063-T6.

2.1.2 Carbon Steel

ASTM A568/A568M, cold-rolled sheets, commercial bright finish. Stretcher level sheets 1.5 mm thick 16 gage and lighter.

2.1.3 Stainless Steel

ASTM A480/A480M, Class 301, 302, or 304.

2.2 ITEMS

2.2.1 Film-Loading Bin

Cabinet suitable for storing and sorting open, unexposed boxes of medical radiographic film; approximately 525 mm wide, 450 mm deep and 875 mm high 21 inches wide, 18 inches deep and 34 1/2 inches high. Include:

a. Base cabinet fabricated of carbon steel with finished sides, with solid-face, recessed base, suitable for application of resilient base material.

b. Swing-out bin: flush mounted, with front panel marked "FILMS - DO NOT OPEN IN LIGHT." Counterbalance unit mount with continuous piano-type hinge along lower edge.

c. Built-in spacers, dividing bin into five equal compartments each approximately 395 mm wide by 57 mm front to back by 500 mm deep 15 1/2 inches wide by 2 1/4 inches front to back by 20 inches deep.

d. At least four removable inserts, suitable for adapting divided spaces to accept film boxes in sizes of 100 by 125 mm 4 by 5 inches, 125 by 175 mm 5 by 7 inches, 165 by 215 mm 6 1/2 by 8 1/2 inches, 200 by 250 mm 8 by 10 inches, 175 by 430 mm 7 by 17 inches, 240 by 240 mm 9 1/2 by 9 1/2 inches, 250 by 300 mm 10 by 12 inches, 275 by 350 mm 11 by 14 inches and 350 by 430 mm 14 by 17 inches, all with box tops flush with top of bin.

e. Limit switch: 115 volts, 60 hertz (Hz), located in cabinet back, ready for connecting in series with darkroom white light so lights are automatically extinguished when bin is opened.

2.2.2 Cassette Transfer Box Cabinet

Four-door, automatic interlock, lead-lined, double compartment unit, suitable for through-the-wall transfer of radiographic film cassettes, approximately 550 mm wide by 475 mm deep by 550 mm high 22 inches wide by

19 inches deep by 22 inches high. Include:

a. Automatic interlock doors, preventing both doors of a common compartment from being opened at same time.

b. Label doors "EXPOSED" and "UNEXPOSED".

c. Automatic signal device, activated when one or more standard, 125 by 175 mm 5 by 7 inch or larger cassettes are in compartments, consisting of:

(1) Light system, mounted over doors of transfer cabinet, with white light on side of transfer cabinet opposite darkroom; lighted when compartment designated as "UNEXPOSED" is occupied and colored light on darkroom side of box; lighted when compartment designated as "EXPOSED" is occupied.

(2) Colored light, safe for up to 2 minutes for unprotected high-speed medical radiographic films when they are exposed at distance of 600 mm 24 inches from light source.

d. Voice passage, light, and radiation baffle.

e. Installation accessories, including rough-in frame, brackets, and trim.

f. Lead lining, 2 mm 1/16 inch minimum thickness, providing protection of complete assembly, equal to or greater than protection of wall within which it is located.

g. Power source of [120] [208] [220] [_____] volts, [50] [60] Hz, single-phase, operating from primary electric power.

2.2.3 Illuminator, Radiographic Film, Recess Mounted

Explosion-proof fluorescent fixture, with each viewing panel independently switched. Include:

a. Electrical characteristics: [120] [220] [_____] volts, [50] [60] Hz, single-phase.

b. Illumination: Maximum panel brightness not less than 1540 candelas per square meter 450 foot lamberts located within a 150 mm 6 inch square at center of viewing panel. Minimum panel brightness not less than 65 percent of maximum panel brightness. Do not include areas of viewing panel within 38 mm 1 1/2 inches of edges in brightness measurements.

c. Trim for recessed installation.

d. Film-holding device: Continuous-ball or strip-spring type extending across top of each viewing panel. All parts corrosion-resistant steel or plastic.

2.2.3.1 Illuminator, 1 Panel Recessed

Single unit approximately 500 mm high by 375 mm long by 125 mm deep 20 inches high by 15 inches long by 5 inches deep.

