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UNIFIED FACILITIES CRITERIA (UFC)

DESIGN: MILITARY MEDICAL FACILITIES

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DESIGN: MILITARY MEDICAL FACILITIES IN UPPERCASE

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U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	Date	Location
1	6 Sep 23	Metric conversions, adds acronyms for metric units, and miscellaneous clerical changes. 1-3, 2-3.1.1, 3-3.3, 3-3.3.2.5a, 5-4.11.1, 5-5.3.3, 6-5.2, 7-6.1, 9-2.4, 9-2.4.1, 9-2.4.2, 9-2.4.2.1, 9-3.1.4, 9-5.18, 9-5.20.2, 9-5.27, 9-5.27.1, 10-2.1, 10-2.7, 10-2.9, 10-7.1.2b, 10-8.8.3, 10-9.4, 10-11.1, 11-3.5, 11-3.7, 11-4.1.3.1, 11-4.9, 11-4.12.3, 11-4.14.2, 11-4.14.2d, 11-4.14.2g, 11-4.14.2j, 11-5.2.3.1, 11-5.2.5, 11-5.3, 11-5.4.3i, 11-5.8.2, 11-5.9, 11-5.9.3, 11-5.9.9, 11-6.1.3, 12-2.1, 12-2.1a, 12-2.1 d, 12-2.1h, 12-2.2, Table 12-1, 12-2.3, 12-2.5, 12-2.6, 12-4.3, 12-5.1, 12-7.5, 12-9.5.5.1, 12-9.6.2, 12-11.1, 12-18.1, 19-2, B-3.1, B-7.1, and B-8. Includes changes in Table B-1: changes to room codes DNTB1, DNTC1, DNTE1, DNTG1, DNTG2, DNTG3, DNTG4, DNTP1, DNTP2, NBCD1, and NBCD2; and adds room codes PHHR1 and SHRM2. Adds definitions for Ambulatory Care Center and Hospital and eliminates third unnumbered paragraphs.
2	25 Oct 23	Correct captions for Table B-1, change med gas for DNTE1, and provide missing Table B-1 page (room codes OFA03 through OPD01).
3	30 Nov 23	Corrections in Table B-1 - Task lighting.
4	15 Jul 25	Critical edits to include requirements for corridor floor finishes, mock-ups, door hardware, receptacles, lighting control, telecomm rooms, replace Table B-1 (finishes,

		lighting, and miscellaneous changes), and temporary facility requirements in support of construction. Other changes to address code changes and construction requirements, such as cybersecurity, camera locations, solid surface requirements, supplemental disinfection, receptacle counts, transformer, generator and breaker changes, reduce fluorescent lighting and radio paging systems. Miscellaneous corrections to references, metric conversions, and extraneous text.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States, its territories, and possessions is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Military Department's responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Technical content of UFC is the responsibility of the cognizant DoD working group. Defense Agencies should contact the respective DoD Working Group for document interpretation and improvements. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide website https://www.wbdg.org/dod.

Refer to UFC 1-200-01, *DoD Building Code*, for implementation of new issuances on projects.

AUTHORIZED BY:

PETE G. PEREZ, P.E., SES
Chief, Engineering and Construction
U.S. Army Corps of Engineers

R. DAVID CURFMAN, P.E., SES
Chief Engineer
Naval Facilities Engineering Systems Command

DAVID H. DENTINO, SES
Deputy Director of Civil Engineers
DCS/Logistics, Engineering &
Force Protection (HAF/A4C)
HQ United States Air Force

MICHAEL McANDREW, SES
Deputy Assistant Secretary of Defense
(Construction)
Office of the Secretary of Defense

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CHAPTER 1 INTRODUCTION

1-1 PURPOSE AND SCOPE.

This Unified Facilities Criteria (UFC) 4-510-01 provides technical guidance and mandatory requirements to implement laws, regulations, executive orders, and policies to sustain, operate, plan, design, and construct DoD medical, dental and all other medically related facilities authorized by Title 10, United States Code (Reference (k)) and policies. This document defines performance and quality requirements as defined in MIL-STD-3007 for Military Medical Facilities supporting Health Service Support as defined in Joint Publication 4-02 (JP 4-02) throughout the life cycle. Federal legislation, Executive Orders (EOs), DoD Directives, DoD Instructions, and selected technical data, publications, and standards are referenced in the text by basic designation only and form a part of these criteria to the extent required by these references.

1-2 REISSUES AND CANCELS.

This UFC reissues and cancels UFC 4-510-01, dated 30 May 2019, with Change 2 dated 04 December 2019.

1-3 APPLICABILITY.

\4 In addition to the applicability of UFC 1-200-01, APPLICABILITY, this UFC applies to **/4/** Category Code series 500 hospital and medical facilities and Category Code series 310 medically related research laboratories in the Defense-Wide Military Construction (MILCON) program, or other medically specific appropriations as provided by Congress. These requirements apply to **\1** Medical Treatment Facility (MTF) projects **/1/** and to veterinary, medical-related research, medical training facilities, and other projects which require conformance with UFC 4-510-01. **\4\ /4/**

1-4 GENERAL BUILDING REQUIREMENTS.

Comply with UFC 1-200-01, *DoD Building Code*. UFC 1-200-01 provides applicability of model building codes and government unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein. The requirements of this UFC take precedence over conflicts between this UFC and UFC 3- Series requirements.

1-5 POLICY.

As stated in DoD Instruction (DoDI) 6015.17, it is DoD policy to design efficient, economical, and safe facilities that sustain an effective combat force, support the DoD medical mission, and comply with the provisions of Title 10 U.S. Code (U.S.C.).

Detailed instructions and procedures, which may be developed and issued by the Design and Construction Agents must be consistent with the policy statements and criteria contained herein. Projects must:

a. Meet the current established operating requirements of the DoD Project Sponsor.

b. Provide reasonable flexibility in the design to accommodate future changes.

c. Meet applicable Federal legislation, codes, standards, and criteria.

d. Ensure that The Joint Commission (TJC), Accreditation Association for Ambulatory Health Care (AAAHC), or other applicable accreditations are achieved for Medical Treatment Facilities.

e. Meet certification requirements for Centers for Disease Control and Prevention (CDC), DoD Project Sponsor, Association for Assessment & Accreditation of Laboratory Animal Care (AAALAC), and Biosafety in Microbiological and Biomedical Laboratories (BMBL), or other applicable entities for laboratories.

f. Provide functional facilities at the most economical and practical life-cycle cost (LCC).

g. Be aesthetically compatible with the local environs and published Installation Design Guidelines.

1-5.1 Supplemental Technical Criteria.

The Design and Construction Agent(s) may maintain supplemental technical criteria to execute their organization's established design and construction regulations and procedures. Design and Construction Agents must produce designs for a complete and usable facility within the DoD Project Sponsor approved programmed scope and programmed authority.

1-6 FUNCTIONAL AUTHORITY.

The program functional and regulatory authority for applicable facilities is the Defense Health Agency.

Requests for project-specific waivers and exemptions to any UFC criteria or this document will be submitted in accordance with MIL-STD-3007. Regardless of DoD Project Sponsor, requests must have concurrence/nonconcurrence from the Defense Health Agency Facilities Enterprise (DHA-FE), as the Functional Authority for medical facilities, before final approval authority decisions are pursued.

1-7 ROLES & RESPONSIBILITIES.

1-7.1 Project Sponsor.

The DoD Project Sponsor is the DoD Agency or Service Component that provides the funding for the project. In most projects the DoD Project Sponsor will be the DHA-FE; however, other DoD Agencies can utilize these criteria for their medical projects.

The DoD Project Sponsor provides clinical and functional input on all aspects of facility sizing, functional requirements, and facility-essential or critical-use requirements such as, utility, sewer, water, and operational needs, and must work in partnership with the Design and Construction Agents throughout the design and construction process.

1-7.2 Design and Construction Agents.

The Design and Construction Agents are listed below.

1-7.2.1 U.S. Army Corps of Engineers (USACE).

The Headquarters USACE Program Integration Division (CEMP-II) is the primary USACE point of contact with the Functional Authority and DoD Project Sponsor for non-medically specific design and construction aspects of applicable facility projects and is responsible for all non-medically related program management issues and resolution between the Functional Authority, the DoD Project Sponsor, and USACE. The USACE Medical Facilities Mandatory Center of Expertise and Standardization, Huntsville Engineering and Support Center (CEHNC-EDX), has multi-disciplinary expertise in medical design criteria, standards, and policy, and has sole USACE responsibility for oversight, decision, and technical review of medically unique aspects of applicable projects. USACE's geographical District Offices must closely coordinate with CEHNC-EDX for all medically specific aspects of project design, construction, management, and execution of design and construction projects located within their respective geographical regions, including quality assurance (QA) and oversight of design and construction. CEHNC-EDX is responsible for assisting USACE geographical District Offices with project-specific design instructions to supplement the Architect/Engineer Firm (A/E) Scope of Work (SOW), for interfacing with the Functional Authority and DoD Project Sponsor regarding technical issues and mandatory submissions during both design and construction.

1-7.2.2 Naval Facilities Engineering Systems Command Headquarters (NAVFAC HQ) Medical Facilities Program Office (MFPO).

NAVFAC HQ MFPO is the Navy's point of contact with the Functional Authority and DoD Project Sponsor to provide the technical expertise for medical design and construction. NAVFAC HQ MFPO is the Navy's technical authority regarding project management and for providing project-specific design instructions to supplement the A/E SOW. NAVFAC HQ MFPO is responsible for technical issues, mandatory design and construction submissions, technical guidance, criteria, and all project standards, from project initiation to beneficial occupancy.

1-7.2.3 Air Force Civil Engineer Center (AFCEC).

AFCEC is the primary point of contact with the DoD Project Sponsor for all applicable facility design and construction projects in the United Kingdom and provides project management, technical reviews, and guidance for the Air Force.

Table 1-1 Responsibility Matrix

PROCESS GROUPS	FUNCTIONAL AUTHORITY	DoD PROJECT SPONSOR	DESIGN & CONSTRUCTION AGENTS
GROUP 1: STRATEGIC FACILITIES MANAGEMENT 1.1 Establish Program Policy 1.2 Authorize, Conduct, and Administer Research and Innovation Efforts Related to MHS Facilities 1.3 Integrate Inter-Agency Market Based Planning	R	C	C
GROUP 2: REQUIREMENTS PLANNING 2.1 Local Planning, Requirements Development and Gap Analysis 2.2 Analysis and Evaluation of Potential Solutions/Options 2.3 Business Planning, Market Solution Planning and Facility Requirements Planning	C	R	C
GROUP 3: DESIGN/CONSTRUCTION EXECUTION 3.1 Project Sponsor Representatives Coordination 3.2 Project Delivery and Contract Management	C	C	R
GROUP 4: FACILITY ACTIVATION AND OPERATIONS 4.1 Facility Transition and Activation 4.2 Facility Operations, Repairs, Maintenance, Sustainment, Restoration, and Modernization 4.3 Facility Specific Operations and Maintenance 4.4 Facility De-commissioning and Disposal	C	R	C
Key: R = Responsible; owns the problem or project C = To be consulted; has information or capability needed to complete the work			

1-8 CYBERSECURITY.

All facility-related control systems (including systems separate from a utility monitoring and control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.

1-9 GLOSSARY.

\4 Appendix I **/4/** contains acronyms, abbreviations, and terms.

1-10 REFERENCES.

\4 Appendix J **/4/** contains a list of references used in this document. The publication date of the code or standard is not included in this document. Unless otherwise specified, the most recent edition of the referenced publication applies.

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CHAPTER 2 PREDESIGN

2-1 GENERAL.

This chapter and its references provide requirements for predesign information required by the Design and Construction Agents to execute the design of applicable facilities. Predesign information includes requirements from the planning processes as defined and described in this chapter. Ensure that projects submitted contain sufficient planning, accurate scope, adequate documentation, and a valid cost estimate and realistic schedule for successful execution.

2-2 PREDESIGN PROJECT DOCUMENTATION.

Projects under consideration for budget submission must undergo additional detailed planning to include additional project documentation; collection of relevant site, environmental, and Installation specific information; and development of other guidance essential for subsequent project design. The DoD Project Sponsor must prepare this information that is used by the Design and Construction Agent as the basis of design. Within 30 days of initial project Design Authorization (DA) release, this information/documentation must be submitted electronically to the Design and Construction Agent.

2-2.1 Documents Prior to DA.

Prior to release of the initial project DA, the DoD Project Sponsor must update and prepare this basic project documentation.

2-2.2 Functional Program.

The DoD Project Sponsor will develop the strategic objectives and the facility and operational requirements for the project (the Functional Program) in written narrative form as part of the project documentation. The DoD Project Sponsor will issue the Functional Program in a standard format with standardized content for consistency across all projects. This narrative must be coordinated with the Program for Design.

The DHA-FE current form for this narrative is titled the “Facility Planning Functional Program”.

2-2.3 Program for Design (PFD) and Project Room Contents (PRC).

The DoD Project Sponsor will develop the PFD facility space allocation and PRC requirements for installed equipment and furniture at an individual room level.

2-2.4 Existing Facilities Surveys.

The DoD Project Sponsor will provide facility deficiency tabulations and upgrade surveys to the Design and Construction Agent. The DoD Project Sponsor will provide an updated Deficiency Tabulation Report and updated estimate of costs and duration to

correct the deficiencies to establish the requirements in support of facility alteration projects.

2-2.5 Site Information.

For additions and new facilities, the DoD Project Sponsor will provide a completed site checklist as a project document. Sites with known contamination must not be considered, unless no other siting options are available and the appropriate cost and adequate schedule for mitigation are applied to the project for cleanup and other costs. The completed site checklist must reference or include Installation master plans for the specific site under consideration for development.

Site information collected for project design must be comprehensive and used to avoid site-related scope and cost impacts during construction. As applicable to a project, this information includes:

a. Area maps: location and site maps (including grades, access control points).

b. Description of existing site condition including previous use and contamination potential and environmental impacts.

c. Any Wetlands or other areas reserved for Fish & Wildlife preservation which would have a cost impact if encroached upon.

d. The statement regarding the facility's contingency-mode or mission assurance status and related additional sustained operations requirements.

e. Specific Installation requirements or restrictions, style of architecture, construction season limitations, seismic, wind, and snow considerations.

f. SOFA or other local host country agreements or criteria.

g. Soil and foundation conditions.

h. Utility distribution.

i. Site restrictions, for example, Air Installations Compatible Use Zones (AICUZ), potential helipad approach/departure zone obstructions, flood plain, rights-of-way.

j. Site security requirements and restrictions.

k. The National Capital Planning Commission (NCPC) requirements.

l. Cybersecurity requirements.

m. Completed NEPA documentation.

n. Code restrictions and other surrounding building types and condition.

o. Any local traffic patterns or constraints (schools or high occupancy buildings), public transportation routes.

p. High noise levels or toxic fumes adjacent to building site affecting building occupants. Such as proximity to flightline operations or maintenance/cargo handling/refueling.

2-2.5.1 Utility Availability.

The site information must include a discussion of utility availability including water, sewage, storm drainage, electrical power, communications systems, existing fuel sources, and central steam, heating, or chilled water systems, including the tap-in locations. It must also include the available capacities, power service characteristics and locations, electrical distribution, water and wastewater needs or considerations, and the DoD Project Sponsor's intention, if any, for future expansion/construction of these services. Any abandoned utilities within the site footprint shall also be identified.

2-2.6 National Environmental Policy Act (NEPA) Documentation.

Provide a copy of the appropriate level of NEPA documentation as required by the NEPA, or host-nation equivalents for projects outside of the United States. If not completed, provide a plan and timeline for completion, in accordance with requirements of the NEPA.

2-2.7 Force Protection/Security Requirements/Cybersecurity.

The project documentation must include a situation report based on consideration of all applicable threat levels. Reference UFC 4-010-01, UFC 4-020-01, and UFC 4-010-06 for force protection, security, and cybersecurity requirements.

2-2.8 Mission Essential Facilities and Related Requirements.

If a project facility is identified by the hosting Installation as 'mission essential,' the DoD Project Sponsor will coordinate project requirements with the hosting Installation Command. During planning, it must be determined which operations within the facility need to be maintained, and to what extent, under a range of risk situations. The conclusions of this assessment must be documented in the project planning assumptions. Any added facility scope and cost related to 'mission essential' status must be included in the development of the project DD Form 1391.

2-2.9 Contingency Mode Functional Program (where applicable).

During healthcare requirements identification and facility requirements planning, the DoD Project Sponsor must define contingency operations and requirements in a contingency mode functional program. In addition to operational changes required to accommodate increased workload and levels of patient care, strategies to maintain operations over a stated period of time must be clearly stipulated. The impact on patient and staff access, utility services, emergency power availability, water supply, and sewer service must be assessed and included as design requirements.

The Functional Program must address medical mobilization expansion requirements where such temporary measures are included in the contingency mode of operations.

2-2.10 Fire Protection and Life Safety Considerations.

Fire protection and life safety considerations for alteration projects must be based on a completed Life Safety Assessment (LSA) as described in Chapter 14. In projects involving alteration or additions, the limitations of work in the existing areas of the facility must be determined and specifically addressed in the project DD Form 1391. Provide documentation of fire department access, supervision of protected premises, and fire service water supply.

2-2.11 Electrical.

Project document must include a description of exterior electrical power distribution systems covered in Chapter 11. Where exterior electrical service is connected from existing primary feeder, the Designer of Record (DoR) must coordinate with the Design and Construction Agent and receive direction regarding point of connection and concurrence that the existing circuit can support the new facility.

2-2.12 Communications.

Project documentation must include a description of all required systems covered in Chapter 12 to a level enabling development of a programmatic cost estimate. The infrastructure for various digital radiography technologies must be assessed and addressed. An Information System Cost Estimate (ISCE) must be included in DD Form 1391 development.

2-2.13 Commissioning.

Project documentation must include a description of the commissioning requirements for the project as covered in Chapter 19 to a level enabling development of a programmatic cost estimate. During planning, the DoD Project Sponsor must anticipate a requirement for commissioning based on facility and project type and include commissioning in the Budget-Ready DD Form 1391. As applicable, commissioning costs must be estimated during planning using DoD facility cost guidance.

2-2.14 Parking Requirement Calculation.

The DoD Project Sponsor must calculate and report on the 1391, the number of parking spaces including ABA spaces required consistent with the calculation method described in Appendix G and if applicable, the scope for any structured parking, including the number of spaces and where limited by known site restriction with the estimated number of floors (levels) above grade.

2-2.15 Addition-Alteration Facility & Demo Information.

For addition or alteration projects, information must be provided on the type and characteristics of the existing construction, size of the facility, roof and access, condition of utilities and services, existence of code or safety issues, environmental information or surveys, current HAZMAT report, and descriptions of previous alterations or additions of significance.

2-2.16 Safety Risk Assessment (SRA).

Provide predesign project documentation of the initial project-specific patient and staff SRA. These must be conducted by the DoD Project Sponsor. The project-specific SRA must be utilized to determine which design strategies are appropriate for the type of facility, and for incorporation in the project design. See Chapter 3 for SRA process requirements.

2-3 SCOPE AND COST CONSIDERATIONS.

During planning, the DoD Project Sponsor will be comprehensive in anticipating and considering scope and costs resulting from conditions that are applicable to a project. These scope and cost considerations may be based on specific studies or based on typical facility and project types. The scope and costs of such items or conditions must be estimated in the planning DD Form 1391 using DoD facility cost guidance.

2-3.1 Improvement/Alteration/Additions.

The criteria contained herein are not to be used as the sole justification for any addition, alteration, or improvement to an existing facility. These criteria define requirements that must be met when improvement or alterations of existing facilities, or sub-portions or systems thereof, are specifically authorized by reference in the project document, and justified during the above described programming and planning processes.

2-3.1.1 Levels of Facility Alteration.

All costs associated with projects containing altered areas (including the cost of temporary structures if required), **\1** Life Cycle Cost (LCC), **/1/** and other cost impacts must be categorized according to the following definitions:

2-3.1.1.1 Level 1.

Level 1 alterations include minor partition layout changes, new finishes, minor casework and equipment changes, minor modifications to HVAC distribution systems, and minor electrical branch circuit changes. The estimated cost of Level 1 alterations should not exceed 30 percent of replacement cost for the facility.

2-3.1.1.2 Level 2.

Level 2 alterations include Level 1 changes, minor to major partition layout changes with associated modifications to the HVAC distribution systems and electrical power and light requirements, minor structural modifications, new plumbing fixtures, allowances for roof repair, and changes in mechanical system insulation when asbestos is present. The estimated cost of Level 2 alterations should not exceed 50 percent of replacement cost for the facility.

2-3.1.1.3 Level 3.

Level 3 alterations include Level 1 and 2 changes, gutting of the building to structural frame without demolishing floors, exterior walls and roof assembly, modifications to structural frame, main electrical distribution system, air handling units (AHUs) and auxiliary equipment, plumbing system, and energy plant. The estimated cost of Level 3 alterations should not exceed 75 percent of replacement cost for the facility.

2-3.1.2 Cost of Alteration.

When proposed alteration project costs exceed 75 percent of the replacement cost for a facility, and when total facility replacement is feasible, selection of the total facility replacement option will be required.

2-3.2 Site Investigation.

The DoD Project Sponsor is responsible for all facility and site investigations required to generate design and cost impacts for planning and programming. Investigations may include, but are not limited to, inspection of concealed spaces (for example above-ceiling areas, chases, equipment rooms, and other reasonably accessible spaces to permit evaluation and accurate depiction of as-built conditions), environmental material testing or surveys, existing condition drawings and reports, and any other substantial information that would affect cost, scope, or schedule. When all possible, document site investigations with pictures, in particular areas that are confined or that depict complicated conditions.

2-3.3 Interstitial Building System (IBS).

In projects where IBS design concepts are under consideration as part of the base scope of the project, the scope and cost of IBS design concepts must be included as a separate line item in the DD Form 1391 and later updated in the project DD Form 1391. See Appendix E for IBS criteria.

2-3.4 Parking Facilities.

The scope (to include number of spaces) and estimated cost of parking provisions, surface or structured, must be determined during planning and included in the DD Form 1391. Cost of structured parking, appropriate road access and infrastructure must be included as a separate DD Form 1391 line item. DHA-FE is the sole Approving

Authority over Military Medical Facility parking requirements. The MHS parking policies and the standards for calculating parking requirements are located in Appendix G.

2-3.5 Future Expansion.

Consideration for future expansion must be incorporated into planning for all projects. Consider external and internal expansion of vital functions such as ancillary and utility services. Do not locate future expansion in areas that cause significant disruption to the future operations of the facility or significant cost (for example main entry, removal of mechanical rooms). Building site, vehicular access, structural systems, departmental adjacencies, functional layouts within departments, and utility type and source all play major roles in developing an economically expandable design. Provision for future expansion is authorized when approved by the DoD Project Sponsor. The scope and cost of approved expansion capability must be included as a separate line item in the project DD Form 1391.

2-3.6 Special Environmental Conditions.

Consideration must be given to water requirements for the facility, including availability and capacity of Installation water treatment facilities. Identify and provide documentation on Installation or environmental remediation requirements, if any, beyond those described in this document during the initial planning phase of the project, and adequately program associated costs into the budget for the project.

2-3.7 Emergency Power.

Consideration must be given regarding emergency power supply and availability. Identify Installation requirements, if any, beyond those described in this document during the initial planning phase of the project, and adequately program associated costs into the budget for the project. Give consideration to additional supply and availability requirements pursuant to determination of: reliability of power supply; facility Mission Assurance status; and special contingency mode Functional Program. Reference Chapter 11. Scope and cost emergency power supply must be included as a separate line item in the project DD Form 1391.

2-3.8 Antiterrorism/Force Protection (AT/FP).

Identify scope impact during the initial planning phase and adequately program associated costs int DD Form 1391 (reference Chapter 5).

2-3.9 Demolition of Vacated Facilities.

The DoD Project Sponsor must provide a descriptive plan for the disposition and extent of vacated facilities as part of the project planning package and adequately program associated costs into the budget for the project. Provide any documented HAZMAT report or survey data.

2-3.10 Sustainability Considerations.

The scope and cost of sustainable design features must be developed during the planning stage and included in DD Form 1391 (reference Chapter 4). Indicate the applicability of the Guiding Principle requirements and sustainability goals for the project in accordance with UFC 1-200-02. Provide a list of Renewable Energy Technologies that may be incorporated into the design of the facility (line item in the DD1391).

2-3.11 Special Studies.

Include special scope and cost considerations resulting from special facility studies performed prior to design or existing information where required or applicable for:

a. Material Handling and Transportation (reference Chapter 16)

b. Food Service (reference Appendix F)

c. Temporary facilities planned for occupancy during construction

d. Storm water management

e. Hazardous Containing Materials

f. Geotechnical

g. Identification of “Other” unique project requirements:

Identify and coordinate unique project requirements such as Construction restrictions due to airfield/waterfront operations, Explosive Safety Site Approval, base access restrictions, building hardening provisions for seismic, wind, or flood prone areas. **\4**

2-3.12 Temporary Spaces Supporting Construction Phasing

Include special scope and cost considerations for construction phases. This should include site location, utility requirements, PFD, and initial PRC. Refer to Appendix H for requirements. **/4/**

CHAPTER 3 DESIGN

3-1 GENERAL.

This chapter defines DoD Project Sponsor requirements for design procedures, submittals, and documentation. The Design and Construction Agent(s) may establish additional or fewer project-specific requirements in coordination with the DoD Project Sponsor to meet specific project requirements.

3-2 DESIGN CODES AND CRITERIA.

All DoD facilities must comply with UFC 1-200-01. Refer to UFC 1-200-01 for the effective dates for UFCs, codes and criteria. When scope, cost, and schedule permit, the Design and Construction Agent may include new or updated codes and criteria.

3-3 DESIGN PARAMETERS.

3-3.1 Scope and Cost.

3-3.1.1 Documentation.

During Concept Design (0–35 percent) or RFP development, the A/E must produce documentation that meets project requirements and complies with criteria while establishing final project scope and an appropriate Programmed Amount (PA), Design Directive Amount (DDA), or both.

3-3.1.2 Changes.

For projects submitted in the President's Budget or projects with funds appropriated by Congress, the project scope and cost are as stated on the submitted or enacted DD Form 1391. Cost and scope changes to these projects must be processed in accordance with Title 10 U.S.C. Section 2853 by the DoD Project Sponsor. For projects not yet submitted in the President's Budget, there is some flexibility to adjust scope and cost. The degree of flexibility varies with the level of design. Project scope is locked for DBB projects with the 20 percent deliverable and for DB projects with the draft RFP. Project cost is locked for DBB and other delivery method projects with the 35 percent deliverable, and for DB projects with the final RFP.

3-3.1.3 Added Project.

In the event a project is added to the MILCON program by Congressional insert, the project scope, cost, and criteria are locked when the DD Form 1391 is submitted to Congress.

3-3.1.4 Functional Changes During Design.

The most cost-effective time to address functional requirements is during the 20 percent and 35 percent design development process. Functional changes must be addressed

not later than the 35 percent design. Changes to the functional design after 35 percent design dramatically increase cost with redesign work and possibly construction modifications. After the 35 percent design is approved, functional changes must be submitted as a user change request with justification to the DoD Project Sponsor for approval.

3-3.2 Gross Building Area Calculation.

Gross area accounting rules are illustrated in Table 3-1 and Figure 3-1. Gross area tabulation is the square footage measurement used on the project DD Form 1391. The gross area documentation requires calculation of the building gross floor area illustrated with small scale, single-line dimensioned drawings as demonstrated in Figure 3-1. The gross area includes the total area of all floors with a floor-to-clear height of 7 ft (2.1 m) or greater, including those building features listed in Table 3-1. Gross area is measured from the outer-most exterior surfaces of all enclosing walls. Utilize the instructions in Figure 3-1 to calculate the gross building area.

3-3.3 Departmental Building Area Calculation.

Departmental gross area calculations are illustrated in Figure 3-2. Departmental tabulation is the **\1** area **/1/** measurement associated with the Two-Step Method in the "DoD Space Planning Criteria Chapter 130: Net to Gross Conversion Factors". The Two-Step Method calls for allocating the building gross area between the various departments shown in the project Program for Design and overall building common areas not assigned to a specific department. The gross area rules of Table 3-1 and Figure 3-1 must apply to departmental tabulation. The instructions in Figure 3-2 must be used to calculate the departmental gross areas. A single line diagram must be provided with the design deliverable to clearly convey how the building gross area was proportioned.

Table 3-1 Gross Area Accounting Rules

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Departmental Scope	Primary	Yes	Full	Included in PFD. Refer to Figure 3-1 Areas A & B	Yes

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Walls and Partitions	Primary	Yes	Full	Included in departmental gross and circulation grossing factor. Refer to Figure 3-1 Areas A & B	Yes
Ambulance Garage	Primary	No	Full	Authorized when included as separate line on DD Form 1391	Yes
Ambulance Shelter	Primary	No	Half	Authorized when included as separate line on DD Form 1391	Yes
Atrium	Primary	Yes	Full	Included in circulation grossing factor. Count only floor area. Refer to Figure 3-1 Area E	Yes
Attic or Roof Sloping Space	Primary	No	N/A	Unoccupied space only	No
Circulation					
Building Circulation	Primary	Yes	Full	Included in circulation grossing factor. Refer to Figure 3-1 Areas A & B	Yes
Vertical Circulation (elevator shaft, interior stairwells, escalators, lifts, and trash chutes)	Primary	Yes	Full	Included in circulation grossing factor. Count only at one floor in gross area. Net area on subsequent floors must not be included. Refer to Figure 3-1 Area D	Yes

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Exterior Open Stairs	Primary	Yes	Half	Included in circulation grossing factor. Count only at one floor in gross area. Net area on subsequent floors must not be included. Refer to Figure 3-1 Area D	Yes
Alcove	Primary	No	N/A	Refer to Figure 3-1 Area F	No
Attached Covered but Not Enclosed Walks, Passageways, Ramps, and Canopies	Primary	No	Half	Tabulate scope separately for DD Form 1354	Yes
Unattached Covered but Not Enclosed Walks, Passageways, Ramps, and Canopies	Supporting	No	Half	Tabulate scope separately for DD Form 1354	No
Unattached Roof Overhangs, Soffits for Weather Protection	Supporting	No	N/A		No
Crawl Space	Primary	No	N/A	Unoccupied space only	No
Loading Dock/Logistics					

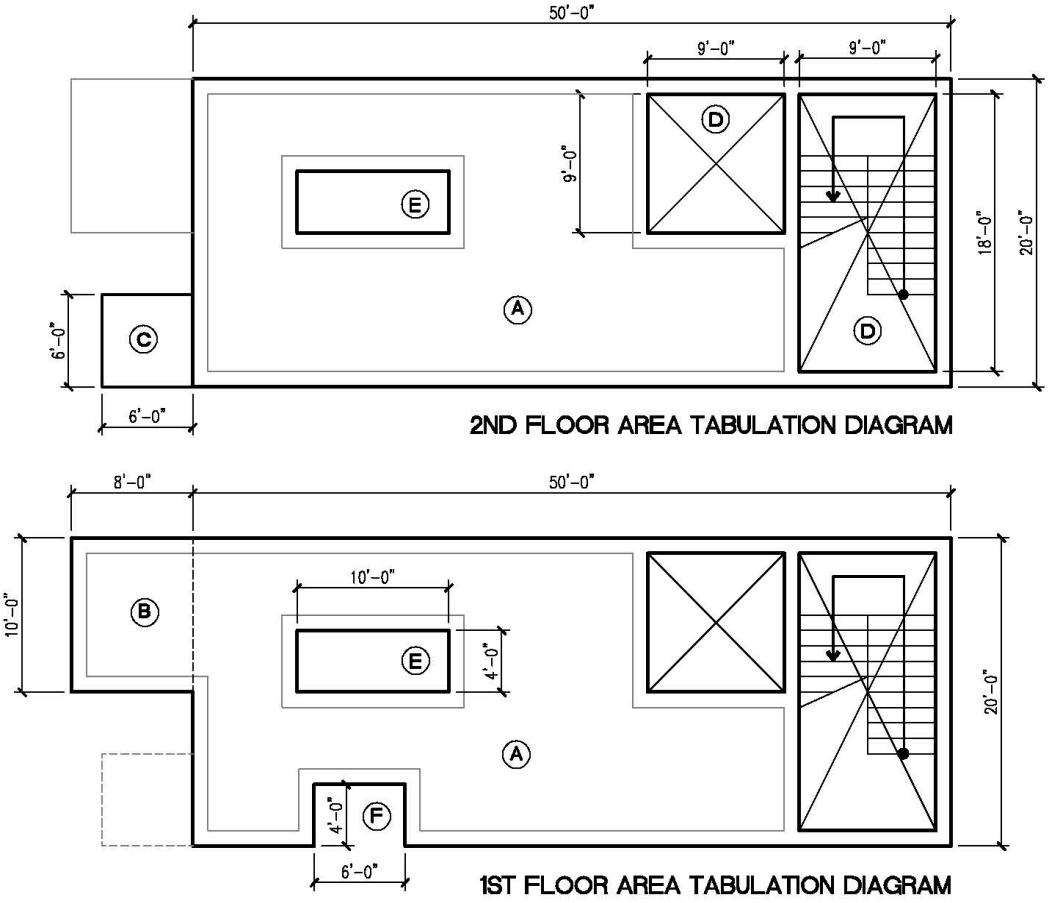
Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Enclosed Loading Dock	Primary	Yes	Full	Authorized when included on PFD. Refer to Figure 3-1 Areas A & B	Yes
Unenclosed Loading Dock	Supporting	No	Half	Tabulate scope separately for DD Form 1354. Refer to Figure 3-1 Area F	Yes
Mechanical/Electrical/Communications					
Mechanical Space	Primary	Yes	Full	Included in mechanical grossing factor. Refer to Figure 3-1 Areas A & B	Yes
Electrical Space	Primary	Yes	Full	Included in electrical grossing factor. Refer to Figure 3-1 Areas A & B	Yes
Telecommunication Room (TR)	Primary	Yes	Full	Included in electrical grossing factor. Refer to Figure 3-1 Areas A & B	Yes
Enclosed Building Connectors	Primary	Yes	Full	Include in Building Gross Square Feet	Yes
Interstitial Space	Primary	No	Full	Authorized when included as separate line on DD Form 1391 and Life-Cycle Cost justified	Yes
Penthouse with Over 7 ft (2.1 m) Clear	Primary	Yes	Full	Included in mechanical grossing factor	Yes

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Penthouse with Under 7 ft (2.1 m) Clear	Primary	No	N/A	Excluded from building gross area when the average ceiling height is less than 7 ft (2.1 m) measured from the underside of a structural system and with perimeter walls measuring a minimum of 59 in (1500 mm) in height	Yes
Mezzanines or Platform for Stacking of Logistical Storage and Mechanical Equipment	Primary	No	Full	Tabulate scope separately for DD Form 1354	No
Roof Top Equipment	Primary	No	Full	Unoccupied space	Yes
Roof Top Equipment Maintenance Vestibule with Over 7 ft (2.1 m) Clear	Primary	Yes	Full	Manufacture enclosure integral with equipment for maintenance personnel	Yes
Roof Top Equipment Maintenance Vestibule with Under 7 ft (2.1 m) Clear	Primary	No	N/A	Manufacture enclosure integral with equipment for maintenance personnel	Yes
Pad Mounted Equipment	Support	No	N/A		Yes

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Mechanical and Utility Shafts Connecting Two or More Floors	Primary	Yes	Full	Included in mechanical/electrical grossing factor. Count only at one floor in gross area. Net area on subsequent floors must not be included. Refer to Figure 3-1 Area G	Yes
Central Utility Plant	Primary	No	Full	Tabulate scope separately for DD Form 1354 when authorized as separate line on DD Form 1391	No
Internal Pump and Utility Rooms (for example fire pump, bottle gas storage)	Primary	Yes	Full	Fire pump room is included in mechanical grossing factor. Other rooms may be included unless specifically included in a department within the PFD, whereas bottle gas storage is included in departmental scope	Yes
External Pump House and Utility Buildings (for example sewage lift station)	Supporting	No	Full	Tabulate scope separately for DD Form 1354	No
Utility Tunnels	Supporting	No	N/A		No
Equipment Yards	Supporting	No	N/A		No
Other					

Building/ Project Feature	Primary/ Supporting Facility Cost	Include in Building Gross Area (DD Form 1391)	Full or Half Area	Comment	Include in Gross Area on Property Record Card (DD Form 1354)
Exterior Balconies	Primary	Yes	Half	Tabulate scope separately for DD Form 1354. Refer to Figure 3-1 Area C	Yes
Exterior Sun Shades	Primary	No	N/A		No
Courtyard	Supporting	No	N/A		Yes
Exterior Ramp, Stoops, and Pads	Supporting	No	N/A		No
Attached Roof Overhangs, Soffits for Weather Protection	Primary	No	N/A		No
Green Roof and Roof Top Healing Gardens and Unenclosed Roof Terraces	Supporting	No	N/A		No
Smoking Shelters	N/A	N/A	N/A	Not authorized	No

Figure 3-1 Instructions for Preparing Gross Area Tabulation



(A) GROSS BUILDING AREA - TO BUILDING PERIMETER

(B) GROSS BUILDING AREA - 1ST FLOOR ONLY

(C) GROSS BUILDING AREA - HALF AREA [L x W x 1/2] (BALCONY OR PORCH)

(D) GROSS BUILDING AREA - DEDUCT (SHAFT, STAIR or ATRIUM)

(E) GROSS BUILDING AREA - DEDUCT (COURTYARD)

(F) GROSS BUILDING AREA - DEDUCT (ALCOVE)

GROSS AREA TAKE-OFF

PLAN AREA TYPE	dimension	x	scope	=	area (SF)
First floor gross area A	50'x20'	x	1	=	1000 sf
First floor gross area B	8'x10'	x	1	=	80 sf
Courtyard, deduct on first floor	10'x4'	x	−1	=	−40 sf
Alcove, deduct on first floor	6'x4'	x	−1	=	−24 sf
Second floor gross area A	50'x20'	x	1	=	1000 sf
Courtyard, deduct on 2nd floor	10'x4'	x	−1	=	−40 sf
Stairwell, deduct on 2nd floor	9'x18'	x	−1	=	−162 sf
Mechanical shaft, deduct on 2nd floor	9'x9'	x	−1	=	−81 sf
Second floor Balcony, half area	6'x6'	x	.5	=	18 sf
TOTAL BUILDING GROSS AREA					1751 SF

Note: 1000 sf = 92.9 sm

3-3.3.2 Measuring Instructions.

3-3.3.2.1 Terms.

This chapter uses Net Square Feet (NSF), Departmental Gross Square Feet (DGSF), and Building Gross Square Feet (BGSF) as defined in DoD Space Planning Criteria Chapter 130.

3-3.3.2.2 Departments.

Space and Equipment Planning System (SEPS) provides Net Area for specific rooms in a facility. Rooms are grouped into individual departments, such as Physical Therapy, Pharmacy and Common Areas. Some rooms in individual departments are not intended to be co-located and may be located outside of the general department area. Specific common area rooms, intended to be distributed throughout the facility, are combined in the Common Areas Department.

3-3.3.2.3 Departmental Grossing Factor.

SEPS applies a unique departmental grossing factor to departmental NSF to determine DGSF, which includes area of the rooms defined in the individual department, internal circulation, and interior walls/partitions. DGSF includes half of the wall thickness between other departments but does not include exterior walls.

3-3.3.2.4 Building Grossing Factor.

SEPS applies a building grossing factor to the sum of all DGSFs to determine the BGSF. The BGSF includes all areas within the exterior skin of the building according to the gross area rules of Table 3-1 and Figure 3-1. It includes all departmental areas and areas not specifically defined in the PFD, such as public corridors, building circulation, atria, walls/partitions, mechanical and electrical spaces, vertical circulation, and shafts.

3-3.3.2.5 Common Area Rules.

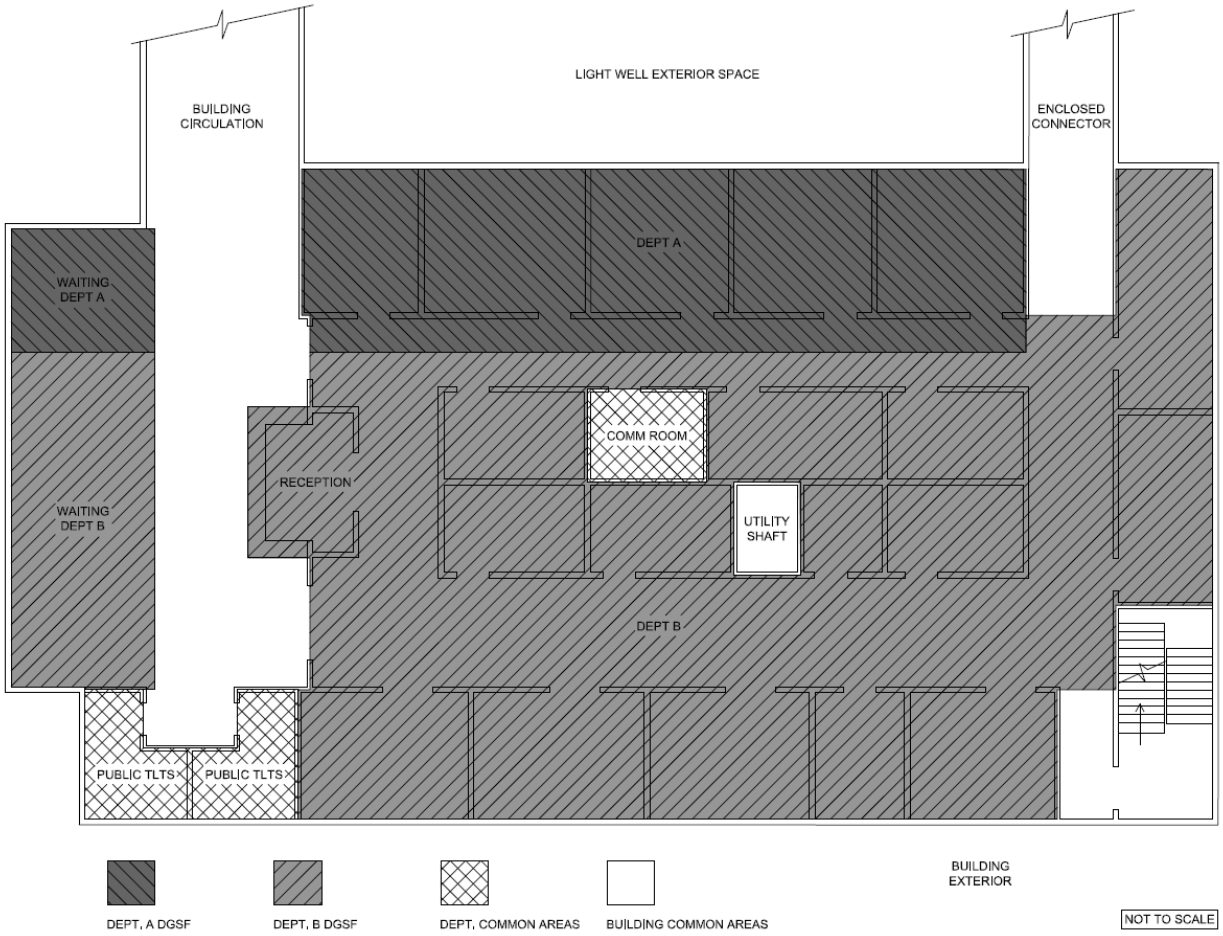
Departmental and Building Common Area rules are defined in Figure 3-2. The following are additional examples and rules:

a. Pro-rating example for shared room: **\1** Department A Waiting net area is defined as 100 sf (9.3 sm) and Department B Waiting net area is defined as 50 sf (4.6 sm) in the PFD. The as designed waiting net area is 120 sf (11.1 sm). The pro-rated net areas for Department A Waiting is 120*(100/150) = 80 sf (11.1*(9.3/13.9) = 7.4 sm) and for Department B Waiting is 120*(50/150) = 40 sf (11.1*(4.6/13.9) = 3.7 sm). **/1/**

b. For facilities that have multiple CATCODES specified in the project 1391: Dedicated Building Common Areas must be assigned to the respective CATCODE. Shared Building Common Areas must be prorated to each CATCODE at the designer's discretion, with the basis for pro-rating used

to determine the appropriate accounting of area to CATCODE being provided.

Figure 3-2 Instructions for Preparing Departmental Gross Area Calculations



Notes for Figure 3-2

1) Individual departmental gross area includes individual rooms in a department, corridors and walls within a departmental area, and half of the common wall shared with other departments and/or building common areas.
2) Shared walls between departments and/or building common areas shall be measured from the centerline of the wall.
3) For areas without partitions such as waiting areas, use the assigned floor area of the furniture seating area, or building feature (i.e. change in flooring or ceiling).
4) For rooms that are shared by multiple departments, pro-rate the area based on the individual departmental PFD areas that are combined.
5) For corridors that feed two or more rooms from two departments, assign half of the corridor to each department. For single rooms from a different department, the corridor will be assigned to the larger department.
6) The Common Areas Department includes telecommunication rooms, janitor closets, public toilets and other common rooms as identified on the PFD. These distributed areas shall be reported on the Net Area Tabulation sheet back to the Common Areas Department rather than the department where they are located on the floor plate.

3-3.4 Design to Cost.

During the final design phase (35 percent through 100 percent design completion) for DBB projects, the A/E must produce a set of construction documents within the PA, DDA, or both, established at Concept Design approval. If design requirements or refinements cause the estimated project cost to exceed the established PA or DDA, the Design and Construction Agent must present cost adjustment or reduction alternatives to the DoD Project Sponsor before completing the design documents.

For DB projects, cost is established at construction contract award. No cost updates are required to the DoD Project Sponsor post construction award.

3-4 DESIGN SEQUENCE AND RESPONSIBILITIES.

Detailed design submission requirements, including sequence, submittals, and documentation, are provided in Appendix C.

3-4.1 Title 10 U.S.C. Section 2807 Action.

The Design and Construction Agent is responsible for providing the estimated A/E design contract and other design costs and schedule to the DoD Project Sponsor for inclusion in Block 12 supplemental data on DD Form 1391. Using this estimate, the DoD Project Sponsor will determine if a project requires notification to Congress in accordance with Title 10 U.S.C. Section 2807. The DoD Project Sponsor personnel must notify the Design and Construction Agent when the notification letters have been signed and the date after which the contract can be awarded, and forward copies to the appropriate personnel. The Design and Construction Agent is required to strictly adhere to the statute and not obligate funds for design until the 14-day Section 2807 waiting period has expired.

3-4.2 Design Authorization (DA).

The DoD Project Sponsor will issue the DA to the Design and Construction Agent as appropriate to meet design and programming milestones. The Design and Construction Agent must manage design in accordance with established policies and procedures unless otherwise coordinated with the DoD Project Sponsor. The Design and Construction Agent must not pursue any level of design beyond that authorized by the DoD Project Sponsor.

3-4.3 Authorization to Advertise Construction.

The Design and Construction Agent must provide a Current Working Estimate (CWE) worksheet and the final design or RFP to the DoD Project Sponsor to request authorization to advertise the construction contract. Bid options must be clearly delineated on the CWE worksheet. The DoD Project Sponsor will notify the Design and Construction Agent when the project is approved for advertising.

3-4.4 Authorization to Award Construction.

The Design and Construction Agent must provide a CWE worksheet based on the latest construction estimate and bid results, accepted bid options, and other information the DoD Project Sponsor requires when Title 10 U.S.C. Section 2853 notification is required. When Title 10 U.S.C. Section 2853 action is complete, the DoD Project Sponsor will notify the Design and Construction Agent that the project is approved for award.

3-5 REVIEW OF DESIGN DELIVERABLES, ROLES, AND RESPONSIBILITIES.

3-5.1 Design and Construction Agent.

The Design and Construction Agent is responsible for executing the A/E and contractor's contract. They are also responsible for the overall design development, review of all design deliverables for contract compliance in accordance with codes, criteria; project design is in accordance with authorized project scope, cost, and schedule; the design incorporates best value design and construction practices; reviews for constructability; cost schedule risk analysis and mitigating strategies; development and review construction contract documents in accordance with approved acquisition strategy; incorporated accepted design review comments, ensures the designer complied with the approved quality control practices, and practices good stewardship of Government resources.

3-5.2 Installation Manager.

The Installation Manager is responsible for reviewing design deliverables for compliance with environmental requirements (NEPA), storm water management, and various permits; meeting the intent of the Installation master plan and exterior architectural standards; connection to the existing infrastructure and maintainability of the infrastructure utility systems; Installation force protection, traffic, fire protection, security standards; and real property transfer (DD Form 1354).

3-5.3 DoD Project Sponsor.

The DoD Project Sponsor is responsible for reviewing design deliverables for project planning and functional requirements (spaces, contents, finishes, departmental adjacencies, ability to support the flow of patients and logistics within facility and its compliance with the design concept of operations) to meet the medical program requirements; clarification of medical unique criteria; maintainability of the design solution; utility connection for medical equipment and suitability for initial outfitting; making notifications to Congress when design deviates from prior notifications; reviewing the design deliverables for compliance with the DD form 1391 and, project scope, criteria, and schedule. They are also responsible for the initial outfitting and transition (IO&T) of the facilities. They may comment on other aspects of the design deliverables.

3-6 REPORTING REQUIREMENTS.

The Design and Construction Agent must report project data as required in the Title 10 U.S.C. Section 2851 Monthly Report to the DoD Project Sponsor.

3-7 DESIGN CONSIDERATIONS.

3-7.1 General.

All design elements, including functional, architectural, electrical, energy, fire protection and life safety, mechanical, structural, Safety Risk Assessment (SRA), and other features, must be coordinated.

3-7.1.1 Dedicated Administrative Area.

When directed by Design Authorization in coordination with the Design and Construction Agent, administrative buildings and separate administrative suites (no internal spaces will be considered), and training buildings, which are not intended to flex into clinical (refer to the Functional Program) should use the technical requirements of UFC 1-200-01 General Building Requirements and not additional requirements of this UFC (cable trays, plenum returns, etc.).

3-7.1.2 Interstitial Building System (IBS).

The DoD Project Sponsor approval for the use of IBS design, and whether the DoD system module or alternate non-DoD system module concept design is used, must be made no later than the 20 percent submission and must include consideration of the required economic comparison with conventional design. See Appendix E for IBS criteria.

3-7.1.3 Safety.

The DoR must follow the concepts from the most current ANSI/ASSP Z590.3: Prevention through Design Guidelines for Addressing Occupational Hazards and Risks in Design and Redesign Processes. Through the application of Prevention through Design concepts, decisions pertaining to occupational hazards and risks can be incorporated into the process of design and redesign of work premises, tools, equipment, machinery, substances, and work processes including their construction, manufacture, use, maintenance, and ultimate disposal or reuse. This standard also provides guidance for a life-cycle assessment and design model that balances environmental and occupational safety and health goals over the life span of a facility, process, or product.

All DoD facilities must comply with DoDI 6055.01 and applicable Occupational Safety and Health Administration (OSHA) safety and health standards.

3-7.1.4 Equipment Room Locations.

The DoD Project Sponsor's preference is to locate mechanical, and electrical equipment rooms with exterior at grade access. Major equipment rooms must have exterior access with paved surfaces for wheeled transport of equipment. Provide horizontal and vertical access to interior, below-grade, or upper-level equipment rooms including transport of the largest items of equipment that may require replacement. Equipment rooms must be designed so the largest serviceable part of equipment can be transported in/out of the building. This includes transporting the equipment without voiding warranties or reducing the end-state performance of the equipment.

3-7.1.5 Distribution Equipment Space Clearances.

Provide the greater of manufacturer recommended maintenance and design criteria clearances in accordance with Chapter 9, Chapter 10, Chapter 11, and Chapter 12.

3-7.1.6 Utility Distribution Considerations.

Locate service isolation and balancing devices and terminal equipment that require periodic inspection or maintenance above corridors.

3-7.2 World-Class Checklist.

A project-specific checklist must be developed and provided in accordance with Appendix C. If the DoR is unable to incorporate a mandatory feature, justification must be included in the 35 percent design submittal.

3-7.3 Functional Program During Design.

During concept design, the design phase portion of the Functional Program is finalized by the Project Delivery Team. This document provides a departmental and area-specific narrative and graphic that documents what functions the organization envisions inside a facility as well as how those functions operate. It is a concise but detailed description of the projected operation of the facility that pulls together information concerning the mission and organizational purpose, types of services being performed, and patient and staff "flow" throughout the spaces. It may include the functional description of the spaces, special requirements specific to those spaces, and adjacency requirements within and among the various departments and clinics. The document depicts the routine, daily actions of staff and patients, the flow of supplies, the use of equipment and all other pertinent functions within the building. Refer to Appendix C for the functional narrative required in the 35 percent Design Analysis. For DB projects, the designer preparing the RFP documents may assist in the Functional Program development and ensure the RFP documents are coordinated with the Functional Program.

3-7.4 Parking.

Patient and staff parking guidance is provided in Appendix G. The amount of parking required is determined using the parking formulas provided. Design must ensure ease of patient access.

3-7.5 Future Expansion.

Provide external horizontal building expansion of 20% of the enacted DD Form 1391 gross building area divided by the number of number of floors within the project unless the project requirements state otherwise. Departments most likely to be expanded or converted for future adaptation need be located adjacent to the expansion zone or internal soft spaces.

The tenets of flexibility are:

a. Select sites wherever feasible and plan for the ability for expansion, horizontal and or vertical.

b. Facilities should have the capacity for adaptation and for possible conversion to alternative use.

c. Ensure continuous high-performance facilities by separating building components and systems for maintenance, according to their expected technical or utility lifespan.

d. Consider the potential impacts of future horizontal and vertical expansions on adjacent spaces, departments, chases, utilities, structure, and all other important features of the facility.

3-7.6 Alterations and Additions to Existing Facilities.

For alteration and building addition projects, the A/E must conduct thorough investigations of existing facilities to become knowledgeable of facility conditions. The A/E must establish the existing condition and characteristics of each affected facility to include: utilities and services, systems, existence of code and life safety issues, construction type, requirements for maintaining a secure environment, and infection control as they pertain to the design, construction, and phasing of the work. These investigations and their impact on design of facility alterations and additions must be described in the project design documents.

Alterations to existing equipment and systems, including temporary connections, changes to system performance, or measures necessary to sustain service, must also be shown and described in detail in the project design documents. The A/E must evaluate the impact on existing systems where connections are made that increase overall system demand. The locations of new connections must clearly be shown, described, or both. The A/E must determine and document any project work that must necessitate a reduction or interruption of any service to an existing occupied space.

3-7.7 Safety Risk Assessment.

A Safety Risk Assessment (SRA) must be applied from the programming phase through construction to guide, inform and aid in incorporation of risk based safety practices into each MILCON project. The SRA must be that developed by the Center for Health Design. It must be utilized to determine which design strategies are appropriate for the type of facility, and for incorporation in the proposal and design. A project-specific SRA must be submitted in accordance with Appendix C. The SRA must be initiated by the DoD Project Sponsor during the planning phase of the project. Management of the SRA must be the responsibility of the A/E of record as the SRA continues to evolve with additional levels of detail as needed to support the creation of a safe environment throughout the design, construction, and commissioning phases.

3-7.8 NFPA 99 Risk Assessment.

A NFPA 99 Risk Assessment for Risk Category, Space Category, and Building System Category must be developed and provided in accordance with Appendix C.

3-8 PROJECT COST ESTIMATES.

The Design and Construction Agent must review and approve all construction cost estimates. Construction cost estimates must separate the costs by the type of appropriations.

Cost estimates for building systems developed during design must include the costs associated with providing the Real Property Installed Equipment (RPIE) and the infrastructure to support Personal Property (PP). RPIE and PP is further defined in Chapter 15.

3-9 FUNDS MANAGEMENT POLICY.

3-9.1 Title 10 U.S.C. Section 2853 Action.

The Design and Construction Agent must provide the CWE to the DoD Project Sponsor with their request for authority to award a construction contract. When a project requires notification to Congress in accordance with Title 10 U.S.C. Section 2853, the Design and Construction Agent must plan for and allow at least four weeks to complete the Congressional Notification process prior to the desired award date. The DoD Project Sponsor will notify the Design and Construction Agent when the Congressional Notification correspondence is within 14 days of being complete so that a contract award may be made.

When a project requires reprogramming action in accordance with the applicable MILCON Appropriations Act, the Design and Construction Agent should allow three months prior to the desired award date after additional funds are secured. Projects that are authorized and appropriated through non-standard MILCON funding, such as Supplemental Appropriations or Base Realignment and Closure (BRAC), may require additional notification time so the DoD Project Sponsor can complete unique notification

and coordination requirements. DoD Project Sponsor personnel must notify the Design and Construction Agent when the notification letters have been signed, and forward copies to appropriate personnel. The Design and Construction Agent is required to strictly adhere to the statute and not obligate funds for award until the waiting period has expired.

3-9.2 Return of Excess Funds.

At the DoD Project Sponsor's request, the Design and Construction Agent must return any cost savings (difference between project funds allocated and award CWE) to the DoD Project Sponsor.

3-10 HISTORICAL ANALYSIS GENERATOR (HAG) DATA.

The Design and Construction Agent is responsible for loading construction contract award data into the HAG (also known as HII) database within 30 days of contract award. (Refer to the Historical Analysis Generator website.) These data are used to generate historical Guidance Unit Costs (GUCs) for publication in UFC 3-701-01, in accordance with the latest version of UFC 3-730-01.

CHAPTER 4 SUSTAINABLE DESIGN PRINCIPLES

4-1 GENERAL.

This chapter supplements UFC 1-200-02 High Performance and Sustainable Building Requirements by describing requirements and developing uniformity specific to applicable facilities.

4-2 DESIGN PROCESS.

Analyze LCC effectiveness in support of the military medical mission, to include first cost, energy consumption, annual O&M, and other associated direct costs when evaluating sustainable design features and systems. Prioritize sustainable features that have the highest potential for cost-effective implementation. Do not de-scope sustainable design elements that have been shown to be LCC effective to reduce cost.

4-3 SUPPORTING DOCUMENTS.

Supporting documents include DoD Project Sponsor and Design and Construction Agent publications and regulations including sustainable design policies applicable to DoDM projects, Medical Design Instructions (MDIs), Engineering Technical Letters (ETLs), project-specific design instructions, engineering and construction bulletins, and other DoD-related criteria.

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CHAPTER 5 ANTITERRORISM (AT) AND PHYSICAL SECURITY

5-1 GENERAL.

This chapter provides facility design criteria and guidance for antiterrorism, physical security, and crime prevention. These programs are intended to protect assets: people, facilities, and equipment from terrorism and other hostile manmade threats.

5-2 ADDITIONAL CRITERIA.

The Planning Team uses UFC 4-020-01 DoD Security Engineering Planning Manual, to develop the security and AT requirements. UFC 4-020-01 and the multiple supporting AT UFCs referenced by UFC 4-020-01 implement the facility requirements of DoD Instruction (DoDI) 2000.16, for new and existing construction. This criteria provides minimum construction requirements which must be incorporated in inhabited new construction and major renovations projects. See additional regulatory requirements for physical security of controlled substances in 21 CFR 1301.72. AT and physical security systems required by this chapter must also comply with NFPA 101.

5-3 DESIGN CRITERIA PLANNING TEAM.

Ensure appropriate key personnel are identified and are represented to ensure their varied interests relating to security and AT requirements are included. The specific membership of a planning team will be based on local considerations, but the following functions must be represented; facility user, engineer, security, intelligence, and Antiterrorism Officer.

5-4 ELECTRONIC SECURITY SYSTEMS (ESS).

5-4.1 Purpose.

Provide an ESS utilizing various combinations of capabilities for Access Control Systems (ACS), Duress Alarm Systems (DAS), Infant Protection Alarm System (IPAS), Intrusion Detection Systems (IDS), Video Surveillance system (VSS), Behavioral Health Staff Assist (BHSA) Alarm system, and photo badging. Refer to Chapter 12 for additional information and requirements for communication supporting infrastructure and interoperability.

5-4.2 Systems Considerations.

ESS is an integrated electronic system that encompasses interior and exterior ACS, DAS, IPAS, IDS, VSS, BHSA Alarm system, and photo badging. An assessment of ESS alarm systems requirements must be conducted for facilities in accordance with the project Functional Program and in coordination with the DoD Project Sponsor. Multiple ESS components may be integrated to provide an overall facility security system.

5-4.2.1 Stand-Alone Clinic Facilities Projects.

For stand-alone clinic facility projects, provide ESS with all the capabilities identified for ACS, DAS, IDS, VSS as appropriate for the services noted in the project Functional Program. Project-specific criteria must be fully coordinated with the DoD Project Sponsor.

5-4.2.2 Inpatient Facility Projects.

For inpatient MTF projects, provide an ESS with all the capabilities identified herein as a turn-key system that is networked together for a totally integrated ESS for the facility. An interface with the facility Radio Page (RP) System or other wireless personal communications device must be included (reference Chapter 12) so alarm events can be communicated to the facility security staff (for quick response), and the facility NTS System (reference 12-5, Network Time Synchronization System).

5-4.3 ESS Components and Funding Restrictions.

The systems and equipment items listed here require Proponent funds to purchase and install the items. The construction project can fund all infrastructure and utility support. Therefore, a listing for separate line-item funding and accounting is required for these items. The Military Interdepartmental Purchase Request (MIPR) of Proponent funding to the contracting agency is required to pay for the totally integrated ESS that must be provided as a turn-key system from a single qualified ESS contractor. Refer to MIL-STD-1691 Table 6-1 Systems Planning Matrix for property type designations for the ESS System and its subcomponents.

5-4.3.1 ESS: Access Control System (ACS).

Reference UFC 4-021-02 Electronic Security Systems for components and requirements associated with the ESS: Access Control System.

5-4.3.2 ESS: Duress Alarm System (DAS).

Reference UFC 4-021-02 Electronic Security Systems and Table 5-1 for components and requirements associated with the ESS: Duress Alarm System. Reference Appendix A for details on the functionality and requirements associated with the BHSA Alarm system.

This proponent-funded duress alarm equipment is not included as part of the door access control system.

5-4.3.3 ESS: Infant Protection Alarm System (IPAS).

Infant Protection Alarm System is required for all Medical Facilities with Pediatric Units, Labor and Delivery Units, Obstetric Units, Neonatal ICUs. Coordinate expansion of the IPAS to cover additional inpatient Units, as noted in 5-4.9 and per the project Functional Program.

5-4.3.4 ESS: Intrusion Detection System (IDS).

Reference UFC 4-021-02 for components and requirements associated with the ESS: Intrusion Detection System. Also reference Table 5-1 for intrusion detection locations and component types.

5-4.3.5 ESS: Video Surveillance System (VSS) Equipment.

Reference UFC 4-021-02 for components and requirements associated with the ESS: Video Surveillance System. UFC 4-021-02 refers to this system as CCTV.

5-4.3.6 ESS: Behavioral Health Staff Assist (BHSA) Alarm System.

Reference Appendix A for details on the functionality and other requirements associated with BHSA Alarm system and the associated Duress Alarms for Behavioral Health inpatient and outpatient settings.

5-4.4 System Configuration and Major Functional Components.

Major functional components include but are not limited to:

a. ESS network
b. Intrusion detection and alarm system
c. Door access control system
d. Video surveillance system
e. Infant Protection alarm system
f. Behavioral Health Staff Assist alarm system

Major interfaces in inpatient MTFs include:

a. Interface with Radio Page (RP) Systems (reference 12-11)
b. Interface with Network Time Synchronization (NTS) System (reference 12-5)

5-4.5 ESS Network.

Provide an independent, dedicated, industry-standard network with DISA and DoD Project Sponsor standard LAN technology, protocols, equipment, and cabling to interconnect all provided electronic security capabilities into an integrated ESS in support of facility-wide security requirements and operations. During design consider all outlying medical buildings using the hospital ESS Network for Access Control. The facility Information System network must not be used for ESS networking:

a. As an independent, stand-alone network, the application design must **\4** meet the Risk Management Framework (RMF) authorization requirements

/4/ outlined in Chapter 12. This must include the system network architecture, software, hardware, and security requirements.

b. Servers and workstations must meet standardized baseline requirements and specifications as defined by DISA and DHA. Servers and workstations must utilize the most current DoD approved operating system and must provide central databases for all the operating systems, application programs, and data logging. In hospitals and medical centers which have an onsite Radio Page System and/or other wireless networked personal communication devices, the ESS network must also provide an interface with these facility systems to communicate security events to the staff.

c. Network Infrastructure (switches, routers, etc.) must meet the standard baseline specifications as defined by DISA and DHA. When possible, network electronics must match NiPR infrastructure for patch management and network administration.

5-4.5.1 Integrator Network Major Components.

The ESS integrator network must be configured as a Client Server network with the major components listed here to serve all the specified capabilities:

a. LAN and infrastructure

b. Database servers

c. Digital video servers and digital video recorders

d. System Operator Workstations

e. Management Workstation

f. Maintenance Workstation

g. System software

5-4.6 Intrusion Detection and Duress Alarm.

5-4.6.1 Sensors and Locations.

Intrusion detection and duress alarm locations and sensor types are as indicated in Table 5-1. Table 5-1 is provided for guidance. Specific design must be in accordance with the project Functional Program.

Table 5-1 Intrusion Detection and Duress Alarm Locations and Sensor Types

Location	Balanced Magnetic Switch	Motion Detector	Duress Alarms
Inpatient and Outpatient Pharmacy	X	X	
Inpatient and Outpatient Pharmacy dispensing Window(s) and consult rooms	X	X	X
Reception and Nurse Stations			X
Pharmacy Vault and vault-based equipment	X	X	
Food Service Account Office	X	X	X
Cashier Locations	X	X	X
Logistics Vault	X	X	
Logistics Warehouse	X	X	
Silver recovery central Collection point	X	X	
Behavioral Health			X*
Admissions Cubicles			X
Command Office			X
*This includes both inpatient and outpatient Behavioral Health settings. See Appendix A for locations of Duress Systems equipment and operational requirements in Behavioral Health settings.			

A balanced magnetic switch must be placed on each door or window of locations indicated in the Functional Program and Table 5-1 as requiring balanced magnetic switches and that could provide access. The motion detector must cover the entire area being protected. Locate the motion detectors in coordination with the systems furniture and equipment. Video surveillance monitoring and recording must be activated by the intrusion detection and duress alarms unless the cameras are recording 24/7/365 and meet recording period capacity as required by the DoD Project Sponsor for forensic purposes. The intrusion detection and duress capability design must follow the DoD

Project Sponsor regulations and other applicable specifications and be coordinated with the facility and Installation security staffs.

5-4.6.2 Remote Alarm Reporting.

Any combination of intrusion or duress alarms that requires immediate military police response must be communicated to the Installation Security Office. For the implementation of this function, provide an interface to the existing Installation ESS network. The system contractor must field coordinate the exact configuration and location of this interface with the Installation Security Office.

The selection of alarms to be routed to the Installation Security Office must be under software control from the facility ESS Management Operator Workstation. The initial list of alarms to be programmed for remote reporting at the time of facility ESS activation must be coordinated with the Contracting Officer.

5-4.7 Door Access Control.

Provide electronic door access control capability, as a minimum, at the locations listed here and as required by the project-specific criteria. The capability must:

a. Provide for addition of access authorization to CAC cards as the primary access control card; and

b. Include photo badging equipment to produce access control cards, and a Management Workstation to issue access cards, when CAC card usage is not feasible; and

c. Generate and maintain a listing of current authorized access by individual, location, and time; and

d. Discontinue access authorization for issued cards. Monitor and control of door access activity and events must utilize the integrator network Workstations. Where required, provide an interface between the video surveillance and the door access control capabilities to initiate video monitoring and recording of surveillance cameras anytime these doors are opened unless an authorized access control card has been read by the card reader or an authorized personal identification number (PIN) is entered in an access control keypad. This must be as further defined herein in paragraph 5-4.8.

A staff identification card system with multiple levels of access control may be provided.

5-4.7.1 Access Controlled Door Locations.

Electronic door access control devices must, as a minimum, be provided at these locations:

a. All building exterior doors, including doors to the first floor mechanical and electrical equipment rooms

b. Each door between waiting areas/general circulation corridors to clinical spaces
c. Each storage room entrance door
d. Each Pharmacy entrance door
e. Each Pharmacy vault door
f. Server Room Support Equipment (CMP04) door
g. Each Cashier Office door
h. Each Behavioral Health Unit entrance door
i. Command suite entry door
j. All Telecommunication Room doors
k. Service Entrance Facility (COMC2) door
l. Server Room (CMP01) door
m. Communications Radio Equipment (COM04) door
n. Penthouse equipment room door
o. Each staff locker room door
p. Inpatient Records room door
q. Outpatient Records room door
r. Multimedia equipment room door
s. Security Department entry doors
t. Medication Rooms
u. Mail Room
v. Select elevators as directed by the DoD Project Sponsor
w. Additional locations must be as directed by the DoD Project Sponsor

5-4.7.2 Door Access Control Major Components.

Reference UFC 4-021-02 for components and requirements associated with the ESS: Access Control System. Major components of the door access control system are listed in UFC 4-021-02.

5-4.8 ESS: Video Surveillance System (VSS).

The provided video surveillance capability must perform functions for capturing, viewing, controlling, monitoring, and recording of video surveillance scenes for specified locations throughout the facility and site. Operation for monitoring and control functions for video surveillance must take place at system integrator network Operator Workstations. Where required, all images from all video cameras must be digitally recorded on video camera servers at all times. Provide as many video camera servers

as are required for recording all images from all video cameras. Recording parameters, to include **\4** camera coverage, **/4/** frame rate, resolution, and record duration, must be as specified by the DoD Project Sponsor and verified by the system contractor. All alarms routed over the ESS integrator network must be received and processed for automatic initiation of special video monitoring and recording protocols for the alarm event point and a designated zone associated with the alarm event point. **\4**

Coordinate exterior camera locations and mounting heights with landscaping to prevent obstruction of views. Coordinate exterior camera mounting heights so that vehicles do not obstruct views. **/4/**

5-4.8.1 Color Video Camera Coverage.

Color video images of surveillance scenes from points throughout the facility and site must include but not be limited to these locations:

a. Main Entry Lobby area
b. Ground level Elevator Lobby area
c. Mechanical Room door
d. Cashier Office
e. Cashiers locations in food service and Installation exchange
f. Vaults
g. Entrances and exits from the Labor and Delivery (L&D) Unit, NICU, Pediatric and Behavioral Health Units
h. Server Room Support Equipment (CMP04) door
i. Service Entrance Facility (COMC2) door
j. Server Room (CMP01) door
k. Communications Radio Equipment (COM04) door
l. Emergency Waiting areas
m. Emergency Walk-In Entrance and Reception
n. Ambulance dock and entry area
o. Corridors connecting buildings
p. Pharmacy dispensing windows and Waiting Area
q. Pharmacy narcotic counting & prescription preparation area
r. Main and secondary building entrances and exits
s. Service elevator lobbies
t. Loading docks and dock dumpster areas
u. All Parking Lot areas

v. Inpatient Behavioral Health outdoor areas

w. Additional locations must be as directed by the DoD Project Sponsor

All other locations can be covered using black and white cameras as directed by the DoD Project Sponsor.

5-4.8.2 Video Surveillance Major Components.

Reference UFC 4-021-02, Chapter 4, for components and requirements associated with the ESS: Video Surveillance System.

5-4.9 ESS: Infant Protection Alarm System (IPAS).

Provide the capability to detect and report alarms if an attempt is made to abduct an infant or pediatric patient from protected patient care areas, such as the L&D Unit, Obstetric Unit, Pediatric Unit, Med/Surg Unit when infants or pediatric patients are admitted to them, Level 1 Well Baby/Holding Nursery and Level II, III or IV Neonatal ICUs. To protect the infants or pediatric patients in these units, an interactive tag must be attached to each patient in the units. The tag must signal an alarm and the VSS must begin recording if there is any unauthorized attempt to remove the patient from the secured unit (exit alarm) or if there is an unauthorized removal of the tag or strap from the patient (tag tamper alarm). In an alarm condition, electromagnetic locks on exit doorways from the unit must be activated to delay or prevent the unauthorized individual from being able to leave the unit with the patient and allow time for the staff in the area to respond to the alarm.

The system must be continuously supervised to detect any tampering or removal of a monitoring device. Any detected unauthorized tampering with, or unauthorized removal of equipment must generate an alarm condition. All alarms must be concurrently routed in real-time to all Operator Workstations and transmitted to the security staff and staff in the alarmed unit via radio page or other wireless networked personal communication device. Operation and management of the IPAS capability must take place at Infant Protection Workstations installed in the designated Nurse Station of each unit. The electromagnetic door locks must be interfaced with the facility fire alarm and fire detection system to unlock the doors in the event of a fire or other emergency. Also, if there are elevators within the perimeter of a protected area, an alarm condition signal must be routed to the elevator controls to prevent the elevators from arriving in or leaving the protected unit area.

5-4.9.1 Infant Protection Major Components.

Major components to provide Infant Protection Alarm capability include, but are not limited to:

a. Network adapters

b. Infant Protection Workstations

c. RF readers

d. Low frequency (LF) readers

e. Infant tags and straps

f. Door position switches

g. Exit door dome lights with tone device

h. Electromagnetic door locks and power supplies

i. Proximity card readers

j. Speakers

k. Infant protection software

5-4.10 ESS: Behavioral Health Staff Assist (BHSA) Alarm System.

Appendix A describes the required functionality of the primary signaling (response managed within the unit or clinic) and secondary signaling (elevated response by resources external to the unit or clinic) for the BHSA Alarm system. **\1\ /1/** The primary signaling capability must consist of wired and wireless components as prescribed by Appendix A.

The secondary (external to the unit or clinic) signaling for BHSA Alarm system must consist of centrally located Duress Alarm components as prescribed by paragraph 5-4.6.2 and Appendix A.

5-4.11 Basic Design Requirements.

5-4.11.1 Electrical Power.

ESS equipment in inpatient MTFs must be powered from the essential electrical system with branch assignments per Table 12-1. AC powered equipment must be protected by either an internal battery backup or a UPS unit which must provide at least 15 minutes of full power during an AC power failure. UPS units must comply with **\1** Underwriter's Laboratory (UL) **/1/** 1778 and 47 CFR Part 15.

Power all video cameras from camera power supplies located in the nearest Telecommunications Room (TR).

5-4.11.1.1 DoD Assessment and Authorization.

The ESS must be RMF certified in accordance with DoD Assessment and Authorization Process. This certification requires the system to have a number of security characteristics and features.

5-5 SPECIAL CONSIDERATIONS FOR SECURITY SENSITIVE AREAS AND ROOMS.

Sensitive areas and rooms must be designed to store valuable assets (for example, funds, narcotics, dangerous drugs, and controlled substances and materials). The most cost-effective method of providing adequate security for these assets must be selected.

5-5.1 Safes.

Drugs classified as Schedule I or II controlled substances under the Controlled Substance Act of 1970 must be stored in safes or vaults. Drugs classified as Schedule III–V may also be stored in safes or vaults as deemed appropriate by the DoD Project Sponsor.

5-5.2 Vaults.

Features to be considered for vault storage areas are outlined in 21 CFR 1301.72 and DoD Project Sponsor directives.

5-5.3 Pharmacies.

Walls, floors, ceilings, doors, and service windows of pharmacies must provide resistance to forced and covert entry where necessary and required by the DoD Project Sponsor physical security regulations. Doors and windows must be kept to a minimum and doors must be keyed separately from the master key system. IDS sensors must be installed at all doors and windows including windows opening to corridors. As a minimum, walls surrounding pharmacies must be constructed full height from floor slab to structure above.

5-5.3.1 Doors.

Doors must be provided with security hinges and must be locked with security locksets. Doors must be solid core wood or hollow core steel. Other considerations include “peep holes”, two-way intercom system with camera, and card access system with keypad for the main staff entrance door, double-locking locksets with 1 in. (25 mm) throws, warning signs stating doors must remain unlocked during normal operating hours (for emergency egress), and warning signs stating “Controlled Area”.

5-5.3.2 Service Windows.

Provisions, such as roll-up shutters, must be made for securing all service windows after normal operating hours. Frames holding roll-up shutters and security screens, or bars must be securely fastened with smooth-headed bolts with nuts peened in place.

5-5.3.3 Utility Openings.

Duct terminals and connecting points must be in exposed locations where they may be readily observed to detect tampering. Openings of 96 in^2 (0.062 m^2) or larger must be protected **\1** in accordance with (IAW) **/1/ \4** UFC 4-026-01. **/4/**

5-5.4 Medical Supply Storage Areas or Facilities.

In addition to the criteria provided for pharmacies, high value, critical, and pilferable resources stored in this type of storage area or facility must be protected in accordance with specific requirements as defined by 21 CFR 1301.72 and the DoD Project Sponsor.

5-5.5 Other Security Sensitive Areas and Rooms.

Other activities or locations may be identified by the DoD Project Sponsor as security sensitive. These areas and rooms must minimize the security risk for these activities or locations. Package inspection devices may also be considered for mail rooms. Design ESS in accordance with UFC 4-021-02.

CHAPTER 6 ARCHITECTURAL

6-1 GENERAL.

This chapter provides architectural design guidance. Design of applicable facilities must emphasize architectural design excellence while balancing economical, functional, energy efficient, and sustainable architectural design elements. Principles of Evidence Based Design (EBD) and world-class facility standards must be included where applicable, based on project scope and building type. Designs must adhere to general healthcare industry standards, DoD and DoD Project Sponsor specific functional requirements, Core UFCs such as UFC 3-101-01, and criteria specified herein.

6-2 EXTERNAL DESIGN.

Adhere to applicable Installation design guidance and individual DoD Project Sponsor exterior design standards where applicable. Give special attention to provide convenient and Architectural Barriers Act (ABA) compliant patient access and drop off areas. Consider safety and separation of public, staff, emergency, and logistics travel paths as an integral part of the design.

6-3 EXTERIOR WALL DESIGN

All facilities must comply with the requirements listed in Chapter 4 and with any DoD Project Sponsor or Design and Construction Agent directives mandating increased energy performance.

6-4 FENESTRATION AND WINDOWS.

Provide natural day lighting to maximum extent possible throughout the facility. Exterior windows must be provided in normal nursing care areas. Intensive Care and Cardiac Care bedrooms, Prosthodontic Dental Treatment Rooms (DTRs), and Prosthodontic-Ceramics Laboratories should also be provided with natural lighting or artificial lighting balanced to the natural wavelength. Natural lighting may be provided in Dermatology Clinics if required by the DoD Project Sponsor. Exterior windows must also be provided per host nation requirements where it exceeds DoD criteria. **\4**

All exterior windows to receive solid surface window sills/stoops in compliance with section 6-5.1 below. Sills/stoops for windows higher than 10 feet above finish floor or clearstory, may consider alternate materials approved by the DoD Project Sponsor. **/4/**

6-5 INTERIOR CONSTRUCTION.

6-5.1 Aseptic Environments.

An Infection Control Risk Assessment (ICRA) must be developed to address risk management during the project. The risk assessment must include requirements that address patient care, facility design, construction, construction phasing, ventilation, safety, and epidemiology. Selection of interior construction and finishes must consider

the need for aseptic environments. Use smooth, nonporous, seamless materials to minimize contamination and reduce housekeeping requirements. Smooth, seamless wall and floor coverings facilitate cleaning. Cabinetry should be designed and installed without gaps behind or underneath base units. At a minimum, these areas must be designed for ease of housekeeping, with elimination of materials or surfaces that could harbor contamination and to minimize maintenance requirements:

a. Oral Surgery Rooms, DTRs

b. Special Procedure Rooms, for example, Cardiac Catheterization, Angiography, Endoscopy

c. Operating Rooms (ORs), including C-Section and Hybrid

d. Emergency and Trauma Rooms

e. Decontamination Rooms in Surgery, Labor/Delivery, Dental, and Central Processing and Distribution (CPD)

f. Sterile Storage Rooms (Surgery, Labor/Delivery, Dental, CPD)

g. Sub sterile and Recovery Rooms (Surgery and Labor/Delivery)

h. All Patient Treatment Rooms

i. Intravenous Admixture and Chemotherapy Preparation Rooms in Pharmacy

6-5.2 Interior Design.

All finished designs must comply with Appendix B.

\1 Design all direct patient care spaces at full scope in accordance with the Program for Design (PFD) area requirement. Design all other spaces to meet the PFD area requirements without varying more than plus or minus 10 percent. Approval from the DoD Project Sponsor is required to deviate from these requirements. Record all area differences from the PFD in the submittal requirements, Appendix C, specific to the net area calculations with narrative justification. **/1/**

6-6 FRONT DESK AND RECEPTION AREAS.

For areas that regularly receive patients for care or administrative reasons, patients and users must have a clear understanding of where to go upon check-in and must be within immediate, physical reach of attendants if directional or medical assistance is required.

Position and design the front desk or reception areas to provide direct observation of the entry area and the waiting area of each department to ensure that the desk attendant(s) have unobstructed line of sight to the patients in the area and can physically access anyone needing assistance or summon other staff to assist.

6-7 FLOORS.

Reference Appendix B for required floor finishes. Ensure floor to receive finish is properly cured, level and free from any loose material prior to any installation. **\4** Provide no-wax floor finishes.

Provide the following floor finishes for corridors, unless the DoD Project Sponsor directs other finishes are to be used in the design documents or in the DB RFP:

6-7.1 Primary and Public Spaces and Corridors.

- Medical Centers, Hospitals, and Ambulatory Care Clinics: Epoxy terrazzo flooring system or approved alternate by DHA-FE.
- Medical Clinics and Dental Clinics: Epoxy terrazzo flooring system, porcelain tile, or approved alternate by DHA-FE.
- Veterinary facilities: Epoxy terrazzo flooring system.

6-7.2 Departmental Corridors.

- Inpatient and open concept dental departments – Sheet rubber with integral rubber base.
- Outpatient (except open concept dental departments) – Rubber tile with rubber base.
- Administrative departments without outpatient spaces – Carpet tile with rubber base.
- Veterinary facility– Epoxy terrazzo flooring system with resinous integral base.
- Command Suite corridors – Carpet tile with wood base or millwork rubber base.

6-7.3 Service and Staff Only (Back-of House/Off-Stage) Corridors.

Service and staff only (back-of-house/off-stage) corridors subject to pallet jack traffic are to have sealed concrete. Other corridors shall match departmental corridor flooring. **/4/**

6-8 WALL AND PARTITION SYSTEMS.

Reference Appendix B. Provide systems that permit modification with the minimum cost and difficulty within acoustical and fire criteria, except in areas subject to severe impact. Interior non-load bearing metal studs must be a minimum 20 gauge, 16 in. (405 mm) on center. The DoR will determine if more stringent structural requirements apply. Provide non-combustible wall backing **\1** (alternatively fire-retardant wood blocking may be used as coordinated with the equipment vendor and DoR) **/1/** at all wall-hung equipment and accessories. Architectural acoustics must be coordinated across all building systems. Resilient channels are prohibited to be used. Consider the use of other

methods and products to control sound, vibration and achieving required STC ratings listed in Appendix B.

6-8.1 Use of Full Height Partitions.

Full height partitions (floor to structural slab above) must be used where required to meet fire or smoke separation, critical pressurization, and sound performance requirements and in the rooms, spaces, and compartments listed below for physical security purposes. Refer to Appendix B and paragraphs 10-7.5 and 10-14.1 for construction and leak test requirements for rooms with critical pressurization.

a. Medical Record Storage areas (paper file areas or large centralized areas), Legal, credentials, quality, and Human Resource records storage areas
b. Materiel Services Storage areas
c. CPD Storage areas
d. Pharmacy
e. Prosthodontics and Ceramic Laboratory
f. Medical Equipment Maintenance and Repair
g. Orthotic Appliance Manufacturing
h. Facility Engineer Maintenance Shops
i. Pulmonary Function and Laboratory
j. Medical Service Account (MSA) Funds Storage
k. Labor, Delivery, and Recovery Rooms (LDR)/Labor, Delivery, Recovery, and Postpartum Rooms (LDRPs)
l. Corridors
m. Neonatal Intensive Care Unit (NICU), Nurseries, and Pediatric Inpatient Rooms
n. Behavioral Health Inpatient and Seclusion Rooms

6-8.2 Barriers.

Design protective barrier partitions to protect occupants or equipment in rooms, spaces, and compartments from fire, smoke, radiation exposure, electrical interference, magnetic resonance imaging (MRI) shielding, or for physical security purposes.

6-8.3 Protection and Safety Features.

Use door and wall guard systems (for example **\4** full height corner guards, **/4/** crash rails, handrails, chair rail, wall protection panels) in all patient care areas subject to frequent abrasion and impact. Areas include, but not limited to, corridors, alcoves, patient treatment rooms, utility (soiled/clean) rooms, **\4** janitor closets, drinking

fountains/fill stations, CPD, physical therapy Exercise Gym, **/4/** gurney storage, laboratories, kitchens, loading docks and others.

Provide handrails in corridors where patients routinely travel and public areas where travel along a wall is possible. Handrails are not necessary in administrative areas.

6-8.4 Toilet Facilities.

Provide appropriate floor slope, water containment, and drainage as required. Give consideration to slip resistant surfaces in wet areas. All thresholds must meet ABA requirements.

6-8.5 Toilet Partitions.

In locations where toilet partitions are utilized, provide ceiling hung type, unless directed otherwise by the Design and Construction Agent. **\4**

6-8.5.1 Showers and Wet Bathrooms.

Provide positive slope (¼ in. per foot (5.2 mm per m) minimum) at all shower locations along with the use a linear trench drain located at either end or front edge of the shower. Utilize a single plane slope to a trench drain as opposed to a four-way pitch with center drain.

In new construction, provide slab depressions for all showers and wet bathrooms, where the entire bathroom floor slopes to the one drain. **/4/**

6-9 CEILINGS.

6-9.1 Support.

Suspended ceiling surfaces cannot be used for the direct support of cubicle curtain tracks and ceiling lights. Ceiling-mounted accessories must be secured through the ceiling to secondary support members.

6-9.2 Utility Access.

Provide maximum accessibility in corridor ceilings to the mechanical, electrical, plumbing and telecommunication distribution systems. Do not use concealed-spline ceiling systems requiring special tools to lower tile assemblies. Identify the access panels into ceiling plenums in order to identify the type of utility present and coordinate with all disciplines.

6-10 VESTIBULES.

Provide exterior vestibules at primary patient entrances. Vestibules must comply with ABA requirements and should be of sufficient depth to allow the outside doors to close before the inside doors are opened. The Design and Construction Agent may waive

this requirement in moderate climates if justification concerning energy and life cycle cost are provided.

6-11 DOORS.

6-11.1 Automatic Doors.

\4 Provide automatic operated sliding doors at Emergency Trauma entrances and primary patient entrances of MTFs. Provide swing doors only if directed by the DoD Project Sponsor. **/4/** Doors, Frames, and Hardware.

Door sizes and types are as indicated in Appendix B. Unless otherwise stipulated by the Design and Construction Agent, all door frames must be **\4** hollow metal welded frames. Door frames to be 16 gauge minimum (Level 3 Heavy Duty) for interior and 14 gauge (Level 4 Extra Heavy Duty) for exterior. Frames are to be factory assembled, squared, welded, ground smooth and prime painted. The welded corners to provide a smooth seamless appearance. Knockdown (KD) frames are prohibited. **/4/** Refer to Chapter 14 for fire protection and life safety labeling requirements. Provide a glass view panel in OR doors and other areas where staff may be transporting non-ambulatory patients. At patient toilets, provide rescue hardware that, in an emergency, allow access to the room regardless of privacy lock type or obstruction on interior side of door. Door hardware must be of Builders Hardware Manufacturers Association (BHMA) Grade 1, meet ABA requirements, and be aesthetically compatible with the design of the facility.

6-12 SUSTAINABLE DESIGN.

Reference Chapter 4 for sustainable design principles.

6-13 WAYFINDING PLAN.

A wayfinding plan must be generated for all new medical facilities. The Design and Construction Agent must substantiate that all architectural and engineering systems, specifications, and contract documents support the elements and features proposed in the wayfinding plan. Signage, a tool associated with wayfinding, must be fully coordinated and consistent with the facility's wayfinding plan. Development of a wayfinding plan must begin at the start of a project's design and conclude with the project's final design submission.

For addition/alteration projects, coordinate the wayfinding plan with existing conditions. In the absence of a base or facility wayfinding master plan, evaluate and assess one's ability to navigate, via wayfinding cues, from the existing facility to the addition/alteration project. Consider adjacencies, circulation, building entrance locations, parking considerations, and overall building configuration as part of this evaluation.

6-14 BEHAVIORAL HEALTH.

See Appendix C and Appendix A for other specific requirements. **\4**

6-15 INTERIOR MOCK-UPS.

Provide interior Room Mock-Ups at all spaces and/or rooms listed below for review and coordination during the design process. At a minimum provide architectural floor plan, equipment/furniture plan and JSN schedule, interior elevations, 3D isometric, reflected ceiling plan, which include all disciplines (electrical lights, power outlets, IT/COMM data outlets, mechanical items, Fire Protection with sprinkler heads and other ceiling mounted devices). For drawing mock-ups, try to limit one room type per sheet with all required elements.

DoD Project sponsor to determine types of mock-ups (drawing, physical, virtual reality) required to be provided at various stages of design.

6-15.1 Drawing Mock-Up Spaces and Rooms.

Provide 2D/3D detailed drawing mock-ups for the following rooms:

- Radiographic / Fluoroscopic X-Ray (XDRF1)
- CT Scan Room (XCTS1)
- MRI Scan Room (XMRS1)
- Exam Room (EXRG1)
- Airborne Infection Isolation (AII) Exam Room (EXRG6)
- OB/GYN Maternal Fetal Medicine Exam Room (EXRG8)
- Behavioral Health Provider Office (OFDC1)
- General Infusion Therapy Station (OPCT1)
- C-Arm Fluoroscopy Procedure Room (ORPP1)
- Phase I Recovery (RRSS1)
- Phase II Recovery Multi-Station (RROP2) - Pre-Operative Holding
- Endoscopy Procedure (TREE1)
- LDRP Patient Room (LDRP1) with LDRP Patient Room Airborne Infection Isolation (AII) Room (LDRP3)
- LDRP C-Section Operating Room (LDDR1)
- Medical Surgical Bedroom (BRMS1) with In-Patient Toilet/Shower (TLTS2)
- Medical Surgical Airborne Infection Isolation (AII) Bedroom (BRIT1) with Protective Environment Ante Room (BRAR1) *(Patient room is similar to BRMS1)*

6-15.2 Physical Mock-Up Spaces and Rooms.

DoD Project sponsor to determine the level of "finish" for the physical mockups. This may include full scale room mock-ups for interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings, equipment, lighting, electrical switches/outlets and med gas outlets, plumbing fixtures and other essential elements and accessories. Location of interior physical mock-ups can be in a warehouse or other type of building either on site or off. As a minimum, the following rooms shall be included in the physical mock-up, constructed on-site or off-site, each using the same room orientation:

- Exam Room (EXRG1)
- General Treatment Room (TRGM1)
- Operating Room General (ORGS1)
- Emergency Care Treatment (TRET4) (minimum one-bay of 2 bays)
- Emergency Room Exam/ Treatment Room (EXER1)
- Medical Surgical Bedroom (BRMS1) with In-Patient Toilet/Shower (TLTS2)
- LDRP Patient Room (LDRP1)

6-15.3 Virtual Reality Mock-Up Spaces and Rooms.

In addition to drawings, provide Virtual Reality (VR) mock-ups of the following rooms:

- Endoscopy Procedure (TREE1)
- LDRP Patient Room (LDRP1) with LDRP Patient Room Airborne Infection Isolation (AII) Room (LDRP3)
- LDRP C-Section Operating Room (LDDR1)
- Medical Surgical Bedroom (BRMS1) with In-Patient Toilet/Shower (TLTS2)
- Medical-Surgical Airborne Infection Isolation (AII) Bedroom (BRIT1) with Ante Room BRAR1 *(Patient room is similar to BRMS1)*

6-15.4 Timing of Interior Mock-Up

Start the design for 2D/3D detailed drawing mock-ups at the 20% stage with final development and design at 35%. Contractor to take mock-up designs and construct actual full-scale physical mock-up of each room identified above in section to inform the 65% design submission.

The 65% design stage shall address all the changes, comments, conflicts and/or issues from the PDT related to the physical mock-ups. Virtual Reality (VR) mock-ups to be completed by 65% design stage.

6-16 HARDWARE CONSULTANT.

A U.S. Certified Door and Hardware Consultant must be a part of the project delivery team (PDT) who will actively participate in the development of plans, specifications, and narratives. This independent Hardware Consultant (not a manufacturer's representative, manufacturer, distributor, or sales agency) shall have the following minimum qualifications and experience requirements.

6-16.1 Professional Certification.

For the purposes of meeting this requirement, a qualified Hardware Consultant is defined as an individual meeting the following conditions: A Certified Professional who has passed the Door and Hardware Institute (DHI's) training and examination process with one (1) of the following DHI's recognized certification designations:

- Certified Door Consultant (CDC)
- Architectural Hardware Consultant (AHC)
- Electrified Hardware Consultant (EHC) and/or Architectural Openings Consultant (AOC).

6-16.2 Verifiable Experience.

- Have a minimum ten (10) years of experience specifying door hardware for medical/healthcare projects.
- Hardware Consultant is responsible for selecting, modifying, or developing appropriate hardware sets for each door opening.
- Hardware Consultant is responsible for the selection of hardware and the preparation of Builder's (Finish) Hardware Specifications.
- The Hardware Consultant shall prepare specifications for Section 08 71 00 Door Hardware.
- The Hardware Consultant shall also review the following sections for coordination with the Door Hardware specification: Section 08 11 13, "Steel Doors and Frames; Section 08 11 16 Aluminum Doors and Frames"; Section 08 14 00, "Wood Doors"; Section 08 41 13, Aluminum-Framed Entrances and Storefronts"; and any other project related specifications based upon the DoD Unified Facilities Guide Specifications (UFGS). **/4/**

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CHAPTER 7 STRUCTURAL

7-1 GENERAL.

This chapter provides criteria for the selection, analysis, and design of structural system(s) and materials, including Seismic criteria, to be used for applicable facilities.

7-2 DESIGN CRITERIA.

Structural design must be in accordance with UFC 3-301-01. The Risk Category of buildings and other structures must be based on the nature of occupancy in accordance with Table 2-2 of UFC 3-301-01 for the purpose of applying design load. The desired seismic level of performance for a particular facility is dependent on the nature of the occupancy and whether the structure is required for post-earthquake recovery. The structural engineer of record must assign a Risk Category, as defined in UFC 3-301-01, based on the facility function and the desired seismic performance level. The Authority of Jurisdiction must review and approve the designation.

If required by the DD Form 1391, certain facilities may require only key areas to be operational after the Design Earthquake. Areas that are not required to remain operational may be assigned a lower Risk Category only if both the structural and non-structural systems are designed by the structural engineer of record to be seismically independent or fully isolated from areas that are required to remain operational. Systems that are required to be operational following the Design Earthquake are identified as Designated Seismic Systems in accordance with ASCE 7.

7-3 DESIGN LOADINGS.

Unless otherwise indicated herein, the minimum design loadings must be in accordance with UFC 3-301-01. Floor live loads must be in accordance with UFC 3-301-01, and as amended by Appendix B of this UFC.

7-4 POST-EARTHQUAKE EMERGENCY STATUS.

During the planning period, an evaluation of water for potable and fire suppression purposes, fuel, sanitary sewer, and power, is required for all Risk Category IV facilities in Seismic Design Categories D through F to support continued operations 72 hours after a seismic event. Onsite storage of these lifeline utilities may be required when established by the project DD Form 1391.

7-5 CONCEPT DESIGN DEVELOPMENT.

Develop project specific seismic design concepts. Coordinate the type of structural system to be used in the early concept development of the functional layout, in accordance with UFC 3-301-01. Specific project criteria include mechanical, electrical, medical gases, and communication systems design criteria.

7-6 DESIGN OF NON-STRUCTURAL SYSTEMS.

Design all non-structural systems in accordance with UFC 3-301-01. Special Designated Seismic Systems are non-structural building systems, utility services, equipment, and medical equipment required to remain operational after an earthquake to sustain life safety systems. Some Designated Seismic Systems known as “Active” require Special Seismic Component Certification to ensure that they do not change state or fail during an earthquake. “Active” Designated Seismic Equipment is a limited subset of Designated Seismic Systems that have parts that rotate, move mechanically, or are energized during operation; and may be limited to motors greater than 10 horsepower or greater than 200 MBH. Pipes, ducts conduits, and similar apparatus are not “Active”. Special seismic component certification must be based on shake table testing per ICC-ES AC156 unless the component is inherently rugged. See UFC 3-301-01, Appendix E-1. Develop a complete list of Designated Seismic Systems and Active Designated Seismic Systems for approval and identify in the Construction Documents. Where applicable, Designated Seismic Systems must be placed above tsunami inundation elevation height as determined by ASCE 7, Chapter 6 including onsite power generators. **\1**

7-6.1 Equipment and Furniture.

From the Equipment and Furniture in the PRC, identify the items where falling may pose a life safety hazard or displacement may cause injury or damage to Designated Seismic Systems. For these items, identify and specify Special Seismic Component Certification requirements and design seismic anchorage and/or bracing elements per ASCE 7 as amended by UFC 3-301-01. Provide a table in the construction documents that defines requirements for this equipment and furniture. **/1/**

7-6.2 Hazardous Materials – Special Storage Provisions.