2.2.3.2 Illuminator, 2 Panel Recessed

Double unit approximately 500 mm high by 750 mm long by 125 mm deep 20 inches high by 30 inches long by 5 inches deep.

2.2.3.3 Illuminator, 8 Panel Recessed

Eight-panel, (four in tandem, double deck), four over four, approximately 1000 mm high by 1500 mm wide by 125 mm deep 40 inches high by 60 inches wide by 5 inches deep.

2.2.3.4 Illuminator, 4 Panel Recessed

Four-panel, approximately 700 mm high by 1750 mm wide by 150 mm deep 28 inches high by 69 inches wide by 6 inches deep.

2.2.3.5 Illuminator, 4 Panel Explosion Proof

Four-unit, approximately 500 mm high by 1500 mm wide by 125 mm deep 20 inches high by 60 inches wide by 5 inches deep.

2.2.4 Illuminator, 1 Panel Surface

Explosion-proof, single-panel, fluorescent fixture, each viewing panel independently switched. Approximate dimensions: 500 mm high by 430 mm wide by 125 mm deep 20 inches high by 17 inches wide by 5 inches deep. Include:

a. Electrical characteristics: [120] [220] [_____] volts, [50] [60] Hz, single-phase.

b. Illumination: Maximum panel brightness not less than 1540 cd/sq m 450 foot lamberts located within 150 mm 6 inch square at center of viewing panel. Minimum panel brightness not less than 65 percent of maximum . Do not include areas of viewing panel within 38 mm 1 1/2 inches of edges in brightness measurements.

c. Enameled steel frame.

d. Line cord, 3-wire, 2125 mm 7 feet long with hospital-grade plug.

e. Film-holding device: Continuous-ball or strip-spring type extending across top of each viewing panel. Corrosion-resistant steel.

f. Mounting hardware.

2.2.5 Illuminator, 2 Panel Surface

Double unit, continuous-surface viewing with dual switches, heli-grip film support. Approximate dimensions: 450 mm high by 120 mm wide by 775 mm long 17 7/8 inches high by 4 3/4 inches wide by 31 inches long. Include:

a. Electrical characteristics: [110] [220] [_____] volts, [50] [60] Hz, single-phase.

b. Illumination: Maximum brightness not less than 1540cd/sq m 450 foot lamberts located within 150 mm 6 inch square at center of viewing panel. Minimum panel brightness not less than 65 percent of maximum. Do not include areas of viewing panel within 38 mm 1 1/2 inches of

edges in brightness measurements.

c. Stainless steel frame.

d. Line cord, 3-wire, 2125 mm 7 feet long with hospital grade plug.

e. Film holding device: Continuous-ball or strip-spring extending across top of each viewing panel. Corrosion-resistant steel.

f. Mounting hardware.

2.2.6 Illuminator, 8 Panel With Desk

Four over four format mounted in high density particleboard frame with walnut grain melamine, high-pressure laminated end panel. Mount lower bank of illuminators at a 30- or 45-degree angle. Illuminator unit approximately 1475 mm long by 525 mm deep by 1350 mm high 59 inches long by 21 inches deep by 54 inches high. Desk, of same construction as illuminator frame, shall be approximately 1500 mm long by 450 mm deep by 200 mm high 60 inches long by 18 inches deep by 8 inches high. Include:

a. Electrical characteristics: [115] [230] [_____] volts, [50] [60] Hz, single-phase.

b. Two remote control switches for individual light panel control.

c. High intensity spot-viewer device, manual type.

2.2.7 Processor, X-Ray Film, 90 Seconds

Unit shall automatically develop, fix, wash, and dry 350 mixed-sized medical radiographic films per hour at 90 seconds per film. Provide cabinetized unit, roller-transport type, for locating in lighted room and fed from darkroom through opening in wall. Include the following:

a. Cabinet: chemical-resistant finish with removable panels to facilitate servicing.

b. Controls: automatic, accessible from feed side of unit; include power switch and replenisher status indicators.

c. Standby mode: to reduce power and water consumption when films are not being processed.

****

NOTE: Heat and corrosive fumes are normally exhausted from darkroom face of this unit. The exhaust hose connects collar on unit to duct stub in the darkroom. Other specification sections must provide duct stub and exhaust fan, fabricated of corrosion-resistant materials.