Provide special storage equipment or accessories that are convenient for normal daily use and functional after earthquakes. Examples of such equipment are lower profile shelves with face bars to secure shelves to the wall or floor and restrain their contents, specially designed racks for restraining reserve oxygen (O) and nitrous oxide (NO) tanks, and special bins for storing anesthetic gas containers.

7-6.3 Hazardous Materials – Fuel Gas Piping.

Brace piping and provide shut-off valves. Use malleable fittings and valves and provide swing joints where necessary.

7-6.4 Electrical Systems – Vibration Isolation.

Where vibration isolation is not required, bolt generators directly to an appropriate foundation. Where vibration isolation is necessary, provide restraining clips at vibration isolators to prevent failure of the isolation mountings in earthquake vibration conditions.

7-6.5 Emergency Generators.

Where practicable, use generators with integral radiator cooling systems. Where auxiliary cooling systems are necessary, install cooling towers or remote radiators at grade level. Brace cooling towers or radiators and provide special bracing for piping. All emergency generators must be set above tsunami inundation height as determined by ASCE 7, Chapter 6 and above the flood design elevation per ASCE 24.

7-6.6 Medical Systems and Equipment – Stationary equipment.

Secure stationary equipment or shelving to a partition or floor. Shelving or equipment with doors that does not require continuous access must have automatic positive latching devices.

Blood bank, drug storage, critical refrigerators, freestanding incubators, and centrifuges should be secured.

7-6.7 Medical Systems and Equipment – Fragile equipment.

Secure sequential multiple blood analyzers and other fragile laboratory equipment. Anchor related shelving and provide lips and face bars as necessary.

7-6.8 Medical Systems and Equipment – Wheeled equipment.

Wheeled equipment must have wheel locks and must be assigned a specific location when not in use. Wheeled equipment must have programmed closets or alcoves whenever possible to limit rolling. Portable equipment must be stored in recessed cabinets secured to partitions, whenever possible.

7-6.9 Supply Storage.

Supply cabinets must have either plastic or tempered glass sliding doors, and the doors must slide closed automatically. Open shelving should have a shelf rim to preclude supplies from being shaken from their storage position.

7-6.10 Medical Gas Bottles.

Metal boxes attached to the floor and equipped with double chains must be provided for medical gas bottles. Wheeled carts carrying oxygen or other medical gases must be equipped with wheel locks and chains for fastening to walls.

7-7 EVALUATION OF EXISTING FACILITIES.

For existing facilities, the Design and Construction Agent and the DoD Project Sponsor must verify the performance objective or Risk Category and the Designated Seismic Systems required, as established in the planning documents. The performance objectives are defined in UFC 3-301-01, and must consider operational mission, disaster preparedness, and medical post-earthquake needs.

7-7.1 Seismic Hazards Evaluation Considerations.

Seismic Structural Evaluations. Seismic structural evaluations and retrofit of existing buildings must be conducted in accordance with UFC 3-301-01. For proposed facility alteration projects, seismic structural evaluations must be conducted during the project requirements planning phase (see Chapter 2).

7-8 ADDITIONAL DESIGN CONSIDERATIONS.

Several aspects of structural design typically associated with facilities are addressed here. It is essential that structural design considerations enter into the earliest stages of concept planning and design, to ensure compatibility with medical function and architectural and equipment features.

7-8.1 Vibration.

Structural vibration requires special consideration. Designs must limit vibration in floor framing systems and must ensure adequate isolation and damping of vibrations produced by HVAC equipment, emergency generators, elevator equipment, human activity, and other machinery. Provide a vibration design in accordance with the following standards:

- Structural steel structures – AISC Design Guide 11: Floor Vibrations Due to Human Activity.
- Reinforced concrete structures – CRSI Design Guide for Vibrations of Reinforced Concrete Floor Systems.
- Steel Joist Institute Technical Digest 5, Vibration Analysis of Steel Joist-Concrete Floor Systems.
- UFC 3-450-01.

7-8.2 Vibration Limits.

Limit floor vibration according to manufacturer requirements for all other vibration sensitive equipment. The below noted floor vibration limitation must apply to the floor above where said equipment is attached to the ceiling structure. Limit hospital floor vibration to 0.5% g or less, except in the case of the following stricter requirements wherein the maximum acceptable floor velocity is listed in micro inches per second. These values must be superseded by any explicit manufacturer requirements:

- Hospital patient rooms: 6000 mips
- Standard operating rooms, surgery suites, bench microscopes up to 100X, and laboratory robots: 4000 mips
- Bench microscopes up to 400X: 2000 mips

- Microsurgery, eye surgery, neurosurgery, and bench microscopes greater than 400X: 1000 mips
- Magnetic resonance imagers: 500 mips

7-8.3 Magnetic Resonance Equipment (MRI) Foundations.

Provide non-ferrous foundation reinforcement for MRI foundation according to manufacturer requirements. Ensure that primary structural foundations surrounding MRI rooms are free of ferrous materials that may cause magnetic interference. Consult with the equipment manufacturer.

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CHAPTER 8 - NOT USED

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CHAPTER 9 PLUMBING AND MEDICAL GASES

9-1 GENERAL.

This chapter provides design requirements for plumbing and medical gas systems. The primary purpose of these systems is to provide safe and reliable support to the medical functional mission. In addition, appropriate design consideration must be incorporated to ensure system maintainability, economy and energy efficiency, and adaptability to future facility modification or expansion.

9-1.1 Supplemental Criteria and Standards.

This chapter may be supplemented with individual Military Department (MilDep) criteria, including Installation-specific requirements, as established by the Design and Construction Agent. Minimum design requirements must be as provided by the International Plumbing Code (IPC) in accordance with UFC 3-420-01, the NFPA Standards, and the other documents noted in this chapter.

9-1.2 Plumbing Systems.

Plumbing systems include domestic cold and hot water; sanitary, storm, and industrial (acid) waste drainage; water treatment, for example, softening, deionization, reverse osmosis; fuel gas; and landscape irrigation. Plumbing systems must be designed to be safe, reliable, and maintainable. Selection of materials, equipment, and installation techniques must consider LCC effectiveness and maintainability in addition to medical functional requirements. Designers must provide for appropriate system isolation and balance with necessary equipment and design practices to avoid cross-connections and backflow.

9-1.3 Medical Gas and Vacuum Systems.

Medical gas and vacuum systems include compressed air (medical, dental, instrument, medical laboratory, dental laboratory, process), vacuum (medical, dental surgical, oral evacuation [OE], waste anesthesia gas disposal [WAGD]), exhaust (laboratory dental), positive pressure gases (nitrogen [N], oxygen [O], nitrous oxide [NO], carbon dioxide [CO2]), and the associated equipment, for example, piping, filters, regulators, alarms, manifolds, and tanks.

9-1.4 Seismic Requirements.

Seismic design criteria for bracing and utility systems, for example, storage, redundancy, are provided in Chapter 7.

9-1.5 Corrosion Protection.

All piping that must be installed in an environment that supports galvanic reaction must be protected from corrosion in accordance with MilDep criteria and the standards and recommended practices of the National Association of Corrosion Engineers.

9-1.6 NFPA 99 Risk Assessment.

A Risk Assessment must be performed in accordance with NFPA 99 to establish the System Categories for all medical gas and plumbing systems. See Appendix C for the timing and responsibilities of the Risk Assessment.

9-1.7 Piping Coordination.

All piping systems must be installed in a manner that promotes cleanliness, protection of room contents and addresses infection control concerns. **\1\ /1/** Piping must be concealed under floor, within walls, and/or above ceilings, except in dedicated mechanical spaces.

Piping must not be routed within the room or above the ceilings of communications, electrical and server rooms unless dedicated to serving the room as indicated in Chapters 11 and 12. Where feasible, avoid routing piping above other sensitive areas such as: operating rooms, delivery rooms, nurseries, food preparation areas, food serving areas, food storage areas, sterile processing clean side, and radiology equipment in procedure rooms, control rooms and equipment rooms. Where routing over sensitive areas cannot be avoided, provide all wet and drainage piping with special protection provisions (for example double wall containment piping or drip pans with leak detection) to protect the space below from leakage and/or condensation.

9-2 POTABLE WATER SUPPLY SYSTEM.

9-2.1 Quality.

All potable water supplies must have an established potability monitoring program to be acceptable for use by an MTF. When an MTF project includes a non-potable water service, for example, “gray water,” for systems, such as irrigation, heating, or cooling, the design must provide for requirements for signage, pipe labeling, and other means as needed to clearly identify the system (including outlets) as unsafe for human consumption.

9-2.2 Continuity of Service.

For hospitals and ambulatory surgery centers, provide a minimum of two water services, fed from either separate mains and sources or separate connections to a multi-sourced network, each designed for full demand (serving potable and process systems). These services must enter the building at separate locations from a piped loop around the facility with isolation valves. The purpose of this provision is to provide an uninterrupted supply of potable water or permit swift service restoration in the event of a water main break. If two separate water sources are not reasonably available, the Design and Construction Agent may seek authorization from the DoD Project Sponsor to utilize onsite storage in lieu of a second water service.

9-2.3 Backflow Prevention.

Backflow prevention must meet the requirements of UFC 3-420-01, the International Plumbing Code and be coordinated with the Design and Construction agent for maintenance accessibility and testing. Configure the backflow preventer(s) for device testing without disruption to the building water service for any MTF with 24/7 operation. Where Continuity of Service requirements allow for a single water service connection, parallel backflow preventers must be provided. Where dual service connections are required, ensure either connection can fully support the facility while the other supply backflow preventer is out of service.

9-2.3.1 Devices and Methods.

All potable water discharge points, such as a faucet discharging into a reservoir sink or tub, must be provided with an adequate air gap in accordance with UFC 3-420-01. Fixtures or equipment where the discharge point is positioned below the reservoir rim must be fitted with a vacuum breaker. Examples of concern include the devices listed here:

a. Bedpan washers, or similar fixtures including a flushometer valve

b. Flexible hoses or shower heads of length sufficient to reach below fixture rim, typically found in procedure rooms, hydrotherapy bath equipment, laboratories, and food service areas, for example, washers, steam tables

c. Laboratory or other serrated-nozzle fixtures designed to accept flexible tubing

d. Water delivery outlets serving therapeutic, surgical, or autopsy or mortuary procedures

e. Hose bibbs and wall hydrants

For the protection of make-up supplies to low-hazard equipment, for example, autoclaves and fire protection sprinkler systems, double-check backflow preventers may suffice. For the protection of sources supplying the building with potable water, and for high hazard equipment and processes, reduced-pressure backflow preventers are required. Designers must include provisions for drainage of the discharge from these devices; refer to Table 9-1 and Table 9-2.

9-2.4 Water Treatment.

A water chemistry analysis **\1** of all potential water sources to the facility (primary and alternate) reporting, at a minimum, the parameters indicated in Table 9-1 must be used as the basis for determining the facility water treatment design scope related to hardness, corrosivity, waterborne pathogen control, specialized treatment for high purity systems, etc. Water testing location must be coordinated with the DoD Project Sponsor and is typically at the point of connection or line of demarcation of real property

ownership. Facility water treatment requirements must be based on the recommendations of a qualified water treatment specialist and coordinated with the Installation, the water supplier, the Water Management Program and all unique water requirements for equipment and systems within the facility. Water treatment requirements must address the use of centralized versus decentralized treatment based on life cycle cost considerations. These evaluations must include domestic water and all specialty water systems. The water treatment specialist must not be affiliated with any water treatment manufacturer or vendor and be independent from the Contractor for DB projects. **/1/**

Water treatment equipment for any facility operating 24/7 must include sufficient redundancy to enable routine maintenance, backflushing, and regeneration without disruption to the facility water supply. Water treatment technologies for the control of waterborne pathogens are discussed in paragraph 9-2.5.

Table 9-1 Water Testing Parameters

Parameter	Units
Water Temperature	°C
Water pH	-
Total Alkalinity	as CaCO3
Total Hardness	as CaCO3
Calcium	mg/l
\4 Silica	mg/l **/4/**
Magnesium	mg/l
Sodium	mg/l
Chlorides	mg/l
Sulfates	mg/l
Nitrate	mg/l
Iron	mg/l
Manganese	mg/l
Lead	µg/L
Copper	mg/l
Conductivity	µS/cm
Total Dissolved Solids	mg/l
Chlorine Residual	mg/l
Langelier Index	Dimensionless
Calcium carbonate precipitation potential	as CaCO3
Dissolved inorganic carbonate (DIC)	as C
Equilibrium alkalinity	as CaCO3
Rysnar Saturation Index	dimensionless
Larson's Ratio	Dimensionless
Chloride to Sulfate Mass Ratio	Dimensionless

Table 9-2 Potential Backflow Preventer Discharge Rates

Assembly Pipe Size in NPS inches (DN mm)	Discharge GPM (L/S) at 60 PSI (414 kPa)	Discharge GPM (L/S) at 150 PSI (1034 kPa)
¾–1 ¼ (20-32)	75 (4.7)	140 (8.8)
1 ½–2 (40-50)	170 (10.7)	280 (17.7)
2 ½–3 (65-80)	250 (15.8)	400 (25.2)
4–6 (100-150)	500 (31.5)	850 (53.6)
8–10 (200-250)	525 (33.1)	890 (56.2)

Table 9-3 Floor Drain Flow Rates

Drain Size	Flow Rate*
Inches (DN mm)	GPM (L/S)
4 (100)	88 (5.6)
6 (150)	264 (16.7)
8 (200)	575 (36.3)
10 (250)	1050 (66.2)
12 (300)	1700 (107.3)
* Flow rates for a floor drain with slotted cover and ⅛ in. per ft (10.4 mm per m) drain pipe slope.	

9-2.4.1 Scale Control.

Provide water softening when the water supply to **\1** a facility has a hardness of 170 mg/l of CaCO3 or more (85 mg/l of CaCO3 for a dental facility). Design the softening system to deliver water with hardness between 50-85 mg/l of CaCO3 unless specialized equipment in the facility requires more stringent standards. Potable water must not be less than 50 mg/l as CaCO3 due to the corrosive nature of overly softened water. All water softening systems must include a proportional blending valve and a bypass meter to ensure positive control over the discharge hardness. Include provisions for softener regeneration discharge, which may require a floor sink or receptor. Provide full automation of softener regeneration process and the ability to monitor blended water hardness, softener status and alarm conditions at the building automation system. All softener materials and additives used for potable water must be NSF certified for drinking water use. **/1/**

9-2.4.2 High Purity Water Systems.

Water purification is the process by which contaminants or impurities, which undesirably affect the performance of specific equipment or the outcome of medical and laboratory tests, are removed from the water. Water purification systems include reverse osmosis,

deionization, ultra-filtration, and ultraviolet (UV) sterilization. Type I and Type III reagent grade water, as specified in ASTM D 1193, are used in various applications such as for medicine preparation processes in pharmacies, in distillation units, for designated laboratory outlets, and in selected equipment for renal dialysis, glassware washing, central sterile supply, and other medical and laboratory functions. Their use must be coordinated with DoD Project Sponsor and the Design and Construction Agent. The designer is responsible to determine local and central treatment options and treatment system combinations to best meet DoD Project Sponsor needs and overall LCC **\1** as part of the water treatment analysis in 9-2.4. The water treatment specialist must confirm the required water quality for each end use and validate the system design can deliver the required water quality. **/1/** Refer to Chapter 10 for make-up water treatment design guidance for steam systems. **\1**

9-2.4.2.1 Sterile Processing.

Design water system to deliver water to sterile processing fixtures and equipment to meet water quality requirements of AAMI TIR 34 and equipment manufacture's recommendations. Large sterile processing departments in hospitals, or central instrumentation processing centers (CIPCs), typically involve larger workloads, more equipment, and more water demand. In these instances, centralized high purity water system should be evaluated which may involve pre-treatment (softening and carbon filtration), principal treatment (reverse osmosis, de-ionized water, or combination), distribution (water storage tank, recirculation at 2-3 fps (0.6 to 0.9 m/s), UV disinfection), and other microbial monitoring, testing, and sanitation features. These systems may also serve other high purity water demands in the facility. Small sterile processing, such as dental instrumentation processing centers (DIPC's), have the same water quality requirements, but have lower workloads, less sterile processing equipment, and less water demand. These small spaces are typically served with point-of-use treatment at a better LCC.

9-2.4.2.2 Reagent Water.

Reagent grade water (RGW) is water that is suitable for use in a specified procedure such that it does not interfere with the specificity, accuracy, and precision of the procedure. Process definitions alone (such as "RO", "DI", "Distilled") do not in themselves adequately define required water quality.

Design water system to deliver water quality that meets user and equipment requirements. Reagent water quality must be classified using ASTM Standard D 1193 reagent water type 1, 2, 3, or 4. When bacterial levels need to be controlled, the level of water quality required must additionally be classified as Type A, B, or C. Reagent grade water must be monitored for resistivity, microbial content, and total organic carbon.

9-2.4.2.3 Laboratory Water Systems.

Design water system to deliver water quality that meets user and equipment requirements for the laboratory. This typically includes compliance with the Clinical Laboratory Standards Institute (CLSI) Preparation and Testing of Reagent Water in the Clinical Laboratory for water requirements. Provide monitoring of resistivity, microbial content, and total organic carbon. **/1/**

9-2.5 Waterborne Pathogens Control.

The relative danger that Legionella and other waterborne pathogens, including pseudomonas, pose in any given facility is a function of (a) “system” factors that promote or discourage colonization, (b) the relative vulnerability of the patient population, and (c) climate and groundwater temperature. Procedures that increase aspiration increase the risk of infection from waterborne pathogens, as does the presence of aerosol-generating sources, such as showers and whirlpool baths. In addition to potential contamination danger from hot water systems, cold water systems pose the risk of supporting pathogen colonization if the piping systems are subjected to heat sources. The temperature of cold water systems might inadvertently be elevated into ranges more conducive to pathogen colonization by ground temperatures, piping located in attics, ceiling spaces, equipment rooms, crawlspaces, other unconditioned spaces, or by being located adjacent to hot water or steam piping. All of these risk factors must be considered when designing the domestic water system.

9-2.5.1 Scale, Sediment, and Biofilm.

Scale, sediment, and biofilm are contaminants that support Legionella bacteria (and other waterborne pathogens) colonization. The extent to which these contaminants support colonization is a function of factors including potable water service quality (including the presence of living aquatic amoebae such as are found in biofilms), system operating temperatures, and pipe material. Standard control technologies for scale and sediment deposits normally minimize the contribution of these factors to pathogen colonization. Biofilms are resistant to some treatments.

9-2.5.2 System Design.

Design the building water system to address management of water temperature, minimize water age, reduce stagnation, maintain a sufficient disinfectant residual, and minimize the use of materials that support colonization to maintaining water quality and manage control of waterborne pathogens.

9-2.5.2.1 Water Management Program \1\ (WMP). /1/

For new Hospitals and Ambulatory Surgery Centers comply with ASHRAE 188 to develop a Water Management Program in conjunction with a Water Infection Control Risk Assessment (format per CDC toolkit). The Program and its required analyses must address all potable and non-potable building water systems and incorporate all control measures prescribed in this Chapter plus any control measures that result from

the analyses. Coordinate the ASHRAE 188 Water Management Program and Water Infection Control Risk Assessment with the Facility Water System Management Team (for example Facility Water Safety Committee, Program Team, etc.) or DoD Project Sponsor to obtain facility and location specific information. Reference ASHRAE Guideline 12 for additional information. For additions or alterations to existing Hospitals and Ambulatory Surgery Centers, update and expand the existing Water Management Program to address the new conditions.

The Water Management Program must be developed and submitted during the 35% design for DBB acquisition or RFP development phase for DB acquisition for determination of design features. During final design, update the Water Management Program to comply with the Elements of Performance in the Environment of Care prescribed in The Joint Commission for the Water Management Program and submit for approval. **\1**

9-2.5.2.2 WMP Requirements for Projects with Limited Water System Impact.

/1/ For small projects affecting a Hospital or Ambulatory Surgery Center with limited impact to the water systems, verify compliance with the existing Water Management Program and provide a compliance report.

9-2.5.2.3 Supplemental Disinfection.

For all Hospitals, provide a supplemental disinfection system(s) with residual disinfection properties for waterborne pathogen control of the potable water system. Examples of systems include, but are not limited to, copper-silver ionization, chlorine **\4** and monochoramine. Hot and cold water supply must be analyzed separately and provided with separate treatment systems if required by the analysis. Provide permanent continual monitoring and trending of water temperature, pH, pressure, disinfectant residual and any other environmental sampling or monitoring required for the selected treatment system. Trend, display, and alarm all monitoring points on the building automation system.

/4/ Exception: Supplemental disinfection may be omitted where approved by CEHNC-EDX/MFPO with concurrence from the DoD Project Sponsor and the Facility Water System Management Team, as supported by the Water Management Program and its required analyses. The analyses must demonstrate that sufficient control measures are in place to address all potentially hazardous conditions without the need for the supplemental disinfection. **\4**

9-2.5.2.4 Selection of Supplemental Disinfection Systems

The selection of supplemental disinfection system must be based on an analysis of all feasible alternatives. The comparison must be site and system specific and address applicability, operational constraints, source water chemistry impact, monitoring and testing, EPA registration/regulation, local and federal restrictions, risk to occupants, occupational safety, system efficacy, performance reliability, disinfection by-products,

staff maintenance capabilities, operating cost, capital cost and life cycle cost, as defined in the research report referenced below. The selected treatment system must be compatible with municipal primary water disinfection system without adverse impacts. Disinfectants must be registered with the EPA as a biocide for drinking water. Comply with applicable federal, state, and local government requirements and regulation which may impose restrictions on implementation or operations. Reference research report "RT #2 Legionella and Supplemental Water Treatment" dated March 2024 (available upon request) as a guide to the analysis. See also ASHRAE Guideline 12 for additional information.

9-2.5.2.5 Start-up and Activation of Treatment Systems

Start-up and activation of the treatment system must be integrated into the Commissioning Plan including documenting the baseline (pre-activation) and post-activation water quality; pre and post disinfection agent concentration (for example: copper/silver ions or residual chlorine). These tests must be performed by an approved laboratory in addition to any field testing required by the manufacturer. A plan for on-going distal flushing and monitoring must be established in accordance with the manufacturer's recommendations and implemented immediately upon system activation (even before building occupancy). The plan must initially be implemented by the construction contractor and then integrated into the facility's ongoing maintenance plans. **/4/**

9-2.5.2.6 Connections to Existing Systems.

For addition and alteration projects, designers must take into consideration the likely presence of biofilms, sediments, and scale and how its disruption may impact the new and existing systems. These considerations must be addressed within the Water Management Program.

Flushing, disinfection, and testing plans for the associated existing system must be coordinated with local shutdown policies and procedures and be approved by the Design and Construction Agent and the Facility Water System Management Team. These plans must address all new piping and all existing piping potentially affected by the work. This requirement includes but is not limited to all piping downstream of the tie-in point and any piping that is inactive during construction.

9-2.5.2.7 Piping Materials.

Potable water distribution within the building must be copper or stainless steel. Specify equipment, and fixture components intended for direct water contact to be of materials that inhibit bacteria colonization, such as copper. For inpatient MTFs, avoid materials that support colonization, such as natural rubbers and some plastics, whenever practicable.

9-2.5.2.8 Piping Design/Distribution.

Design hot and cold water distribution mains to maintain balanced flow throughout. Design piping runs as short as practicable. Avoid creating piping “zones,” which experience infrequent use and, therefore, stagnation. As practicable, route mains close to fixtures to minimize the lengths of branch piping runs. Avoid stagnant piping sections, for example, dead legs. To avoid water temperature rise, design cold water piping, distribution, and insulation to limit heat transfer from hot water piping or other heat sources. The developed length of hot water piping from the hot water recirculation piping to showers, emergency showers, and emergency eyewashes must not exceed 6 ft (1.8 m). The developed length of hot water piping from the hot water recirculation piping to all other fixtures must not exceed 10 ft (3.0 m).

9-2.5.2.9 Location of Temperature Limiting Devices.

Locate temperature limiting devices as close as practicable to the fixture discharge. Do not exceed a 6 ft (1.8 m) developed length from the temperature limiting device to the fixture discharge.

9-2.5.2.10 Hot Water Generation.

Provide a central system for hot water generation. To avoid stagnant storage conditions, consider semi-instantaneous and instantaneous hot water heaters where feasible and when onsite storage is not required by other criteria.

Exception: electric instantaneous water heaters (for example tankless point-of-use) may be considered where remote sinks or lavatories are more than 150 ft (45.7 m) away from a hot water circulation loop but may only be utilized when approved by the Design and Construction Agent.

9-2.5.2.11 Water Storage Tank Design.

Water storage or holding tanks, both cold and hot, must be designed **\4** in coordination with the Water Management Program and **/4/** have continuous flow. Consider using horizontal tanks with baffles to limit stagnation.

9-2.6 Domestic Hot Water Systems.

9-2.6.1 Hot Water Demand.

The demand load can be calculated using several different methods, examples of which are contained in the ASHRAE Handbook: HVAC Applications and the American Society of Plumbing Engineers (ASPE) Data Book. The preferred method for calculating hot water demand for a facility is the Per Fixture method. This method provides a means to account for various uses within each facility and permits the tabulation of the hot water load using a specified demand for each fixture.

Table 9-4 provides a list of representative fixtures taken from MIL-STD-1691 and their demands based on data provided in ASHRAE Handbook: HVAC Applications and the ASPE Data Book. For any fixture not shown, the designer must determine the demand rate based upon experience, standard practice, and available DoD Project Sponsor input. The Per Fixture method is adequate for typical usage. Expanded usage for food service, non-standard fixtures, or abnormal usage patterns (extreme low- or high-demand peaks or erratic peak duration and occurrence) must be factored into the sizing calculations. For example, food service fixture demand factors need to be adjusted if disposable service ware is used. Concentrated patient treatment for sick call, or other instances of high-peak usage are other examples of fixture hot water demand adjustment.

9-2.6.2 Hot Water Storage Tank Sizing Factors.

The Demand Factor and Storage Capacity Factor are listed in the ASHRAE Handbook: HVAC Applications and the ASPE Data Book for given building types, which includes hospitals but not medical clinics, dental clinics, nor laboratories. A Demand Factor of 0.40 and Storage Capacity Factor of 1.00 must be used for clinics. Factors for facilities with laboratory space greater than 10 percent of the total facility space must be coordinated with the Design and Construction Agent. The Probable Maximum Demand is factored by the Storage Capacity Factor to determine the Storage Tank Capacity. The Storage Tank Capacity is the capacity required to be available for use. Storage tanks are not considered to be 100 percent usable and thus, a Usable Storage Tank Factor must be applied to the Calculated Storage Tank Capacity, unless the water in the entire tank is recirculated. The percent capacity considered usable for most tanks is 70, thereby resulting in a 1.43 Usable Storage Tank Factor. The Usable Storage Tank Factor for systems utilizing instantaneous generators or multiple tank arrangements must be coordinated with the Design and Construction Agent.

Table 9-4 Hot Water Demand per Fixture

FIXTURE	GPH (L/h)	HW SFU
Sink, Clinic	4 (15.1)	3
Sink, Plaster	10 (37.8)	3
Sink, Service (General)	20 (75.7)	3
Lavatory, Public (General)	6 (22.7)	1½
Lavatory, Patient (Private)	2 (7.5)	1
Lavatory, Clinic	8 (30.3)	3
Basin, Mop Service	20 (75.7)	3
Shower, Staff or Patient Group	75 (283.9)	3
Shower, Patient (Private)	30 (113.6)	2
Shower, Hydrotherapeutic	400 (1514)	11
Bathtub	20 (75.7)	3
Bath, Whirlpool, Arm	35 (132.5)	3
Bath, Whirlpool, Arm/Foot/Knee	15 (56.8)	3

FIXTURE	GPH (L/h)	HW SFU
Bath, Whirlpool, Leg	100 (377.5)	7
Bath, Body Hydrotherapy (Hubbard)	600 (2271)	17
Bath, Sitz	30 (113.6)	3
General Notes: 1. SFU = supply fixture units. 2. Summing individual fixture demands provides the Possible Maximum Demand. A Demand Factor is applied to the Possible Maximum Demand to calculate the Probable Maximum Demand. The Probable Maximum Demand is the rate at which the heater must generate hot water, or the recovery rate.		

9-2.6.3 Domestic Water Heater Redundancy.

Provide facilities with Category 1 or 2 Spaces (per Appendix B) with multiple water heaters and storage tanks. Total installed capacity to meet or exceed design capacity. Individual heaters and storage tanks to be sized such that the loss of any unit would reduce system capacity by no more than 33%.

9-2.6.4 Hot Water Design Temperature.

Generate and store domestic hot water at a minimum 140 ºF (60.0 ºC). Temper water with a master thermostatic mixing valve at the hot water generator to minimum 130 ºF (54.4 ºC) hot water supply. Recirculate water from all points of use complying with the maximum developed length requirements of paragraph 9-2.5.3.3. Limit the recirculation system temperature drop to 6 ºF (3.3 ºC) for a minimum return temperature of 124 degrees F (51.1 degrees C), providing isolating and balancing provisions.

9-2.6.4.1 Thermal Eradication.

Provide system capability to increase the domestic hot water storage and supply temperature to 180 ºF (82.2 ºC) for a thermal eradication process occurring under the direction of the Infection Control Officer with restricted system use and no general demand.

9-2.6.4.2 Patient and Visitor Toilet Facilities.

Provide ASSE 1070 compliant point of use water temperature limiting devices for supplying tempered water to lavatories and sinks intended for use by patients or visitors. Grouped fixtures may be served from a common water temperature limiting device within the limits of the maximum developed length requirements of paragraph 9-2.5.3.4.

9-2.6.4.3 Showers and Baths.

Provide shower and bath-shower combination valves as point of use balanced-pressure, thermostatic or combination balanced-pressure/thermostatic type valves that conform to the requirements of ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1. Valves must be equipped with a field adjustable means to limit the maximum setting of the valve to 120 ºF (49.0 ºC).

9-2.6.4.4 Supply and Utility Areas.

Central sterile supply, soiled utility rooms equipped with bedpan washers, cart wash areas, and special pathological wash areas must be provided with 140 ºF (60.0 ºC) hot water.

9-2.6.4.5 Food Service Areas.

Review and comply with the Dishwashing and Ware Washing requirements in Appendix F and the Tri-Service Food Code (TSFC). Provide these areas with 140 ºF (60.0 ºC) hot water. Mechanical ware-washing and sanitizing equipment normally require 180 ºF (82.2 ºC) water. Provide Booster heaters to obtain the temperatures required.

9-2.6.4.6 Renovation, Additions and Alteration Projects.

Where a project includes upgrading an existing domestic hot water system to the current higher supply water temperature requirements, precautions for the prevention of scalding must be included.

9-2.7 Plumbing Fixtures and Other Equipment.

Plumbing fixtures should conform generally to American Society of Mechanical Engineers International (ASME) Standards Series A112 or International Association of Plumbing and Mechanical Officials (IAPMO) Standards Series Z124. For uniformity, all fixtures must be identified by the Joint Schedule Number (JSN) provided in MIL-STD-1691. Quantities of fixtures must be in accordance with the International Building Code but not less than indicated in the approved PFD and PRC.

9-2.7.1 Accessibility Fixtures.

Provide accessible fixtures in accordance with Chapter 13.

9-2.7.2 Drinking Water Coolers.

Locate public drinking water coolers convenient to each public waiting room and elsewhere as required by the IPC and as directed by the DoD Project Sponsor. The standard rating and performance must conform to Air Conditioning and Refrigeration Institute (ARI) Standard 1010.

9-2.7.3 Emergency Shower and Eye Wash Fixtures.

Emergency shower and eye wash fixtures must be designed in accordance with the American National Standards Institute (ANSI) Standard Z358.1.

9-2.7.4 Water Usage Conservation.

Water usage conservation design must comply with UFC 1-200-02.

9-2.7.5 Wall Hydrants.

Provide wall hydrants where required by UFC 3-420-01 and within 20 ft (6 m) of any loading dock, emergency room ambulance drop-off, and ambulance shelter.

9-2.7.6 Urinals.

Urinals must be low flow with a maximum water use of 0.125 GPF (0.5 LPF). Waterless urinals may only be used when approved by the DoD Project Sponsor.

9-2.8 Coordination with Medical and Dental Equipment.

Medical and Dental equipment can have special water quality and pressure requirements. Plumbing designers must carefully analyze the building water supply condition before starting a project design. When a facility building water supply cannot meet equipment manufacturer's requirements, local (or centralized) water treatment systems and/or water pressure boosters must be provided in appropriate mechanical spaces.

9-2.8.1 Dental Water Purification Systems.

Dental water is specially treated water for patient use which undergoes multiple stages of filtration to achieve zero Total Dissolved Solids (TDS), chlorine and chemical free, prevent biofilm and bacterial growth in the water lines etc. The need for on-site production of dental pure water must be coordinated with the DoD Project Sponsor. Dental water purification systems may be direct feed or bottle-fill systems as determined by the DoD Project Sponsor. Installation of the purification system must be in accordance with manufacturer's recommendations and instructions. This includes providing any required pre-filters, booster pumps, water storage tanks, and dental water faucets. The purified water may also be used for sterilizers by direct feed or water faucet. Provide an additional water faucet with direct feed installation systems. Connect the dental water purification system to the building's essential electrical system where provided. Piping material downstream of the dental water purification system may be either type 304 or 316 stainless steel or material recommended by the dental water purification system manufacture. Do not use copper pipe downstream of the purification system.

9-3 DRAINAGE SYSTEMS.

9-3.1 Sanitary Drainage System.

The sanitary waste system must be connected to an approved existing sanitary sewer system, either Government or private as appropriate. If an existing sewage disposal system is not available, an approved alternative system must be provided. For example, a holding tank may be acceptable for remote locations, for temporary service while awaiting the installation or retrofit of an approved sewage disposal system, or a backup such as for hardened or essential facilities. Any alternative to an approved central sanitary system must be coordinated with the Installation's local approving authority. When connected to a local public system, code requirements in excess of the IPC imposed by the local regulatory agencies must be considered in the design. The system must be designed to avoid excessive back pressure and aspiration effects. If a facility sanitary waste requires lifting or pumping, comply with UFC 3-240-01. Connect this equipment to the emergency power system if one exists or is included in the project scope.

9-3.1.1 Cleanouts.

Provide cleanouts in accordance with the International Plumbing Code to permit access to all sections of the sanitary sewage system. Locate the cleanouts to avoid or minimize disruption of medical functions. Do not locate cleanouts above ceilings; extend cleanouts to the floor above.

9-3.1.2 Protection of Special Fixtures and Equipment.

Fixtures and equipment used for sterilization, and food preparation, processing, or storage, must be protected from contamination by backflow of waste. An indirect waste line, such as an air break or physical disconnection (open drain) at the associated waste outlet, must be incorporated into the system design. These provisions also apply to equipment that cannot be easily cleaned. Included are sterilizers, glass washers, refrigerators, kitchen equipment, dental laboratory equipment, for example, boil-out assembly tanks, and vacuum system separator tanks.

9-3.1.3 Special Drainage Equipment.

Interceptors must be provided when precious materials or heavy metals, such as silver and barium, or sediment is in the waste drainage from spaces such as cast rooms, prosthodontics laboratories, barium procedure areas, and spaces employing blood analyzers. Interceptors for barium waste must be aluminum. Flush rim floor drains must be provided in Autopsy. Food waste disposers must be provided in kitchens on dishwashers, pot and pan sinks, and other sinks as designated. Grease traps must be provided with grease-producing kitchen equipment including prewash sinks, pot washers or sinks, and floor drains serving kettles. Separators must be provided in areas where petroleum products are subject to dripping or spills, such as ambulance garages and mechanical equipment rooms. **\1**

9-3.1.4 Coordination with Medical and Dental Equipment.

Placement of floor drains and floor sinks for specialized equipment must be coordinated to minimize infection control risk. Special consideration must be given to drains in rooms where infection control restrictions are heightened due to potential contamination of equipment, instruments, or supplies (for example central sterilization, dental instrument processing, pharmacy, etc.). For example, floor drains should not be located in Sterile Storage rooms and floor drains for pass-through sterilizers should be located in the loading-side room rather than the unloading side room. **/1/**

9-3.1.5 Special Purpose Waste Lines.

9-3.1.5.1 Acid Waste.

Separate waste lines must be provided for acid waste from laboratories when justified by the quantities, concentration, or both, of reagent expected to be introduced. Acid-resistant waste piping must be utilized for such applications and, must pass through a neutralizing or dilution tank before combining with building waste. If more than test tube quantities of acid or strong base solutions are to be discharged into the waste system, neutralization is required.

9-3.1.5.2 Radioactive Waste.

Separate waste lines must be provided for radioactive waste from laboratories and nuclear medicine treatment rooms. There are various radioactive materials to be found in medical facilities. The particular radioactive waste for a given facility must be identified. The appropriate prescribed manner of disposal in accordance with 10 CFR (Code of Federal Regulations) Part 20—Standards for Protection Against Radiation and local safety standards must be incorporated into the design.

9-3.1.6 General-Purpose Floor Drains.

General-purpose floor drains must be considered for rooms in which water-using plumbing fixtures or equipment are located. These include physical therapy (PT) rooms that are equipped with hydrotherapy equipment, central sterile areas for sterilizers and sanitizing washers, food service areas, wash-down and housekeeping spaces, and mechanical equipment rooms that contain water-using equipment. Floor drains are not required at emergency shower or eyewash locations but may be provided to facilitate mandatory testing. Provide properly sized floor drainage system for restrooms designed for more than single occupancy, where equipment wash-down might occur, and capture unplanned water dump from fixtures/equipment to prevent damage to adjacent spaces, to include floors below, following UFC 3-420-01. Floor drains, where provided, must follow the criteria in UFC 3-420-01.

9-3.1.7 Trap Priming.

Where a trap **\4** is subject to loss by evaporation, protect the trap seal with a deep seal trap consisting of a 4-inch (100 mm) seal and a trap primer valve. The trap primer valve

must include an air gap or a vacuum breaker for backflow prevention. This requirement is applicable to locations where the trap does not automatically receive water waste on at least a bi-weekly basis. **/4/**

9-3.1.8 Retrofit or Alteration Considerations.

The replacement of older existing fixtures with lower-flow fixtures may alter system performance. Provide a system that ensures transport of solid wastes utilizing strategies that include flows from other water-consuming appliances, plumbing fixtures, (for example lavatory faucets, flushing urinals, showerheads), increased slope, or change of pipe diameter in accordance with UFC 3-420-01.

9-3.1.9 Elevator Pit Sumps.

Elevator pits must be provided with a sump and sump pump. Pumped designs must include integral oil sensors and must deliver fluids to an indirect connection to the sanitary or storm drainage systems, such as a floor drain. The sump discharge line must include a check valve to prevent backflow of fluid into the sump. If permitted by the local jurisdiction, a direct connection to the storm drainage system may be considered. Designers should also assess whether the DoD Project Sponsor requires an oil interceptor. No other drains or sump discharges must be connected to the elevator pit drain or sump. This equipment must be connected to the alternative power source if one exists or is included in the project scope. Refer to Chapter 16 for additional requirements.

9-3.1.10 Mercury Control.

Facilities containing operations that generate mercury wastes in the free or leachable states (for example dental filling amalgams) must be provided with ISO 11143 certified amalgam separators and comply with any additional Federal, state, or local requirements. See also paragraph 9-5.21.1.

9-3.1.11 Dialysis Waste Box.

Provide dialysis waste box drains with automatic trap primers and/or automatic disinfection systems.

9-3.2 Storm Drainage System.

9-3.2.1 Cleanouts.

Provide storm sewer cleanouts in accordance with the International Plumbing Code to permit access to all sections of the storm sewer system. Locate the cleanouts to avoid or minimize disruption of medical functions. Do not locate cleanouts above ceilings but instead extend the cleanout to the floor above (except for the top floor). Avoid placing cleanouts in high traffic areas.

9-4 FUEL GAS SERVICE.

Applications for fuel gas utilization include a fuel source for space heating, domestic hot water generation, cooking, generation of steam for humidification and sterilization, and as a point-of-use heat or flame source to support medical and laboratory functions. Fuel gas system design, including liquefied petroleum gas systems, must be in accordance with NFPA 54, 58, and 59A, as applicable.

9-5 MEDICAL GAS SYSTEMS.

Medical gas systems for all applications covered by this UFC must comply with NFPA 99 as limited by this UFC and United Facilities Guide Specifications (UFGS) 22 60 70 Gas and Vacuum Systems for Healthcare Facilities. Unless otherwise noted, the term "medical gas systems" in this UFC refers to all medical gas, dental gas, and vacuum systems. Refer to Table 9-5 for general medical gas systems information. **\4**

Medical gas requirements must be served by central supply systems as detailed in this chapter except where indicated below or approved by the DoD Project Sponsor. **/4/**

Table 9-5 Medical Gas Systems[a]

Reference NFPA 99

System	Appendix B Notation	System Pressure
Compressed Air		
Medical Compressed Air	MA	50-55 psig (345–380 kPa)
Dental Compressed Air	DA	90-95 psig (620–655 kPa)
Laboratory Air – Dental	LA	30-35 psig (210–245 kPa)
Laboratory Air – Medical	LA	50-55 psig (345–380 kPa)
Instrument Compressed Air	IA	50-185 psig (345–1275 kPa)
Process Air	PA	120-125 psig (830–865 kPa)
Vacuum		
Medical Surgical Vacuum	MV	15-19 in-HgV (51–65 kPaV)
Dental Surgical Vacuum	DSV	15-19 in-HgV (51–65 kPaV)
Oral Evacuation	OE	6-8 in-HgV (21–27 kPaV)
High Volume Lab Dust Evacuation	LDE	50 in-HgV (10 kPaV)
Waste Anesthesia Gas Disposal	WAGD	6 in-HgV (21 kPaV)[b c]

System	Appendix B Notation	System Pressure
Gases		
Oxygen	O	50-55 psig (345–380 kPa)
Carbon Dioxide	CO2	50-55 psig (345–380 kPa)
Nitrous Oxide	NO	50-55 psig (345–380 kPa)
Nitrogen	N	50-185 psig (345–1275 kPa)
a. Other gas systems included in this chapter but not in Appendix B: Gas (natural or propane) – flame or heat source.		
b. This is a minimum value; vacuum controlled by healthcare provider administering the anesthesia gas.		
c. For veterinary care, design pressure must be coordinated with the anesthetizing equipment.		

9-5.1 Application of NFPA 99 to Dental Systems.

Dental gas and vacuum systems must comply with NFPA 99 and this UFC. Allowances/exceptions in NFPA 99-2018 Chapter 15 which reduce/relax NFPA 99 Chapter 5 system requirements are NOT permissible; as such do not incorporate any of the exempted features into designs for dental systems. All requirements for piping, piping installation, warning systems, testing and verification must follow NFPA 99 Chapter 5 for the system category determined in NFPA 99 Chapter 15. For example, if a Dental Air system is determined by NFPA 99 Chapter 15 to be Category 2, the system must meet all Category 2 requirements in NFPA 99 Chapter 5 as well as the prescriptive requirements in this UFC.

9-5.2 Application of NFPA 99 to Veterinary Care.

Medical gas systems for veterinary care must comply with NFPA 99 even though NFPA 99 indicates an exclusion for veterinary care. The required Risk Assessment process must be carefully implemented with the unique considerations of the veterinary patients and caregivers to arrive at appropriate System Categories. **\4**

9-5.3 Systems for Medical Clinics.

Central supply systems for medical gas/air/vacuum are not normally required for medical clinics. If attached to a facility having central systems, designers must extend service lines to the clinic if LCC effective. **/4/**

9-5.4 Systems for Dental Clinics.

Centrally-piped systems must normally be provided for dental compressed air (DA), OE, dental surgical vacuum (DSV), high volume laboratory dust evacuation (LDE), and dental laboratory air (LA). A separate system for WAGD must be required unless the DoD Project Sponsor designates the DSV system for that purpose. Fuel gas (natural or propane) must be provided as required to support prosthodontic and orthodontic laboratories and DTRs. For freestanding clinics with fewer than five chairs, selection of a central system for gases as opposed to point-of-use systems must be based upon LCC considerations. **\4**

9-5.5 Medical Gas Designer.

Medical gas systems must be designed by a party technically competent and experienced in the field of medical gas and vacuum system design and certified in accordance with ASSE/IAPMO/ANSI 6060, Professional Qualifications Standard for Medical Gas System Designer. Designer must demonstrate a minimum of 5 years' experience performing medical gas system designs on projects of similar size.

9-5.6 Pipe Sizing.

Pipe sizing calculations must utilize proven pressure drop calculation methods such as the Darcy-Weisbach Formula or pressure loss tables built from those formulas, for example the IAPMO Manual of Recommended Practice for Medical Gas Resiliency or Beacon Medaes Medical Gas Design Guide. Calculate pressure loss from the inlet/outlet to the source equipment including manufactured assemblies that have manufacturer specific pressure drop characteristics (for example: surgical booms). Inlet/outlet demands and simultaneous use factors (SUF) must comply with this chapter. If any inlet/outlet demand or SUF is not defined, proposed values must be approved by the DoD Project Sponsor and the Design and Construction Agent. The maximum total pressure drop in the system and minimum pipe sizing is governed by NFPA 99. In addition, size the mains and risers up to and including the service valves on each floor for not more than 0.1 psi per 100 lineal feet (23 pa per lineal meter). All other piping must not exceed 1 psi per 100 lineal feet (230 pa per lineal meter). Pipe sizes must increase from the most remote outlet/inlet toward the source. Calculations must demonstrate the most stringent flow path governing the pressure drop. **/4/**

9-5.7 Corrugated Medical Tubing.

Corrugated Medical Tubing (CMT) may only be utilized if approved by the Design and Construction Agent. CMT may be advantageous for emergency repairs or temporary facilities however it is limited in size, has a higher pressure drop than standard medical gas copper tubing and must not be utilized for wet vacuum systems.

9-5.8 Medical Gas Equipment Rooms.

Install medical gas system equipment such as air compressors and vacuum pumps in a mechanical equipment space complying with NFPA 99. The medical gas system

equipment space must be ventilated and conditioned in accordance with manufacturer's recommendation or mechanical room criteria (Appendix B Room Code MECH1), whichever more stringent.

9-5.9 Underground Piping.

Underground medical gas piping must be protected in a continuous concrete trench or steel pipe enclosure and comply with NFPA 55 section 7.1.17 Underground Piping and NFPA 99 section 5.1.10.11.5 Underground Piping Outside of Buildings. Consider provisions for future replacement of piping. Piping must not be installed under a building.

9-5.10 System Control Valves.

All medical gas centrally-piped systems must be provided with shut-off valves and zone valve box assemblies in accordance with NFPA 99. Additional shut-off valves must be included as designated by the Design and Construction Agent to provide system section isolation for maintenance or alterations.

9-5.11 Alarm Systems.

Medical gas alarm systems must be provided for all centrally-piped systems in accordance with NFPA 99 except that the use of a centralized computer system (for example Building Automation System) in lieu of a Master Alarm Panel is not permitted. A Building Automation System may be utilized for monitoring only of a medical gas system.

9-5.12 Gas System Sources (Storage).

Gas system sources or storage provisions must be designed in accordance with NFPA 99. Flammable and nonflammable storage containers must be stored in separate enclosures. Bulk oxygen storage design must be in accordance with NFPA 55.

9-5.12.1 Point-of-Use Sources.

Point-of-use cylinders are defined as B, D, or E sizes. The designer must coordinate with the DoD Project Sponsor the provisions for point-of-use cylinder storage when use is planned. Storage in the storage room for central system cylinder banks is permissible. The point-of-use cylinder volume must be included in the total when determining the storage room ventilation requirements. Design must incorporate Compressed Gas Association (CGA) requirements of Pamphlet P-2.

9-5.12.2 Alternative Compressed Air Sources.

Alternative compressed air sources, such as pneumatic control air or shop air compressors, must not be used as a source for medical compressed air (MA), DA, LA, instrument air (IA), or process air (PA).

9-5.12.3 Oxygen Concentrators.

Oxygen Concentrators may only be considered for utilization in unique circumstances where a reliable source for oxygen delivery is not available such as in forward deployed isolated locations. A written request documenting the requirement for this type of system must be provided and coordinated with the DoD Project Sponsor and the Design Construction Agent. When authorized these systems must comply with NFPA 99.

9-5.13 Color Coding and Labeling.

Labeling and color identification of piping must be in accordance with NFPA 99 and the CGA Pamphlet C-9. System components must also be labeled for identification to prevent tampering and inadvertent closing. In particular, shut-off valves and pressure gauges must be labeled in accordance with NFPA 99.

9-5.14 Medical Gas Systems Outlets.

Appendix B contains guidance for allocation and location of medical services and outlets in the various spaces within a facility. **\4** Carbon Dioxide outlet requirements are not listed in Appendix B but must be coordinated with the medical equipment planning and CONOPS. Refer to the Project PRC for medical equipment that requires medical gas. **/4/** Additional outlets and gas types may be provided when justified by the DoD Project Sponsor. All outlets must comply with the latest edition of NFPA 99 and the requirements of CGA Pamphlet V-5. There are Diameter Index Safety System (DISS) and quick connect-type outlets, with three primary configurations of the quick connect outlet (geometric configuration, pin index, latching type). Therefore, the designer must also coordinate the outlet type configuration with the DoD Project Sponsor so users must not have to use outlet adapters for existing medical equipment.

The use of a central medical gas system to serve an outlet that indirectly supports the medical function, such as in a laboratory, may be justified. If so, the branch piping and outlets must be in accordance with NFPA 99. Non-medical uses are not permissible except for unique circumstances with documented waiver requests, coordinated with the DoD Project Sponsor and Design and Construction Agent, reviewed individually.

9-5.15 Power Source for Medical Gas Systems.

Medical gas system equipment must be served by an EES where determined through an NFPA 99 Risk Assessment or where otherwise required within NFPA 99 or this UFC.

9-5.16 Medical Compressed Air (MA).

The MA system must be an independent centrally-piped system consisting of two or more medical air compressors and a central receiver, all conforming to the requirements of NFPA 99. It must be used only for medical functions requiring breathable air to support respiration or for air-driven instruments that discharge into the pharynx. The MA system must not be used to satisfy any other compressed air requirements. The

system design must include automatic operation of the compressors, including alternating lead and lag status.

9-5.16.1 Air Quality Standards.

Medical air compressors must be specifically designed and manufactured for Medical Air purposes, meeting NFPA 99 and these requirements. Intake air must be direct from outdoors or from an HVAC supply air system operational 24/7 and in compliance with NFPA 99 paragraph 5.1.3.6.3.11(E) with the following clarification: HVAC supply air systems with motors or drivebelts in the air stream may be utilized as an air source provided that an intermediate filter of MERV 13 (or better) is located downstream of the fan(s) and cooling coils.

Filtration of intake air must include redundant activated carbon filters with redundant pre-filters and final filters (located downstream of the carbon filters). System pressure regulators and filters must be duplexed with the ability to isolate any device.

9-5.16.2 General Requirements.

MA must be provided by two or more compressors with provisions for automatic, alternating, and simultaneous operation. The compressors must be sized such that if any one compressor fails, the remaining compressor(s) must provide 100 percent of maximum system demand. Provide an alarm to indicate compressor failure that annunciates at the master medical gas alarm panel. All system components downstream of the compressors must be sized for 100 percent standard system demand and be duplexed. The receiver must be sized per manufacturer recommendation and must have an automatic drain feature.

9-5.16.3 Air Drying.

System must include an air dryer of the desiccant type capable of drying the air to a dew point of -40 ^{o}F (-40 ^{o}C). Designers must consider: **\1**

a. **/1/** Desiccant dryers are capable of drying the air to a dew point as low as -40 ^{o}F (-40 ^{o}C), which may be considered too low for some medical applications. When required by the DoD Project Sponsor, the design must include specification of equipment accessories that permit upward adjustment of air moisture to the required dew point. **\1**

b. **/1/** To improve the efficiency of a desiccant dryer system, a refrigerated dryer may be used to precondition the intake air to the desiccant dryer. When mechanical refrigeration systems are specified, designers must include specification of a cycling feature for all systems under 5 hp (3.7 kW) to minimize the possibility of icing and moisture carryover. Designers must evaluate whether anticipated flow conditions require the cycling feature for systems 5 hp (3.7 kW) and over.

9-5.16.4 MA Demand.

System demand must be calculated utilizing the peak flow and simultaneous use data in Table 9-6 as a minimum. The simultaneous use factors must be used with judgment and modified to adapt to special conditions if required.

Table 9-6 Medical Compressed Air (MA) System Demand

	General Demand[1]			Ventilator Demand[2]			
	SCFM (SLPM)	Units	Usage Factor	SCFM (SLPM)	Units	Qty	Usage Factor
Ventilator Locations:							
Recovery Phase 1 (RRSS1)	2.0 (57)	Bed	25%	2.6 (75)	Bed	1	100%
Patient Bedrooms, ICU[3]	2.0 (57)	Bed	50%	2.6 (75)	Bed	1	100%
Biomedical Equipment Repair (BMER1)	1.5 (42)	Outlet	10%	2.6 (75)	Room	1	100%
Anesthesia Ventilator Locations:							
Operating Room[4]	0.5 (14)	Room	100%	0.9 (25)	Room	1	100%
Veterinary Surgery (VS001)	0.5 (14)	Room	50%	0.9 (25)	Room	1	100%
Veterinary, Surgery, Preparation / Dental (VSPD1)	0.5 (14)	Bed	50%	0.9 (25)	Room	1	100%
Trauma – (TRET1 & TRET3)	0.5 (14)	Room	25%	0.9 (25)	Room	1	100%
Radiology (XABP1 & XCCE1)	0.5 (14)	Room	10%	0.9 (25)	Room	1	100%
Medical Air for Peripheral Device Locations:							
Exam/Treatment[5]	1.1 (30)	Room	10%				
LDR/LDRP (LDRP1, LDRP3) includes infant armoire	1.0 (28)	Room	50%				
Observation (OOTR1)	1.1 (30)	Bed	10%				
Anesthesia Workroom (ANCW1)	1.1 (30)	Room	10%				
Respiratory Equipment, Clean (OPRC1)	1.5 (42)	Station	10%	2.6 (75)	Room	1	100%
All Other Room Codes[6]	0.5 (42)	Outlet	10%				

[1] Demand for devices not including ventilators.

[2] Ventilator demands (locations and flow rates) must be validated for each project but will not be less than provided for in this table.

[3] ICU Bedroom category includes Room Codes BRIC1, BRII1, BRII2, BRIT2, BRUN1, NYIC2, NYEC1, NYIR1, NYUN1, NYUN2.

[4] Operating Room category includes Room Codes ORCS1, ORCT1, ORGS1, ORHY1, ORNS1, OROS1, LDDR1.

[5] Emergency Room category includes Room Codes EXEB1, EXEN2, EXER1, EXER2, TRET4, TRET5.

[6] All room codes in Appendix B that have one or more medical air outlet requirements.

9-5.17 Dental Compressed Air (DA).

A centrally-piped DA system with two or more compressors and other components described herein must be provided in accordance with NFPA 99. DA must be used for drying applications during dental procedures and as a power or drive source for lifts, locks, and pneumatic dental instruments and equipment. DA, unlike MA, is not used for breathing or respiratory support of any kind and must not be used to satisfy MA requirements. Air that is normally used for dental laboratory restorative and fabrication techniques may be provided by the DA system.

9-5.17.1 Air Quality Standard.

Dental Air compressors must be designed and manufactured IAW NFPA 99, UFGS 22 60 70 and these requirements. Intake air must be direct from outdoors or from an HVAC supply air system operational 24/7 and in compliance with NFPA 99 paragraph 5.1.3.6.3.11(E) with the following clarification: HVAC supply air systems with motors or drivebelts in the air stream may be utilized as an air source provided that an intermediate filter of MERV 13 or better is located downstream of the fan(s) and cooling coils.

Filtration of intake air must include redundant activated carbon filters with redundant pre-filters and final filters (located downstream of the carbon filters). System pressure regulators and filters must be duplexed with the ability to isolate any device.

9-5.17.2 DA Components.

DA must be provided by two or more equally sized compressors, with provisions for automatic, alternating, and simultaneous operation. Each compressor must be sized such that if any one compressor fails, the remaining compressor(s) must provide 65 percent of standard demand. Provide an alarm to indicate compressor failure that annunciates to the master medical gas alarm panel. All system components downstream of compressors must be sized for maximum combined compressor output. In-line pressure regulators must be provided when DA and dental LA systems are served by a common compressor. Each laboratory supply main must have a pressure regulator. Dryer type must be desiccant.

9-5.17.3 DA System Demand.

The system must be sized using these criteria:

Select a DTR Usage Factor:

Number of DTR Chairs	DTR Usage Factor (DUF)
1–3	1.0
4–6	0.9
7–12	0.8
13–19	0.7
20 and up	0.6

Equation 9-1. DTR Demand = No. of DTR chairs X 3 SCFM (85 SLPM) X DUF

Select a lab usage factor:

Number of Technicians	Lab Usage Factor (LUF)
1–5	0.6
6–10	0.5
11–19	0.4
20 and up	0.3

Equation 9-2. Lab Demand = No. of Technicians X 1 SCFM (28 SLPM) X LUF
+ No. of sand/shell blasters X 4 SCFM (113 SLPM) X LUF
+ No. of air chisels X 3 SCFM (85 SLPM) X LUF
+ No. of denture presses X 1 SCFM (28 SLPM) X LUF
+ No. of micro-blasters X 6 SCFM (170 SLPM) X LUF
+ No. of high speed hand pieces X 3 SCFM (85 SLPM) X LUF

Equation 9-3. Sterilization demand = No. of hand piece purge stations X 1 SCFM (28 SLPM)

Equation 9-4. Standard demand = DTR demand + Lab demand + Sterilization demand

Select the optimum compressor grouping:

Table 9-7 Compressor Grouping

Type	System Usage Factor (SUF)
Duplex	0.65
Triplex	0.33
Quadplex	0.25

Equation 9-5. Compressor size = SUF X Standard demand

The receiver must be sized based on Table 9-7

Table 9-8 Receiver Size

Number of DTR Chairs	Gallons (Liters) per DTR Chair
1–6	10 (37.8)
7–9	9 (34.0)
10–12	8 (30.3)
13–15	7 (26.5)
16–18	6 (22.7)
19–21	5 (19.9)
>21	4 (15.1)

9-5.18 Laboratory Air (LA).

The medical or dental LA system must be a centrally-piped system consisting of two or more compressors and a central receiver, all conforming to the requirements of NFPA 99.

9-5.18.1 Air Quality Standard.

Laboratory Air compressors must be designed and manufactured IAW NFPA 99, UFGS 22 60 70 and these requirements. Intake air must be direct from outdoors or from an HVAC supply air system operational 24/7 and in compliance with NFPA 99 paragraph 5.1.3.6.3.11(E) with the following clarification: HVAC supply air systems with motors or drivebelts in the air stream may be utilized as an air source provided that an intermediate filter of MERV 13 or better is located after the fan(s) and cooling coils.

Filtration of intake air must include redundant activated carbon filters with redundant pre-filters and final filters (located downstream of the carbon filters). System pressure regulators and filters must be duplexed with the ability to isolate any device.

9-5.18.2 LA System Components.

LA must be provided by two equally sized compressors with provisions for automatic, alternate, and simultaneous operation. Each compressor must be sized to provide 65 percent of maximum demand. Provide an alarm to indicate compressor failure that annunciates to the master medical gas alarm panel. All system components downstream of compressors must be sized for maximum combined compressor output. A DA generator package used to service an LA system must be supplied by a dedicated main located just downstream of the final package component and inside the equipment room.

9-5.18.3 LA System Demand.

Determine the LA system flow demand by the number of workstations and their function plus the requirements for laboratory equipment. The DoD Project Sponsor must provide this information. The designer in conjunction with the Design and Construction Agent must establish the flow rates. Medical LA system flow rate demand must be 1 SCFM (28 SLPM) per outlet. Dental LA system flow rate demand is determined by the sizing procedure shown in paragraph 9-5.15.3. The simultaneous use factors must be as listed in Table 9-9.

Table 9-9 Medical Laboratory Air (LA) System Demand

No. of Outlets	Use Factor	Minimum SCFM (SLPM)
1–2	100	
3–12	80	3 (1.4)
13–38	60	10 (4.7)
39–115	40	25 (11.8)
116–316	30	50 (23.6)
317–700	20	95 (44.8)

9-5.19 Instrument Air (IA).

An IA system is **\1** a Medical Support Gas intended to power medical and dental devices not related to human respiration, for example, surgical hand tools, surgical arms, surgical columns, and SPD support. This system may be utilized in lieu of a piped nitrogen (N) system. The DoD Project Sponsor in conjunction with the Design and Construction Agent must identify IA requirements. IA must not be used to satisfy medical air requirements. IA systems must be designed in accordance with the requirements of NFPA 99. System pressure must be determined within the range identified in Table 9-5 and coordinated with all intended uses.

Each individual use location, for example, individual OR, DTRs, must be provided with a local pressure control panel for the purpose of independently regulating pressure at that location. Provide additional pressure control panels where needed to meet the intended use. Where all end uses are determined to be uniform in pressure, pressure control panels may be eliminated with the concurrence of the DoD Project Sponsor and Design and Construction Agent. **/1/**

9-5.19.1 Air Quality Standard.

Air compressors used for IA must conform to the requirements of NFPA 99, UFGS 22 60 70 and these requirements. IA quality must be as defined in NFPA 99. System must include an air dryer of the desiccant type capable of drying the air to a dew point of -40

°F (-40 °C). Intake air must be direct from outdoors or from an HVAC supply air system operational 24/7 and in compliance with NFPA 99 paragraph 5.1.3.6.3.11(E) with the following clarification: HVAC supply air systems with motors or drivebelts in the air stream may be utilized as an air source provided that an intermediate filter of MERV 13 or better is located after the fan(s) and cooling coils.

Filtration of intake air must include redundant activated carbon filters with redundant pre-filters and final filters (located downstream of the carbon filters). System pressure regulators and filters must be duplexed with the ability to isolate any device.

9-5.19.2 IA System Components.

The number of compressors for an IA system must be a function of the application; however, at least two compressors must be provided. For stand-alone clinics, one compressor with a standby header may be provided. Coordinate the compressor arrangement with the Design and Construction Agent. The compressors must be sized such that if any one compressor fails, the remaining compressor(s) must provide 100 percent of maximum system demand. Provide an alarm to indicate compressor failure that annunciates at the master medical gas alarm panel. All system components downstream of the compressors must be sized for 100 percent standard system demand and be duplexed. The receiver must have an automatic drain feature and must be sized per manufacturer recommendation.

9-5.19.3 IA System Demand.

The number of workstations and their functions plus the requirement of any equipment must determine the IA system flow demand. The piping system must be suitable to deliver 15 SCFM (425 SLPM) per outlet, with a demand usage factor of 100 percent. System capacity must be determined using these equations:

Capacity (SLPM) = 340 + ([n-1] X 85) or

Capacity (SCFM) = 12 + ([n-1] X 3)

Where: n = number of locations or tools

9-5.20 Process Air (PA).

PA may be a centrally-piped system when warranted by the application, for example, medical service column adjustment, shop operations, door operators. The DoD Project Sponsor, in conjunction with the Design and Construction Agent, must identify PA requirements. When approved by the Design and Construction Agent, LA or IA may be used to satisfy PA requirements. PA is not required to be oil free, but must be suitable for the application as recommended by the equipment manufacturer.

9-5.21 Medical Surgical Vacuum (MV) System.

The MV system must be a centrally-piped, dry vacuum system containing two or more continuous duty pumps with a central receiver. The system must meet the requirements of NFPA 99 and must be sized so that if one pump fails, the remaining pump(s) can supply 100 percent of the total system demand. The system design must include automatic operation of the vacuum pumps including alternating lead and lag status. Provide an alarm to indicate vacuum pump failure that annunciates to the master medical gas alarm panel. Refer to Table 9-10.

Table 9-10 Medical Vacuum Source Sizing

Occupancy/Location	Diversity Factor	High Demand
Anesthetizing Locations:		
Special Surgery and Cardiovascular	A	Y
Major Surgery and Orthopedic	A	Y
Minor Surgery/Cystology	A	Y
Endoscopy	A	N
Trauma	A	Y
Veterinary Surgery	A	Y
Radiology	B	N
Cardiac Catheterization	A	Y
Ambulatory Care Locations:		
Recovery Room (PACU)	A	N
ICU/CCU	A	N
Emergency Room (ER)/Triage	A	Y
Neonatal ICU	A	N
Dialysis Unit	A	N
Postpartum Recovery	A	N
Infant Resuscitation (within Nursery)	A	N
Pediatrics ICU	A	N
Subacute Care Locations:		
Nursery	A	N
Patient Rooms	B	N
Decontamination Station	B	N
Exam/Treatment	B	N
Pre-Op Holding	B	N

Occupancy/Location	Diversity Factor	High Demand
Respiratory Care/Therapy	B	N
Pulmonary Function Lab	B	N
EENT, EEG, ECG, EMG	B	N
LDR & LDRP	A	N
Animal Research	B	N
Blood Donors	B	N
Cast Room	B	N
Airborne Infection Isolation Rooms and Protective Environment Rooms	B	N
Observation (within ER)	B	N
Pediatric/Adolescent Bedroom	B	N
Other:		
Anesthesia Workroom	B	N
Respiratory Care Workroom	B	N
Nursery Workroom	B	N
Equipment Repair	B	N
Medical Laboratory	B	N

9-5.21.1 Applications.

The MV must be used only for medical functions involving patient care, therapy, and diagnostic functions as described here. It may also serve DSV requirements for DTRs and oral surgeries, and small laboratories in patient care areas that function in direct support of medical functions. Analysis, research, or teaching laboratories located within a **\4** medical treatment facility and supporting medical functions may also be served by the MV producers, **/4/** provided that a separate system connection or main is located at the vacuum receiver, with a shut-off valve and trap with a drain valve. Laboratories not supporting medical functions must have a vacuum system separate from the MV.

9-5.21.2 Demand.

Size vacuum system pumps and piping in accordance with these equations:

$$\text{Demand Medical Vacuum} = \text{Demand}_A + \text{Demand}_B + \text{Demand}_C$$

Where: Demand_A = # Inlets for Diversity Factor A X 0.25 SCFM/inlet (7 SLPM/inlet) X Diversity Factor A

$Demand_B$ = # Inlets for Diversity Factor B X 0.25 SCFM/inlet (7 SLPM/inlet) X Diversity Factor B

$Demand_C$ = # Rooms with High Demand X 1.5 SCFM/room (42 SLPM/room)

It is important to note that $Demand_A$ and $Demand_B$ have a diversity factor determined by Figure 9-1, whereas $Demand_C$ assumes no diversity .

For example, the demand for a medical vacuum system for five **\1** Operating Rooms with 12 each medical vacuum inlets would be calculated as follows: **/1/**

Demand Medical Vacuum = $Demand_A$ + $Demand_B$ + $Demand_C$

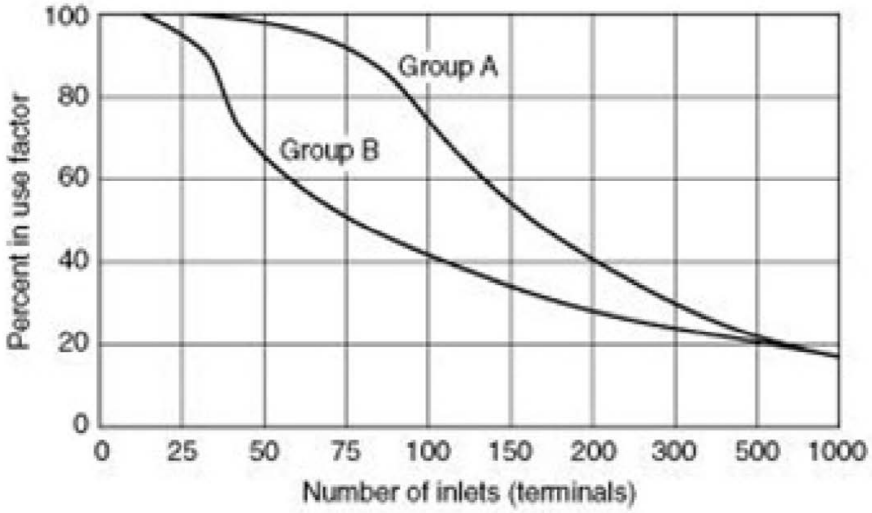
Where: $Demand_A$ = 12 medical vacuum inlets per OR per Appendix B X 5 ORs X 0.25 SCFM/inlet X 0.97 Diversity Factor for 60 inlets with "A" Diversity Factor = 14.55 SCFM

$Demand_B$ = 0

$Demand_C$ = 5 Rooms with High Demand X 1.5 SCFM/inlet
= 7.5 SCFM

Medical Vacuum Demand = 14.55 + 0 + 7.5 = 22 SCFM

Figure 9-1 Simultaneous Use Factors for Medical Vacuum



1. This graph is adapted from 1999 version of NFPA 99.
2. It is understood that percentage in use factors represent a typical hospital and may need to be increased, but must not be decreased without approval from the Design and Construction Agent.
3. **\4** If the medical-surgical vacuum system is to be used for DSV or WAGD, the demands for the DSV and WAGD inlets as defined in 9-5.22 and 9-5.25 at 100% usage factor must be added to the MV demands. **/4/**

9-5.21.3 Inlets.

The intended use of “Y-connectors” as a means of increasing available inlets is not recommended. A justified need for a vacuum inlet must be accommodated with another wall inlet, not a Y-connector. Verify with the DoD Project Sponsor that the number of vacuum inlets proposed must support the planned medical function operation without the use of Y-connectors.

9-5.21.4 Performance.

Design system pressure drop must be a maximum of 3 in-Hg (10 kPA) at the calculated demand flow rate. Performance is verified IAW NFPA 99 as follows: Flow each inlet (one at a time) at a flow rate of 3 SCFM (85 SLPM)) while maintaining 12 in-HgV (41 kPaV) at any adjacent station inlet.

9-5.21.5 Slide Brackets.

Vacuum bottle slide brackets must be provided for all medical vacuum inlets. Vacuum bottles must be used at all vacuum inlets to prevent liquids and solids from entering the piping network. Vacuum bottles must be provided with an overflow shut-off device to prevent carryover of fluids or solids into the piping system. Brackets must be positioned to provide proper clearance for flow meters and adapters and to eliminate conflict with electrical receptacles. Thus, it is recommended that the vacuum outlet be located at either end of a group of medical gas outlets, with the slide bracket to the outside, for example, in a healthcare station head wall unit. If two vacuum inlets are required at a given station, locate one at each end of the outlet group with the slide brackets to the outside. It is critical to coordinate vacuum inlet and slide locations with the designer and the DoD Project Sponsor to avoid interference with other items without compromising the medical function.

9-5.21.6 Exhaust.

Exhaust the medical vacuum system in accordance with NFPA 99 but do not combine with any other system exhaust.

9-5.21.7 Filtration.

Provide inlet filtration on central supply systems per NFPA 99. Filters must be sized for 100 percent of peak calculated demand while one filter or filter bundle is isolated. Ensure adequate space is provided at filters to allow clearance for maintenance personnel to access filter housings to replace filter elements.

9-5.22 Dental Surgical Vacuum (DSV).

A central DSV system may be supplied for areas in dental clinics where MV is required as specified in Appendix B. This system is also a dry system with a centrally-piped distribution system and receiver; no liquids or solids must be transported in the distribution system. Individual separators must be located in each applicable DTR. The

system must consist of two or more vacuum pumps and a central receiver. The system must be sized so that upon failure of one pump, the remaining pump(s) must maintain the minimum vacuum specified while providing 100 percent of the calculated demand. The system design must include automatic operation of the vacuum pumps including alternating lead and lag status. Provide an alarm to indicate vacuum pump failure that annunciates to the master medical gas alarm panel. For dental clinics located in a hospital, the MV system may be used in lieu of a DSV system.

9-5.22.1 Performance.

A minimum vacuum of 19 in-Hg (65 kPa) must be maintained at the receiver. System pressure drop must be such that the most remote inlet must have a minimum vacuum of 12 in-Hg (41 kPa) under peak demand conditions. System pressure drop must be a maximum of 3 in-Hg (10 kPa) at the calculated demand flow rate.

9-5.22.2 Demand.

Calculate system demand based on 2 SCFM (57 SLPM) for each DTR DSV inlet with the demand factors in Table 9-11:

Table 9-11 DSV Demand Factors

No. of DTR DSV Inlets	Use Factor
1–6	1.0
7–10	0.8
>10	0.6

9-5.22.3 Exhaust.

Exhaust the Dental Surgical Vacuum system in accordance with NFPA 99 but do not combine with any other system exhaust.

9-5.23 Oral Evacuation (OE).

A central low vacuum, high volume OE system must be installed in dental clinics to provide scavenging, collection, and disposal of liquids, solids, and aerosols from dental procedures. This is a wet system with liquids and solids transported through wetted piping from the collection point to one or more liquid or air separator tanks located upstream of two or more vacuum pumps. The tank serves as a collector for the fluids and solids and provides a means of automatic draining by indirect connection to the sanitary sewer. The tank draining system must include an automatic wash down feature for larger systems in a facility having greater than 10 DTR chairs. The vacuum pumps must be sized so that when one pump is inoperable, the remaining pump(s) must provide the required vacuum pressure and fluid flow for a minimum of 70 percent of the system demand. The system design must include automatic operation of the

vacuum pumps including alternating lead and lag status. Provide an alarm to indicate vacuum system fault, for example, pump failure, which annunciates to the master medical gas alarm panel. Protocol must include alarm initiation when a pump is not appropriately operating.

9-5.23.1 Components.

The service inlet normally is floor mounted in a utility center at the dental chair, or wall mounted with a means of connection to clinical end items, such as the high volume hose. The separator(s) must receive all liquid, air, and solids upstream of vacuum pump(s). Liquids and solids must be discharged from the separator(s), with piped gravity flow through an air gap into a trapped and vented receptor, for example, floor drains, sinks, standpipe receptors for small system suspended tank installations, connected to the sanitary waste system. Amalgam separators must be provided IAW paragraph 9-3.1.10 Mercury Control and must be configured centrally for a single point of collection at the vacuum producers. Additional point-of-use collection may be utilized where requested by the DoD Project Sponsor. The liquid/solid separator tank must discharge a minimum of once during a 24-hour interval for a one-tank system, when a high liquid level sensor activates for a two-tank system, or multiple daily discharges as recommended by the manufacturer. Separator overflow protection must be included to protect during periods of abnormal usage or when the automatic discharge malfunctions.

9-5.23.2 Performance.

The system operating range must be 6–8 in-HgV (20–27 kPaV). A minimum vacuum of 6 in-HgV (20 kPaV) must be maintained at the farthest inlet. System pressure drop must be a maximum of 1 in-Hg (3 kPa) at the calculated demand flow rate. A flow rate of 7 SCFM (200 SLPM) per inlet must be measured while maintaining 6 in-Hg (20 kPa) at the farthest inlet.

9-5.23.3 Demand.

Calculate the system demand based on 7 SCFM (200 SLPM) per inlet-nozzle orifice. The demand usage factor is normally 100 percent. Verify the specific usage factor with the Design and Construction Agent.

9-5.23.4 Separator Tank.

The separator and collector tanks must be sized per manufacturer recommendations but must be a minimum of 2.75 gallons (10.45 liters) per DTR chair. Multiple tanks must be provided for more than 20 chairs and must be considered for 20 or fewer chairs if continuous operation is necessary. Tank drainage piping must slope from the tank discharge point down to the discharge point at the floor drain or standpipe receptor.

9-5.23.5 Equipment Location.

The OE equipment must be located below the DTR floor level. Locate the separator tank adjacent to or stacked with the vacuum pump. Size the pipe to maintain system pressure loss within the maximum limit. The tank drain valve discharge must be a minimum 0.5 foot (150 mm) above the floor to accommodate the pipe slope, drain line turndown, and the indirect connection air gap to the sanitary drainage system receptor. The sanitary waste centerline of pipe must be a minimum 1 foot (300 mm) below the floor to accommodate the floor drain trap. The equipment room must be located as near the DTRs as possible to minimize distribution piping bends and pipe length. Equipment placement in the mechanical room must be arranged to provide the most direct connection to the distribution piping, the sanitary waste line, and the exhaust discharge point, in that order.

9-5.23.6 Piping Distribution.

Piping from each dental treatment chair must continuously slope back to the first separator at the vacuum source equipment to facilitate transportation of fluids and particulate. Minimum required slope is 1/4 in. per 10 ft (20 mm per 10 m). Distribution system piping must be a minimum 2 in. (DN50) in diameter. Where maintenance access is required, piping must be installed in accessible locations in covered trenches, tunnels, or crawl spaces. Provide cleanout fittings at every change of direction greater than 45 degrees and at every change in slope. Minimum clearances and access to cleanouts must comply with the cleanout requirements for sanitary piping in the International Plumbing Code, Section 708 Cleanouts.

In existing buildings, when piping must be routed above the dental treatment chairs or limited rise is necessary, observe the following requirements:

a. Minimize lift height.

b. Vertical pipe run from inlet to overhead pipe must be ½ in. (DN15) or in accordance with manufacturer's recommendation.

c. The vertical pipe must "tee" into the top of the overhead branch main.

d. The available vacuum level to satisfy performance requirements stated in paragraph 9-5.22.2 must be based on a reduction of the pump-generated vacuum at the rate of 1 in-Hg (3.4 kPa) for each 1.1 ft (335 mm) rise.

e. Provide cleanout fittings at the base of all risers.

9-5.23.7 Exhaust.

The exhaust pipe material and size, including the connection to the equipment discharge point, must be in accordance with manufacturer's recommendation. The number of bends and total length must be minimized. The exhaust piping must be a dedicated run from the equipment connection to the discharge point outside the facility, sloping back to the equipment and must not be connected to any other system exhaust. The exhaust discharge must be protected from backflow of air or liquids by detailing an

appropriate discharge arrangement, such as a gooseneck or shroud with screen with a check valve, or using a flapper valve approved by the manufacturer. The discharge point must be separated a minimum of 33 ft (10 m) from the DA or MA system intake and any HVAC system outdoor air intake.

9-5.24 High-Volume Laboratory Dust Evacuation (LDE).

The LDE system must scavenge and centrally separate, filter, and collect material trimmings, grinding debris (toxic and nontoxic), and particulates from polishing and finishing operations in the dental laboratory. Point-of-use dust collection may be provided for some operations per DoD Project Sponsor requirements.

9-5.24.1 System Components.

The LDE system for dental laboratories must consist primarily of one belt-driven vacuum pump complete with a preset, field-adjustable ingestion valve, exhaust silencer, and a central cyclonic separator with a filter bag system.

9-5.24.2 Performance.

The vacuum at the farthest inlet must be a minimum of 1.25 in-Hg (4.2 kPa). A flow rate of 60 SCFM (1700 SLPM) per technician workstation inlet and 150 SCFM (4250 SLPM) per equipment item inlet must be measured while maintaining the 3 in-Hg (10 kPa) at the separator. Verify the equipment requirements with the DoD Project Sponsor.

9-5.24.3 Demand.

The system demand must be calculated based on the inlet flow rate requirement. Apply the usage factor values shown in Table 9-12 for the given number of inlets.

Table 9-12 LDE System Utilization Factors

Lab Size	Usage Factor	Separator Filter
# of inlets	percent	square feet (square meters)
1–4	100	60 (5.6)
5–10	80	120 (11.1)
11–15	70	160 (14.8)
16–24	60	220 (20.4)

9-5.25 Waste Anesthesia Gas Disposal (WAGD).

The WAGD system must be a centrally-piped, dry vacuum system containing two or more continuous duty pumps with a central receiver. It must meet the requirements of NFPA 99 and be sized so that if one pump fails, the remaining pump(s) can supply 100 percent of the total system demand. The system design must include automatic operation of the vacuum pumps including alternating lead and lag status. Provide an

alarm to indicate vacuum pump failure that annunciates to the master medical gas alarm panel.

For Veterinary Facilities, the design vacuum pressure must be carefully evaluated and established in coordination with the intended anesthetizing equipment and include provisions for pressure/flow rate adjustment and visual monitoring at each inlet.

9-5.25.1 Applications.

WAGD must be incorporated into the facility design. A dedicated WAGD system must be provided in accordance with NFPA 99. When permitted by NFPA 99, the DSV system may be used for WAGD in dental clinics. Inlets must be provided in anesthesia locations. Verify that the system vacuum pump is suitable for the high oxygen and nitrous oxide exhaust content associated with anesthetizing procedures.

9-5.25.2 Demand and Performance.

Base design on a demand of 1.8 SCFM (50 SLPM) per patient care station except for veterinary care which must be based on a demand of 0.18 SCFM (5 SLPM) per patient care station.

9-5.25.3 Exhaust.

Exhaust the WAGD system in accordance with NFPA 99 but do not combine with any other system exhaust.

9-5.26 Oxygen (O).

Oxygen (O) is used in the gaseous state to sustain life through direct delivery to the patient. Oxygen can be stored as a gas in cylinders or as a liquid in bulk tanks. The Federal Register (49 CFR 172) classifies oxygen primarily as a non-flammable gas with a secondary classification as an oxidizer; it can increase the range of flammability of other materials and gases when present in sufficient concentration. Its storage requires proper construction and ventilation in accordance with NFPA 99 and NFPA 55 for both a pressurized non-flammable gas and as a pressurized oxidizer gas. The oxygen system must not be used to supply non-patient uses with limited exceptions defined in NFPA 99 paragraph 5.1.3.5.2 Permitted Locations for Medical Gases. Separate point-of-use services must be used for such non-patient applications.

9-5.26.1 Provision of Central Systems.

When more than five outlets are provided and used on a routine basis, central oxygen storage and distribution systems must be provided, such as is typically the case with medical centers, hospitals, and large clinics. Point-of-use (“roll-in”) cylinders should be utilized for clinical applications involving few oxygen outlets and infrequent utilization.

9-5.26.2 Emergency Connections.

Provide an emergency oxygen supply connection (EOSC) on the building exterior as required by NFPA 99 except that an in-building oxygen reserve is not to be considered as a substitute for an EOSC. Provide an Auxiliary Source Connection as required by NFPA 99 except that it must be provided for all types of central supply systems, not just for cryogenic fluid supply systems. These connections may be used as a temporary auxiliary source of supply.

9-5.26.3 System Demand.

The piping system must be designed to deliver 0.7 SCFM (20 SLPM) at the outlet, utilizing a 100 percent usage factor for outlets in Category 1 Spaces and factors for outlets in other areas as defined in Table 9-13. Historical usage data from replaced or similar facilities may be used as a guideline when determining system demand instead of the **\4** storage capacity sizing method. **/4/** Reference paragraph 9-5.24.5 for additional design considerations for determining the required capacity of liquid bulk tanks.

Table 9-13 Oxygen System Utilization Factors

Number of Outlets	Percent Usage (%)
1–3	100
4–12	75
13–20	50
21–40	31
41–80	25
81 or more	15

9-5.26.4 Storage Capacity Sizing Method.

In the absence of available historical oxygen consumption data, Table 9-14 must be used in estimating required system storage capacity for inpatient MTFs. For facilities with predominantly outpatient functions, designers must work with the DoD Project Sponsor to estimate consumption rates and appropriate storage capacities.

9-5.26.5 Liquid Bulk-Tank Storage.

Designers must coordinate with the DoD Project Sponsor to consider the economic aspects of storage capacity. Excessive capacity translates to higher utilization costs due to boil off. Tank must be sized to account for boil off. Too little capacity may lead to higher costs because of more frequent tank refills, which includes vented oxygen cost as well as delivery fees. Designers must also consider the availability of an oxygen refill service. For remote locations, oversized capacity may be more practical and economical to minimize deliveries and provide for unexpected consumption increases. The selection between purchasing or leasing the bulk storage tank and ancillary equipment must be coordinated. Economic and logistic factors relative to the given

supplier(s) must be considered. Consider provisions for future replacement of piping. The standard tank sizes are shown in Table 9-15.

Table 9-14 Cylinder Manifold Systems

Number of Beds	Minimum Number of Cylinders[1 2]
1–50	8
51–75	12
76–100	16
101–125	20
126–150	24
1 Per bank of “H” cylinders	
2 Study must be performed that includes an analysis of an appropriate diversity factor and the cost-effective option between cylinder and bulk storage.	

Table 9-15 Oxygen Bulk Tank Sizes

Liters	Gallons
1,895	500
5,680	1,500
11,355	3,000
22,710	6,000
34,065	9,000
41,635	11,000
49,205	13,000
68,130	18,000
75,700	20,000

9-5.24.6 System Monitoring.

The central oxygen system design must facilitate oxygen system purity monitoring with an outlet placed in the biomedical maintenance area, or other area, as directed by the Design and Construction Agent. This outlet must be upstream (on the source side) of other oxygen outlets.

9-5.27 Nitrous Oxide (NO).

Nitrous oxide is an anesthetic gas capable of inducing the first and second stages of anesthesia when inhaled. It is classified as a nonflammable gas; however, it can increase the range of flammability of other materials and gases when present in sufficient concentration. Its storage requires proper construction and ventilation in

accordance with NFPA 99. Nitrous oxide manifolds must not be located outside in cold climates due to the low vapor pressure of nitrous oxide at low temperatures.

9-5.27.1 System Demand.

The piping system must be designed to provide for a demand of 0.7 SCFM (20 SLPM) per patient care station. The system manifold must be sized to provide a minimum of 1/2 cylinder per week per patient care station (based on H-size cylinders). The minimum number of cylinders per header must be two.

9-5.28 Nitrogen (N).

Nitrogen is **\1** a Medical Support Gas primarily used as an operating or driving means for surgical hand tools and equipment. This system may be utilized in lieu of the IA system. The number of outlets must be the same as depicted for IA in Appendix B. The cylinder manifold system must be designed and installed in accordance with NFPA 99. System pressure must be determined within the range identified in Table 9-5 and coordinated with all intended uses.

9-5.28.1 Pressure Control Panel.

Each individual use location, for example, individual OR, DTRs, must be provided with a local pressure control panel for the purpose of independently regulating pressure at that location. Provide additional pressure control panels where needed to meet the intended use. Where all end uses are determined to be uniform in pressure, pressure control panels may be eliminated with the concurrence of the DoD Project Sponsor and Design and Construction Agent. **/1/**

9-5.28.2 Demand.

The piping system must be suitable to deliver 15 SCFM (425 SLPM) per outlet, with a demand usage factor of 100 percent. The system manifold must be sized to provide a minimum of 2 cylinders per week per orthopedic or neurosurgery OR and 1 cylinder per week per all other anesthetizing locations (based on H-size cylinders). The minimum number of cylinders per header must be two.

9-5.29 Carbon Dioxide (CO_2).

Carbon dioxide is used during laparoscopic procedures to facilitate the insertion of surgical instruments into the body. It is pumped into the body to create space between the muscles and the organs, providing the surgeon a clear view of the area to be operated. Carbon dioxide is above its triple point under ordinary conditions of storage and is actually a liquid in the cylinders (but not a cryogenic liquid). It is classified as a nonflammable gas and its storage requires proper construction and ventilation in accordance with NFPA 99. The cylinder manifold system must be designed and installed in accordance with NFPA 99. Carbon dioxide manifolds must not be located outside in cold climates due to the low vapor pressure of CO_2 at low pressure.

Design the piping system to provide a minimum demand of 2.0 SCFM (57 SLPM) per outlet with a 100 percent usage factor. In determining the storage capacity, designers must evaluate the CO2 demand of the equipment intended for each facility and in consultation with the DoD Project Sponsor. At a minimum, the system manifold must be sized to provide a 1/2 cylinder per medical location (based on H-size cylinders). The minimum number of cylinders per header must always be two.

9-5.30 Process Gas.

Process gas is natural or propane that is used as a point-of-use heat or flame source. The process is typically found in laboratories and sometimes in other areas, such as equipment repair and DTRs, to support medical or dental functions. The gas system design must be in accordance with NFPA 54 and 58. **\1**

9-5.30.1 Process Gas Load and Outlet Demand.

/1/ The load is the sum of the consumption rates for the given apparatus or equipment to be serviced. Laboratory burners are typically sized at 5000 Btuh (1465 W) for small burners and 10,500 Btuh (3075 W) for large burners. For other equipment, such as casting ovens, use manufacturer's data.

Demand is based upon the number of outlets shown in Table 9-16.

Table 9-16 Process Gas Utilization Factors

Number of Outlets	Percent Usage (%)
1–8	100
9–16	90
17–29	80
30–79	60
80–162	50
163–325	40
326–742	35
743–1570	30
1571–2900	25
>2900	20

CHAPTER 10 HEATING, VENTILATION, AND AIR CONDITIONING

10-1 GENERAL.

This chapter provides HVAC design requirements for applicable facilities. The primary requirement of the HVAC system(s) is the support of medical function and the assurance of occupant health, comfort, and safety. The HVAC system functions not only to maintain minimum requirements of comfort and ventilation, but is an essential tool for the control of infection, removal of noxious odors, dilution and expelling of contaminants, and establishment of special environmental conditions conducive to medical procedures and patient healing. Subject to these requirements, appropriate consideration must be given to the HVAC design to ensure system maintainability, economics and energy efficiency, and adaptability to future facility modification or expansion.

10-1.1 Applicability.

This criterion applies to new and existing facilities. Applicability to existing facilities is restricted to upgrade or replacement projects, and for those specific systems or services included in the scope of the project authorization. For existing facilities, when complete compliance with the technical criteria of this chapter is not economically practicable, consideration must be given to substitution of other recognized industry standards or criteria upon application to the DoD Project Sponsor as provided under Chapter 3. All facilities must comply with the applicable standards of the NFPA.

10-1.2 Supporting Documents.

This guidance may be supplemented by Design and Construction Agent, and DoD Project Sponsor publications, including project specific Medical Design Instructions, UFCs, Technical Manuals, ETLs, and other criteria. Minimum HVAC design criteria must be in accordance with the latest editions of the ASHRAE Handbook series, the American Conference of Governmental Industrial Hygienists (ACGIH) publication Manual of Recommended Practices for Industrial Ventilation, and NFPA Standards 45, 90A, 96, 99, 101, and 801, as well as applicable governmental regulations. Other industry and Government standards must be utilized for HVAC design as applicable.

10-2 DESIGN CONDITIONS.

10-2.1 Weather Data.

Weather data must be obtained from UFC 3-400-02. **\1** Obtain the outdoor humidification design conditions not included in UFC 3-400-02 from the ASHRAE Handbook of Fundamentals. If given Military Installations are not listed in the data above, or **/1/** have access to more recent or accurate information of weather conditions in their region, designers must coordinate use of this information with the Design and Construction Agent.

10-2.2 Interior Design Conditions.

Interior design conditions must be in accordance with Appendix B or as otherwise addressed in this chapter.

10-2.3 Space Ventilation.

Minimum total and outdoor air change rates must be in accordance with Appendix B. Supply higher air change rates as required to meet air conditioning or make-up air requirements as supported by engineering calculations. See 10-16, Ventilation Design, for additional guidance and requirements.

10-2.4 Ambient Outdoor Design Conditions.

10-2.4.1 Facilities Housing Critical Care and Other Inpatient Services.

a. Design the HVAC cooling based on the **\4** highest enthalpy **/4/** of the three following Total Cooling conditions: the 0.4 percent dry bulb temperature, and corresponding mean coincident wet bulb temperatures; the 0.4 percent wet bulb temperature and corresponding mean coincident dry bulb temperature; and the 0.4 percent humidity ratio and corresponding mean coincident dry bulb temperature.

b. Design the heating based on the 99.6 percent dry bulb temperature.

c. Design the cooling tower evaporation rate based on the 0.4 percent wet bulb temperature.

d. Design humidifiers based on the 99.6 percent humidity ratio and corresponding mean coincident dry bulb temperature.

10-2.4.2 Outpatient Facilities Not Housing Critical Care.

a. Design the HVAC cooling based on the **\4** highest enthalpy **/4/** of the three following Total Cooling conditions: the 1.0 percent dry bulb temperature and corresponding mean coincident wet bulb MCWB temperature; the 1.0 percent wet bulb temperature and corresponding mean coincident dry bulb temperature; and the 1.0 percent humidity ratio and corresponding mean coincident dry bulb temperature.

b. Design the heating based on the 99 percent dry bulb temperature.

c. Design the cooling tower evaporation rate based on the 1.0 percent wet bulb temperature.

d. Design humidifiers based on the 99 percent humidity ratio and corresponding mean coincident dry bulb temperature.

10-2.5 Critical Care Spaces.

Critical Care Spaces are identified in Appendix B.

10-2.6 Laboratories.

Space design and ventilation requirements for clinical laboratories are indicated in Appendix B. Research laboratories, to include animal holding facilities in research laboratory facilities, must be designed in accordance with the ASHRAE Handbook of Fundamentals, the Biosafety in Microbiological and Biomedical Laboratories, and Guide for Care and Use of Laboratory Animals.

10-2.7 Temperature during Smoke Control Operation.

When a supply air system is required to operate on 100 percent outdoor air during smoke mode operation, the system must be designed with sufficient heating capacity to maintain a minimum **\1** AHU discharge temperature of 45 ºF (7.5 ºC) **/1/** under the 99.6 percent winter design conditions.

10-2.8 Mechanical Equipment Rooms.

Mechanical equipment rooms must be conditioned as needed to meet the manufacturers recommended conditions for any sensitive electronic equipment, such as variable frequency drives, microprocessor-based controls or circuit breakers, or other electronic components unless those devices are installed in conditioned cabinets. Designer must confirm the requirements of such equipment and consider not only the manufacturers allowable conditions but also the potential degradation of performance within the allowable conditions in determining the room design temperature (for example elevated temperatures reduce the life expectancy of backup batteries). Mechanical equipment rooms without temperature sensitive equipment or where that equipment is otherwise installed in a conditioned cabinet must be designed to maintain temperatures within 10 degrees F of summer ambient design temperature. In humid climates, mechanical rooms that are contiguous with the occupied building must be conditioned to a humidity level equivalent to the occupied areas to minimize transfer of moist, unconditioned air to the interior of the building.

10-2.9 Humid Climate Definition.

A humid climate is a region that meets or exceeds both of the cooling load criteria indicated herein. The charts and tables referenced can be found in the region-specific climate data reports entitled Engineering Weather Data (EWD) available from the **\1** 14th Weather Squadron (14WS) **/1/** as referenced in UFC 3-400-02. Humid climates are defined as regions where the latent load is three times the sensible load AND where the monthly latent load exceeds the monthly sensible load for two or more consecutive months of the year. (Reference data field “Ventilation Cooling Load Index” and graph “Average Ventilation and Infiltration Loads”, as referenced in UFC 3-400-02.)

10-2.10 NFPA 99 Risk Assessment.

A Risk Assessment must be performed in accordance with NFPA 99 to establish the System Categories for all HVAC systems. See Appendix C for the timing and responsibilities of the Risk Assessment.

10-3 REFRIGERANTS.

Refrigeration equipment must utilize refrigerant having an Ozone Depletion Potential (ODP) of not greater than 0.0 (refer to the U.S. Environmental Protection Agency [EPA] Significant New Alternatives Program [SNAP] for acceptable refrigerants). Refrigeration room design must include the safety features, such as sensing devices and purge ventilation system, as required for the particular refrigerant in accordance with ASHRAE Standards 15 and 34.

10-4 LIFE-CYCLE COST AND ENERGY ANALYSIS.

Life-cycle cost and energy analysis required in conformance with this chapter, or necessary for the evaluation of building sustainability features or performance, must be in accordance with criteria referenced in Chapter 1 and Chapter 4.

10-5 ELIGIBILITY FOR AIR CONDITIONING.

10-5.1 Total Air Conditioning.

Air conditioning is required in all normally occupied facilities and spaces to meet the interior conditions listed in Appendix B. “Normally occupied spaces” include such spaces incidental to the facility as corridors and circulation areas. Normally unoccupied, or intermittently occupied, spaces, such as restrooms, locker rooms, soiled linen rooms, janitor closets, indoor stairwells, and similar spaces accessible to medical staff or the public and having exterior exposure, must be air conditioned (in addition to being provided with the required ventilation) to maintain reasonable conditions.

10-5.2 Food Service Area.

Design air conditioning of the kitchen areas to minimize energy costs including compliance with ASHRAE 90.1, while providing a reasonably comfortable environment for kitchen staff.

10-5.3 Medical Warehouses.

Base HVAC design upon the environmental requirements of the stored materials. Provide air conditioning for spaces within medical warehouses that are normally occupied, including Administrative or Break Rooms, as required to meet the design conditions listed in Appendix B. Provide air conditioning for any warehouse spaces housing computer or other environmentally-sensitive equipment.

10-6 MECHANICAL EQUIPMENT SPACE.

10-6.1 Mechanical Room.

Locate mechanical rooms for major mechanical equipment such as central station air-handling units, heat exchangers, central pumps, medical gas supplies, vacuum pumps, and air compressors within the facilities with direct access to the outside of the building.

Exceptions to locate AHUs in conditioned penthouse equipment rooms may be considered by the Design and Construction Agent if justified from a cost or functionality standpoint, provided that stairwell access, at a minimum, is provided. For multi-story facilities, direct access to rooftop AHU penthouses must be provided from an elevator. Rooftop mounted air handlers must not be used in any new facility in excess of 15,000 ft^2 (1400 m^2) gross **\1** area, **/1/** except for temporary or deployable facilities, due to the difficulty of maintenance access, and consideration of safety and working conditions for O&M personnel. Mechanical room location and layout must consider:

a. Sufficiency of space to enable access for operation, maintenance, and replacement of equipment.

b. Minimization of distribution runs.

c. Relative location to electrical equipment rooms: Consider NFPA 70 vertical clearance and dedicated space requirements for electrical equipment which may restrict or preclude the routing of piping and ductwork through these locations.

d. Do not locate adjacent to Communication Rooms: adjacency of mechanical rooms and Communications Rooms create congested above-ceiling conditions where cable trays and ductwork converge.

e. Adjacency to corridors, as a path for the routing of ductwork.

f. Adjacency to spaces having stringent noise control requirements, or spaces with high ceilings that may restrict duct distribution space.

g. Potential future expansion of mechanical system capacity.