****

d. Exhaust hose: flexible, acid fume-resistant tubing, [3000 mm] [10 feet] [_____] long.

****

NOTE: Select size and type. Location of replenisher tanks should be enclosed by raised curb,

and enclosed area should include an acid-resistant drain to facilitate emptying tanks without lifting them.

****

[e. Replenisher tanks: two, 53 liter 14 gallon capacity, suitable for locating inside processor cabinet.]

[e. Item Chemical Automatic Mixer to automatically mix replenisher solutions: on rollers with flexible hose connector. Electrical characteristic: 120-volts, 60 Hz, single phase.]

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NOTE: When chemical tanks are remotely located, chemical supply lines (each approximately 25 mm one inch in diameter) should be concealed in construction.

****

f. Chemical supply tubing, plastic: resistant to harm from chemicals, to run from chemical tank spout to processor fitting.

****

NOTE: The wall where this unit is to be located may be provided with an opening larger than necessary, and millwork can provide a lightproofing rough-in frame fabricated from 20 mm 3/4 inch plywood with compressible foam lightlock strip.

****

g. Lightproof stripping: compressible foam for application to either perimeter of rough opening or edge of unit's face.

****

NOTE: Minimum drainpipe diameter shall be 88 mm 3 1/2 inches. It shall include a strainer and incorporate a bucket or funnel design that deters splashing during discharge. Both drain and waste lines from this drain must be both acid- and corrosion-resistant.

****

h. Pipe and fittings: ASTM D2665, polyvinyl chloride (PVC). Assemble as L-shaped line connected to face of processor at waste opening, allowing waste flushed from processor to discharge directly over floor drain; provide 25 mm one inch minimum air gap between discharge end of pipe and drain.

****

NOTE: Provide breaker in vicinity of processor to facilitate safe removal and servicing.

****

i. Service characteristics:

Electrical: [120/208] [120/240] [_____] volts; [50] [60] Hz; [3] [4] [5]-wire; [single-][three-] phase.

2.2.8 Developing Tank, X-Ray

Refrigerated type tank assembly, refrigerated type, splashproof, single compartment unit, for manually developing, fixing, and washing medical radiographic films; approximate overall dimensions of 950 mm high by 500 mm wide by 525 mm deep 38 inches high by 20 inches wide by 21 inches deep. Include:

a. Cabinet: Type 316 stainless steel, heliarc welded and chemically passivated, with insulated tank, assembly reinforced, and corrosion-resistant legs with adjustable leveling feet.

b. Refrigeration unit: Integrally located, mounted on isolators, including thermostatic control, watercooled condenser, and cooled water storage tank; capable of delivering 95 liters per hour (LPH) [20] degree Centigrade (C) 25 gallons per hour (GPH) [68] [_____] degree Fahrenheit (F) water when incoming water is [29] [_____] degrees C [85] [_____] degrees F.

c. Waste piping: Preinstalled, acid resistant, including overflow drain, drain valve, couplings, and fittings.

d. Inserts: Two solution tanks, each with 19 liter 5 gallon capacity.

****
NOTE: Select applicable paragraph(s) from following:
****

[e. Insert tank covers: One for each insert, Type 316 stainless steel.]

[e. Tank covers: For covering full tank opening and all inserts, Type 316 stainless steel.]

f. Valve: Thermostatic, for wall surface mounting, 3.8 liters per minute (LPM) through 19 lpm at 412 kilopascals one gallon per minute (GPM) through 5 gpm at 45 pounds per square inch (psi), with integral dial thermometer, diverter valve, and spray hose unit for cleaning tank and components.

PART 3 EXECUTION

3.1 INSTALLATION

Install at locations indicated. Conform to installation requirements of Section 11 70 00 GENERAL REQUIREMENTS FOR MEDICAL AND DENTAL EQUIPMENT.

3.2 FIELD QUALITY CONTROL

3.2.1 Inspections

Examine each item for visual defects and conformance to specifications.

3.2.2 Adjustments

Adjust each item to ensure that equipment is operational and conforms to specification requirements.

-- End of Section --