Equipment rooms must be designed to provide a minimum of 24 in. (610 mm) clearance on all sides of AHUs. Sufficient access must be provided for removal and replacement of filters, coils, fans, motors, pumps, and other associated equipment, with piping, ductwork, and conduit installed such as not to block the access-way. Unions, flanged fittings, or other readily demountable connections must be provided at equipment piping connections to facilitate removal.

10-6.2 Energy Plant.

Chilled water, steam and hot water generators may be located in a separate energy plant. Install utility lines connecting the energy plant to the facility within a tunnel or other accessible enclosure providing maintenance access and protection from the elements. Provide access such that any valves, fittings, or equipment requiring periodic maintenance or inspection are accessible to workers without using lifting equipment. Accessibility to all other equipment within the enclosure may be accomplished with removable panels or coverings readily accessible to mobile cranes or rigging equipment. Where authorized by the Design and Construction Agent and DoD Project Sponsor, prefabricated direct-buried utility lines with closed-cell foam insulation, integral leak detection, and exterior sheathing may be utilized for water services only (for example chilled and heating hot water) provided that all valves or maintenance items are installed in man-holes.

10-7 HVAC SYSTEM DESIGN FOR FUNCTIONAL AREAS.

The primary considerations of the HVAC design are to provide the environmental conditions required to meet the functional requirements. Medical facilities must be primarily served by central-station AHUs using single duct terminal reheat, and variable air volume (VAV), or constant air volume (CAV) terminals, as appropriate for room conditioning and pressure control. Where electric resistance heating is utilized in accordance with UFC 3-410-01, provide with modulating capacity control (for example SCR technology). When utilized, VAV systems must be of the pressure independent, minimum air quantity type. Direct Expansion (DX) coils must not be used in VAV systems. Induction-type terminal units (for example chilled beams) may be utilized but only to meet sensible loads (non-condensing) and the air changes induced by these devices may not be counted toward the total air change requirement in Appendix B (see total air change definition in paragraph 10-16.1). With the exception of sensitive equipment spaces; mechanical, electrical, and plumbing (MEP) rooms, all-water (for example fan coil units), unitary, and fan-powered VAV systems are not acceptable, due to concerns with maintenance, noise, and limited ability to meet filtration and ventilation requirements.

10-7.1 Critical Care Spaces.

These spaces must normally be served by single-duct terminal reheat systems. Simultaneous temperature, humidity, and pressurization control requirements for these spaces preclude the use of other types of systems. Air handling systems serving Critical Care Spaces must be of the draw-through arrangement, in order to utilize the supply fan heat to avoid a saturated supply airstream.

10-7.1.1 Operating Room Air Systems.

The room air supply system for Operating Rooms (C-Section, Cystoscopic, Cardiothoracic, Integrated, Hybrid, Neurology, Orthopedic, and General) must be a ceiling supply type, located over the operating table or treatment area, using non-aspirating “low velocity” 25–35 cfm/ft^2 (124–178 L/s/m^2) diffusers that isolate the air over the operating or treatment area. Extend the area of the primary supply diffuser array a minimum of 12 in. (305 mm) beyond the footprint of the surgical table on each side. Use no more than 30 percent of the primary supply diffuser array area for non-diffuser uses such as lights, gas columns, etc. Room exhaust and return provisions must consist of a minimum of two exhaust or return registers, located at diagonally opposing corners of the room, mounted with bottoms of registers approximately 8 in. (200 mm) above finished floor. In addition to the required low return or exhaust registers, return or exhaust may be accommodated using registers placed high on the walls.

10-7.1.2 Continuity of Service.

The design for the HVAC systems serving Critical Care Spaces must include:

a. The AHUs serving OR suites must be separate, independent units serving only the respective Surgical or Obstetrical Department or portions thereof, to enhance the reliability of these systems and minimize demand on the EES. However, if justified from a cost or functional standpoint, and where authorized by the Design and Construction Agent and the DoD Project Sponsor, the AHU(s) serving each suite may also provide service to other Patient Care or support areas outside the respective Surgical or Obstetrical Department. A maximum of four ORs should be served by any single AHU. Where a Surgical or Obstetrical Department has four or fewer ORs, these should be served by at least two separate air handling systems, to enhance reliability.

b. HVAC equipment, including controls, that serve Critical Care Spaces (including ventilation and pressure controls for isolation/protective environment bedrooms) must be connected to the EES. This must include a sufficient number of chillers and boilers, with necessary supporting equipment, to meet critical design loads. Boilers must have dual-fuel burners that are not solely dependent on one source of fuel for ignition **\1** to support utility service interruptions. If two separate fuel sources are not reasonably available, the Design and Construction Agent may seek authorization from the DoD Project Sponsor to utilize one fuel source with onsite backup in lieu of a second fuel source. **/1/**

c. Designs must include features to minimize HVAC service interruptions to Critical Care Spaces, without the provision of redundant AHUs or distribution systems. Provisions must be such that service interruption to any Critical Care Space, as a result of failure of an AHU component or its supporting electrical or controls systems, must be minimized. Such features may include the provision of multiple, isolatable, heating and cooling coils; spare stock of replacement motors, drive belts, and bearings in the immediate vicinity of the equipment room; multi-fan units; or other measures providing for continuity or expeditious restoration of service.

d. AHUs, with associated controls, that serve Critical Care Spaces and patient bedrooms must be connected to the EES.

10-7.2 Sensitive Equipment Areas.

These are spaces or areas in which equipment or processes require special environmental control, including continuous (24 hours per day, year-round) air conditioning and individual room temperature or humidity control. Examples include Telecommunications Rooms and closets, data storage equipment spaces, Data Centers, spaces housing computer equipment supporting imaging and special treatment systems. For those spaces which are critical to continued facility operations, backup or redundant features must be provided to ensure continuity of air conditioning in the event of primary air conditioning equipment failure or when the primary system includes night-setback or economizer features. This may also include the requirement for connection of air conditioning equipment to the EES. Where feasible, the main building systems

must be utilized for primary cooling/outdoor air and a redundant system utilized for back-up cooling.

10-7.3 Patient Bedrooms.

Normal-care patient bedrooms may be served by dual duct, VAV, or single duct reheat systems. All systems utilized must maintain minimum ventilation quantities under all conditions of operation. Perimeter heating systems may be considered in conjunction with these air systems.

Isolation bedrooms must be served by airflow systems that maintain a constant differential between supply and exhaust airflow rates to maintain the required relative pressurization of the space to the adjacent spaces and corridor. Refer to more detailed design guidance and requirements for isolation bedrooms under paragraph 10-17. Pressurization control equipment serving protective environment and airborne infection isolation bedrooms must be connected to the electrical EES.

10-7.4 Temporary and Deployable Facilities.

When considerations of logistics, equipment availability, limited O&M capability, or expediency dictate, deployable facilities may be served by unitary equipment meeting—to the extent practicable—the ventilation, filtration, and environmental conditions established in Appendix B. Temporary facilities may utilize unitary, all-water, or fan-powered VAV systems when authorized by the Design and Construction Agent and DoD Project Sponsor.

10-7.5 Rooms with Critical Pressurization Requirements.

All spaces in Appendix B with air balance requirements of “++” or “- -” (to include associated anterooms and toilet rooms) must be designed and constructed with the volume differentials and room construction integrity to maintain a differential pressure of 0.02 in. w.g. (5 Pa) between the subjected room and adjacent space, which must be demonstrated during commissioning. The volume differentials noted in Appendix B are a baseline and may need to be adjusted in order to achieve the required pressure differential. Designer must evaluate the room size, fixed openings (for example door undercuts) and anticipated construction integrity in establishing the design volume differentials. The Designer must also consider the need to increase the room differential pressure to provide sufficient margin above the alarm value of 0.01 in. w.g. (2.5 Pa) to minimize false alarms and ensure the integrity of the reading.

In order to prove the integrity of the air barrier, a leak-test of the room must be performed. Tests must be conducted with the room under positive pressurization, regardless of whether the end-state requirement is negative or positive. Provide temporary positive pressure high enough to ensure a valid test, approximately 0.05 in. w.g. (13 Pa). With the room under pressure, the test must consist of moving a smoke pencil at a rate of not more than 1 in/s (25 mm/s) along all construction seams and interfaces, to include floor and structural ceiling partition interfaces, outlet boxes, and all

partition penetrations by piping, conduit, cable, or other equipment. The visible passage of smoke at any point must be considered a failure, requiring resealing prior to repetition of the test. This test must be witnessed by the Government and commissioning team.

Rooms must be provided with a pressure indicating instrument or gauge, located on the outside wall near the door, that must visibly indicate that not less than a 0.01 in. w.g. (2.5 Pa) differential pressure (negative or positive according to room type) is maintained under static (door closed) conditions, and that must alarm if the pressure is not maintained for a period exceeding 30 seconds. In addition, the pressure differential and alarms must be monitored by the building control system. If the alarm can be disabled or silenced locally, the building control system must monitor whether the alarm has been disabled or silenced.

10-8 GENERAL DESIGN CONSIDERATIONS.

10-8.1 Plant Sizing and Optimization.

For all facilities justifying a degree of redundancy in the capacity of primary energy plants, the precise number, capacity, and configuration of primary heat exchangers and pumps must be determined in accordance with the requirements noted here.

10-8.1.1 Facilities with Critical Environments.

These facilities include all MTFs with inpatient functions, ambulatory surgery centers, and for selected research and laboratory facilities in which loss in ability to condition the facility would result in loss of critical research or animals at prohibitive cost to the Government. The plant must be sized and configured such that:

a. For inpatient MTFs, with one major heat exchanger or pump out of service, the remaining plant equipment is sufficient to serve all critical loads, including patient bedrooms and labor rooms, plus one-half of all remaining loads within the facility.

b. For ambulatory surgery centers, with one major heat exchanger or pump out of service, the remaining plant equipment is sufficient to serve all critical loads to include surgery, surgical delivery, surgical prep, surgical recovery, decontamination, and sterile preparation and storage, plus one-half of clinical area loads.

c. For research and laboratory facilities, with one major heat exchanger or pump out of service, remaining capacity must be sufficient to serve the critical environmental loads, plus all support spaces, such as computer records, critical to the continued operation of the facility.

d. For all facilities with critical environmental requirements, with one major heat exchanger or pump out of service for an extended period (one day or more) of maintenance, during the “off” season for such service, the remaining plant equipment must be sufficient to meet the entire facility’s maximum load.

e. For all such facilities, plant optimization must in addition be based on LCCA of the most life-cycle economical number, capacity, and configuration of prime heat exchangers and pumps.

10-8.1.2 Energy Plants for Other Facilities.

When energy plants consisting of multiple primary heat exchangers are justified, on a project-by-project basis, for large outpatient clinics or ambulatory care clinics without operating rooms, the plant must be designed on the basis of LCCA of the most life-cycle economical number, capacity, and configuration of prime heat exchangers and pumps.

10-8.2 Contaminant Removal.

HVAC systems must be designed to remove or reduce to acceptable levels volatile chemical and airborne microbiological contaminants within the facility. Systems must be designed to remove excessive moisture in facility spaces and to control moisture and dust accumulation in AHUs, distribution elements, and chases, to avoid conditions permitting the growth of pathogenic, allergenic, or otherwise objectionable microorganisms.

10-8.3 Interdepartmental Air System Restriction.

In general, individual facility departments should be served by dedicated air handling systems in order to increase system flexibility, energy conservation, facilitate comfort control, and reduce demands upon the EES. When laboratories, pharmacies, Emergency Department, or other facility departments are required to operate during normally unoccupied areas of the balance of the facility, these must be served by dedicated air handling and distribution systems.

10-8.4 Air Filtration.

Individual space air filtration must be provided as indicated in Appendix B. MERV 8 “roughing” filters must be provided upstream of all coils, velocity sensing devices, or other devices requiring protection from dust accumulation. “Roll filters,” cleanable media, or other filtration systems requiring more intensive maintenance are not acceptable. Designers must carefully consider the location of filters relative to humidifiers to minimize the possibility of wetting the filter media. High capacity cartridge-type filters, in lieu of bag type filters, must be provided for units serving Critical Care Spaces due to the propensity for the latter to release particles during air handler startup and shutdown.

10-8.5 Balancing Ports and Features.

Necessary controls, instrumentation, and balancing ports and devices must be provided to establish and maintain the required space temperature, relative humidity (RH), and air changes rate, and to facilitate balancing procedures for all systems.

10-8.6 Additions and Alterations to Existing Facilities.

10-8.6.1 Site Investigation.

Designers must conduct thorough investigations of existing facilities to be upgraded or modified, to become knowledgeable with facility conditions as established by the terms of their design contracts. This includes the need to inspect concealed spaces, for example, above-ceiling plenums, equipment rooms, and chases, to permit evaluation and accurate depiction of as-built conditions that can affect new work. Design and Construction Agents must ensure that this requirement is met; it is advantageous that the expected scope of the site investigation be discussed in detail with the designer during project pre-negotiation and "kickoff" meetings. Generally, designers should be required to directly inspect all equipment rooms and all above-ceiling areas in such a number of locations as to reasonably establish the existing conditions. In facilities with "hard" ceilings, this may require the creation of a suitable number of inspection openings: Design and Construction Agents must define in the Project Design Instructions the responsibility for making and repairing such openings. Structural and architectural building elements, as well as existing equipment, that restrict equipment distribution space should be directly verified to the extent reasonably practicable. The design team must recognize the economic advantages of a detailed designer site investigation: if the designers do not verify conditions, the construction contractor must do so, normally at a cost premium reflected in higher bidding costs (unknown conditions) and change orders (changed conditions).

10-8.6.2 Modifications to Existing Systems.

Too often in the past, addition and alteration project design documents have failed to provide the detailed engineering guidance required to sustain operation of systems serving occupied areas, leaving this engineering responsibility in the hands of QA personnel or construction contractors. The results have included loss of critical services, inadequate system performance, project completion delays, and costly change orders. Therefore, it is hereby emphasized that it is the responsibility of the project designer to carry out all aspects of the design that can reasonably be accomplished during the design phase. Modifications to existing equipment and systems, including temporary connections, changes to system performance, or measures necessary to sustain service, must be shown and described in detail in project design documents. Designers must evaluate the impact on existing systems of extensions of service that increase system demand. The locations of new connections must clearly be shown or described, or both. The designer must determine, and document for the Design and Construction Agent's information, any project work that must necessitate a reduction or interruption of any service to an existing, occupied area. Consider and document Interim Life Safety Measures (ILSM) for use by the facility in accordance with Chapter 14.

10-8.6.3 Protection of Patients from Construction Contaminants.

For additions or alterations to existing hospitals, measures must be provided to minimize contamination of existing hospital areas during the construction period and the associated HVAC systems serving them. Measures to reduce the potential of contamination and nosocomial infections include but are not limited to: negative isolation of construction areas, construction of effective dust barriers (including double-barrier air locks at entrances and exits) separating construction from occupied areas, protection of air distribution systems serving occupied areas, and disinfection of any reused ductwork. Designers must consult with the facility's infection control representative during the design process to ensure thorough coordination of design features that may affect patient welfare. See also the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction.

10-8.6.4 Construction Phasing Plan.

Reference Appendix C.

10-8.6.5 Commissioning Considerations.

Reference Chapter 19 and Appendix C.

10-8.7 Cooling and Heating Load Calculations.

10-8.7.1 Heating Load Calculation.

Calculations used for determination of primary and airside (including reheat) heating equipment must not include credit for internal load sources, including lighting, people, and equipment. These loads are typically not present, or are much reduced, at night and on weekends. Heat calculations should also take into consideration morning warm-up loads when night setback temperatures are utilized in non-ward areas.

10-8.7.2 Equipment Heat Generation.

In many spaces within facilities, the primary component of cooling loads will be equipment heat generation. It is therefore necessary for accurate load determination that the HVAC designer coordinate on a project-by-project basis with the medical or research equipment designer, and with the individual DoD Project Sponsor, to identify all individual equipment items and the corresponding load contributions. To estimate equipment usage duration and frequency, designers must gather information from the DoD Project Sponsor, or if unavailable from that source the manufacturer, personal experience, or other sources. In performing load calculations, designers must consider the as-designed equipment provisions of each unique space. "Rules of thumb" loading assumptions are not acceptable for final design calculations.

10-8.7.3 Lighting Loads.

Lighting loads present a significant component of facility cooling loads and, as such, require consideration of the as-designed lighting fixture numbers and characteristics of each space. “Rules of thumb” lighting load assumptions are not acceptable as the basis for final design load calculations.

10-8.8 Piping Systems.

10-8.8.1 Pipe Routing.

Piping distribution systems should be routed above corridors whenever practicable, to minimize leaks, maintenance intrusion, and noise in occupied areas of the facility. Pipes must not be routed through Telecommunications Rooms and Electrical Rooms unless dedicated to serving that room.

10-8.8.2 Thermal Expansion.

Designers are responsible for designing all aspects of piping systems necessary for the control of thermal expansion, and for showing the necessary control features on design drawings. This includes showing and dimensioning, as applicable, the approximate locations of guides, anchors, expansion ells and offsets, and flexible couplings, as well as any other piping features that may affect expansions forces in the piping. The intent of this requirement is to ensure that this critical aspect of piping design is accomplished by the qualified mechanical engineer selected for the project design, and not by a construction contractor of unknown engineering ability or qualification. In the case of direct burial, (for example pipe within a pipe, underground heat distribution systems) engineering of the expansion compensation features by the system manufacturer may be preferred or necessary. Designers must design piping systems such that piping expansion forces are isolated from equipment. Where piping systems subject to thermal expansion are seismically braced, coordinate the thermal expansion design with the seismic bracing. Include any seismic bracing in the expansion/flexibility analysis. Design and Construction Agents must ensure contractor’s shop-drawing layout drawings of piping systems subject to thermal expansion are reviewed by the designer or by an equally qualified engineer representative of the Government.

10-8.8.3 Steam and Condensate Piping.

Steam mains **\1** operating above a gauge pressure of 15 psi (100 kPa) **/1/** must not be distributed in above-ceiling areas of spaces normally occupied by patients or public within a facility, to include corridors. Designers must show the required direction and degree of line slope on drawings, and must provide and show the locations and details of drip traps and other drainage features. Piping for clean steam and associated condensate return must be stainless steel.

10-8.9 Insulation for Mechanical Systems.

Insulation thicknesses and thermal characteristics must be not less than cited per ASHRAE 90.1. Insulation with higher "U" values must be provided when shown to be life-cycle cost effective. Insulation materials must be as permitted by the UFGS; it is important to note that under no circumstances will mineral wool or fiberglass insulation be permitted on new chilled water systems or other systems handling fluids at a temperature below 60 ºF (16 ºC).

10-9 HVAC SYSTEM CONTROLS.

10-9.1 Energy Conservation.

All designs must comply with UFC 1-200-02. Additional information on energy conservation design is referenced at Chapter 4.

10-9.2 Temperature Control.

Individual room temperature controls must be provided for all Critical Care Spaces, sensitive equipment spaces, patient bedrooms, labor rooms, and laboratories, to closely maintain the room conditions provided in Appendix B. Utilize zoned temperature control for other spaces within the facility. Serve only rooms with similar exposures and load profiles by a single zone, with a maximum of six spaces per zone. Serve all conference rooms, classrooms, and other rooms with unique exposures or load profiles by individual zones. Unless a separate means of room heating (such as perimeter heating) is available, provide terminal reheat for all terminal units serving normally occupied spaces.

Wound Intensive Care (Burn Care Rooms) must be provided with room temperature controls to maintain temperatures up to 100 degrees F with humidity control as indicated in paragraph 10-9.4.

10-9.3 Control Precision.

Temperature controllers must maintain space temperature within +/-2 Fº (1 Cº) of active set-point, as provided for the individual spaces in Appendix B. The summer and winter design set-points normally differ. For some spaces, a temperature range is given as the summer or winter interior design condition in lieu of a specific temperature set-point. The HVAC system for such spaces must be designed with the capability, under design conditions, to maintain any selected temperature within that range.

10-9.4 Humidity Control.

Humidity controls must be provided as necessary to meet the requirements given for individual spaces in Appendix B. **\1** Provide central AHU humidifiers for units serving Critical Care Spaces, including patient bedrooms unless a psychrometric analysis demonstrates the space humidity will remain within the range specified in Appendix B.

/1/ If necessary to maintain the RH within the allowable range, humidity controls must be provided on a room basis for these Critical Care Spaces:

a. ORs

b. Cystoscopy Rooms

Humidity controls for Wound Intensive Care (Burn Care Rooms) must be provided on a room basis in order to maintain 35–50 percent RH +/-5 percent at room temperatures up to 100 ºF (38 ºC). Humidity controls for all other spaces may be provided on a zone or system basis as determined to be sufficient to maintain the required conditions.

10-9.4.1 AHU Humidifying Equipment.

Air handling system humidification must be achieved utilizing direct steam injection, with a steam source in accordance with paragraph 10-10.1 utilizing humidifiers of the rapid absorption, steam jacketed distribution type designed to deliver dry steam and accomplish complete re-evaporation within 3 feet of the discharge manifold, under the air velocity and temperature conditions designed. No equipment must be located in the AHU casing within the downstream re-evaporation distance, and the inner casing liner within this section must be constructed of stainless steel. Designers are responsible to designate the location of steam injectors relative to ductwork and AHU components, and so design them as to minimize concerns with moisture collection in or on the downstream elements. To minimize the risk of introducing condensation into the air stream, design humidifier control sequences such that the supply air relative humidity will not exceed 85% under winter heating load conditions. Provide safeties including but not limited to a dedicated air flow switch and duct high-humidity limit switch.

10-9.4.2 Trim Humidification for Critical Care Spaces.

Humidification must be achieved utilizing direct steam injection, with a steam source in accordance with paragraph 10-10.1. Humidifier must be separated a minimum 15 ft (5 m) upstream from high-efficiency final filtration, or any other duct equipment, elbow, or takeoff; when this separation cannot practicably be achieved, rapid-absorption-type humidifiers must be provided with design as indicated in paragraph 10-9.4.1. Ductwork within the downstream re-evaporation distance must be constructed of stainless steel with provisions for drainage of condensate.

10-9.5 Direct Digital Controls (DDC).

The DDC System must be a complete system suitable for the control of the HVAC system and other building level systems as specified. Reference UFC 4-010-06 for cybersecurity requirements. When a DoD Project Sponsor determines that communication between a facility's DDC system and a remote Utility Monitoring and Control System (UMCS) is required, the design must ensure that the DDC system is seamlessly compatible with the UMCS system.

No remote UMCS system, in other words not located in the facility or its associated energy plant, will be permitted to exercise control over any hospital HVAC system

equipment providing service to Critical Care Spaces. Remote UMCS systems may be provided with monitoring, alarm, and reporting capabilities as necessary to facilitate maintenance activities.

10-9.6 Air Handling Equipment Control.

10-9.6.1 Building Pressure Control.

All systems must maintain the building at relative positive pressure to the outside environment, with the exception of those spaces on perimeter walls required to maintain a negative pressure relative to contiguous spaces. For facilities in humid climates, and for all facilities of three stories or more in height, automatic controls must be provided to actively monitor and control building pressurization via pressure monitoring at strategic locations on each level, and manipulation of outdoor air, exhaust volume flow rates, or both. All systems that modulate outdoor air, including all VAV air handling systems, must include accurate airflow measurement arrays located in accordance with manufacturer's recommendations as part of their control system. Positive building pressure must be maintained at all times (24/7) for all facilities located in humid climates.

10-9.6.2 VAV AHU Controls.

All VAV systems must be provided with supply and return fans. Airside economizer must be provided where economically life-cycle cost effective. Fan speeds must be modulated by means of variable-frequency drivers (VFDs). For units utilizing multiple fans (for example fan arrays), provide each fan with a separate VFD. Supply fans must modulate based upon maintaining a fixed static pressure at a location remotely located in the ductwork sufficient to ensure operation of all VAV terminal devices. Supply, return, and outdoor airflow rates must be measured by the DDC control system, and the return fan must modulate to maintain a fixed differential airflow below that of the supply fan. A high supply duct static sensor and shutdown capability must be provided.

10-9.6.3 Variable Exhaust Controls.

HVAC controls for laboratories, treatment rooms with coughing booths, autopsy procedure rooms, and other rooms having equipment requiring variable or intermittent exhaust requirements, must be provided that maintain the required room relative pressurization and room conditions for all modes of operation of the equipment, for example, on or off, minimal to maximum sash height, according to the user's intended operation. Variable flow controls must be provided for the general exhaust of such rooms as well as for the equipment, to allow measurement and tracking of supply to exhaust flow differential by the DDC system.

10-10 STEAM SYSTEMS.

10-10.1 Humidification Steam Source.

Steam generated by heating system boilers (or any other steam) containing amines, oxygen scavengers, or other treatment chemicals must not be used for space humidification in any air handling unit or air distribution system serving Critical Care spaces. Separate steam generators for humidification must be provided for these systems and must be constructed throughout of 316 stainless steel.

In systems serving non-critical care spaces, if authorized by the Design and Construction Agent, central steam systems utilizing chemically treated steam generated under the following conditions may be utilized:

10-10.1.1 Water Source.

Water entering humidifiers or primary steam generators must originate from one of the following sources.

- Potable water
- RO water
- DI water

10-10.1.2 Treatment Chemicals.

With the exception of the three specific amines listed below, boiler treatment chemicals as regulated by 21 CFR 173.310 may be utilized. Chemicals and minerals must not be present in the steam in concentrations that are known to be hazardous to health or that might contribute to an indoor air quality problem. All chemical dosing must be accomplished with automated equipment. The specific chemicals listed below may be present in steam, but they must not exceed the following concentrations in the steam.

- Cyclohexylamine (CHA): 10 ppm
- Diethylaminoethanol (DEAE): 5 ppm
- Morpholine: 10 ppm

10-10.2 Sterilizer Steam Source.

Steam generated by boilers located in an onsite (hospital-dedicated) boiler plant may be utilized for sterilization steam subject to approval by the DoD Project Sponsor. As hospital authorities cannot normally exercise a reasonable degree of supervision or control over treatment chemicals utilized in base-wide or district systems, steam from these sources may not be utilized for direct sterilization. Unlike humidification steam, which is injected directly into the air supply, little sterilizer steam escapes into a facility's general environment. Under a reasonably responsible boiler treatment program, any steam that does escape typically will not result in dangerously high levels, for example,

Occupational Safety and Health Administration (OSHA) Recommended Exposure Limits (RELs), of treatment chemicals in the environment.

10-11 AIR HANDLING AND DISTRIBUTION.

10-11.1 AHU Requirements.

AHUs are to be double-wall, internally-insulated, readily maintainable units suitable for utilization in medical facilities. Draw-through units are normally preferred to utilize fan heat to increase the DB air temperature above the saturation point and minimize the possibility of wetting downstream filters, attenuators, or other components. If draw-through units are not provided, an alternative, energy-efficient heating source must be provided to ensure that supply air delivered from the AHU is at least 2 Fº (1 Cº) above saturation temperature. Provide for minimum 18 in. (460 mm) wide access doors **\1** to allow unobstructed access to both the upstream and downstream surface of each heating coil, cooling coil, and heat recovery device, to facilitate coil inspection, cleaning, maintenance, proper installation of the unit freeze stat, and calibration of control sensors. **/1/** When unit heating or cooling capacity are provided—in part or total—by heat reclaim devices, AHUs must be provided with conventional preheat and cooling coils sized for the total system load, to ensure continued service when heat reclaim equipment is out of service.

10-11.2 Energy/Heat Recovery Systems.

Where energy recovery systems are provided, design and construct such systems to comply with the following:

Locate energy recovery systems upstream of intermediate filters. For exhaust systems serving spaces without a "Y" in the exhaust column of Appendix B, provide systems that allow no more than 5% cross-contamination of exhaust air back to the supply airstream via purge, leakage, carryover, or transfer.

For exhaust systems serving any room that has a Y in the exhaust column of Appendix B, provide systems where the supply airstream components and the exhaust airstream components are fully separated by an air gap of adequate distance to prevent cross-contamination that is open to the atmosphere (for example run-around pumped coils).

10-11.3 System Shutdown Capability.

To the extent practical and cost effective, non-critical, non-bedroom area HVAC systems must be designed to permit shutdown (night setback and setup, outdoor air shutdown) of individual areas or departments not in operation on a 24-hour basis. In any facilities in which any spaces are exhausted during non-occupied hours, the HVAC design must provide for conditioned make-up air to prevent a negative pressure within the facility relative to the outside, and the admittance of unconditioned, unfiltered infiltration air. For facilities not located in humid climates and where no spaces are exhausted during non-occupied hours, negative building pressure may be prevented by

shutdown of the HVAC system and isolation from the outside by closing outdoor, relief, and exhaust air dampers.

Air distribution systems must comply with the requirements in UFC 4-010-01 except as modified herein. Due to the nature of operations in medical facilities, completely shutting down HVAC in areas that would risk the health of patients, visitors, and staff is not a decision to be made lightly, and inadvertent activation of the HVAC shutdown must be minimized. The quantity and locations for Emergency Air Distribution Shutoff Switches must be coordinated with the Design and Construction Agent. In any case a minimum of one (1) shutdown switch must be provided. All shutdown switches must be protected from accidental activation by a flip up cover or other double action device. Emergency Air Distribution Shutoff switches for systems serving any critical care spaces, spaces with critical pressurization requirements ("++" or "- -" in Appendix B), or other spaces where HVAC shutdown would pose an immediate danger, must be by keyed switches. These switches must be provided with the following signage “Danger! Critical Care HVAC Shutdown, Exposure Hazard”. Signage must be red background with white letters and be placed above any cover for each individual button. Keyed switches permit responsible personnel in leadership to weigh the risk associated with intentionally degrading a life preserving internal environment to protect against the introduction (or distribution) of an airborne hazard into the facility. Switches for systems serving only non-critical care spaces must be provided with the following signage “Emergency Use Only! Mechanical HVAC System Shutdown”. Signage must be red background with white letters and be placed above any cover for each individual button.

10-11.4 Outdoor Air Intakes.

Outdoor air intakes must be located as far as practical, but not less than 30 ft (10 m), from exhaust outlets of ventilation systems, cooling towers, combustion equipment stacks, MV systems exhaust, plumbing vent stacks, emergency generator exhaust, or from areas that may collect vehicular exhaust and other noxious fumes. Locate the bottom of air intakes serving central systems as high as practical but not less than the distance above ground level required by UFC 4-010-01, or if installed above the roof, at least 3 ft (1 m) above roof level. Outdoor air must not be drawn from equipment rooms. Designers must utilize judgment in the location of contaminant exhausts, and not simply apply the “9M rule” without further consideration of wind direction and velocity, building geometry, and characteristics of the contaminant stream. Appropriate consideration must be given to prevailing wind direction and the season, for example, summer or winter, as applicable; however, designers are cautioned not to rely on prevailing wind direction(s) as a primary factor in the avoidance of intake contamination. In particular, use extreme caution in locating outdoor air intakes in proximity to parking areas, ambulance garages, loading docks, exhaust air outlets, and equipment stacks. Where appropriate, the Design and Construction Agent will provide individual Project Design Instructions for special computational fluid dynamics (CFD) or wind tunnel modeling to provide greater assurance of the correct location of outdoor air intakes.

10-11.5 Noise Control.

Noise criteria for individual rooms and spaces in the facility are provided in Appendix B.

10-11.5.1 Room Breakout.

The HVAC designer must coordinate with the architectural designer to control equipment noise passing from mechanical rooms into adjacent spaces through the surrounding walls or partitions.

10-11.5.2 Crosstalk.

The compromising of patient privacy by transmission of audible speech from one room to another via ductwork is of great concern in medical facilities and must be addressed by HVAC designers. Examination rooms, physician's offices, and toilets require the designer's particular attention. Ductwork connecting adjacent rooms must have the necessary attenuating characteristics to eliminate audible speech transmission. Typically, this is addressed by the provision of well-separated "takeoffs" or several duct elbows in the intervening ductwork, or both.

10-11.5.3 Air Fixtures.

Air distribution supply, return, and exhaust fixtures, for example, diffusers or grills, must be sized to provide air inlet and outlet velocities consistent with room noise criteria level requirements as provided in Appendix B. Designers must be aware that diffuser manufacturer's published noise characteristics are based upon idealized inlet conditions. Poor installation of flex duct, abrupt branch duct connections, elbows located immediately at the diffuser collar, and similar poor connections may result in unacceptable noise levels. Spin-in or other 90-degree duct drop connections to diffusers must be equipped with equalizing grids as necessary to ensure uniform air distribution at the diffuser inlets.

10-11.5.4 Air Velocity.

Designers must limit air velocities in ductwork, air transfer grills, or door undercuts to values consistent with ASHRAE recommendations to control noise generation.

10-11.5.5 VAV/Constant Air Volume (CAV) Terminal Units.

VAV terminal units and constant velocity controllers are a frequent source of noise generation in air distribution systems. Designers must specify or schedule units with minimum inlet sizes for incremental ranges of flow and must indicate maximum sound power output for each unit, at the maximum inlet static pressure that the designer anticipates the unit will be exposed to. If integral sound attenuating devices are required, these must be indicated for the respective terminal unit(s) in specifications or drawing schedules.

10-11.5.6 Exterior Noise Sources.

Designers must evaluate the sound characteristics of exterior equipment provided as part of the project design (such as cooling towers and emergency generators) to ensure that such sources do not result in interior noise levels exceeding limitations provided in Appendix B.

10-11.6 Duct Design.

Design duct systems in accordance with the ASHRAE Handbook series, ACGIH Industrial Ventilation: A Manual of Recommended Practice, NFPA 96, and SMACNA HVAC Systems Duct Design. Maximum velocity in ductwork mains must not exceed 1,800 fpm (9 m/s) over occupied spaces, or a maximum of 2,500 fpm (12.7 m/s) elsewhere, and velocities in branch ducts and takeoffs must not exceed recommended levels in those references. Ductwork plans must indicate the static pressure class required for sealing and reinforcement for all types of duct. Access panels must be provided as necessary for access to fire dampers, smoke dampers, humidifying equipment, control equipment to include reheat coils, and other equipment requiring periodic inspection or maintenance. All supply air, with the exception of air transferred between spaces for the purpose of pressurization, and flexible terminal equipment connections must be provided in sheet metal ductwork.

10-11.6.1 Non-Corrosive Ductwork Material.

Ductwork installed downstream of high efficiency final filters (MERV 14 or greater, see Appendix B) serving Critical Care Spaces must be of stainless steel or aluminum, including all accessories such as dampers, fasteners, and turning vanes. This provision does not apply for ductwork downstream of high-efficiency filters when these are located at the AHUs (filters noted in the “intermediate” column in Appendix B). Stainless steel ductwork downstream from trim humidifiers must extend for the manufacturer’s cataloged re-evaporation distance. Exhaust ducts for glass washers, dishwashers, and cart washers must be non-corrosive and must have soldered or welded joints and must be pitched to drain.

10-11.6.2 Return Air Plenums.

Provide fully ducted return air systems for all facilities, except stand-alone administrative buildings or deployable facilities. Temporary facilities may be considered for plenum returns where authorized by the Design and Construction Agent and the DoD Project Sponsor. Corridors must not be used as return air plenums in any portions of a facility. Exceptions allowing transfer air for toilets and janitor closets, as provided in NFPA 90A and 101, will be permitted.

10-11.6.3 Duct lining.

The utilization of duct lining materials is prohibited in all medical facilities. These materials may harbor dust and moisture, providing an ideal environment for the propagation of pathogenic or noxious microorganisms. Factory fabricated sound

attenuators, packed type, constructed with a perforated inner steel liner and Mylar® or foil underlay separating the packing from the airstream, must be provided to attenuate noise. Such attenuators must comply with ASTM C1071 and UL 181.

10-11.6.4 Balancing Provisions.

Duct branches serving each individual space must be provided with a manual balancing damper, accessible above the ceiling, located as remote from the space supply or return fixture, for example, diffuser or register, as practicable. The balancing damper provided as part of air diffusers is not to be used for system balancing. Duct systems which are fully welded due to containment requirements (for example, Biosafety laboratories, compounding rooms etc.) must be provided with permanent taps to facilitate pitot-traverse airflow measurement at main duct branches. These permanent taps must consist of welded nipples of the same material as the ductwork, with threaded caps, gasketed with material suitable for the materials in the airstream. Similar permanent pitot-traverse taps must be provided in the exhaust ducts serving Neat and Dilute chemical agent laboratories, and in kitchen grease hood exhaust. For the latter, tap nipples must extend to an accessible location outside of the fire-resistant duct enclosure material.

10-11.6.5 Telecommunication Rooms.

Ducts must not be routed through Telecommunications Rooms in compliance with TIA-569.

10-11.7 Cleanliness of Air Handling and Distribution Equipment.

During project construction, protect all AHU and distribution equipment (including all ductwork and fittings exposed to the air stream) from contamination by dust and debris. Cover or seal the equipment until installation and keep open ends of ductwork covered until final connections to diffusers and registers are made. Thoroughly clean any AHUs that are operated during building construction and install new filters before beneficial occupancy of the facility. “Thoroughly cleaned” in this sense is defined as wiped clean of any visible dust or debris. Thoroughly clean any ductwork that has not been properly protected prior to installation or acceptance of the facility.

10-12 MAINTENANCE PROVISIONS.

10-12.1 General Personnel Access.

Safe and practical means of personnel access must be provided to, and within, all areas of the facility where equipment is located, to adequately provide for O&M and replacement of the equipment. Access to equipment rooms from outside the facility should be provided where feasible. Within equipment rooms, provide clearance to all service points to mechanical equipment to allow adequate personnel access and working space in accordance with equipment manufacturer’s recommendations; but as a minimum, maintain 30 in. (770 mm) at all service points and 5.5 ft (1.7 m) of overhead clearance for O&M access-ways. Proper clearance must be provided such that

personnel do not have to climb over equipment or crawl on hands and knees. When rooftop AHUs are provided on multiple story facilities, provide elevator access with direct means of transporting materials to the units via hydraulic handcart without damage to the roof.

Provide convenient stairway access when rooftop AHUs are provided on single story facilities; in addition, the HVAC designer must coordinate with the site designer to provide for a practical location for a mobile crane to approach within reasonable proximity of the AHU(s) for periodic transportation of maintenance or replacement parts and equipment.

10-12.2 Equipment Clearances.

Minimum clearances between electrical and mechanical equipment must be as required by NFPA 70. Ensure that practical means are provided for the removal and replacement of the largest and heaviest equipment item(s) located in the facility. Provide adequate pull space for all coils, heat exchangers, chillers, boiler tubes, and filters. Sufficient space must be provided in above-ceiling areas to facilitate equipment installation and O&M. For building designs utilizing interstitial floor distribution zones, further guidance is provided at Appendix E.

10-12.3 Suspended and Mounted Mechanical Equipment.

Where suspended and mounted equipment is installed, provide a minimum of 5.5 ft (1.7 m) of clearance for headroom as required. In refrigeration equipment rooms, provide overhead clearances required by ASHRAE 15. For any workstation or location requiring maintenance access that is not readily accessible from an 8 ft (2.5 m) portable ladder, provide a fixed ladder or catwalk.

10-12.4 Air Distribution System Components.

Design outdoor air intake plenums, AHU casings, and distribution ductwork to permit access for periodic cleaning or disinfection.

10-12.5 HVAC System Balancing Provisions.

Adequate access must be provided to facilitate operation, adjustment, and testing at all HVAC balancing and measuring points and equipment, including automatic and manual damper operators, air terminal units, pilot tube ports, valves, and sensing devices.

Prior to Test and Balance (TAB) perform Duct Air Leakage Testing (DALT) in accordance with UFC 3-410-01 on all duct systems regardless of pressure class, to include all return, all exhaust, and all portions of supply upstream of terminal units.

10-13 VIBRATION CONTROL.

Provide mechanical equipment and systems designed in accordance with UFC 3-450-01 to prevent transmission of vibrations to the structure.

10-14 INTERDISCIPLINARY COORDINATION.

10-14.1 Architectural Coordination for Rooms with Critical Pressurization Requirements.

All spaces in Appendix B with air balance requirements of "++" or "- -" (and associated anterooms) must be designed and constructed with full height room partitions, extending from floor to structural ceiling, with all joints and penetrations sealed to prevent the passage of air.

10-14.2 Fire Protection Features.

Refer to Chapter 14 for fire protection features.

10-14.2.1 Smoke and Fire Dampers.

In support of defend-in-place evacuation, design HVAC service zones to coincide with smoke compartments whenever practicable. Ductwork penetrations of fire and smoke - rated walls should be minimized, to minimize the required number of smoke and fire dampers and complexity of controls. Coordinate with the architectural design to ensure that necessary access for inspection or service of these dampers is provided.

10-14.2.2 Ventilation for Commercial Cooking.

Air supply and exhaust systems must be of the mechanical ventilation type and must meet the requirements of NFPA 90A and 96. Grease-laden vapor exhaust ductwork must be in accordance with NFPA 96.

10-14.2.3 Smoke Management Operation.

Comply with Chapter 14.

10-14.2.4 Commissioning of HVAC Systems with Fire Alarm and Fire Detection.

Guide specifications typically do not contain provisions for the simultaneous testing of HVAC and fire alarm and fire detection features or systems, which can have complex, interwoven operational requirements in some facilities. For each project where applicable, designers must develop or modify specifications as needed to provide for testing of HVAC systems under fire alarm conditions, to permit verification not only of correct function, but of acceptable speed of response. In more complex systems involving smoke evacuation or compartmentalization and pressurization, or provisions of smoke/exhaust in support of defend-in-place evacuations, detailed testing protocols, system diagrams, or both, must be developed to clearly convey the required scope of the commissioning effort. (Reference Chapter 19).

10-14.3 Essential Electrical Service.

10-14.3.1 Capacity.

The HVAC system equipment serving Critical Care Spaces must be connected to the EES to ensure service continuation in the event of normal power disruption, in accordance with the requirements of NFPA 99. Cooling, as well as heating, must be maintained to Critical Care Spaces in the event of normal power outage.

10-14.3.2 Commissioning.

Service guide specifications do not adequately address testing requirements for HVAC and EES interoperability. HVAC systems connected to the EES must be shown to function as intended under conditions of normal power interruption. Testing of the EES must be conducted in conjunction with any components of the HVAC system required for support. For example, thermostatically operated louvers may be required in emergency generator rooms for make-up air, generator radiator cooling may be a function of such HVAC components as pumps or cooling tower. Testing must verify the actual connection of HVAC equipment to the EES in accordance with the design following normal power outage, in the priority sequence established by the design. Designers must supplement or modify guide specifications to ensure that such verification testing is adequately detailed and described. (Reference Chapter 19)

10-14.4 Seismic Design Requirements.

Refer to Chapter 7 for seismic provisions for the HVAC system equipment and components. Designers must be responsible for ensuring that seismic bracing of HVAC piping is coordinated by design with thermal expansion compensation features, to allow for the necessary pipe movement with temperature changes.

10-14.5 Design Coordination.

Designers are responsible to coordinate the HVAC with the electrical, communications, architectural, and structural aspects of the design to ensure that equipment can reasonably be installed by a contractor providing equipment, and following installation procedures, within the terms of his contract. For this reason, designers are instructed to base equipment room and distribution space designs upon spatial envelopes (including maintenance clearances) that must accommodate any of at least three manufacturers of major equipment. Routes of ductwork and piping must be carefully coordinated with other elements, considering required slope, insulation, bracing, reinforcement, slope, and maintenance access. This practice in no way infringes on or substitutes for the construction contractor’s responsibility, to be defined in project specifications, to coordinate the installation work of all trades and to provide detailed shop drawings showing the proposed construction.

10-14.5.1 Equipment Rooms.

To ensure adequate coordination, designers must consider not only the HVAC equipment, but the work requirements of other trades. Ensure adequate clearance around AHUs to permit bolting the units together and securing them to their housekeeping pads, meanwhile providing space for the general contractor to install wall partitions. Consider the locations of plumbing and medical gas equipment. Ensure it is possible for maintenance workers to access all controls, electrical panels, valves, and instrumentation. Be aware of NFPA 70 clearance and vertical dedicated space requirements for electrical equipment. Coordinate parameters such as ductwork and outdoor air plenums with the locations of lighting.

10-14.5.2 Above-Ceiling Plenums and Chases.

Designers must anticipate the worst-case insulation, duct reinforcement, equipment support, slope, and fitting characteristics associated with ductwork and piping distribution systems, and be careful to coordinate the location of these systems with other equipment, including in particular cable trays and lighting fixtures with their vertical access and clearance space requirements. Ensure that access space is considered for damper operators, low-point steam drip assemblies, VAV terminal units, reheat coil controls and instrumentation, service valves, and access doors for ductwork for cleaning or damper inspection.

10-15 FUEL STORAGE REQUIREMENTS.

Refer to paragraph 7-4 for requirements for assessing the extent of onsite fuel storage for facilities in seismic threat regions. Additional fuel storage guidance for boiler plants must be obtained from the individual service criteria.

Provide factory-assembled automatic particulate filtration, dewatering and fuel additive injection system to maintain the purity of fuel in storage. Design the system to circulate the fuel from the storage tank, through the system, and back to the storage tank with capacity to turn over the largest connected full tank one time within 72 hours. Provide pre-filter, coalescing filter, and fine particle filters as part of the fuel filtration system. Design the system to maintain water content of fuel to less than 10 ppm and include an automatic wastewater holding and removal system. Provide a fuel additive injection system that includes chemical storage tank and chemical pump that can automatically add chemicals to the fuel being circulated. Chemical storage tank to be sized to hold two years supply of additive recommended by additive supplier. Include biocide treatment, cetane boosters, stabilizers or other additives as recommended by the maintenance treatment system manufacturer.

10-16 VENTILATION DESIGN.

10-16.1 Ventilation Air Changes.

Provide the minimum air change rates for each space, for outdoor air and total air, required by Appendix B. Total air changes as established by Appendix B must consist

of the outdoor air changes, plus re-circulated airflow through a main AHU having the minimum filtration called out for that space in the appendix. For rooms with a positive pressurization requirement, calculate the total air changes based on the supply volume and for rooms with a negative pressurization requirement, calculate the total air changes based on the exhaust/return volume.

10-16.1.1 Occupied room requirement.

Whenever a room is occupied, the minimum air change rates must be provided.

10-16.1.2 Critical care requirement.

The minimum outdoor air change rate from Appendix B in Critical Care Spaces must be maintained at all times. Increase the minimum outdoor air calculated below as needed to ensure that the minimum outdoor air change rate is maintained for Critical Care Spaces.

10-16.1.3 Outdoor Air Correction Calculation.

Provide minimum outdoor air at the AHU equal to the corrected Outdoor Air Intake (Vot), per the following equation:

Equation 10-1. Vot = Vou / (1 + X – Z)

Where:

Vou = the sum of all individual space outdoor air requirements for spaces served by the AHU,

X = the ratio of Vou to total ventilation air calculated to be required, and

Z = the largest ratio of outside air to ventilation air for any of the spaces served by the AHU.

10-16.2 General Exhaust Provisions.

Provide exhaust systems for animal holding areas, autopsy and morgue spaces, laboratory fume hoods, radioisotope hoods, bacteriological cabinet, kitchens, laundry, toilets, isolation rooms, equipment rooms, and other areas as noted in Appendix B, or as designated on an individual project basis. Do not connect duct systems conveying potentially hazardous exhaust, for example, ethylene oxide (ETO) sterilizers and lab hoods, to any general or toilet exhaust system. Provide duct systems conveying isolation room exhaust dedicated to isolation rooms and their associated anterooms and toilet rooms, and not connected with other exhaust systems. Locate all exhaust discharge outlets to prevent short-circuiting to air intakes or other building openings. Locate exhaust fans at the end of the exhaust duct run (exhaust ducts to be under negative pressure).

10-16.3 Space Pressurization.

The required pressurization of individual spaces, relative to adjacent spaces or corridors, is indicated in Appendix B. Where a negative or positive pressurization are required for a given critical or patient bedroom space, that pressurization must be maintained by the HVAC system under all conditions of operation, including periods of reduced ventilation or night setback.

10-16.4 Laboratory Ventilation.

Exit corridors must not be utilized to directly supply or exhaust air from the laboratory, although “transfer” of air to and from corridors may be utilized to establish required room pressurization. Negative pressurization of laboratories in relation to surrounding occupancies must be maintained under all conditions of HVAC system and fume hood operation.

10-16.4.1 Exhaust Systems.

Provide independent exhaust systems for all laboratories. Laboratories containing hazardous chemical, microbiological, or radioactive airborne particles or gases must be provided with independent exhaust systems in accordance with NFPA 45 and should utilize high plume exhaust designed to remove and dilute the air so it does not contaminate the roof area or have the potential to be re-entrained into the building. Exhaust ducts from chemical fume hoods are permitted to be combined with general laboratory exhaust systems within the same laboratory unit in accordance with guidance in NFPA 99 and NFPA 45. Maintain air change rates within laboratories at all times to prevent the spread of airborne contaminants within the space. Where hood exhaust is used to meet the required air change rates, incorporate a bypass with the general exhaust system for times when the hood is not in use or is shut down for maintenance. Exhausts from hoods handling perchloric acid or other strong oxidizing agents, materials, or agents requiring high-efficiency particulate air (HEPA) filtration, or exhausts which, when combined, chemically interact or change the explosion or ignition limits, may not be combined with any other laboratory exhaust system. Additional guidance for hood and exhaust design is contained in the ASHRAE Handbook series, the Manual of Recommended Practices for Industrial Ventilation, NFPA 45, ASHRAE 15, and ASHRAE 62.1. Exhaust duct discharge height must be above the building recirculation cavity boundary. In all cases, exhaust discharge must have sufficient stack height, velocity, and distance from building openings, outdoor air intakes, or recirculating air currents, to preclude reentry into the building. Air velocity in exhaust ductwork must be sufficient to transport the contaminant vapors, fumes, dusts, or other particulate matter for which the fume hood(s) is designed. Refer to paragraph 10-11.6.4 for requirements for permanent pitot traverse ports in certain hazardous exhaust applications.

10-16.4.2 Laboratory Fume Hoods, General.

Fume hoods must be located in areas of minimal air turbulence, away from doors, windows, and traffic, to minimize disruption of required sash airflow. HVAC system and fume hood controls must be designed such that operation or shutdown of any fume hood in a given space must not disrupt the required room air balance or the required sash airflow at other hoods operating in the space. General-purpose laboratory fume hoods that control personnel exposure to chemicals and physical contaminants must have a minimum sash face velocity of 100 fpm (0.50 m/s). Fume hoods must be provided with audible and visual alarms to indicate inadequate sash airflow conditions.

10-16.4.3 Radioactive Material and Radioisotope Hoods.

Duct systems serving hoods for radioactive material must be constructed of acid-resistant-type stainless steel for their entire length. Ductwork must be flanged with neoprene gasketed joints to facilitate dismantlement for decontamination. Fume hood exhaust must remain in constant operation and must be filtered with carbon or HEPA filters as required to meet Nuclear Regulatory Commission (NRC) requirements. The location of filters in the system must be chosen to best facilitate their safe removal, disposal, and replacement by maintenance personnel. All filters must be automatically monitored to provide indication that change-out is required. All hoods must comply with requirements of the NRC.

10-16.4.4 Canopy Hoods for Prosthetic Dental Laboratories.

Canopy hoods for Prosthetic Dental Laboratories, and exhaust ductwork extending for a distance 10 ft (3 m) downstream from the hood connection, must be fabricated of material that is corrosion resistant to the caustic fumes emanating from boil-out tanks and casting activities conducted in the laboratory.

10-16.4.5 Biological Safety Cabinets (BSCs).

Class, type, and location of BSCs must be as directed by the DoD Project Sponsor. Class II BSCs are provided with HEPA filtration of recirculated air or building exhaust, and are provided in such areas as Microbiology and Mycology. The required open door or sash face velocity for Class I and Class II Type A BSCs must be 75 fpm (0.38 m/s), and for Class II Types B1, B2, and B3, must be 100 fpm (0.51 m/s). For further information of biological safety hood class, type, application, and exhaust requirements, refer to the ASHRAE Handbook series, OSHA Part 1910, Biosafety in Microbiological and Biomedical Laboratories, and NSF/ANSI Standard 49.

10-16.4.6 Perchloric Acid Hoods.

Hoods for handling of perchloric acid and other strong oxidizing agents, and the associated exhaust ductwork, must be constructed of stainless steel. Internal water spray systems must be provided for hood and all ductwork to facilitate the periodic washdown. Joints must be welded and ground smooth, and all ductwork pitched back toward the hood to facilitate drainage. Welding must be in accordance with AWS D18.1

Hygienic Welding. More detailed guidance is provided by the ACGIH publication Manual of Recommended Practices for Industrial Ventilation.

10-16.4.7 Containment Laboratories BSL-3 and BSL-4.

These laboratories deal primarily with indigenous or exotic agents that may cause serious or potentially lethal disease as a result of exposure by inhalation. The HVAC design for these laboratories must ensure the continuous negative pressurization and exhaust of the space. The exhaust air from these spaces must not be recirculated to any other area of the building, but must be transported through dedicated exhaust ductwork to be directly discharged to the outside of the building. Design of BSL-3 and BSL-4 laboratory exhausts must comply with Biosafety in Microbiological and Biomedical Laboratories, DA PAM 385-69, and DoDM 6055.18-M.

10-16.5 Exhaust Canopies.

Exhaust canopies must be provided for equipment or appliances generating high heat or moisture (steam) loads, such as glassware washers, boil-out tanks, drying ovens, sterilizers, and stills. In some cases, specially designed canopy hoods may be necessary to control personnel exposure to hazardous chemical vapors. Canopy hood design must comply with the ACGIH data for “Canopy Hood” from the Manual of Recommended Practices for Industrial Ventilation.

10-16.6 Laminar Flow Clean Benches.

These horizontal flow hoods are used in pharmacy for preparing intravenous fluids and similar laboratory processes. Clean benches recirculate room air and do not require exterior air supply or exhaust systems.

10-16.7 Bench-Back Slot Hoods.

Slot hoods are typically built into the wall behind laboratory benches to exhaust vapors, gases, and odors that are released with little energy or velocity. Typical applications are laboratories, brace shops, and other spaces in which volatile chemicals are routinely used. Design of these hoods must be in accordance with ACGIH guidelines, with a slot velocity of 2,000 fpm (10 m/s).

10-16.8 Portable Bench-Top Hoods.

Portable hoods with glass viewing panels and interior lighting may be used to control chemical contaminants of minor toxicity and odors. They must be attached to built-in exhaust outlets with flexible ducts. Each built-in exhaust system outlet must provide a minimum of 160 CFM (76 L/s) or a face velocity of 75 fpm (0.38 m/s) at the hood, whichever provides the maximum mass flow of air. The exhaust duct opening must be provided with a blast gate and sealing plug to stop airflow when the unit is not in service.

10-16.9 Medical Equipment.

Reference Chapter 15 for special ventilation requirements of medical equipment.

10-16.10 Kitchen Hoods.

Equip all hoods over cooking service equipment with fire extinguishment systems, automatic washdown, listed grease extractors, and heat-actuated fan controls. Cleanout openings and required fire protective enclosures and separations must be provided in horizontal exhaust duct systems serving these hoods and grease exhaust ducts in accordance with NFPA 96.

10-16.11 Pharmaceutical Admixture Rooms.

Pharmacy admixture rooms must be in compliance with USP 797 and/or USP 800, Pharmacists' Pharmacopoeia. For each project, designers must interview DoD Project Sponsor personnel to evaluate the nature of drug compounding procedures, including risk level, for each compounding room, as the basis for determining required room air changes, filtration levels, protective equipment, and separation area (anteroom) requirements for the designated clean room level.

10-16.12 MRI Quench Exhaust.

Provide a dedicated cryogen quench vent run as directly as possible to the outdoors. Design the quench vent to meet the requirements of the MRI system manufacturer. Fully insulate the quench vent to the point of discharge. Provide a weather-head to prevent the introduction of horizontally driven precipitation, snow accumulation and animal intrusion at the discharge of the quench vent. Separate the quench vent discharge point from any air intake or operable window as specified in this chapter concerning outdoor air intakes. Clearly mark a 25 ft (7.5 m) radius exclusion zone around the quench vent discharge.

10-17 AIRBORNE INFECTION ISOLATION AND PROTECTIVE ENVIRONMENT ROOM DESIGN.

Isolation rooms consist of airborne infection isolation and protective environment rooms. The former is intended for the patient suffering from a known or suspected infectious disease and is provided with engineering controls that assist in preventing the spread of the disease from the room. Protective environment rooms are provided for the patient having an immune system deficiency and require engineering controls to assist in protecting the patient from contamination from outside the room. Rooms must be one or the other, and not "switchable" from airborne infection isolation to protective environment function, or vice versa. Provide rooms with pressure-monitoring alarms and gauges mounted on the outside corridor wall; when a central DDC control operator's station is provided, the alarm should in addition be connected to that system.

10-17.1 Airborne Infection Isolation Bedrooms.

Design airborne infection isolation bedrooms to incorporate requirements and guidance contained in the Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-Care Facilities (the TB Guidelines), published in the Federal Register Vol. 59, No. 208. Provide negative pressure, exhaust to the outside, and minimum total and outdoor air change rates (12/2, respectively) as referenced in Appendix B. Connect the exhaust ductwork from isolation bedrooms, only with the associated toilet, anteroom (if provided), or other isolation rooms and their associated anterooms and toilet rooms. Where the design includes additional associated rooms that only open directly to the isolation bedroom, apply the Appendix B HVAC requirements for isolation bedrooms to these rooms, and connect the exhaust from these rooms to the isolation bedroom exhaust system. Power isolation bedroom exhaust systems from the EES. Supply bedroom suites by air systems provided with constant-volume control and measuring terminal units that automatically maintain the supply airflow rate set-point to each space. Provide constant volume exhaust systems maintaining a fixed exhaust flow rate for each space. Discharge isolation bedroom exhaust in a vertical direction no less than 10 ft (3 m) above the adjoining roof surface. Provide no less than 30 ft (10 m) horizontal separation from isolation bedroom exhaust and any outdoor air intakes, openable windows/doors, or areas normally accessible to the public. When bedroom exhaust is located such as to prevent re-entrainment into outdoor air intakes or other building openings, HEPA filtration of the exhaust is not required.

10-17.1.1 Existing Facilities.

In existing facilities, only those bedrooms designated by the facility specifically for use as tuberculosis isolation bedrooms are required to be designed in accordance with the TB Guidelines referenced in paragraph 10-17.1. TB Isolation bedrooms must be negatively pressurized, exhausted, and must be provided with 12 air changes per hour if economically or physically practicable. When not practicable to achieve this air change rate, TB isolation bedrooms must have a minimum of 6 air changes per hour, to be supplemented by HEPA filter or UV germicidal irradiation (UVGI) systems specifically designed for TB Room applications and providing the equivalent of an additional 6 air changes per hour. Fixed-in-place HEPA filtration units are preferable to portable units, and upper-level UVGI systems are preferred over duct-mounted units, to enhance reliability. Room exhaust must be conducted to the outside of the building; when designed to avoid re-entrainment into outdoor air intakes or other building openings, HEPA filtration of the exhaust is not required.

10-17.1.2 Isolation Suite Relative Pressurization.

When an anteroom is provided for the isolation bedroom interposing between the bedroom and corridor to provide a “buffer” airspace for additional protection, there are several recognized design approaches for corridor-anteroom-bedroom relative pressurization. A recommended design is to provide for the anteroom to be under

negative pressure relative to the corridor, and positively pressurized relative to the bedroom.

10-17.2 Protective Environment Rooms.

The air supply to the protective environment room and associated anteroom and toilet room must be constant flow and must be provided with HEPA filtration. 12/2 total and outdoor air changes, respectively, are required for these rooms. As with airborne infection isolation bedrooms, there are several recognized approaches to the relative corridor-anteroom-bedroom pressurization; a recommended approach is to establish the anteroom positively pressurized relative to the corridor, and negatively pressurized relative to the bedroom.

When upgrading existing protective environment bedrooms to this criteria, 12/2 air changes per hour must be provided if economically and physically practicable. When impractical, these bedrooms must be provided with a minimum of 6 total air changes per hour and supplemented by HEPA filtration or UVGI systems to provide the equivalent of 12 air changes.

10-17.3 Airborne Infection Isolation Exam or Waiting Rooms.

Airborne infection isolation exam or waiting rooms, including pediatric and emergency waiting rooms, must be provided with a minimum of 12 total air changes, as provided in Appendix B. Exhaust ductwork from these rooms must only be connected to the exhaust from other isolation rooms and their associated anterooms and toilet rooms, and not be connected with other exhaust systems.

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CHAPTER 11 ELECTRICAL

11-1 GENERAL.

11-1.1 Scope.

This chapter provides policy and guidance for planning, design, and construction of electrical power and illumination systems for applicable facilities. Criteria is noted throughout the chapter and included in Appendix B and Appendix I. Criteria also include the General Building Requirements established by UFC 1-200-01, including the core electrical engineering UFC's. The core electrical engineering UFC's, of which UFC 3-501-01 is the top-level, in conjunction with criteria in this chapter, establish minimum design requirements. In the event of conflict this UFC is the ruling criteria.

11-1.2 Supplemental Criteria and Standards.

This chapter may be supplemented with individual MilDep criteria, including installation-specific requirements, as established by the Design and Construction Agent.

11-1.2.1 Seismic.

Design essential electrical systems to function after a seismic event occurs. Provide seismic design in accordance with Chapter 7.

11-1.2.2 Durability.

Provide a minimum rating of continuous full design load for installed electrical systems and electrical equipment, except where other criteria mandate larger ratings, to meet the facility reliability requirements.

11-1.2.3 Maintainability.

Provide a means in the design to remove and maintain equipment and field-install wiring without interruption to essential electrical system loads. Provide standard equipment and sizes to the extent practical to allow interchangeability and simplify parts stock. Provide a removal path for all installed equipment. Where draw-out equipment is utilized, provide means to rack equipment in and out, and provide space for maneuverability during servicing.

11-1.2.4 Efficiency.

Provide power factor correction if the power factor is less than 0.95. Provide balanced three-phase loading such that phase unbalance at nominal voltage does not exceed 5% between A, B, and C phases.

11-1.2.5 Economy.

Evaluate alternative system configurations, and component types and sizing for economic value consistent with other criteria factors.

11-1.2.6 Power Conditioning.

Systems that incorporate solid-state devices are susceptible to electrical system transients that may cause system malfunction or equipment component damage. Do not install power conditioning equipment at the utilization point of the building electrical system, unless explicitly required for specific items of equipment by the MilDep or by an A-E or designer evaluation of solid-state requirements for intensive care areas and approved for installation by the DoD Project Sponsor. Provide transient and surge protection for CFCI systems that utilize solid-state devices. Normally provide static UPS with the equipment and system being served. However, determine UPS requirement or provisions on a project-by-project basis. Determine provisions for future installed power conditioning equipment on a project-by-project basis.

11-1.2.7 Voltage Tolerance.

Provide nominal voltage ratings and operating tolerances in compliance with maximums and minimums established by ANSI C84.1. Consider all system voltage drops and supply variation in order to ensure voltage levels are met, from the high voltage main electric supply substation to the low voltage point of utilization. Provide voltage regulators within the facility when the tolerance to demand peaks is not met through conductor sizing or automatic load tap changers in the high voltage main electric supply substation transformer. Provide voltage drop on branch circuits and feeders in accordance with UFC 3-501-01. Base load current for calculation of voltage drop on the circuit capacity as required by UFC 3-501-01; except for feeders, the load current may be based on the frame size of the replaceable plug unit in an adjustable breaker.

11-1.2.8 Risk Assessment for System Categories.

Perform a risk assessment in accordance with NFPA 99 to determine risk categories for activities, systems, or equipment; and the essential power requirement. Use the results of this assessment in conjunction with paragraph 11-4.14 and B-6.2 below to determine loads served and sizing of the alternate power source. The results of the assessment are in addition to the equipment otherwise prescriptively required within this UFC to be served by the essential electrical system. See Appendix C for the timing and responsibilities of the risk assessment.

11-1.2.9 Growth.

Provide the following growth factors:

a. Load Capacity. Provide a minimum 20% spare load growth at 100% demand throughout the electrical system, to include primary feeders, transformers, generators, secondary feeders, and distribution equipment.

b. Bus Space. Provide a minimum of 20% empty bus space in all switchgear, switchboards, and panelboards.

c. Wall Space. Provide a minimum 20% horizontal wall space, to include floor space for cubicle gear, within each separate electrical room for system expansion.

d. Spare Breakers. If the design includes draw-out breakers and the facility includes Category 1 space or is 24/7 or is in-patient; provide one spare draw-out in each frame size on the normal power side and essential power side.

11-1.2.10 Elevators.

Provide design for elevators in compliance with ASME A17.1 and UFC 3-490-06.

11-1.2.11 Containment Laboratories BSL-3, BSL-3+, and BSL-4.

Design BSL-3, BSL-3+, and BSL-4 laboratories in compliance with Biosafety in Microbiological and Biomedical Laboratories, DA PAM 385-69 and DoDM 6055.18-M.

11-1.2.12 Alternative Energy Sources.

If alternative energy sources such as fuel cells or photovoltaics are provided, connect to the normal power system.

11-1.3 OCONUS Criteria.

Comply with requirements herein, except where alternative design standards have been developed and approved in accordance with Chapter 1, to achieve the intent of criteria without compromising safety or property. **\4\ /4/**

11-1.4 Campus and Other Large Facilities.

Medium voltage may be approved for the central utility plant, where essential power demand exceeds capacity of commercially available distribution gear, or where facilities are separated from the central utility plant over a distance impractical to transmit power. Submit life cycle cost analysis to include staffing of medium voltage engineers, for approval by the Design and Construction Agent. If medium voltage is approved by the Design and Construction Agent, provide a primary selective, secondary radial system design; which is otherwise in compliance with this chapter.

11-2 AREA DESIGNATIONS.

11-2.1 Patient Care Space.

NFPA 70 and NFPA 99 establish minimum safety practices and requirements for patient care spaces. “Critical”, “general”, “basic” and “support” patient care spaces are identified in Appendix B by NFPA 99 category code 1 through 4. For medical research facilities, laboratories, and veterinary facilities, provide the essential electrical system in

compliance with NFPA 99 and NFPA 70 article 517 even though an exclusion is provided in these codes for care not rendered to human beings.

11-2.2 Wet Locations.

Wet locations are those patient care areas that are normally subject to wet conditions, including areas with standing water on the floor or areas where routine dousing or drenching of workspaces is performed, and those areas defined in NFPA 99 and NFPA 70. However, wet conditions as a result of routine housekeeping procedures or an incidental spill of liquid are not considered wet locations.

11-2.3 Wet Procedure Locations.

Wet procedure locations are defined in NFPA 99. They include operating and C-section rooms, but not labor and delivery rooms. Define wet procedure locations in the project requirements documents.

11-3 EXTERIOR ELECTRICAL.

11-3.1 Primary Voltage.

Common primary distribution voltages for military installations are 4.16 kV, 12.47 kV, 13.2 kV, 13.8 kV, and 34.5 kV. However, 12.47 kV, 13.2 kV, and 13.8 kV are the normal primary distribution voltages serving medical facilities.

11-3.2 Normal Source Site Investigation.

Provide exterior electrical systems in compliance with IEEE C2, except where technical criteria are more stringent. Provide site electrical evaluations in accordance with the requirements within this document. Coordinate electrical utility siting with other utilities. Provide underground distribution on site and visual screening by location or landscaping elements where appropriate for the project to improve overall site aesthetics.

11-3.3 Hospital Normal System.

11-3.3.1 Primary Feeders.

Provide hospitals with two primary feeders, each serving one end of a double-ended substation or to a selector switch serving a multi-ended network substation (Reference Annex B Multi-Ended Network Substation and Annex C Expandable Dual-Ended Substation for additional criteria related to substation design). Size each feeder to carry the full hospital demand, plus 20% spare load growth at 100% demand. Install each feeder in an underground, concrete-encased duct bank within the hospital site. Connect primary feeders to different power sources (main electric supply substations) if available, and differently route the two primary feeders such that they are electrically and geographically separated. Where two main electric supply substations are not available, the service feeders may be connected to two different sections of a true open loop system.

11-3.3.2 Open Loop System.

A true open loop system configuration is a utility primary feeder where both ends originate from different main electric supply substations or switching stations, or different breakers and transformers in the same main electric supply substation, and have the capacity to serve the total loop load from either end. Consider both the main electric supply substation primary (high voltage) and secondary (medium voltage) loop configuration, redundancy within the main electric supply substation design (for example, double ended), and outage history in the overall reliability determination. The Government and Public Utility each have defined responsibilities (ownership), and where reliability does not meet standards, provide normal power back up of systems to sustain operations if requested by the DoD Project Sponsor.

11-3.3.3 Transformer Substation.

Provide a manually-operated primary selector switch and fused load break disconnect switch for each transformer as indicated in Figure 11-1. Transformers should normally be located outside the hospital but may be located within the building where practicable and economical. Design double-ended unit substation distribution systems for hospitals, medical centers, and specially-designated facilities. Arrange the double-ended substation for easy expansion from each end. Provide identical and interchangeable tiebreaker and main feeder breakers of double-ended substations. Provide draw-out power class breakers (tie, main feeder, and sub-feeder) for **\4** double-ended and single-ended substations as described in paragraph 11-5.2.3. **/4/** Size each transformer in the double-ended unit substation to serve approximately 60–70% of the substation demand load (linear and nonlinear) before forced air cooling is initiated, at 100% of demand load plus 20% future load growth with forced air cooling initiated. Provide **\4** transformers with identical specifications. **/4/** Provide coordinated transient/surge and fault protection for double and single-ended unit substations. Provide selective system protection. Design all double-ended substations for normal open tie breaker operation, which is interlocked with the main breakers, so that all three breakers “main-tie-main” cannot be closed simultaneously. Upon loss of a single transformer or its feeder, the main breaker is automatically opened and the tie breaker is automatically closed to add its load to the remaining transformer.

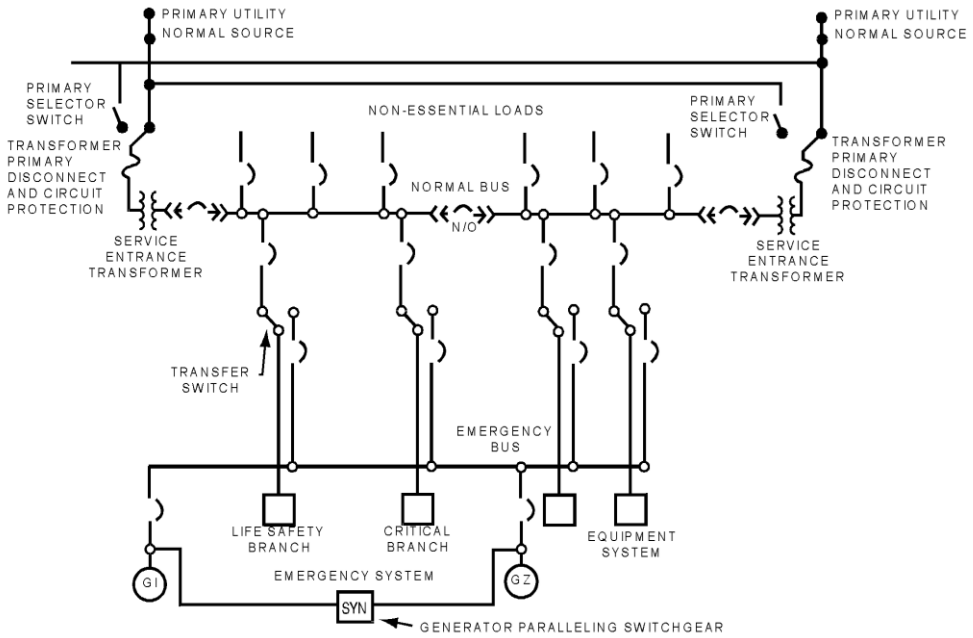
11-3.3.4 Fire Pump Controller.

To prevent unnecessary generator starting due to loss of only one of the two normal power sources, provide an ATS connected to both normal sources to supply normal power to the fire pump controller.

11-3.3.5 Grounding.

Provide adequate system ground for safety and for reliable operation of sensitive users and facility equipment. Typical communications system equipment used in hospitals requires 5-ohm system ground for proper operation. Bond all grounding systems together as required by NFPA 70.

Figure 11-1 Hospital One-line Traditional Diagram



\1\ /1/

11-3.4 Ambulatory Care Clinics Normal System.

For ambulatory surgery centers, provide dual sources of normal power as described in paragraph 11-3.3. For other ambulatory care clinics, provide normal power as described in paragraph 11-3.3 Hospital Normal System, except provide only a single primary source and single-ended substation(s).

11-3.5 Medical and Dental Clinics Normal System.

For medical and dental clinics, provide normal power as described in paragraph 11-3.3, except provide only a single primary source and **\1** single transformer. **/1/**

11-3.6 Medical Research Facilities and Laboratories Normal System.

For medical research facilities and laboratories, provide dual sources of normal power as described in paragraph 11-3.3, except a single primary source and single-ended substation(s) is permissible if requested by the DoD Project Sponsor.

11-3.7 Veterinary Facilities Normal System.

Design veterinary facilities as described in paragraph 11-3.3, except provide only a single primary source and **\1** single transformer. **/1/**

11-3.8 Other Medical Facilities Normal System.

Other facilities include blood donor facilities, medical warehouses, or other facilities which do not include patient care space. Design other facilities as described in paragraph 11-3.3, except provide only a single primary source and single transformer, unless described otherwise in programming documents.

11-4 ESSENTIAL ELECTRICAL SYSTEM.

11-4.1 Facility.

11-4.1.1 Hospitals.

Hospitals must be provided with an essential electrical system in compliance with this chapter.

11-4.1.2 Ambulatory Care Clinics.

Design ambulatory surgery centers and ambulatory care clinics with Category 1 spaces in compliance with the requirements of paragraph 11-4.1.1. Design ambulatory care clinics without operating rooms or other Category 1 space in compliance with paragraph 11-4.1.3.

11-4.1.3 Medical and Dental Clinics.

Justification for an emergency generator is required in the planning and programming phase in order to authorize funding. An essential electrical system, with an alternate source of power, will be required if the facility contains Category 2 space; refer to the patient care space categories in Appendix B. Design the electrical system in accordance with paragraph 11-4.1.1, except as described otherwise in this section.

11-4.1.3.1 System Configuration.

If an essential electrical system is required, provide the system in compliance with NFPA 99 for the space category. If the facility contains Category 2 space, but not Category 1, provide a generator or battery system for the alternate power source; and perform a life cycle cost analysis no later than concept design, to select the economic choice in coordination with the DoD Project Sponsor. For the intent of this section, the battery system only provides for cessation of procedures upon loss of normal power. For either system, provide a permanent switching means to connect a portable or temporary alternate source of power in accordance with NFPA 70 article 700.

11-4.1.3.2 Generator.

If a generator is selected for the alternate power source, a single diesel generator may be used. Locate the generator indoors within a separate room or outdoors in an exterior enclosure with skid mount tank. The fuel supply is to be no less than 8 hours at full load. Provide leak protection system. If an exterior enclosure is used, provide

architectural screening compatible with the building and grounds; force protection in accordance with UFC 4-010-01; a sound attenuating enclosure; and hospital grade silencer.

11-4.1.3.3 Battery System.

A battery system for the alternate power source is not allowed for Category 1 space, but is permitted for Category 2 through 4 spaces. If the battery system is used, provide capacity to sustain full connected load at rated voltage for a minimum of 1½ hours. Design the system in accordance with NFPA 111, NFPA 855, and UFC 3-520-05. Provide a separate room for the system if required by the battery type.

11-4.1.3.4 Essential Loads.

Arrange the system to automatically connect the alternate power source to the load within 10 seconds. Design the essential electrical system to supply life safety and task illumination, outlets related to patient safety, and mechanical equipment as determined by the NFPA 99 risk assessment. This typically includes but is not limited to surgical vacuum, medical air, waste anesthetic gas disposal, and any other system or equipment which is necessary for safe and orderly cessation of procedures and all related anesthesia and resuscitation equipment. The critical branch of the essential electrical system is omitted for an NFPA 99 Type 2 system; and in this situation, adjust branch loads as described in paragraph 11-4.14. Provide a minimum of one normal and one essential power circuit in Category 2 spaces or provide separate essential circuits originating from separate essential branch transfer switches.

11-4.1.3.5 Miscellaneous.

Electric driven fire pumps may be connected to the normal power supply if an analysis in accordance with NFPA 20 and UFC 3-600-01 proves the supply is reliable. Normal power may be supplied by a single primary feeder and single ended substation. **\4** Provide draw-out construction for circuit breakers and automatic transfer switch(es) only if required by paragraph 11-5.2.3. **/4/** A separate room is not required for automatic transfer switch(es) if the location complies with NFPA 110. If the load is 150 kVA or less, a single transfer switch may be used as permitted by NFPA 70. An interior door for the main electrical room is not required.

11-4.1.4 Medical Research Facilities and Laboratory Facilities.

Justification for an emergency generator is required in the planning and programming phase in order to authorize funding. Provide an emergency and or standby system with an alternate source of power if included in the programming documents.

11-4.1.5 Veterinary Facilities.

Justification for an emergency generator is required in the planning and programming phase in order to authorize funding. An essential electrical system with an alternate source of power will be required if the facility contains Category 1 or 2 space; refer to the patient care space categories in Appendix B. Provide the essential electrical system in compliance with NFPA 70 and NFPA 99, even though an exclusion is provided in these codes for veterinary care. Design the electrical system in accordance with paragraph 11-4.1.3, except if the facility contains Category 1 space, provide a generator for the alternate power source and the fuel supply of no less than 24 hours at full load. Dual sources of critical power, originating from separate critical branch transfer switches are required in some spaces by Appendix B; and the dual sources may be critical and normal.

11-4.1.6 Other Medical Facilities.

Other medical facilities include blood donor centers, medical warehouses, and other facilities which do not include patient care space. Provide an emergency and or standby system with an alternate source of power if included in the programming documents. Justification for an emergency generator is required in the planning and programming phase in order to authorize funding.

11-4.2 General.

Provide the alternate power source in conformance with NFPA 70 and NFPA 99, except where technical criteria from the DoD Project Sponsor is more stringent. Provide adjustable trip spare circuit breakers, raceway, and buss bar connection box for load bank testing. Size load bank breaker for 100% capacity of one generator set; and provide a second breaker, 100 A, 3-phase, for the load bank fans. Cable to be provided by user after turnover. Provide additional load capacity to those hospitals assigned mobilization or mass casualty response missions as identified in the project DD Form 1391. Design the emergency power source as a separately derived power source. Provide true root mean square (RMS) metering for load monitoring.

11-4.3 Alternate Power Source.

Provide an alternate power source to supply the essential electrical system during interruption of the normal source as required by NFPA 70 and NFPA 99. Provide parallel operation by two or more generator sets in accordance with Figure 11-1 (see Annex B and Annex C for alternate configurations); except where the essential electrical system load is 150 kVA or less, one generator set may be considered. Consider factory service, parts, and supplier support in the design.

Provide generator sets of equal capacity and rating when operated in parallel with matched impedance and loss characteristics, and designed to carry in parallel or through priority transfer equipment the maximum demand load (linear and nonlinear) of the essential electrical system. Evaluate motor starting and X-ray unit momentary kVA

loads when sizing generator sets. Size each generator set for the capacity to serve all non-sheddable loads (life safety and critical branches, medical air compressor, medical-surgical vacuum pumps, jockey pumps, fire pumps, generator set fuel pumps, other generator set accessories, and non-sheddable helipad loads) plus 20% future load growth at 100% demand. Provide generator set performance class and transient limits in compliance with UFC 3-540-01, and include block loading calculations in the project documentation. Hospitals built under the 1971 version of NFPA 70 may have a life-support branch that is the second critical branch supplied by a separate ATS.

11-4.4 Generator Sets.

Provide diesel-electric generator sets **\4**. Provide performance class G3 generator sets in accordance with UFC 3-540-01. Use a step load to determine the transient response of each generator set, equal to 100% of the generator capacity, or the sum of the loads of the life safety branch, critical branch, and other non-sheddable loads, plus 20% spare capacity. Comply with the performance class transient response limits using this defined step load. Provide the generator set power rating category in accordance with UFC 3-540-01. **/4/** The preferred generating voltage is the highest utilization voltage proposed for the facility. Normally, 480Y/277 V, 3-phase, 60 Hz, 4-wire system is the highest utilization voltage. Higher voltages may be generated where line losses would otherwise be excessive. Include automatic start-and-stop equipment, solid-state battery chargers, fuel storage tanks, remote NFPA 110 panel and audible and visual warning devices to alert of less than four hours of fuel supply, and day tanks and radiators (as required) all as part of the generator set design. Provide the generator set with a hospital grade exhaust silencer and the ability to start and assume its full electrical loads within 10 seconds from the interruption of the normal source. Provide protective relaying for generator sets and related equipment in accordance with the recommendations of IEEE STD 242, including reverse power relays in accordance with NFPA 110 to prevent damage from commercial power or other onsite generators. Equip all generator sets with an isochronous governor to ensure stable voltage, frequency, and power by preventing erratic load operations and allowing computerized equipment to operate directly from the essential electrical system.

11-4.5 Location of Generator Sets.

Locate generator sets in the central utility, provided it is sufficiently close to minimize line losses and cable runs. When the central utility plant is remote from the medical structure, locate generator sets in a building adjacent to or within the medical structure. Locate generator sets and related switch gear rooms (auxiliaries) near the building exterior to facilitate installation and replacement of equipment. Arrange generator sets and auxiliaries so minimum facility modifications are required for future installation or replacement. Do not install service entrance transformers and other equipment not supporting the essential electrical system in the same area (room) as the generator sets. Provide a view window in, or adjacent to, the entrance door.

Do not locate generator sets and auxiliaries below finish-grade level. Locate generator sets and auxiliaries directly accessible from the facility’s interior and exterior to a

vehicular way. In regions subject to flooding, locate equipment above the Design Flood Elevation and provide flood proofing in accordance with paragraph 11-5.4.4. **\4\ /4/**

11-4.6 Engine Starting.

Provide electric or pneumatic starting for generator sets in conformance to NFPA 70, NFPA 99, and NFPA 110. Where electric start is used, provide dual heavy-duty electric starters on generator sets above 1,250 kVA.

11-4.7 Manual Test Switches.

Provide manual test switches for each ATS of the essential electrical system. Provide a group of test switches at a single point in the generator set control area, and one test switch with each ATS. Wire the two test switches associated with each ATS in series to allow testing at either location. Provide capability to test either individual ATS or the entire essential electrical system. Upon depressing any test switch a simulation of a normal power source failure is to occur. The simulation is to automatically cause the generator sets to crank, to attain rated frequency and voltage, and to transfer associated essential electrical system loads from the normal source to the alternate power source; and after 30 minutes of operation in the emergency mode, automatically transfer essential electrical system loads back to the normal source. If for any reason during the simulation, the generator sets experience difficulty while in the emergency mode, immediately transfer load to the normal source automatically. During this simulation, continue serving nonessential hospital loads from normal source without interruption. Install a manual override switch that can be actuated to keep essential hospital loads on the alternate power source as long as desired and which permits generator sets to operate indefinitely beyond the 30-minute automatic transfer restoration time.

11-4.8 Generator Set Operation.

11-4.8.1 Generator Starting.

Design generator sets to function as discussed here. After one second following interruption of the normal source, each generator set is to receive the starting signal simultaneously from the ATS, whereupon each generator set is to automatically crank and attain normal speed and voltage. Do not bundle the starting signal together or series connect between ATS's. Voltage for sensing devices to start generator sets is to be taken from each phase of the incoming normal power terminal of each ATS and hardwired back to the generator set start controls. The first generator sets to reach preset voltage and frequency conditions are to be automatically connected to the emergency bus.

11-4.8.2 Paralleling and Load Transfer.

Provide system protection to prevent simultaneous connection of non-synchronized generator sets to the dead emergency bus. Provide a priority selective device programmed or preset to transfer the non-sheddable loads from the normal bus to the

emergency bus within 10 seconds from time of normal source interruption. The remaining generator set(s) are to automatically synchronize with the emergency bus, close the respective generator SET breaker, and connect the generator sets in parallel for normal operation. After this, automatically transfer the equipment system loads to the emergency bus by programmed or preset incremental steps.

11-4.8.3 Load Shedding System.

Where two or more units are paralleled, provide a load management system in compliance with NFPA 99 and 110. For such system, provide automatic load shedding with manual override that will commence should one or more of the generator sets fail to crank or is shut down for any reason during the operation, or if the total load were to exceed a preset value beyond which a cascading shutdown could occur. Schedule the remaining generator set(s) to serve only the non-sheddable loads, and if possible, highest priority equipment system loads until the failed unit(s) is energized and connected to the emergency bus. For such a condition, provide a programming device to shed all or part of the equipment loads to keep the remaining generator(s) within its kW rating. Design the system in accordance with UFC 3-540-01 and provide for load prioritization by operation and maintenance. Provide a system with redundant processors with wiring and control not shared with other building systems. Provide load priority, sequence, and time delay.

11-4.8.4 Manual Override.

Provide a manual start switch to override the automatic start of the generator sets so they can be cranked, synchronized, and connected on the emergency bus. Provide manual controls to allow the synchronizing and paralleling of the generator sets.

11-4.8.5 Return to Normal Power Source.

Thirty minutes following the return of a stable, normal source, automatically transfer essential system loads to the normal source. Provide an automatic timer for this transfer, having an adjustable time range from 2 to 30 minutes (set at 30 minutes). Following transfer of the loads, generator sets are to continue to run unloaded for a period of not less than 15 minutes for cool-down before shutdown; after which controls automatically reset for a new cycle. Provide a manual start switch to override the automatic start of generator sets so they can be manually cranked, synchronized, and connected to the emergency bus if automatic controls fail.

11-4.9 Automatic Transfer Switch (ATS).

Provide double-throw, open-transition, ATSs with draw-out construction. Use 4-pole ATSs when serving line-to-neutral loads or a combination of line-to-neutral and line-to-line 3-phase loads. Use 3-pole ATSs when serving only 3-phase line-to-line loads. Provide ATSs which are UL tested with the main up-stream breaker to ensure coordinated withstand compatibility between the ATS and the interruption time of the breakers. Circuit-breaker-type transfer switches are not acceptable. Provide green

indicator lights to identify normal power and red to identify emergency power in each ATS. Provide each ATS with at least three normally open and three normally closed spare shaft contacts. **\4** Equip each ATS supplying the essential electrical system, or supplying 24/7 operation for temperature sensitive medical products, **/4/** with a load break bypass isolation switch (BP/IS) to maintain normal or emergency power while the ATS is being repaired or maintained. Provide for BP/IS operation with not more than two movements of the hand to either position regardless of the position or condition of the ATS. **\1\ /1/** Provide an in-phase monitor to prevent an out-of-phase transfer in each ATS feeding high efficiency motors rated 25 hp (18.6 kW) or larger. Provide in-phase transfer without control of the frequency of either power source to prevent excessive motor in-rush current. Use of closed-transition switching for facilitating essential system testing **\1** or paralleling with utility requires DoD Project Sponsor authorization, approval by the Installation Management Organization (IMO), and approval by the utility as described in UFC 3-540-01 **/1/**. **\4\ /4/**

11-4.9.1 ATS and BP/IS Location.

For hospitals and ambulatory surgery centers, locate the ATS and BP/IS equipment in a separate room with 2-hour fire-rated construction having direct access from the normal main power equipment room and the alternate power source equipment room.

11-4.9.2 ATS and BP/IS Testing.

Provide for conduction of laboratory testing, for example, UL, Factory Mutual (FM), or other nationally recognized authority, on the ATS and BP/IS equipment, unless it was completed on a previous randomly selected standard production unit of the same model and capacity as the specified ATS and BP/IS equipment. Conduct the overload, endurance, and temperature tests (in sequence) as listed here:

a. General
b. Normal Operation
c. Overvoltage
d. Under-voltage
e. Overload
f. Endurance
g. Temperature Rise
h. Dielectric Voltage – Withstand
i. Contact Opening
j. Dielectric Voltage – Withstand (Repeated)
k. Withstand
l. Instrumentation and Calibration of High Capacity Circuits
m. Closing

n. Dielectric Voltage – Withstand (Repeated)

o. Strength of Insulating Base and Support.

It is important to note that no deviations from the test sequence are permitted. Approval is not granted to deviate from the overload, endurance, and temperature test sequence.

11-4.10 Ground Fault Protection Equipment.

Do not provide ground fault protection devices on the essential electrical system. Provide ground fault detection features, when required, to indicate a ground fault and sound an audible alarm but not trip the breaker, for the generator circuit breaker and essential electrical main distribution board circuit breakers. Provide activation level for each ground fault alarm sensor when the ground fault current is 10% of the breaker rating or 50 A, whichever is less.

11-4.11 Remote Alarm Annunciator.

Provide a remote alarm annunciator that receives power from a storage battery in a location readily observed by operating personnel at a regular workstation. Indicate alarm conditions on the annunciator of the alternate power source, as indicated in NFPA 99 and NFPA 110, and include (but is not limited to): battery and battery charger malfunction, engine generator run status, engine generator alarms, and less than a 3-hour fuel supply in the day tank and 24-hour supply in the main storage tank. Provide a separate audible and visible derangement signal within the hospital at a continuously monitored location. Reference Chapter 12 for details. This derangement signal need not display individual alarm conditions; however appropriate labeling is required.

11-4.12 Fuel Storage System.

11-4.12.1 Fuel Tanks.

Provide fuel storage tanks and installations in compliance with NFPA 30 and local, state, and Federal Environmental Protection Agency (EPA) policies and regulations. Provide a 4-day capacity at full load for the fuel oil tank sized to the nearest standard size. For remote locations OCONUS and for prime power projects, fuel storage capacities may be larger based on mission requirements or risk analysis as determined by the DoD Project Sponsor. If underground fuel storage tanks are required, provide double-walled with leak detection in accordance with EPA standards. Provide separate day tanks for each generator set, sized for not less than four hours of operation at full load, with an overflow back to the main storage tank. Base fuel usage at full load on manufacturer's full load test data. Follow NFPA 37 for fuel tanks inside of structures.

11-4.12.2 Transfer Pumps and Fuel Filtration.

Provide at least two transfer pumps arranged such that all pumps are capable of drawing from and returning fuel to any selected main storage tank. Provide quantity and sizing of pumps such that should any pump be out of service, the remaining

pump(s) will meet the total fuel demand of all boilers (if applicable) and generators. Provide fuel filtration system per recommendations of the generator set manufacturer, to meet NFPA 110 and maintain the integrity of on-site fuel for up to 10 years. Include automatic particulate filtration, dewatering, and fuel additive injection in the fuel filtration system. Fuel filtration system does not apply to systems with 8 hours or less capacity.

11-4.12.3 Fuel.

\1 Design engine-generators to operate on No. 2-D diesel conforming to ASTM D975. **/1/** Do not use natural gas or comparable gas fuel as an operating fuel for hospital emergency power generation.

11-4.13 Loads on the Alternate Source.

Provide a capacity in the alternate power source to supply the facility's essential electrical system as outlined in NFPA 70 and NFPA 99, as modified herein, and as required by items listed in Appendix B. Do not oversize generator sets such that load banks are necessary for testing under load as required by accreditation authorities. It is important to note that operating generator sets at low loads leads to fouled combustion and unreliable performance. Supplying a mixture of normal, critical, and equipment branch power to critical care areas is more reliable and is recommended in NFPA 99. Additional loads may be added to the critical branch or equipment system by the DoD Project Sponsor as needed to improve the facility's operations. Do not connect other loads to the life safety branch other than those loads identified in NFPA 70 and NFPA 99.

11-4.14 Essential Loads.

Essential loads are divided into three branches: life safety, critical, and equipment. These loads receive both normal and emergency power. Essential branch assignment is specified for medical gas in Chapter 9, and for telecommunication systems in Chapter 12. An NFPA 99 Type 1 system has life safety, critical, and equipment branches; while an NFPA 99 Type 2 system only has life safety and equipment branches. The branch assignment provided in this UFC is for an NFPA 99 Type 1 essential electrical system. For a facility without Category 1 space which has an NFPA 99 Type 2 essential electrical system, map critical branch loads to life safety and equipment branches in accordance with NFPA 70 and 99.

11-4.14.1 Life Safety Branch Loads.

The life safety branch provides emergency power to ensure patient and personnel safety during the interruption of normal power source. The lighting, receptacle, and equipment limitations listed here are defined by NFPA 70 and NFPA 99. Life safety branch provides power to the following:

a. Egress illumination, which includes 25% of corridor and 50% of stairway illumination, plus 25% of assembly areas, such as dining rooms.

b. All battery chargers for emergency battery-powered lighting units used in the event of a life safety branch outage.

c. Exit signs for marking of egress.

d. Fire alarm systems and piped medical gas alarm systems, including smoke detectors, medical vacuum system alarms, and alarms for ventilation for smoke evacuation for those areas where patient evacuation is not feasible.

e. Emergency communications used to notify the general population (radio paging [RP] and intercom systems) including telephone system, power and lighting for communication closets and crisis control centers, and associated equipment. Various related systems are included as directed.

f. Selected power, task lighting, and receptacles at generator set locations; in transformer, switchboard, mechanical, and electrical equipment rooms; repair shops and other equipment rooms; and charger for battery-powered emergency light sets.

g. Elevator cab lighting, control, communication, and signal systems.

h. Electric-powered doors used for building egress.

i. Auxiliary functions of fire alarm mass notification systems complying with NFPA 72.

j. Fuel transfer pump, battery charger, jacket water heaters, alarms, controls, air compressors for pneumatic start, and other similar generator systems accessories essential for generator operation.

11-4.14.2 Critical Branch Loads.

The critical branch provides essential electrical system alternate power to supply task illumination, fixed equipment, selected receptacles, and special power circuits serving areas and functions related to patient care during the interruption of normal power as listed here, derived from NFPA 70 and NFPA 99. The critical branch provides power to the following:

a. NC, telephone equipment rooms and closets, and selected computer equipment and selected data outlets.

b. Oxygen and medical gases equipment, MV pumps, and medical surgical compressed air system, and surgical vacuum pumps.

c. In patient rooms (on inpatient nursing units), provide one duplex receptacle per bed, including mobilization beds, located in the patient service console. Provide two additional wall-mounted duplex receptacles in single bedrooms and pediatric bedrooms.

d. Receptacles in nursery isolation rooms, cystoscopy, intravenous pyelogram (IVP) rooms, cardiac catheterization room, radiographic special procedure rooms, **\1\ /1/** and recovery rooms as indicated in Appendix B.

e. All receptacles and hard wired equipment in selected rooms in the surgery suite, the delivery suite, nursery, coronary care unit, ICUs, hemodialysis, and emergency department rooms/spaces as required by Appendix B.

f. All equipment for the refrigerated storage of blood, biological, and pathology specimens, and medicines.

g. Two X-ray rooms (including one fluoroscopic room) **\1\ /1/**.

h. Laboratories, incubators, analysis, blood bank, bone and tissue banks, chemistry, hematology, plus selected receptacles.

i. One flash sterilizer in each surgical suite and delivery suite cluster core and in central sterilization.

j. Selected receptacles in admitting and disposition, pharmacy, treatment rooms, nurse stations, **\1** oral surgery dental treatment rooms, comprehensive dental treatment rooms and periodontic dental treatment rooms. **/1/**

k. Medication preparation stations and nourishment stations.

l. Electronic data equipment for patient records.

11-4.14.3 Equipment Branch Loads.

Equipment branch feeders and branch circuits connected to the emergency and alternate power source automatically supply loads in a delayed selective order through ATSs. The equipment list noted here is derived from NFPA 99 and NFPA 70. The equipment branch provides power to the following:

a. One passenger type and one hospital service elevator per hospital wing (or section if applicable) to operate on a selective basis.

b. Fire pumps, jockey pumps, and controls (non-sheddable loads); with own listed controller and configured for 10-second start-transfer. See exception, paragraph 11-4.1.3.

c. Food service refrigeration, morgue refrigeration, pharmacy, laboratory, research, and other locations as determined by risk analysis of the DoD Project Sponsor.

d. Essential power for auxiliaries and controls to provide safe operation of the heating plant.

e. Medical vacuum, waste anesthesia evacuation, and medical air system.

f. Dental vacuum, dental air, and waste anesthesia gas disposal serving Category 2 spaces for oral surgery and comprehensive treatment as determined by the DoD Project Sponsor and NFPA 99 risk assessment.

g. HVAC systems, including cooling and heating equipment and controls for all critical care areas per Chapter 10.

h. Domestic water, sump, and sewage equipment necessary for continuous hospital operations.

i. Special purpose exhaust systems, hoods in laboratories including radioisotope hoods, and isolation room exhaust fans.

j. The pneumatic tube system (PTS).

k. Helipad lighting and visual navigational aids. Note: If night/twilight operations are required, provide 15 minutes of battery backup to obtain no-break system and connect as a Priority 2 load. Where helipad operations are essential, provide a Priority 1 non-sheddable equipment connection.

11-4.15 Alternate Source Testing.

Test alternate power source essential electrical systems for proper operation before final acceptance, as required by NFPA 99 and 110. Prior to testing, make all connected loads operational and operate within normal demand load tolerances. Design alternate power systems to facilitate periodic system-wide and component testing and inspection.

11-5 INTERIOR ELECTRICAL SYSTEMS.

Conform to NFPA codes, except where technical criteria from UFC 3-520-01 and this document are more stringent. Use only copper conductors **\4** within buildings, including conductors originating outside the building and terminating inside the building. **/4/** Use only copper bus in switchgear, switchboards, panelboards, and for grounding points.

11-5.1 System Voltage.

Systems with 480Y/277 V, 460 V, 208Y/120 V, 240 V, and 120 V low voltages, and 4.16 kV and 6.9 kV medium voltages are common utilization voltages found at military installations. However, 480Y/277 V and 208Y/120 V are the standard utilization voltages for new and existing medical facilities. Only chillers may be served by medium voltage, and when so, provide separate generators to supply them that are not part of the essential electrical system.

11-5.2 Interior Distribution.

11-5.2.1 Utilization Voltage.

Serve interior lighting and power loads at the highest voltage practicable. Supply fluorescent and high intensity discharge (HID) lighting systems and building power loads by a 480Y/277 V system. Use dry-type transformers to furnish 208Y/120 V power for receptacles and small equipment loads. Provide a 208Y/120 V system where the use of higher voltage is not cost effective.

11-5.2.2 Transformers.

Provide dry-type transformers in accordance with UFC 3-520-01 and TSEWG TP-05, using de-rating or harmonic mitigating transformers for non-linear loads. Analyze non-linear loads in each building area using Table 11-2 Sample Nonlinear Load Analysis Matrix. Where transformer-type voltage regulators are used to maintain nominal voltage within plus or minus 5% (see paragraph 11-1.2.7), use an automatic step or induction transformer regulator with adjustable high and low-voltage limit controls and a voltage meter.

Table 11-1 Sample Nonlinear Load Analysis Matrix

Service Module Type	Total Recept. kVA	Estimated Non-Linear kVA	Module XFMR Size	Non-Linear Percent of Total kVA	XFMR Rating
Clinic					
Logistics					
Dentistry					
Pulmonary					
ICU					
Surgery					
Food Service					
Labor/Delivery					
CCU					
ICU					
Orthodontics					
Physical Therapy (PT)					
CMS					
Nuclear Medicine					
Emergency					
Waste Management					
Materials					
Radiology					
Collecting Labs					
Pathology					
Chemistry Laboratory					
Pharmacy					

Service Module Type	Total Recept. kVA	Estimated Non-Linear kVA	Module XFMR Size	Non-Linear Percent of Total kVA	XFMR Rating
Social Work					
Auditorium					
Patient Services					
Nursing (3 Mods)					
Administration					

11-5.2.3 Switchgear, Switchboards, and Panelboards.

In this chapter switchgear, switchboards, and panelboards conform to definitions in NFPA 70. **\4** Provide equipment in accordance with Table 11-2 and core UFC's, as modified by paragraphs below.

Table 11-2 Equipment Design

Equipment	Design		
	Voltage	Standard	Breaker Mounting
Metal-Clad Switchgear	1 kV – 48.3 kV	IEEE C37.20.2	Draw-out
Metal-Enclosed Interrupter Switchgear	1 kV – 48.3 kV	IEEE C37.20.3	Draw-out and Fixed
Metal-Enclosed Low Voltage Switchgear	≤ 1000 V	IEEE C37.20.1 UL 1558	Draw-out and Fixed
Switchboards	≤ 1000 V	UL 891 NEMA PB-2	Draw-out and Fixed
Panelboards	≤ 1000 V	UL 67 NEMA PB-1	Fixed

/4/\1

11-5.2.3.1 General.

Provide solid-state, adjustable trip circuit breakers as required to meet the overcurrent protection coordination requirements of paragraph 11-5.3. Provide ground fault protection, including ground fault protection of the essential electrical system, in accordance with NFPA 70 and NFPA 99. **\4**

11-5.2.3.2 Draw-out Circuit Breakers.

Provide draw-out breakers for the following distribution equipment in hospitals, ambulatory surgery centers, facilities containing BSL-3 and BSL-4 laboratories, 24/7 patient care facilities, and facilities whose operation requires 24/7 uptime to protect

property that is vital for their mission (such as: live specimens, blood storage, perishable stores). **/1/**

a. Unit substations, for medium voltage breakers in the primary section(s), except where manually operated interrupter switchgear is provided as the primary selecting means, as depicted in Figure 11-1, and for low voltage breakers in the secondary section(s).

b. Medium voltage switching stations or switchgear.

c. Low voltage service equipment.

d. Low voltage essential electrical system equipment down to and including the equipment fed directly from the load side of each ATS, except where the equipment is rated 600 A or less.

e. Low voltage optional standby NFPA 70 article 702 system equipment down to and including the equipment fed directly from the load side of each ATS, except where the breaker or bus is rated 600 A or less. This case applies to a facility that has an optional standby system rather than an essential electrical system.

Provide draw-out breakers for low voltage switchboards or switchgear rated 2,000 A or higher in all facilities.

11-5.2.3.3 Other Requirements.

Provide exterior medium voltage equipment up stream of the facility's service entrance in accordance with UFC 3-550-01. **/4/**

11-5.2.4 Power to Fire Alarm Fire Detection Mass Notification.

In lieu of providing dedicated distribution panel(s) to supply the fire alarm detection mass notification system as required by UFC 3-520-01; provide dedicated circuits from life safety branch panels and comply with the power supply requirements of NFPA 72. Follow UFC 3-520-01 if no essential electrical system is available.

11-5.2.5 Power to Telecommunication Spaces.

\1 UFC 3-580-01 requires a dedicated distribution panel in each TR. In an MTF that has an essential electrical system, a TR my require circuits from multiple panels, but space is limited to one panel only. If the building has a Type 1 essential electrical system, provide a critical branch panel in the TR. If the building has a Type 2 essential electrical system, provide an equipment branch panel in the TR. Serve the remaining loads in the TR with dedicated circuits from the normal panel or other essential electrical panels in the electrical room in accordance with Table 12-1 power branch assignments. **/1/** Follow UFC 3-580-01 if no essential electrical system is available.

11-5.3 Short Circuit, Selective Coordination, and Arc Flash.

Conduct short-circuit, protective devices coordination, and arc flash studies in accordance with UFC 3-501-01 and NFPA 99. Conduct the studies in the design stage and again in the construction stage with the actual equipment installed. Provide protective devices settings within the studies. Base the selection of protective devices and equipment for a new electrical system on the study analysis. For additions or modifications to an existing system, include all the protective devices affected in the existing system in the analysis. Coordinate all protective devices for **\1** the period of time that a fault's duration extends beyond 0.1 second. **/1/** Series rated protective equipment or devices is not allowed. Incorporate transient/surge protection in the selective coordination analysis.

11-5.4 Electrical Rooms.

11-5.4.1 Main Electrical Rooms.

Main electrical rooms include service points, rooms with generators or other large equipment assemblies such as substations and feeder panels; in which direct access is required for initial installation, for removal and replacement, for maintenance, or for ease of access by maintenance staff. Provide main electrical rooms with direct exterior access to a vehicular pathway and loading point. Provide main electrical rooms additionally with access from the facility's interior if any of the following apply:

a. The facility is 24/7.

b. The electrical service is 1,200 A or more.

11-5.4.2 Branch Electrical Rooms.

Branch electrical rooms include electrical closets and related distribution. Provide a minimum of one branch electrical room for each smoke compartment. Provide a minimum of one branch electrical room for each 22,500 ft^2 (2,090 m^2). Do not feed loads beyond the smoke compartment in which the branch electrical room is located. Do not exceed three percent voltage drop on branch circuits. Do not oversize branch circuits such that junction box jumpers are required.

11-5.4.3 Location and Layout Considerations.

Consider the following impacts for electrical room location and layout:

a. Provide access off of a primary through corridor. Swing entry door(s) out 180 degrees, so as not to impede traffic flow in the corridor or violate clearance requirements of NFPA 70 within the room.

b. Consider relative location to mechanical rooms, in order to minimize above ceiling congestion of raceway, cable trays, ducting, and piping. Pipes and other equipment foreign to electrical equipment are not

permitted to be located in, enter, or pass through electrical rooms or spaces. **\4\ /4/**

c. Locate electrical rooms to minimize runs, but not interfere with patient care areas. Locate panelboards in critical care areas in the vicinity of their loads. Provide access to operating staff only.

d. Do not locate electrical rooms adjacent to spaces having stringent noise control requirements. Locate dry-type transformers and automatic transformer type regulators away from noise-sensitive areas.

e. Provide adequate ventilation to maintain an ambient temperature not to exceed 86 °F (30 °C).

f. For facilities with more than one floor, stack electrical rooms vertically.

g. Provide sufficiency of space to enable access for operation and maintenance, or equipment replacement. Show the footprint for each piece of equipment with working space and NFPA 70 clearance requirements on the drawings submitted.

h. **\1** Locate electrical panels in electrical rooms in new construction. There are two exceptions. First, TRs, due to special circuiting requirements, follow paragraph 11-5.2.5. Second, **/1/** limited dedicated panels provided in the room served such as X-ray, server, mechanical, and operating rooms; where all of the following apply:

- Ready access to the panel is required by the room function or the room equipment is subject to frequent change.
- All branch circuits in that panel serve that specific room only and the room provides access to only qualified individuals.

11-5.4.4 Flood Proofing of Electrical Rooms.

Base flood elevation (BFE) and design flood elevation (DFE) are defined in ASCE 24. The former is one percent chance of occurrence in any given year; latter is the datum specified on community flood hazard map. Electrical rooms should be above grade for access and reliability of equipment; though may be located below grade, provided the location naturally drains above the DFE and flood resistant construction is provided below DFE in accordance with International Building Code (IBC) Section 1612 and ASCE 24. DFE is to be no less than two feet above BFE, except where higher elevation is required by ASCE 24. For the intent of this paragraph, natural drainage is defined as not dependent upon a sewer line, which may back up; and where impractical to provide natural drainage, slope floors to sumps affixed with alternating duplex pumps on essential power and elevate equipment on pads 8 inches above floor level. Provide a hoist shaft for equipment removal and a stairwell for direct access for main equipment rooms located below grade. Provide anti-desiccant strip heaters in electrical equipment located below grade. Protect exterior openings from in-flow, such as stairwell, hoist shaft, drive, or loading dock. Provide sump pump capacity to meet predicted

precipitation events. Provide seals in raceway exiting the building 5-foot line designed for the number and size of cables enclosed.

11-5.5 Isolation Power System.

Provide an isolation power system in Category 1 spaces designated wet procedure locations (see paragraph 11-2.3). Provide each operating room with a minimum of two single-phase panelboards. Connect isolation power panels to the same phase. Locate isolation power panels and the line isolation monitor in the room served. **\4** Provide isolated power for mobile equipment (such as fluoroscopy units or laser photo coagulators) if receptacles are provided to connect within the wet procedure location. **/4/** Do not use ground fault circuit interrupters (GFCI)'s. Design isolation power system in accordance with NFPA 70 and 99. Provide grounding in accordance with paragraph 11-5.11.

11-5.6 Conduit, Cable Tray, and Wire.

In this chapter, conduit and raceway conform to definitions in NFPA 70. Provide insulated copper conductors in metallic raceways installed in accordance with NFPA 70 and UFC 3-520-01 except as noted below. Run a green insulated copper ground conductor with all feeders and branch circuits. Provide an independent neutral in addition to the separate green insulated grounding conductor in all single-phase circuits. In new construction, provide uniformly sized branch circuits from the branch circuit breaker to point of utilization; do not upsize conductors where a junction box and jumpers are required to make the final connection. The use of metal-clad and armored cable is prohibited inside the facility, except where integral to listed assemblies. PVC conduit may only be used below slab on grade in accordance with NFPA 70 and applicable UFCs, in which grade transitions are required to be metallic. Additional requirements are as follows:

a. Serve each electrical room on each floor of multi-story facilities by separate or independent feeder risers of insulated copper conductor in steel conduit. Locate the equipment serving the risers in these facilities in ATS rooms for the essential electrical system and the main electrical rooms for the normal power system.

b. Use only steel compression fittings with electrical metallic tubing (EMT). Do not use die-cast fittings.

c. Do not install conductors to furnish emergency power in the same raceway with normal power conductors.

d. Install all normal and emergency power junction boxes, pull boxes, and similar parts in order to be readily accessible. Install clearly identified access panels as necessary for proper maintenance and operation of the electrical distribution system.

e. Install low voltage control wiring, typically used for lighting and receptacle control, in non-flexible metallic raceway or cable tray separate from telecommunications cable tray.

f. Terminate horizontal telecommunication raceway at the cable tray with a fitting specially designed to clamp the raceway to the tray (for solid type tray) or a specially designed clamp to bond the raceway to the tray (for welded wire type tray).

g. Bond TR ground bars in accordance with TIA-607 with ground conductors placed in raceway.

11-5.7 Branch Circuits.

Provide circuits for patient care areas in compliance with NFPA 70 and NFPA 99, except where applicable criteria require more stringent standards.

11-5.8 Radiology Provisions.

11-5.8.1 X-Ray Rooms.

Supply radiological equipment by a 3-phase, 5-wire neutral and ground 480Y/277 V feeder from the main distribution switchboard to an enclosed circuit breaker disconnect located adjacent to the associated X-ray control room. Do not include X-ray loads in the demand load. Evaluate effect of X-ray unit momentary kVA load on transformer voltage regulation. Increase transformer size as necessary and size feeders for satisfactory system performance. Do not provide separate service transformers to the X-ray units. Provide a single-phase 120/208 V branch circuit panelboard in each room for X-ray unit peripheral equipment. Additional requirements for Universal X-ray rooms are contained within Appendix D.

11-5.8.2 Mobile X-Ray Unit Outlets.

Mobile X-ray equipment in nursing units are normally battery operated. Provide duplex receptacles rated 20 A, 125 V for battery recharging in designated areas and connect to the equipment branch of the essential electrical system. **\4**

11-5.9 Receptacles.

Equip each ATS supplying the essential electrical system, or supplying 24/7 operation for temperature sensitive medical products. **\1** In this chapter, receptacles conform to definitions in NFPA 70. A receptacle is a single contact device. **/1/** Use only NEMA 5-20R duplex receptacles unless otherwise noted or required for equipment. Do not use quadruplex receptacles. Provide no less than 20 A rating for all other receptacles including those dedicated to equipment. **/4/** Provide 20 A rated general purpose multi outlet branch circuits to serve receptacles. Do not place more than four duplex receptacles on a circuit serving desk locations (workstations) and provide a non-shared neutral. Do not place more than six duplex receptacles on a circuit in other **\4** locations. **/4/** Where a power receptacle is incorporated in the same metal box with a

television or data outlet, provide a partitioned metal box with separate power and signal conduits as required. Offset outlets in adjoining room walls to isolate airborne sound as specified in Appendix B and as required by the Fire and Smoke Protection Features chapter of the IBC. Coordinate **\4** receptacles with the equipment (FF&E) to be provided. Circuit equipment receptacles (FF&E) separately from general purpose receptacles, including receptacles for telecommunication outlets (unless the telecommunication outlet is adjacent to the dedicated workstation receptacles).

11-5.9.1 Receptacle Locations.

Provide a minimum of one duplex receptacle per wall in each room or interior area, except as noted below. Do not exceed 12 ft (3.6 m) spacing. In rooms where partitions exceed 10 ft (3.0 m) in length, provide an additional duplex receptacle for each additional 10 ft (3.0 m) feet of wall space or fraction thereof. Provide minimum of one duplex receptacle within 6 in. (150 mm) of each telecommunication outlet. Provide two duplex receptacles at each desk location (workstation), including future desk locations in offices which have a second telecommunication outlet. Provide eight duplex in examination and treatment rooms. Provide six duplex receptacles in offices; except provide eight duplex receptacles in offices with a plumbing connection box (for future conversion to an examination or treatment room). Provide one duplex receptacle every 3 ft (900 mm) of casework in nurse stations, nurse substations, reception counters, and control counters. Provide one duplex receptacle every 50 ft (15 m) in corridor walls. In alcoves fronting corridors in which equipment may be located, provide duplex receptacles in addition to corridor receptacles, so no point on the wall is more than 3 ft (900 mm) from a receptacle. Provide one duplex receptacle within 25 ft (7.5 m) of installed equipment requiring maintenance. Do not provide receptacles in public toilets, staff toilets outside of command areas, closets, janitor closets, and scrub rooms. Do not use floor receptacles where the wiring device extends above the floor. Provide general purpose receptacles in addition to outlets and receptacles for equipment (FF&E). **/4/** See DoD Project Sponsor to identify receptacles in special areas.

11-5.9.2 Hospital-Grade Receptacles.

\4 In patient care areas, provide UL listed hospital grade receptacles in the size, type, and configuration required by project scope and requirements. **/4/**

11-5.9.3 Telecommunication Rooms.

\4 Provide receptacles in TRs as described in Chapter 12 and core UFCs. **/4/**

11-5.9.4 Tamper-resistant Receptacles.

Provide tamper-resistant receptacles in locations required by NFPA 70 and 99 and as follows. Provide tamper-resistant receptacles in all areas where children may be present to include corridors, waiting areas, and examination rooms. In pediatrics, also provide tamper-resistant receptacles in patient rooms, bathrooms, playrooms, and activity rooms. In behavioral health, provide tamper-resistant receptacles in accordance

with Appendix A. Use receptacles designed to prevent shock hazards from metallic objects that might be inserted into the receptacle slots; do not use tamper-resistant receptacle covers.

11-5.9.5 Ground Fault Circuit Interrupters.

Provide Class A, GFCI receptacle protection in wet locations and where required by NFPA 70. See paragraph 11-2 for definition of wet locations and wet procedure locations. Do not provide GFCI on circuits serving critical life support equipment where interruption of power could cause injury or death, for example, wet procedure locations in operating rooms. GFCI breakers are not permitted, except as noted. **\4\ /4/** Wet locations include the following:

- Hydrotherapy
- Therapeutic pool areas
- Patient toilet areas with or without showers
- Staff lockers with toilet or shower areas
- Staff lounge with kitchen facilities
- Outdoor receptacles
- Other locations required by NFPA 99 and NFPA 70
- Receptacles accessible from a building roof
- Crawl spaces
- Emergency Shower/Emergency Eyewash

11-5.9.6 Patient Bedrooms.

\4 Provide eight duplex receptacles at Category 1 patient care headwalls and four duplex receptacles at Category 2 patient care headwalls. Arrange receptacles evenly on the head wall and serve adjacent receptacles from different circuits. Provide a minimum of four dedicated circuits for receptacles in Category 1 patient care head walls and two dedicated circuits for receptacles in Category 2 patient care head walls. In Category 1 and 2 spaces, supply circuits from separate critical branch transfer switches, or if unavailable, critical and normal power. For labor and delivery rooms provide an additional duplex receptacle at the headwall. **/4/**

11-5.9.7 Renal Dialysis Units.

Within renal dialysis units, provide **\4** three hospital-grade duplex receptacles on each side of the patient bed or lounge chair. Provide normal and essential power. **/4/**

11-5.9.8 Nurseries.

\4 Treat each Level III/IV NICU patient space as a Category 1 patient care headwall. Treat each Level II special care nursery patient space as a Category 2 patient care headwall. Provide each Level 1 well-baby nursery in admission, observation, and continuing care with two simplex receptacles. Provide each normal care nursery patient space with two duplex receptacles. Do not use floor-mounted receptacles. Ceiling-mounted receptacles or groups of receptacles should be considered for nursery locations not adjacent to a wall or column.

11-5.9.9 Operating Rooms.

\1 Provide receptacles and circuits as required for the category of the space. Evenly distribute the receptacles along on each wall, coordinated with equipment locations, and mounted 3 ft (900 mm) above the floor. In addition provide each service column with not less than 12 simplex receptacles or six duplex receptacles. Do not place more than two duplex wall receptacles on a 20 A, 125 V circuit. Do not place more than two (simplex) service column receptacles on a 20 A, 125 V circuit. **/1/** Provide one flush-mounted receptacle in each operating room for a mobile fluoroscopy unit or laser photo coagulator; coordinate the receptacle voltage, amperage, and pin configuration with the PRC and the DoD Project Sponsor. Arrange the wall receptacles such that adjacent receptacles are served from a different isolation power panel, equally divide the patient service column receptacles circuits between isolation power panels, and provide switching duty type circuit breakers. **/4/**

11-5.9.10 Laboratory Receptacles.

Laboratory benches are supplied as casework or furniture, fixtures, and equipment (FF&E) depending upon programming and the project design. See FF&E in Chapter 15. For casework benches, provide strip mounted duplex receptacles 18 in. (450 mm) or less on center and connect adjacent receptacles to different circuits. For FF&E benches with prefabricated wiring, estimate load and determine connection requirements. Provide raceway and wiring with the required number of circuits to a connection point adjacent to the FF&E bench, to enable the IO&T contractor to complete the connection. **\4\ /4/**

11-5.9.11 Automatic Receptacle Control.

Provide automatic receptacle control in accordance with ASHRAE 90.1 for offices, conference rooms, reproduction rooms, break rooms, classrooms, and individual workstations. Do not provide automatic control in any area which may endanger the health, safety, or security of patients, staff, or visitors; such as examination, diagnosis, treatment, laboratory, nurse stations, patient care, emergency department, or utility. Provide split circuit type (half-controlled) receptacles. Provide a hard wired system that does not use flexible cords.

11-5.10 Receptacle Identification.

Identify receptacles connected to the life safety, critical, and equipment branches with red bodies to identify essential power and mark the device plate “EMERGENCY”. Also identify the panelboard and circuit number on the device plate for all receptacles, both normal and essential. Mark device plates with steel stamped or silk-screened letters, by laminated plastic nameplates with contrasting color center core, or by embossed aluminum or stainless steel tape. Provide letters not less than ¼ in. (6 mm) high. Do not use pressure sensitive or thermal tapes. In behavioral health, pediatrics, and other areas where it is necessary to protect against the label being removed and ingested, use silk screened letters.

11-5.11 Patient Care Grounding.

Provide a grounding system in general care areas and critical care areas, including all anesthetizing locations, as required by NFPA 99 and NFPA 70. Include grounding system design and initial testing in the contract documents.

11-5.12 Inhalation Anesthetizing Location.

Flammable anesthetics are no longer used in the United States, but if their use is re-instituted an isolation power system would be required in these locations in accordance with NFPA 70 (see paragraph 11-5.5).

11-5.13 Electromagnetic Shielding for Medical Instrumentation.

Designated areas of hospitals and health research laboratories may require electromagnetically shielded enclosures. Base the degree of the attenuation required for the enclosure on the manufacturer’s recommendation for the instrumentation to be used in the designated space. Specify the type of enclosure and the class of attenuation in the final design. When shielded enclosures are not provided, take other measures to limit RFI and EMI in rooms that contain sensitive medical equipment, for example, electroencephalography (EEG), eye LASIK/PRK, and electron microscope rooms. For example, select lighting in which the ballast does not emit electromagnetic radiation. Do not locate such rooms near or directly above or below electrical equipment or mechanical rooms. Do not route high-voltage feeders in the vicinity of these rooms.

11-6 LIGHTING.

11-6.1 Design.

11-6.1.1 General.

Design lighting in accordance with Appendix B, Illuminating Engineering Society (IES) Lighting Handbook, and IES RP-29. This UFC governs where conflicts exist. Do not use electronic ballasts and drivers in the facility which generate electromagnetic fields or radio frequencies that interfere with life support equipment or patient implant life

support devices (for example, pacemakers, heart monitors). Provide electronic ballasts and drivers in the facility which are electromagnetically compatible with the operating environment. Do not use ballast or drivers with inverters which operate in the 20-25 kHz, 32-39 kHz, and above 60 kHz range because of interference. For the intent of this section, lighting is designated general illumination and task illumination. General and task illumination are generally in-ceiling mounted and maintained illumination levels meet criteria specified in Appendix B within plus or minus 10%.

Task illumination is also provided by FF&E lighting equipment, but the illumination from this equipment does not contribute to the levels specified in Appendix B. This lighting equipment is identified in the PRC, see Chapter 15, and is characterized by being either moveable (adjustable arm or focus) or is part of the equipment (integral to or an accessory). For example, ceiling mounted surgical task lights, floor (wheeled) surgical task lights, and under shelf workstation lights.

11-6.1.2 Control.

Provide lighting controls in accordance with Appendix B and UFC 3-530-01 **\4**, in compliance with ASHRAE 90.1 and exceptions, **/4/** subject to the functional and operational intent of the facility. Do not provide automatic control in a manner which could endanger the health, safety, or security of patients, visitors, or staff. Do not use time-scheduled controls in patient care or utility spaces. Provide override devices where automatic controls are installed. Where occupancy/vacancy controls are used, provide dual technology type. Do not use occupancy/vacancy controls in treatment or utility rooms, as turning lights off in these areas could create a safety hazard. Where day lighting strategies are employed for energy conservation, accomplish de-lighting with automatic lighting controls utilizing photo sensors to provide continuous dimming of the electric lighting system. Do not use de-lighting in patient care rooms and areas. Where Appendix B lighting controls result in general illumination levels which exceed the allowable lighting power density, provide individual control of lamps/arrays within fixtures, to split illumination into an allowable general level and a separate task level, to meet applicable exemptions.

\4 The following paragraphs represent lighting control strategies by ASHRAE 90.1, Space Type, most often referenced in Appendix B. They are provided here as a quick-reference guide. The information in these tables is taken from the 2022 edition of ASHRAE 90.1, but use the edition required for the project by UFC 1-200-02.

11-6.1.2.1 Control Requirements for Healthcare Facility: Exam/Treatment

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	None (ASHRAE 90.1 exemption 9.4.1.1(h).2.)
Time Schedule [90.1-9.4.1.1(i)]	None (ASHRAE 90.1 exemption 9.4.1.1(i).2.)
Daylight [90.1-9.4.1.1(e,f)]	Automatic responsive daylight dimming when daylight is present.
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.2 Control Requirements for Healthcare Facility: Operating Room

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	None
Time Schedule [90.1-9.4.1.1(i)]	None
Daylight [90.1-9.4.1.1(e,f)]	None
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.3 Control Requirements for Healthcare Facility: Recovery Room

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	None (ASHRAE 90.1 exemption 9.4.1.1(h).2.)
Time Schedule [90.1-9.4.1.1(i)]	None (ASHRAE 90.1 exemption 9.4.1.1(i).2.)
Daylight [90.1-9.4.1.1(e,f)]	None.
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.4 Control Requirements for Healthcare Facility: Patient Room

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	None
Time Schedule [90.1-9.4.1.1(i)]	None
Daylight [90.1-9.4.1.1(e,f)]	None
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.5 Control Requirements for Laboratory: All other laboratories

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	ON: Manual ON <or> Automatic ON to a maximum of 50% of total lighting power. OFF: Automatic OFF within 20 minutes of vacancy. <or> Scheduled Shutoff as described below.
Time Schedule [90.1-9.4.1.1(i)]	Automatically Shutoff all lighting during periods where space is scheduled to be unoccupied.
Daylight [90.1-9.4.1.1(e,f)]	Automatic responsive daylight dimming when daylight is present.
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.6 Control Requirements for Healthcare Facility: Nurse's Station

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	Automatic OFF within 20 minutes of vacancy. <or> Scheduled Shutoff as described below.
Time Schedule [90.1-9.4.1.1(i)]	Automatically Shutoff all lighting during periods where space is scheduled to be unoccupied.
Daylight [90.1-9.4.1.1(e,f)]	Automatic responsive daylight dimming when daylight is present.
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.7 Control Requirements for Pharmacy Area

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	ON: Manual ON <or> Automatic ON to a maximum of 50% of total lighting power. OFF: Automatic OFF within 20 minutes of vacancy. <or> Scheduled Shutoff as described below.
Time Schedule [90.1-9.4.1.1(i)]	Automatically Shutoff all lighting during periods where space is scheduled to be unoccupied.
Daylight [90.1-9.4.1.1(e,f)]	None
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	Provide continuous dimming to 10% or less of full lighting power in addition to full ON/OFF.

11-6.1.2.8 Control Requirements for Healthcare Facility: Physical Therapy Room

Manual Control [90.1-9.4.1.1(a,b)]	Manual Control provided for each Zone in the space.
Occupancy/Vacancy [90.1-9.4.1.1(c,g,h)]	Automatic OFF within 20 minutes of vacancy. <or> Automatically Dimmed to a maximum of 50% of full lighting power within 20 minutes of vacancy <or> Scheduled Shutoff as described below.
Time Schedule [90.1-9.4.1.1(i)]	Automatically Shutoff all lighting during periods where space is scheduled to be unoccupied.
Daylight [90.1-9.4.1.1(e,f)]	Automatic responsive daylight dimming when daylight is present.
Zoning	Provide separate control for task and ambient lighting systems.
Dimming [90.1-9.4.1.1(d)]	None

/4/

11-6.1.3 Sources.

Provide **\4** light emitting diode (LED) lighting to the maximum amount practicable. Provide fluorescent lighting only where required to meet the color rendition required by other paragraphs and patient safety. **/4/** For exterior lighting see paragraph 11-6.9. Provide recessed luminaires in rooms with lay-in acoustical tile ceilings and recessed or surface-mounted luminaires in rooms with gypsum board on plaster ceilings, except where other types are required by the functional design. Generally, use industrial type or open strip type luminaires in rooms with unfinished ceilings and protect each from breakage. Mount luminaires in large storage and supply rooms to readily permit relocation within **\1** 6 ft (1.8 m).**/1/** In locations subject to occasional wet or damp conditions, such as near emergency showers, provide requisite listing. Tandem wiring, where ballasts or drivers in one luminaire supply lamps or arrays in another, is not permitted. In unconditioned buildings or spaces, specify a luminaire that has been UL listed for 140 ºF (60 ºC) or above. Use of HID lamps in patient care areas is not permitted. “U” shaped fluorescent lamps are not permitted. Tubular LED (TLED) lamps are not permitted. Base the fluorescent lighting system baseline energy efficiency on the use of 28-watt T5 and 32-watt T8 lamps. Provide LED luminaires with a 5-year warranty by the manufacturer. Minimize types of luminaires and lighting sources as far as practical to simplify operation and maintenance.

11-6.1.4 Color.

The same color requirements apply to fluorescent and LED sources. Provide 4000K correlated color temperature (CCT) throughout the facility. This single CCT is used to maintain consistency and to coordinate with task lighting provided as FF&E.

11-6.1.4.1 Chromaticity.

Provide chromaticity of lighting products to fall within an ANSI C78.377 4-step quadrangle centered at 4000K. Chromaticity for different units in the production is required to be enclosed by a 3-step MacAdam ellipse. Compliance is to be verified by the manufacturer or an independent photometric testing laboratory with a minimum test size of 10 units and warrantied by the manufacturer. The chromaticity of every unit in the test sample is required to be contained in the ANSI 4-step quadrangle. The entirety of the MacAdam ellipse, centered at the mean chromaticity of the samples, need not be fully contained in the 4-step quadrangle. For all units in the test sample, change in chromaticity from the zero-hour measurement to the 6000 measurement hours is required to be within a total linear distance of 0.003 on the International Commission on illumination (CIE) 1976 Uniform Chromaticity Scale (UCS) (u', v') chromaticity diagram. All interior lighting products are to comply with the following performance criteria, which are based on IES TM-30. The light source spectral power distribution (SPD) and the IES TM-30 color vector graphic are required submittals.

a. Fidelity Index: Rf ≥ 80,

b. Relative Gamut Index: 97 ≤ Rg ≤ 110,

c. Fidelity Index, Hue-Bin 1: Rf,h1 ≥ 78,

d. Chroma Shift, Hue-Bin 1: -9% ≤ Rcs,h1 ≤ +9%.

11-6.1.4.2 Violet Fraction.

In areas defined in Appendix B and as described in paragraph 11-6.6, where color matching is a critical function, provide the violet fraction for LED general lighting products between four and six percent. Violet fraction is computed as the optical radiation from 360 to 430 nm divided by the optical radiation from 360 to 830 nm. This criterion is in addition to the criteria for chromaticity, CCT, color shift, and color rendition.

$$\text{Violet fraction } (\%) = \frac{\text{Optical radiation from 360 to 430 nm}}{\text{Optical radiation from 360 to 830 nm}} \text{ x } 100$$

11-6.1.4.3 Exceptions.

The following exceptions are allowed during the transitional period for industry to adapt, produce, and document a variety of products meeting the TM-30 metrics. Exceptions only apply if products from three manufacturers are not readily available meeting TM-30 metrics. The TM-30 metrics are fidelity index, gamut index, hue-bin one fidelity, and

hue-bin one chroma shift; plus violet fraction. All other lighting requirements specified herein must also be met.

a. Exception No. 1, Decorative Lighting: Decorative lighting, as defined in ASHRAE 90.1, is not required to meet the gamut index and hue-bin one metrics; but is required to meet the fidelity index. If fidelity index products are unavailable; color rendering index (CRI) 80 or greater will be considered an acceptable alternative.

b. Exception No. 2, Unusual Location: Architectural focal points and utility spaces are not required to meet the gamut index and hue-bin one metrics; but are required to meet the fidelity index. If fidelity index products are unavailable; CRI 80 or greater will be considered an acceptable alternative. Architectural focal points are defined as entry and atrium (but not to include patient waiting). Utility spaces are mechanical and electrical rooms, elevator pits, tunnels, etc.

c. Exception No. 3, LED Luminaires: If TM-30 metric products are unavailable, CRI 90 or greater LED luminaires will be considered an acceptable alternative to the fidelity index, gamut index, and hue-bin one metrics.

d. Exception No. 4, Fluorescent Lamps: If TM-30 metric products are unavailable, CRI 85 or greater lamps will be considered an acceptable alternative to the fidelity index, gamut index, hue-bin one metrics, color consistency, and color shift; except provide CRI 90 lamps where indicated in Appendix B.

e. Exception No. 5, Violet Fraction: If LED luminaires are unavailable to meet violet fraction, CRI 90 or greater **\4** with an R9 value of at least 50 **/4/** will be considered an acceptable alternative.

11-6.1.4.4 Submittals.

Confirm the list of factors in Annex D Luminaire Design Review Checklist, through catalog cuts or manufacturer letters, in both the design and construction phases. Annex D is not all inclusive and is intended to be used in conjunction with the UFGS. TM-30 submittal data will not be required for the metric for which an exception above applies.

11-6.1.4.5 UFGS Coordination.

Modify the UFGS to accommodate the minimum requirements contained herein. After the transitional period the UFGS and other criterion will be updated.

11-6.1.5 Glare.

Provide indirect LED lighting or utilize a refractor to eliminate glare. Shield LED light sources in the luminaires with physical separation or refractors to avoid a direct view of light sources and the resultant glare. Avoid placing non-exam lighting directly over a location where a patient lying supine or angled in a bed or gurney will be. Consider

illuminance of the point source in LED lighting designs, in relationship to the ambient background, and eliminate glare though higher mounting heights or using more luminaires at lower lumens. Do not locate luminaires utilizing T5HO lamps below 8 ft 6 in. (2.6 m) unless specifically designed to control brightness.

11-6.1.6 Uniformity.

Design illumination to meet IES uniformity. For rooms in which the furniture or equipment layout is changeable, for example office and examination rooms, include the entire room in the task area. In rooms with ceiling curtains or other partitions, for example examination rooms, meet uniformity within the entire room with curtain or partition closed.

11-6.1.7 Flicker.

Provide LED fixtures in compliance with IEEE 1789. Limit the maximum percent flicker to less than or equal to the flicker frequency x 0.08. For dimmable LED products, comply at full output and throughout the dimming range.

11-6.1.8 Nameplates.

Identify luminaire driver/array/lamp replacement by an appropriate marking on the fixture reflector. Marking should indicate replacement with the original equipment by name only and should not be visible through the fixture lens.

11-6.1.9 Life.

Provide LED luminaires with a minimum L70 lumen maintenance value of 60,000 hours.

11-6.1.10 Illumination of means of egress.

Provide illumination of means of egress in both the normal and emergency modes of operation in accordance with NFPA 101. Illuminate egress paths with the minimum NFPA 101 illumination at all times the building is occupied, controlled by a switch class circuit breaker, with higher illumination level(s) motion controlled, as required by UFC 3-530-01. Hallways adjacent to sleeping rooms and nursing stations are an exception; manually switch higher illumination level(s) to avoid disturbances to patients and staff. Provide emergency lighting in all electrical rooms, mechanical rooms, and TRs.

11-6.2 Battery-Operated Lighting.

Provide 25% of the general and task lighting in the operating rooms, emergency treatment rooms, cystoscopy, cardiac catheterization rooms, and any other room with invasive procedures with 1½-hour battery backup for general ceiling-mounted luminaires that provide general or task illumination that operates without interruption during periods of normal and emergency power lapse. Provide not less than 500 lux of maintained illumination measured at floor level in these rooms with luminaires which fully illuminate when on battery backup or UPS. Provide all permanently installed

surgical task luminaires with a minimum of 1½ hours of no-break power to bridge the power interruption due to loss of normal power or essential electrical system failure. **\4** Unless integral to the Luminaire, locate batteries for operating room lights outside those rooms. **/4/** Provide 15% of lighting in nurseries with 1½-hour battery backup. Provide a minimum of two battery-powered lights in each generator set location and emergency switchboard location and central Communications Room. Provide a battery-backup luminaire above each blood draw station unless lighting is connected to essential power.

11-6.3 Patient Bedrooms.

In patient bedrooms, provide one wall-mounted direct or indirect, or ceiling mounted indirect luminaire or a medical wall module system, with lighting features as described herein, at each bed for task (reading) and general illumination. Each wall unit is to provide upward directed light for general illumination and downward light for patient use. Each ceiling unit is to have separate general and patient use illumination. Control general illumination at the door and at the wall unit with a three-way switch. Control patient's use lighting at the bed. Provide quiet-operating switches. Consider use of low-voltage switching utilizing the nurse call handset. Provide night-lights mounted in the patient service console at each bed which are photocell controlled and manually controlled at the corridor door. Provide an additional task (exam) luminaire located over the patient bed and switched at the patient head wall.

11-6.4 Special Location Requirements.

Comply with the following location requirements:

a. Mounting. Provide recessed luminaires in nurseries, surgery, obstetrical suites, emergency treatment rooms, examination rooms, and laboratories.

b. Nurse stations. Provide selective switching at nurse stations to achieve 33%, 66%, and 100% illumination levels for fluorescent and full range dimming for LED.

c. Supine patients. Provide low-brightness diffused lighting in recovery rooms, coronary and ICUs, and X-ray therapy rooms where patients may be in a supine position for extended periods. Where indirect sources are not feasible or not desirable, locate luminaires outside of direct view of patients.

d. Electroencephalogram. Provide electroencephalogram rooms with dimmable luminaires.

e. Examination. For examination purposes in ICUs, isolation rooms, single patient bedrooms, labor rooms, and recovery, provide an exam luminaire operated by a conveniently located switch above each bed.

f. Behavioral Health. Provide lighting in behavioral health unit in compliance with Appendix A. Provide recessed, anti-ligature, of tamperproof construction, with impact-resistant lenses, for all fixtures including night

lights. Control night lights with a photocell, with a manual switch outside the room.

g. X-ray. Provide X-ray rooms with indirect lighting; in other radiographic procedure rooms, coordinate the location of the room lights with the X-ray equipment. Provide “In-Use” warning lights for universal X-ray rooms and therapeutic X-ray rooms in accordance with Appendix D. Do not provide diagnostic X-ray rooms with “In-Use” lights. Refer to Chapter 15 for more details.

11-6.5 Corridors.

Illuminate wayfinding signage by the corridor lighting system or provide separate fixtures to insure visibility. For corridor lights which are adjacent to intensive care bedrooms and nursing units, provide one-third increment switch controlled for fluorescent and full range dimming for LED.

11-6.6 Dental Clinic.

Arrange ceiling-mounted luminaires symmetrically within all dental treatment rooms and provide full range diming. In oral surgery provide dimmers that default to full intensity and function as an on/off switch in the event a dimmer fails.

11-6.6.1 Violet Fraction.

In areas such as prosthetics laboratory and dental treatment rooms, that involve the visual matching of human teeth to resins, crowns, veneers, or other restorations; provide violet fraction for general illumination as specified in paragraph 11-6.1.4.2. Violet fraction is generically met with fluorescent sources, therefore this requirement only applies to LED sources.

Currently, limited LED products are available which meet the violet fraction requirement. Therefore, if LED lighting is a project requirement, a sole source waiver for LED luminaires in dental areas approved by the Contracting Office in the Geographic District, may be required before commencing design. However, if the waiver is not sought and fluorescent lighting is used in dental areas instead, as an exception, the remainder of the project may still be LED.

11-6.7 Eye LASIK/PRK Rooms.

Provide ceiling-mounted shielded luminaires in eye LASIK/PRK rooms which are fully dimmable and with ballast or driver filters integral to the luminaire assembly. Provide one filter per ballast or driver in the luminaire assembly to suppress/eliminate electromagnetic and radio frequency interference with the LASIK equipment. Provide UPS power for the LASIK equipment and lighting in each room that provides a minimum of 1½-hour of no-break-power in addition to the critical branch of the essential electrical system. Provide an “In-Use” warning light outside each eye LASIK/PRK room.

11-6.8 Exterior Signage.

Provide stencil-faced with red trans illuminated letters exterior signage for "EMERGENCY SERVICES" which is readily visible, identifiable, and legible at all entrance drives. Provide contrast level of illuminated signage which is symmetrical and does not deviate more than plus or minus 5%. Provide trans illuminated letters indicating the facility name in signage for facilities having after-dark operations. Design illuminated signs for rapid replacement (not to exceed 15 minutes). Coordinate sign locations with illumination of access roads, parking areas, and building entrances to minimize requirements for additional illumination of signage.

11-6.9 Exterior Lighting.

Provide exterior lighting in accordance with UFC 3-530-01 and as follows. Provide lighting for the safety of patients, visitors, staff, and for operation and maintenance. Illuminate parking areas and walks, including accessible areas intended for night use, to an average of no less than 10.8 lux , measured on 12 in. (300 mm) intervals of incident light on the area served. Illuminate other areas, including roadways and utility areas, in accordance with the recommendations of IESNA and UFC 3-530-01, following the more stringent requirement. Provide a CCT not less than 3000K or more than 4000K, a CRI not less than 70, and an LED product L70 lumen maintenance life equal to or greater than 50,000 hours. Design lighting to eliminate glare and trespass between site-structure-surround areas; by complying with IES Model Lighting Ordinance (MLO) lighting zones and backlight, uplight, and glare (BUG) ratings; and by complying with ASHRAE 90.1 lighting power density (LPD).

11-6.10 Dimming.

Furnish eye lane, eye examination and eye LASIK/PRK rooms, and group therapy observation room illumination with recessed and full range dimmable luminaires. Locate dimmers for eye lanes and eye examination rooms close to the examination chair and on/off switches at the room entrance. Maximum illumination level in group therapy observation rooms with respect to illumination level in group therapy (mirror) rooms should not exceed manufacturer's recommended ratio for one-way mirrors utilized. For general lighting in fluoroscopic and radiographic special procedures rooms, provide dimming at the control stand or at the door entrance, as required (in the event a dimmer failure, lights are to default to full intensity and the switches function as an on/off switch).

11-6.11 Ultraviolet (UV) Filters.

Provide UV filters for fluorescent lighting in infant care areas to prevent retina damage to premature infants, and other areas where cataracts are a major concern. Provide indirect lighting in premature infant areas for all new construction.

11-6.12 Maintenance Area Lighting.

Illuminate interior utility tunnels and walk-in pipe chases by 10.8 lux of incident light for the safety of maintenance personnel. Provide pilot light equipped switches for these fixtures and locate switches in areas that are normally occupied. Illuminate elevator shafts in accordance with UFC 3-490-06. Locate receptacles for temporary work lights as determined by the Design and Construction Agent.

11-6.13 Auditorium.

Control the down light luminaire over the podium from the podium and the entrance.

11-6.14 Continuity of Service.

Provide spares in the initial procurement to ensure color matching for the LED lighting system serving critical care spaces. For each luminaire in a critical care space served from either the essential or emergency branch within a facility, including battery backup luminaires not connected to the branch, provide a 5% stock of replacement matching LED arrays and pre-programmed LED drivers, with a minimum of one per fixture type.

11-6.15 Accessibility.

Provide maintenance access to luminaires by placing them where they can be reached, by the use of lowering devices, or by built-in access provisions such as catwalks or trolleys. Where specialized equipment is used to gain access, provide said equipment with the fixture and provide adjacent built-in storage. Only step ladders may be considered for portable ladders and height is limited to 20 feet by OSHA. Do not consider moveable machinery such as scissor lifts as meeting this requirement.

11-7 HELIPAD LIGHTING, MARKING, AND CONTROLS.

Provide helipad marking, lighting, and controls in accordance with UFC 3-535-01 and UFC 3-535-02. Design facilities for hospital configuration, visual meteorological conditions (VMC), non-instrument, to include those listed in Table 11-3. Provide retro-reflective markings per UFC 3-535-02. Provide capability to control lighting locally at helipad, remotely within facility, and radio controlled by pilot (see Annex A).

Provide a 2-box Chase Helicopter Approach Path Indicator (CHAPI) visual glide slope indicator when needed based on site conditions described in UFC 3-260-01 and UFC 5-535-01. Provide the usual CHAPI glide slope angle of six degrees unless a steeper glide slope is needed to avoid obstacles. If required, provide a waiver request to UFC 3-535-01 to adjust the glide slope angle.

Table 11-3 Medical Helipad Visual Facilities Requirements

Facility	VMC Day Non-Instrument	VMC Night Non-Instrument	Remarks
Perimeter Lights	NA	R	
Wing Lights	NA	R	
Landing Direction Lights	NA	OPT	
Approach Direction Lights	NA	OPT	
Helipad Floodlights	NA	R	
Visual Glide Slope Indicator	OPT	R	
Helipad Beacon	R	R	
Wind Direction Indicator	R	R	Provide obstruction light and illuminate sock
Retro-reflective Marking	R	R	
Local and Remote Control	R	R	
Essential Power	R	R	

Legend: NA = Not-applicable, OPT = Optional, R = required

11-8 LIGHTNING PROTECTION.

Provide lightning protection in accordance with UFC 3-575-01. Provide a risk assessment in accordance with NFPA 780 and provide a lightning protection system if protection is recommended by the assessment. If the system is required, provide it in accordance with NFPA 780, with components meeting UL, and with a UL Lightning Protection Inspection Certificate certified to NFPA 780 upon completion. In order to obtain the UL inspection certificate, A UL listed installer is required in construction phase; therefore, clarify in bid documents and list three Contractors for OCONUS locations. For additions to existing facilities with a lightning protection system, the existing system is required to be recertified before the new portion can be connected to the existing lightning protection system.

Annex A. Hospital Helipad Radio Control Operation

Provide the radio controller in accordance with AC150/5345-49C and function as noted here:

a. The pilot can activate the hospital helipad lighting by keying the microphone from the helicopter after tuning to the assigned frequency.

b. The pilot can key his microphone three times within a 5-second interval and on the third pulse a relay is energized, which turns on the wind indicator illumination, CHAPI, and the perimeter light pattern.

c. The floodlights can be activated by keying the microphone five times.

d. The lights are to remain on until the pilot keys his microphone seven times. This is to activate the turn off time delay relay, which de-energize the lights at the end of the 15 minute delay.

e. When the lights have been activated by the radio controller, the “OFF” function of the remote “ON-OFF” switch in the manual controller, located in the hospital emergency room (ER) is bypassed.

f. The brightness of the CHAPI, floodlights, and perimeter lights can only be controlled from the manual control panel in the ER.

g. If the microphone has been keyed seven times (floodlight turn off signal), the radio controller can be reset by keying the microphone three or five times.

h. The hospital ER is to be equipped with the manual controller and a base radio station capable of manual or radio operations.

Annex B. Multi-Ended Network Substation

1. GENERAL.

The multi-ended network (fully automatic) substation (see Figure 11-2) design philosophy eliminates many switching time delays; simplifies the monitor and control functions; standardized equipment; reduces equipment size; provides expansion capability for future load growth; and maintains reliability, durability, and maintainability. When using the multi-ended network or the double-ended substation to replace an existing substation, all downstream equipment requires short circuit current validation and power system coordination.

2. NORMAL HOSPITAL SOURCE ALTERNATE DESIGN CONFIGURATION.

For electrical design criteria related to power supply, see documents listed in Appendix I. Provide hospitals with two primary service feeders, each connected to one side of the automatic (with alternate manual operator) load break primary selector switch with manual load break BP/ISs that serves a multi-ended network substation. Provide each feeder with the capacity to serve the full hospital demand plus 20% spare load growth. Install each feeder underground within the hospital site. Provide the primary selector switch with BP/ISs with the capacity to serve not less than the sum of the 3-transformer kVA ratings and have load limiting equal to the full hospital demand plus 20% spare load growth. Monitor both primary feeders with an automatic function. If power is lost to the feeder serving the load, transfer the load to the other feeder in not more than 30 Hz (cycles) if power exists on that primary feeder. Connect service feeders to different power sources, if available, and to two differently routed distribution system feeders. Where two power sources are not available, the service feeders may be connected to two different sections of a true loop system.

Transformers should normally be located outside the hospital, but may be located within the building where practicable and economical. Design multi-ended network substation distribution systems for hospitals, medical centers, and specially designated facilities. Size each transformer in the multi-ended network transformer substation to carry 50% of the full hospital demand and spare load (linear and nonlinear) growth capacity. Use identical and impedance matched transformers. Provide all multi-ended network transformer substations with coordinated surge and fault protection and selective system protection. The capacity of the main feeder panel bus is to be not less than the sum of the transformer capacity.

3. AUTOMATIC PRIMARY FEEDER SELECTOR SWITCHES (APFSS).

The APFSS (not to be construed as an ATS) may be double-throw with draw-out construction. The APFSS rating is to be not less than the sum of the three 3-transformer kVA ratings and have adjustable load or fixed limiting control (the loading control may limit the capacity to that of two transformers). Contacts may have viewing ports for ease of contact inspection. Provide indicator lights for the APFSS to identify

which normal primary feeder is connected to the load (green in color). Load transfer to either **\1** of the normal primary feeders **/1/** is to be achieved with not more than 30 Hz (cycles) of load interruption. Provide the APFSS with a load break BP/IS to maintain normal primary service feeder connection for when the APFSS is being repaired or maintained. The BP/IS can be initiated with not more than two movements of the hand to either position regardless of the position or condition of the APFSS. Two vacuum power circuit breakers with load break BP/IS may be used.

4. **TRANSFORMERS.**

a. Each service entrance transformer of the multi-ended substation with fans is sized to carry 40% of the design load as to utilize standard off-the-shelf units and increase transformer efficiency. Each of the three transformers are equipped with forced air-cooling fans to increase the continuous capacity rating of each transformer by 34–50% of the design load when activated. The fans are automatically activated when the load on any transformer exceeds the no fan rating by a temperature indicator and current relay. If the fans are not activated when the temperature indicator or the current relay exceed the manufacturer's setting, provide alarms so load shedding can be initiated. Each transformer is to have the ability to carry a 10% overload for short periods of time without fans.

b. If a service entrance transformer fails, is offline for maintenance, or the normal bus receives no power from any one of the service entrance transformer feeders, automatically activate the fans on the remaining two service entrance transformers to allow 100% of the total hospital load to be assumed. There is no time delay in the load shifting to the remaining two transformers.

c. Where each transformer of the multi-ended network substation is sized for no fan application, size each transformer to carry not less than 50% of the full hospital demand and spare load (linear and nonlinear) growth capacity. Each transformer feeder serving the normal bus is to be equipped with an alarm to indicate power loss from that feeder to the normal bus.

d. Each transformer in the multi-ended network substation is to be identical and impedance matched.

5. **52 DEVICES.**

Size the 52 devices (AC power circuit breaker devices, draw-out type) to support the transformer capacity.

a. Lay out equipment in a manner that allows load center expansion without requiring replacement. New sections can be added to either end of the load center.

b. Size the main load center bus for not less than the sum of the 3-transformer kVA ratings.

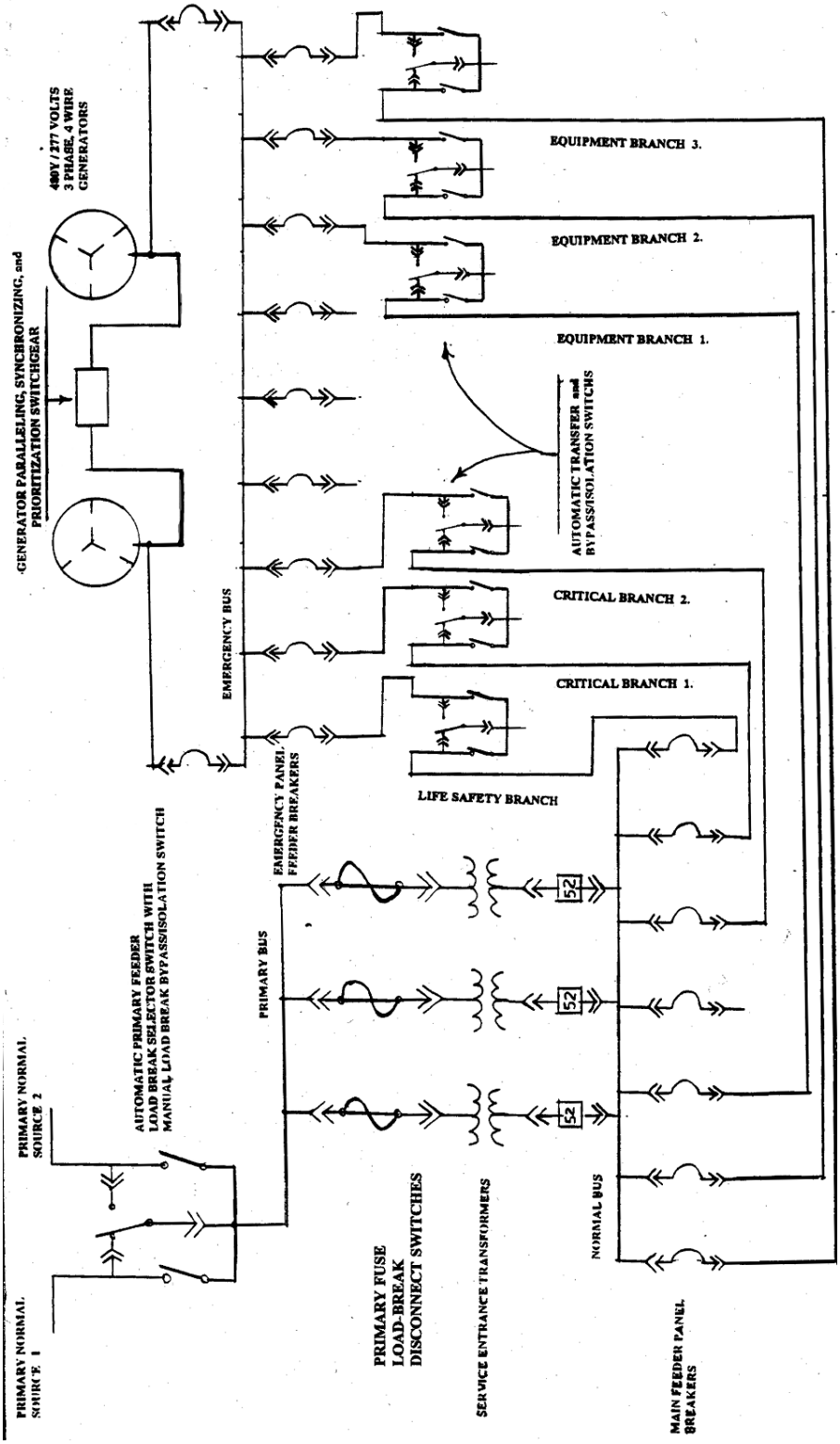
6. GROUND FAULT.

Provide ground fault protection for the facility in conformance to the requirements in NFPA 70, NFPA 99, and this document.

7. STANDARDS.

Provide true RMS reading metering and protective relays and devices in compliance with Institute of Electrical and Electronics Engineers (IEEE) standards.

Figure 11-2 Multi-Ended Network Substation System Diagram



Annex C. Expandable Dual-Ended Substation

See Figure 11-3 and the following requirements:

a. The bus for the substation is sized for the total substation capacity at 100% demand.

b. Generators “1” and “2” do not operate in parallel with each other or the normal power source (utility), but are separate and independent.

c. The normal power side of the ATSs is the default position when power is available and when there is no normal or alternate power available.

d. Generator “1” is sized to support all loads that cannot be shed plus 20% future load growth at 100% demand.

e. Generator “2” is sized to support all sheddable equipment loads of the essential electrical system, non-essential loads plus 20% future load growth at 100%, or the loads addressed in item “4” here, whichever is greater.

f. Load shed controls shed the lowest priority loads (first) on generator “2” when ATS 2-A, 2-B, and 2-LS are transferred to generator “2.” The AC equipment for non-delayed automatic connection are non-sheddable loads.

g. BP/IS is 4-pole, double-throw construction with normal power, open, and emergency power positions.

Figure 11-3 Expandable Dual-Ended Substation

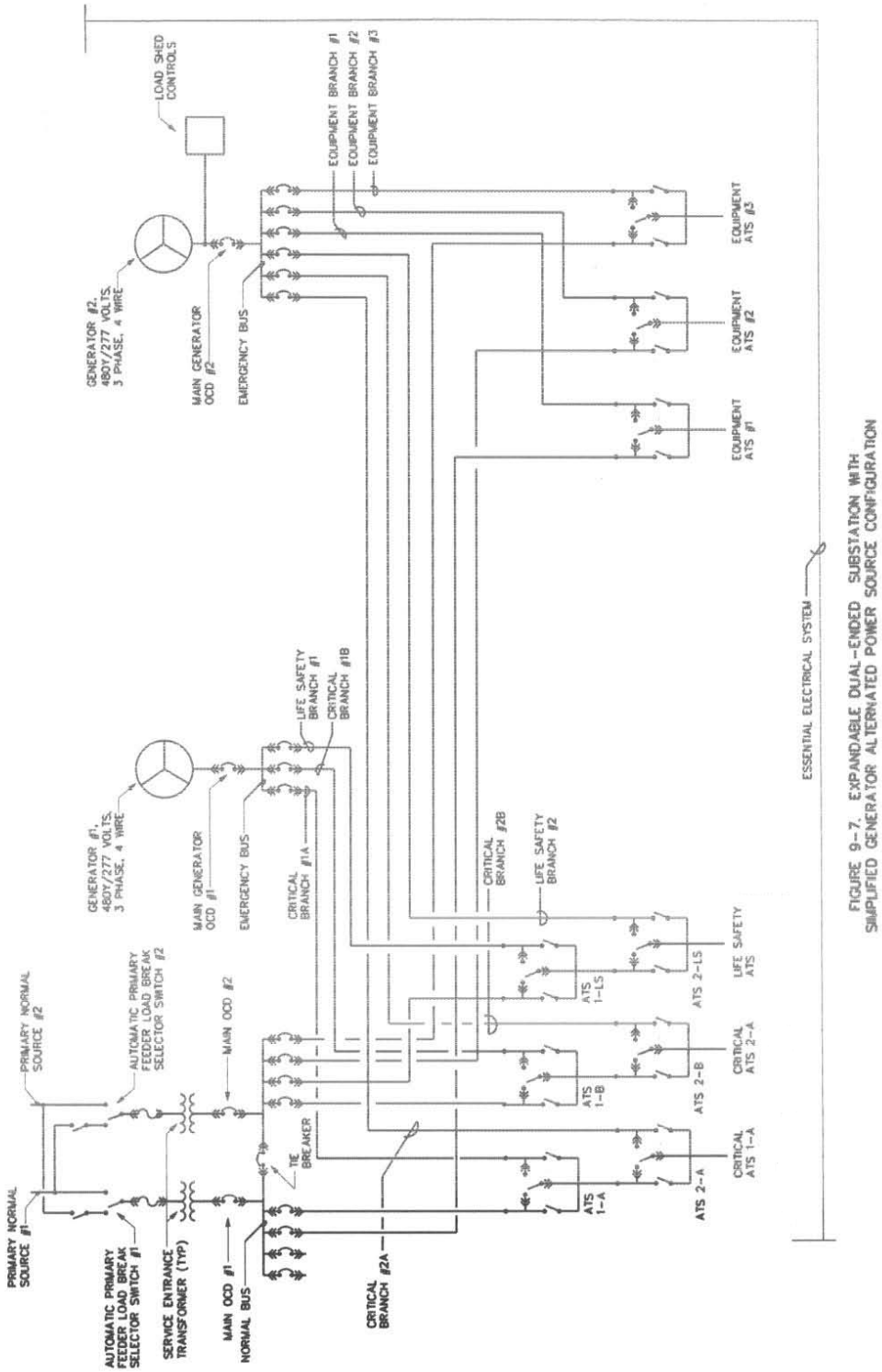


FIGURE 9-7. EXPANDABLE DUAL-ENDED SUBSTATION WITH SIMPLIFIED GENERATOR ALTERNATED POWER SOURCE CONFIGURATION

Annex D. Luminaire Design Review Check List

Confirm the factors in Table **\4** 11-4 **/4/** Luminaire Factors, as applicable to the design, through catalog cuts or manufacturer letters, in both design and construction phases. This list is not all inclusive and is intended to be used in conjunction with the UFGS. **\4**

Table 11-4 Luminaire Factors

- **/4/** Color Consistency: Within a 3-step MacAdam ellipse contained within the ANSI 4-step quadrangle. (Note: May be on cutsheet, otherwise need letter from manufacturer. A 4-step MacAdam ellipse is required in the current specification)
- Color Shift: Du'v' < 0.003 at 6000 hours of operation (Note: Letter from manufacturer)
- Fidelity Index (Rf): ≥ 80 (Note: Likely will eventually be on cutsheet, but currently need letter from manufacturer)
- Gamut Index (Rg): 97≤ Rg ≤110 (Note: Likely will eventually be on cutsheet, but currently need letter from manufacturer)
- Hue-Bin One Fidelity (Rf,h1): > 78 (Note: May eventually be on cutsheet, but currently need letter from manufacturer)
- Hue-Bin One Chroma Shift (Rcs,h1): between -9% and 9% (Note: May eventually be on cutsheet, but currently need letter from manufacturer)
- Violet Fraction: Where white matching is required, provide violet fraction between 4% and 6% (Note: Letter from manufacturer and possible sole source justification, as limited LED products. If LED luminaires are unavailable, use CRI 90 instead.)
- Life: LED Luminaires are to have a minimum L70 lumen maintenance value of 60,000 hours. (Cutsheet – note increase from the L70 of 50,000 hours required in the current specifications)
- CCT of 4000K. (Cutsheet)
- Flicker: Comply with IEEE 1789 (Note: Letter from manufacturer)
- Warranty: 5-year (Note: Cutsheet)

CHAPTER 12 COMMUNICATIONS

12-1 GENERAL.

The planning and engineering of communications systems for applicable facilities must conform to the design criteria contained in this chapter. These facilities use various integrated voice, data, imaging, visual, video information, electronic security, and telemedicine systems to provide quality healthcare. Not all systems listed in this chapter apply to all projects. The DoR must consult with the Design and Construction Agent to establish the systems that are required for each specific project.

12-1.1 Design Criteria.

Communication systems, equipment, and facilities must be designed in conformance with ABA, NFPA 70, NFPA 72, NFPA 99, NFPA 101, Telecommunications Industry Association TIA-568, TIA-569, TIA-606, TIA-607, TIA-758, DHA Technical Requirements-Guidance LAN-WLAN Modernization, DHA Server Room, Computer Room, and Telecommunications Room Design Criteria, and applicable DoD Project Sponsor and DHA standards and criteria. In the event of a conflict with any Standards, this UFC take precedence. This UFC does not take precedence over Code Requirements.

Exception: DoD Project Sponsors other than DHA-FE may have other criteria which should be followed instead of the DHA criteria. However, if DHA-FE will be responsible to operate the facility, follow the DHA criteria.

12-1.2 Approved Product Lists (APLs).

Electronic equipment included with the various systems must utilize, to the greatest extent practicable, equipment listed on the General Services Administration (GSA) APL, Joint Interoperability Testing Committee (JITC) APL and the Defense Information Systems Agency (DISA) Unified Capability (UC) APL. Contractor must review and comply with annual NDAA Guidance on approved products and manufacturers and source restrictions. Facility Related Control System equipment not on an APL and meeting the requirements of an existing Risk Management Framework Authority to Operate may be approved for use by the Design and Construction Agent.

12-2 COMMUNICATIONS SPACES.

12-2.1 Telecommunication Rooms (TRs) (COMC1).

TRs must be located central to the area served and not located on exterior **\4** curtain walls. TRs must not share walls with **/4/** mechanical spaces. TRs must not have exterior doors. TRs may be combined with Entrance Facilities EF. **\1** Special consideration for TR location must be coordinated with the DoD Project Sponsor for single story facilities less than 10,000 sf (929 sm) and non-healthcare facilities. **/1/** The Communications DoR is to design space requirements and layout of each TR based on the following:

a. **\1\\4** The required minimum size of TRs is 130 square feet (12 sq m). Size the TRs for the area served (such as number of outlets and communication systems housed). **/4/** The TR serving area must be sized so as to not exceed the maximum cable length in TIA-568.2 and TIA-569.

b. **/1/** Equip the TRs with utility support in accordance with TIA 569, DHA Technical Requirements-Guidance LAN-WLAN Modernization, DHA Server Room, Computer Room, and Telecommunications Room Design Criteria, and Table 12-1 below.

c. Floor space is to be square or rectangular in shape and have no minimum dimension less than 10 ft (3 m) in length. Door must be 180 degree outswing with no window. For Security requirements, see Chapter 5 Antiterrorism (AT) and Physical Security.

d. TRs are to be vertically stacked with a common footprint to route risers from the bottom TR to the top TR without horizontal offsets. Locate slab penetrations along interior of TR walls.

Exception: TR locations are to accommodate the functional layout. **\1** If **/1/** approved by the Design and Construction Agent, and with the concurrence by the DoD Project Sponsor, the requirement for vertical stacking may be relaxed as needed to accommodate clinical functionality.

e. Pipes, plumbing, and other equipment foreign to the TR are not permitted to be located in, enter, or pass through TRs, or be in the walls which enclose the TR.

f. Floor space is to be reserved for Network and Wireless Local Area Network (WLAN) equipment in accordance with TIA 569 and will accommodate the number of WAO and WLAN outlets to be served within the service area of the specific TR.

g. DoR is to account for all additional equipment to be installed within each TR and adjust the floor space requirements to accommodate the additional non-network equipment.

h. **\4** A rack and equipment footprint of 42 in. (1067 mm) deep and 3 ft (1 m) wide is to be used for initial TR sizing. Confirm the footprint during design with the DoD Project Sponsor. This footprint includes a 1 ft (305 mm) front of rack space required for vertical cable management, patching, optional security doors, and optional forward installation of deep equipment. It also includes 6 in. (152 mm) on either side of a rack with 1 ft (305 mm) total between racks for vertical cable management.

i. DoR is required to maintain a 3 ft (1 m) minimum clearance on the front and rear of all equipment racks and equipment housed. **\1** A minimum of a 3 ft (1 m) clearance at one end of each row is required for unobstructed passage and maintenance. **/1/** A minimum 1 ft (305 mm) clearance is required between the side of the rack and the adjacent wall.

j. Backboards are required around a minimum of two sides of the TR. A 1 ft (305 mm) clearance is required at backboards for wall mounted equipment and cabling. The 1 ft (305 mm) backboard clearance is in addition to the clearances for rack and rack mounted equipment.

k. It is recommended to reserve the top 20 Rack Unit (RU) of rack space for backbone and horizontal cabling termination, the middle 16 RU space for electronics, and the lower 9 RU for UPS and battery systems.

l. Provide 2 RU 48 port angled patch panels for all TR racks. Provide at least one spare 2 RU 48 port angled patch panel in each rack for future terminations. Provide 25% total spare capacity in each rack. Do not provide spare racks or space for spare racks.

m. DoR is required to identify the types and numbers of cables terminating in each TR for each system separately, including the DHA work area outlets separately from DHA wireless access points.

n. DoR is required to provide elevations identifying the specific systems and equipment required at each rack. Confirm rack space required for Government furnished equipment and identify on the elevations. Identify equipment in the BIM model, when provided. **/4/**

o. TRs are three dimensional spaces and utilize the total volume for equipment and maintenance. In accordance with the above criteria, there must be no plumbing, ductwork, conduits, or other materials within the TR unless they directly support the TR. If ceiling surface is a roof, condensate protection must be provided and installed to the extent required for the protection of room contents.

p. **\4** Electrical circuits **/4/** serving equipment in the Telecommunications Room must be connected in accordance with Table 12-1 below and must be provided to serve each TR for each branch of the electrical systems (normal and essential electrical systems) required for service in each TR. Coordinate electrical requirements with Chapter 11.

q. Electrical services and outlets are to be installed for the Network racks as directed in the DHA Server Room, Computer Room and Telecommunication Room Design Criteria. Power for other equipment must be as required by the network manufacturer. A minimum of two dedicated NEMA L6-30R outlets and four NEMA 5-20R with two receptacles per circuit must be installed for each network rack in the TR. TR network rack receptacles are to be installed overhead.

12-2.2 Communications Radio Equipment Room (COM04).

A separate communications head end equipment room with sufficient space for personnel circulation and equipment maintenance must be provided in inpatient facilities for antenna-based systems such as cable television (CATV), public address and program distribution (PAPD), Emergency Medical Service (EMS), Network Time Synchronization (NTS), Internal Cellular Antenna Systems (IRES), and Radio Page

(RP) System. Design the room, including utility support, in accordance with TIA-569. The room must be equipped with weatherproof conduit penetrations to the exterior locations to support the physical interfaces such as coaxial cables and emergency power required by the equipment in accordance with Table 12-1. Pathways must be provided from the 24-hour monitoring location to the headend room to support the EMS radio coaxial or control cables as required for the facility. In addition, the room must be designed as a server room (CMP01) with infrastructure and services as required, to include including fiber and copper cabling and utilities. **\1** Pipes, plumbing, and other equipment foreign to the space are not permitted to be located in, enter, or pass through space, or be in the walls which enclose the space. **/1/**

Systems operating in a client server environment, such as Interactive Television (ITV), Nurse Call and Electronic Security Systems (ESS) must have the server component of the system located in the Server Room (CMP01).

When the design of the facility limits the implementation of a headend room, the equipment associated with these systems must be within the room that is located at the highest elevation available (for example penthouse). Design the room, including utility support, in accordance with TIA-569. The designated room must meet the same design requirements for the head end room. The DoR must coordinate the use of a penthouse to house headend equipment with the DoD Project Sponsor.

12-2.3 Integrated Monitor and Alarm Room.

A central communication room must be provided in inpatient MTFs and ambulatory care clinics. The central communication room size must be based on the quantity of wall-mounted graphic displays, annunciator displays, and other monitor and control equipment. Install monitors, annunciators, and control equipment in the room for any or all of these systems:

a. Fire detection and alarm system with mass notification controller.

b. Generator monitor and alarm system.

c. Medical gas monitors and alarms.

d. Electronic security operator workstations for security monitoring and control of access control and video surveillance.

e. Public address master microphone and paging zone selector panel.

f. RP console.

g. NC failure alarm and Code Blue and other Code Call Annunciator Stations.

h. Elevator Emergency Phones.

i. Infant Protection Alarm System (IPAS)

\1 Pipes, plumbing, and other equipment foreign to the space are not permitted to be located in, enter, or pass through space, or be in the walls which enclose the space. **/1/**

Table 12-1 Essential Electrical System Branch Assignment for Communication Systems

\4\ Communications Systems	Branch Assignment (Category 1 spaces)	Branch Assignment (Category 2 spaces)
Telephone Switching System (TSS)[1]	Life Safety	Life Safety
Radio and Public Address (PA)	Critical / Life Safety[5]	Equipment / Life Safety[5]
Radio Paging (RP)	Critical	Equipment
Physiological Monitoring (acute areas)	Life Safety or Critical	Equipment
EMS Radios	Life Safety	Life Safety
Local Area Network (LAN) Electronic Equipment at TR[2]	Critical[5] / Life Safety[3]	Equipment / Life Safety[3]
NTS System	Critical	Equipment
Nurse Call (NC), including subsystems[4]	Critical	Equipment
Communication spaces[6] and equipment in these spaces	Critical	Equipment
Internal Cellular Antenna Systems (IRES)	Life Safety	Life Safety
Electronic Security Systems	Critical	Equipment
Wireless Access Points and associated network equipment	Critical	Equipment
1. When installed within the facility. If installed in separate structure, telephone system must have a properly rated Emergency Power System (EPS) designed in accordance with NFPA 70 Section 700 with the operational characteristics and requirements of the served facility.		
2. For the purposes of this document, LAN electronic equipment does not include workstations. Workstation requirements are to be addressed on a case by case basis with the DoD Project Sponsor. Provide racks in the appropriate communications spaces to support Telecommunications switches. Media Converters locations for analog devices must be coordinated with the DoD Project Sponsor.		
3. LAN electronic equipment at the TR will be treated as part of the TSS in facilities with Voice over Internet Protocol (VoIP)-based TSS or facilities utilizing telephone instruments that are VoIP PoE and rely on TR primary power for functionality.		
4. Includes infant or patient tracking systems and door access systems interfaced with the NC System.		
5. Place Radio and Public Address systems designed to transmit Mass Notification System emergency communications on the Life Safety Branch.		
6. Reference paragraph 12-2 for a list of Communication Spaces. **/4/**		

12-2.4 Refrigerator Monitoring.

Refrigeration alarms for the morgue, pharmaceuticals, vaccines, blood bank, and other mission critical refrigerators must be addressed by the DoD Project Sponsor. DoR must comply with DHA PI 6205.01 for Temperature Sensitive Medical Monitoring Systems, Chapter 11, and Safety Risk Assessment. DoR must provide infrastructure to support the refrigerator Monitoring System.

12-2.5 Server Room (CMP01).

A separate main Information Systems Server room must be provided in accordance with the DHA Server Room, Computer Room and Telecommunications Room Design Criteria. DoR must coordinate with the DoD Project Sponsor and local IT Staff to determine the correct size of the server room based upon its RPIE and PP contents. The room must be sized to accommodate the equipment planned for installation in the space. The designers must provide power distribution, HVAC with temperature and humidity controls, access control, fire detection, alarm, suppression, uninterruptable power supplies (UPSs), and voice and data cables to support the GFGI and CFCI equipment. The Fiber Main Distribution Frame (FMDF) must be located in this room and all fiber backbone cables in the facility must be terminated on the FMDF. Fiber from each Building Distribution Frame (BDF) must also terminate on this frame. Cables must be distributed via racks above the equipment cabinets. For systems physically located in the building, the server component must be located in the Server Room (CMP01). If the facility does not have a Server Room (CMP01), the DoR will coordinate with the DoD Project Sponsor to identify the parent facility and/or approved location for each systems server component. **\1** Pipes, plumbing, and other equipment foreign to the space are not permitted to be located in, enter, or pass through space, or be in the wall which enclose the space. **/1/**

12-2.6 Service Entrance Facility (EF) (COMC2).

Provide a separate entrance facility (EF). The entrance facility is the space housing the point of entrance of the telecommunications service. It is the demarcation point between the outside plant cabling and the inside plant distribution cabling. Inpatient MTFs and ambulatory surgery centers require two separate EFs with physically separate feed paths in accordance with NFPA 99. **\1** Pipes, plumbing, and other equipment foreign to the EF is not permitted to be located in, enter, or pass through, or be in the walls which enclose the EF. **/1/**

12-3 OUTSIDE PLANT INFRASTRUCTURE AND CABLING.

12-3.1 Outside Plant Purpose.

Provide connectivity to the Installation Wide Area Network (WAN), the Installation telephone system, and other Installation systems via a system of underground ducts and cables.

12-3.2 Outside Plant Duct Work.

All outside plant cabling must be installed in underground ductwork. A system of maintenance holes and or hand holes must be provided at distances and bend radii meeting TIA 758. All buried ducts provided by the project must be encased in concrete from the nearest manhole or hand hole.

Each project must have a minimum of two ducts, each 4 in. (100 mm) in diameter. All of the ducts must be fully populated with inner ducts, except for duct banks with more than

one spare duct must provide one spare duct with no inner duct. Fabric mesh inner ducts are acceptable. All unused or inner ducts must be provided with a nonmetallic pull cord.

12-3.3 Outside Plant FO Cable.

Each project must be provided with single-mode fiber optic (FO) cable. The FO cable must connect to the nearest connection point available to the Installation WAN. Provide a minimum of two physically separate pathways for inpatient MTFs and ambulatory surgery centers, each with 48 strands of single mode fiber. The two fiber paths must be connected to two different Installation WAN nodes and be routed into two different service entrance facilities in the project. Provide other projects with a single path consisting of a minimum of 12 strands of single-mode FO cable.

12-3.4 Outside Plant Twisted Pair Copper Cable.

Twisted pair copper cables must be provided when required by the DoD Project Sponsor for telephone, life safety systems, devices inoperable with VoIP technologies and other project-required connectivity to their various Installation systems. The number of twisted pairs must be based on the facility requirement plus 50 percent spare capacity rounded up to the next larger standard cable size.

When twisted pair copper cables are required for inpatient MTFs and ambulatory surgery centers, provide with two diverse, physically independent, and redundant pathways with twisted pair copper connectivity. The two redundant paths must be routed into the entrance facilities.

12-3.5 Outside Plant CATV Cable.

CATV outside plant cables must be coordinated with the CATV provider on the Installation. A single connection to the Installation CATV service from a single service entrance facility must be provided. The CATV cable must be installed underground. It is not a requirement for it to be installed in the underground duct system.

12-4 RMF AUTHORIZATION PROCESS REQUIREMENTS.

All information systems must be assessed for compliance with DoD security requirements and authorized for operation by a designated DHA Authorizing Official (AO). If the system is not owned by DHA, the DoD Project Sponsor's AO must authorize the system. The Risk Management Framework (RMF) process is a standard process under which all DoD information systems must achieve and maintain their Authority to Operate (ATO). Reference UFC 4-010-06 for requirements.

12-4.1 Information Technology Systems.

Information Systems (ISs)/Platform ITs (PITs) and Local Area Networks (LANs) that access, transmit, process, store, and/or display DoD information, regardless of classification or sensitivity, and/or connect to any DoD IS/PIT and/or LAN must be

Authorized to Operate. The RMF process is initiated by the DoD Project Sponsor's local Information Technology and Cybersecurity personnel with the information being provided by the system vendor or provider. Medical systems must be authorized according to the manner in which the system will be used by the Medical Treatment Facility. The DoD Project Sponsor will determine the RMF authorization process requirements. The RMF process will require input and possible system modifications by the system's vendor or provider and support from the DoD Project Sponsor. The DoD Project Sponsor's Information Systems Security Manager (ISSM) office is the point of contact for all RMF authorization requirements.

12-4.2 Stand-alone Information Systems.

Information Systems (IS) and Platform Information Technology (PIT) Systems that are disconnected from the rest of the DoD Information Network (DoDIN) or Medical Community of Interest (Med-COI) must be authorized through the RMF Process. Reference the DHA RMF SIS and CRN AA Guide for Stand-alone Information Systems (SIS) and Closed Restricted Network (CRN) implementations.

12-4.3 MIL-STD 1691.

MIL-STD 1691 provides a reference list of existing systems that must be reviewed for RMF requirements. Information Systems, including Medical Systems, are generally defined as those containing administrative and/or clinical information. Building Control Systems, Medical Systems, and Information Systems typically found in healthcare facilities are identified in **\1** MIL-STD 1691 **/1/** Table 6-1.

12-5 NETWORK TIME SYNCHRONIZATION (NTS) SYSTEM.

12-5.1 Purpose.

Provide a NTS in projects if there are systems that require precise time synchronization and no existing NTS capability is available. Provide an NTS System that receives precise date and time data from a global positioning system (GPS) satellite, or location specific approved alternative, and distribute this data to all Telecommunications Systems in the facility requiring precise date and time synchronization. The DoR must work with the ISSM to identify the NTS system's security requirements, placement within the networks, and configuration to ensure secure operation within the accreditation boundaries of the networks connected. **\1** Provide all interconnecting hardware, software, and cabling to link to the various Telecommunications Systems.

Provide a GPS receiver with built-in sensitive antenna to receive precise data and time from GPS satellite transmission. The GPS receiver must be weatherproof and constructed for indoor or outdoor installation. The GPS receiver must be located to provide unobstructed reception from the GPS satellite. **/1/**

12-5.2 Date and Time Properties.

Date and time synchronization must automatically occur at least once a day. Time synchronization must typically be within +/-0.02 seconds. Date synchronization must include automatic time zone and updating for daylight saving time and leap year.

12-5.3 Electrical Power.

NTS System and equipment must be powered from the essential electrical system emergency power critical branch per Table 12-1. AC-powered equipment must be protected by a UPS unit that must provide at least 15 minutes of full power during an AC power failure. UPS units must comply with UL 1778 and 47 Code of Federal Regulations (CFR) Part 15.

12-6 TELEPHONE SYSTEM CRITERIA.

12-6.1 Type of Service.

The DoR will coordinate with the DoD Project Sponsor and Installation Service provider to determine the appropriate telecommunications solution for the facility. The solution may be a VoIP based telephone system or a hybrid solution of analog and VoIP. The type of service available on the Installation and the project-specific criteria must determine the type of service provided. A mix of the two types of telephone systems may be used in the same facility.

12-6.2 Central Telephone Equipment.

All facilities must receive high reliability service from the Installation Service Provider. All redundancy and reliability requirements of NFPA 99 must be met.

12-6.2.1 Telephone System Features.

The features listed below must be provided with the telephone system. All required hardware and software to provide these features must be included:

a. Call detail recording
b. Automatic diagnostics with local and remote alarms
c. Remote diagnostics
d. Power fail automatic restart
e. Automatic call distribution
f. Voice mail service

12-6.2.2 Emergency Stand Alone Service.

Provide all facilities with the ability to make telephone calls internal to the facility in the event all connections to the Installation are severed. The VoIP service for these facilities must be provided over networks with Assured LAN Services (ASLAN).

12-6.3 Integrated Intercommunication (Intercom) System.

These intercom systems must be completely provided by the telephone system hardware and software with no external equipment and coordinated with the DoD Project Sponsor. These intercom systems must provide communication among department heads, secretaries, and other designated staff members.

Reference paragraph 12-8 for dedicated intercom services.

12-6.4 Patient Bedside Telephones.

Telephones with a dial pad in the handset or the handset integrated into the bedrail must be provided in patient bedrooms. The project DoR must coordinate patient bedroom telephone service with the Installation Service Provider utilizing appropriate telephone instruments compliant with infection control requirements.

12-7 TELECOMMUNICATIONS INFRASTRUCTURE SYSTEM (TIS).

Provide a TIS throughout the facility which must be designed and installed in accordance with UFC 3-580-01, TIA-568, TIA-569, TIA-606, and TIA-607 and tested in accordance with TIA-568 and the DHA Technical Guidance LAN-WLAN Modernization. The TIS must be a universal wiring network to serve all of the voice and data needs of the facility. The TIS must include horizontal and backbone unshielded twisted pair (UTP) copper cables and FO backbone cables. The TIS must support voice, facsimile, data, voice grade wireless network and other special services within the facility. All TIS backbones to TRs supporting the Clinical Information System(s) must have dual cable feeds occupying dual pathways in accordance with all requirements of NFPA 99 for the category of the facility under construction. The TIS cables must be installed in conduit and cable tray. All cables must be terminated on both ends. Cables and outlets must be marked in accordance with the DoD Project Sponsor or local Installation standard. In the absence of the DoD Project Sponsor standard or local installation standard, TIA-606 must be followed. For Installations outside the contiguous United States, shielded twisted pair cables may be required by the project-specific criteria.

12-7.1 UTP Copper Backbone Cable.

Provide a dedicated multi-pair UTP copper cable to support voice applications which must be run from the BDF to each TR. The cable must be sized to accommodate the initial installed capacity plus 50 percent. The cable insulation must be rated for the environment installed in accordance with NFPA 70. In facilities with an installed TSS, the associated main distribution frame (MDF) must replace the BDF cited here. Backbone copper cables must be terminated on patch panels. For new facilities in

which VoIP is to be installed, the backbone copper cable to each TR must be reduced to the minimum count needed to accommodate legacy medical systems, alarm and signaling circuits. Minimum count must be 25 pair.

12-7.2 FO Backbone Cable.

Provide a minimum of 12 strands of single mode fiber optic cable between the FMDF to each TR. Final strand count required to support the project will be coordinated with the DoD Project Sponsor. All TIS backbones to TRs supporting the Clinical Information System(s) must have dual cable feeds occupying dual pathways in accordance with all requirements of NFPA 99 for facilities with Category 1 and 2 room designations as defined per Appendix B. The FMDF must be located in the server room or other location identified by the DoD Project Sponsor. Patch panels must be used to terminate all backbone FO cables. Where multiple vertical stacks of TRs are used in Inpatient MTFs and ambulatory surgery centers, a 24-strand single-mode FO cable must connect each of the TRs on the top of each stack.

12-7.3 Horizontal Copper Cable.

The horizontal cable must consist of four-pair UTP cable rated Category (Cat) 6A or higher. The cable must be installed between patch panels in the TRs and the user outlets. The horizontal UTP cable must support the voice and data needs of the user. When a VoIP system is to be used there will be no difference or distinction between voice and data cable.

12-7.4 Horizontal FO Cable.

Horizontal FO cable will only be installed when required, as coordinated with the Design and Construction Agent, and approved by the DoD Project Sponsor.

12-7.5 Work Area Outlets (WAO).

WAO outlets must be located to support user workstations throughout the facility. A standard outlet must consist of a minimum 4 11/16 in. (120 mm) X 4 11/16 in. (120 mm) X 2 1/8 in. (55 mm) deep back box with a plaster ring that is equal to the wall thickness plus covering, and a **\4** one in. (25 mm) **/4/** conduit to the cable tray **\1\ /1/**. The cover plate must include four available positions for jacks. All UTP jacks must be 8 pin modular rated at Cat 6A or higher. Standard outlets must at a minimum contain three wired jacks in accordance with DHA Technical Requirements-Guidance LAN-WLAN Modernization. Two outlets of (3) jacks each per 100 sf (9.3 sm) administrative office or area are required. The DoR will coordinate outlet requirements with the PRC. The facility must not be wired to support uncertain future changes. Desk outlets must be mounted 18 inches (415 mm) above the finished floor. A minimum of **\1** 12 **/1/** in. (305 mm) of slack on each cable must be coiled into the outlet box.

12-7.5.1 Equipment.

Provide additional outlets, as required, to support both Log Cat A and Log Cat C equipment, paying particular attention to locations such as laboratories, radiology, inpatient bedrooms, nursing team centers, and conference rooms as prescribed the PRC. Additional outlets will be provided above the UFC 4-510-01 and the PRC minimum requirements where required to support equipment and to meet the functional requirements for each room.

12-7.5.2 Wall Telephone Outlets.

Provide single position modular jack telephone outlet designed to support wall-mounted telephone sets that are Architectural Barriers Act (ABA) compliant. Use faceplates for wall height telephone outlets that have one ANSI/TIA/EIA Cat 6A-rated jack and studs for mounting a wall-type telephone set. Where restricted by casework, adjust outlets and appropriately note location on the floor plan and elevation.

12-7.5.3 Modular Furniture Outlets.

Modular Furniture Outlets may be accommodated by wall-mounted or floor-mounted WAO outlets where appropriate, or by the use of consolidation points as allowed by TIA-568 and UFC 3-580-01 open office wiring requirements. The Intermediate Termination Point may be located either above the ceiling or in the distribution zone with connecting conduit to the modular furniture connection point. The use of “power poles” is permitted only if approved by the Design and Construction Agent in coordination with the DoD Project Sponsor.

12-7.5.4 Pharmacy Ceiling Outlets.

Provide ceiling height outlets in Pharmacy locations to accommodate clinical systems. The DoR must coordinate the location and number of outlets with the DoD Project Sponsor.

12-7.5.5 GFGI Systems.

Provide outlets to support Government Furnished Government Installed (GFGI) systems. Coordinate with the DoD Project Sponsor to determine what systems are to be installed and to identify the data wiring and quantity of outlets required to support the systems.

12-7.5.6 Elevator TIS Outlet.

Cabling and a TIS outlet must be provided in elevator machinery rooms for each elevator car for the connection of elevator telephone sets. Telephone instruments must be furnished by the elevator supplier and instruments will provide a direct ring-down or hotline to a 24-hour staffed location.

12-7.5.7 Conference Room Outlets.

Conference rooms must contain outlets to support voice, data, and video teleconferencing. In addition to the voice and data outlets along the walls, outlets must be provided under conference tables to accommodate voice and data instruments and connections for computer inputs to a wall-mounted flat-screen monitor. Combination power and voice/data outlets for conference room tables will be coordinated with the DoD Project Sponsor.

12-7.6 Data Communications Wireless Access Points (WAPs).

Design of new medical facilities must include site preparation for the DHA DAD IO/J6 wireless data network based upon the predictive heat map survey. The government will provide the predictive survey at 65% design. The outlet configuration will be designed in accordance with DHA Technical Requirements-Guidance LAN-WLAN Modernization. This site preparation must consist of providing outlet boxes and cable in trays or conduit for the WAPs. The outlets for the WAPs must be installed above the ceiling and must be a standard size TIS outlet. Two Cat 6A cables must be installed from the nearest TR and terminated on modular jacks in the outlet. Adjustments to obtain the final WAP configuration must be based on a physical survey using active equipment.

12-7.7 Cable Tray.

Provide cable trays above the suspended ceilings in the corridors for all communications systems cables. Cable trays must be located above the ceiling and be installed to provide 12 in. (305 mm) of clearance above, and 12 in. (305 mm) on at least one side of the cable trays, to ensure ease of accessibility for wiring changes. The Design and Construction Agent, in coordination with the DoD Project Sponsor, may approve a reduction of the clearance above the cable tray to 8 in. (205 mm) when unable to achieve the required clearance, and minor and infrequent incursions into the minimum access spaces if determined that adequate access is provided to allow cables to be removed and/or installed. The cable tray system design and installation must be in full compliance with TIA-569. The DoR must provide a cross sectional model to ensure adequate clearance above ceiling tiles and cable trays. Cable trays for communications systems must not be shared with electrical power systems cables. For facilities with an IBS, cable trays must be installed in the distribution zone instead of the connection zone. J-Hooks must not be used in new construction projects. J-Hooks may only be used in an alteration project where cable trays are not part of the existing structure and space above the ceiling is limited.

12-7.8 Grounding.

All TRs must include a Primary Bonding Busbar (PBB) or Secondary Bonding Busbar (SBB) and be bonded in accordance with TIA-607.

12-8 DEDICATED INTERCOM SYSTEM.

Intercom functions must generally be provided by the telephone system. Dedicated point-to-point intercom systems where the use of the telephone system or direct ring-down telephone circuits is not satisfactory, may be provided. Intercom systems must provide two-way voice communications and may include one- or two-way video communications. Other intercom functions and all dial intercom functions must be by the telephone system.

12-9 NURSE CALL (NC) SYSTEM.

12-9.1 Purpose.

The NC System will communicate patient and caregiver calls for various levels of assistance from appropriate caregiver responders. The communications must include explicit information about the specific call location and level of assistance needed. Consult with the DoD Project Sponsor to determine if the NC System is required to interface with the Medical Facility network. Regardless of network connectivity, the NC System must meet the Assessment and Authorization Process requirements outlined in this chapter. The NC System must meet the requirements of NFPA 99 and be listed to UL 1069 standards for the purpose as installed. A NC System that will be connected to the Clinical Information System must meet the above requirements and be identified for use in a shared network environment. The Clinical Information System must be managed and controlled as prescribed in NFPA 99.

12-9.2 Capabilities and Typical Locations.

NC System capabilities and typical installation locations must be as defined as noted in the following:

12-9.2.1 Nurse Call Audio Visual System (NCAV).

The Networked NCAV System must provide simultaneous multimedia communication of calls that includes alert tones, visual indicators, selectable voice annunciation, alphanumeric video displays, full duplex voice intercom, and alphanumeric RP.

Provide a Networked NCAV System in inpatient MTFs located in the following areas: patient units (Medical/Surgical, Intensive and Neonatal Intensive Care, Cardiac Care, L&D), the Emergency Department and associated Urgent Care area, the surgical services area, pre-operative holding areas, and post-operative recovery areas. **\1** If required and defined by Appendix A, provide Networked NCAV Systems for inpatient behavioral health units that include tamper resistant equipment and limited patient call capability. **/1/**

12-9.2.2 Nurse Call Tone Visual System (NCTV).

The NCTV System must provide simultaneous multimedia communication of calls that includes alert tones, visual indicators, selectable voice annunciation, and alphanumeric video displays. NCTV communications media do not include full duplex voice intercom.

Provide a NCTV System in Ambulatory Care Centers located in the following areas: medical and dental services, ancillary service areas such phlebotomy and imaging, and blood donor areas. **\1\ /1/**When an MTF includes both inpatient and outpatient services, the NCTV system must be integrated with the Networked NCAV System.

12-9.3 Procurement.

The NC System must be procured as a turn-key system from a single qualified NC System contractor.

12-9.4 UL 1069.

All NC Systems must be listed to UL 1069 standards for the purpose as installed.

12-9.5 Common Criteria.

The application design, configuration, and installation of all NC Systems must comply with these common criteria:

12-9.5.1 Electronic Supervision.

Code Blue and other Code Stations, Annunciator Stations, Master Stations, Patient Stations, and associated wiring to each of these stations must be electronically supervised in accordance with UL 1069, with any failure condition annunciated at the local control or monitoring station, and communicated as further defined herein.

12-9.5.2 Keep-Alive Feature.

All personal computer (PC) based Master Stations and Annunciator Stations must be equipped with a “keep-alive” feature that will automatically re-boot the station if it is turned off for any reason.

12-9.5.3 Call Assurance.

When a call is placed from any call station or device, a call assurance indicator lamp on the station or device must illuminate to indicate that the call has been registered on the system. The call assurance lamp must remain illuminated until the call is cancelled.

12-9.5.4 Alert Signal.

A signal to alert staff to a call must be an audio tone or an alternate voice annunciation. **\1** The audio volume of an alert tone is not permitted to fall below the minimum

perceptible decibel level. The adjustment of the alert tone audio volume on any type of station or light must be a maintenance procedure and not an operator function. The alert signal must have an automatic reset feature that turns the alert tone back to announce a new call when the temporary mute feature is activated for the current call. **/1/**

A computer-generated voice annunciation alert of a call, by type and location, must be provided as a user selectable alternative to the alert tone. This alternative must not affect or substitute for any displayed call information.

12-9.5.5 Tone and Visual Call Signals.

12-9.5.5.1 Call Annunciation.

Each call must be annunciated by various combinations of alert tones and visual indicators. **\1\ /1/** In inpatient MTFs that have NCTV and NCAV Systems, the tone and visual signals must be consistent for each System call type and priority.**\1**

12-9.5.5.2 Visual Call Signals. /1/

Visual steady or flashing illumination colors must provide clear and absolute distinction between call types and priorities on the dome and zone lights, and at the duty, annunciator, and master stations. Visual call illumination on zone and dome lights must be identical for each call type. **\1**

12-9.5.5.3 Tone Call Signals. /1/

Tone signals must sound at different intermittent pulse rates to allow adequate distinction between call types and priorities at the duty annunciator, master stations and on dome lights. Audible annunciation is required at all zone lights in accordance with UL 1069.

12-9.5.5.4 Call Routing – Zone Lights.

Within a patient care unit, the routing of call types from any call station, or combination of call stations, must be programmable to allow annunciation of calls on one or more zone lights. Each zone light must be programmed to illuminate in a pattern of zone lights that guides staff from any corridor in the unit directly to the room where the call was initiated.

Zone Light Activation Matrices must be developed. Each zone light must be given an identification (ID) number that must be indicated on the Telecommunications Systems drawings. A Matrix must be developed for each patient care unit served by the NC System. Each Matrix will list all zone lights by their ID number within each patient care zone, and correlate each zone light to the patient care room(s) where a call is initiated to activate zone lights. These Matrices must be included with the submittals beginning at 35% design.

12-9.5.5.5 Call Annunciation Priorities.

All NC systems must simultaneously process and signal all calls regardless of the call priority. When several different priority calls are active on the system at any one time, the signal for the highest priority call must take precedence on call tones and visual indicators that signal several call categories. For example: If dome and zone lights signal an emergency call by a solid red light with intermediate pulse rate tone, and a Code Blue call by a flashing red light with fast rate tone pulse, the dome and zone lights must signal a flashing red light with fast pulse tone when an emergency and code call occur at the same time.

12-9.5.5.6 Call Processing Rates.

a. Except for Code Blue and other Code calls, all calls must be processed from the origination call station to the call destination within 4 seconds.

b. Code Blue and other Code calls must be processed from the call initiation station to the call destinations within eight (8) seconds. The eight seconds must include a four (4) second delay in the initiation of these calls to allow staff to quickly abort accidentally initiated code calls.

c. The call processing rates defined here do not include any RP System transmission time for the alphanumeric RP of calls.

12-9.5.6 Code Blue and other Code Stations.

Each Code Blue and other Code call stations must be physically separate stations and they will not be part of any other station. These stations must be mounted as high as practical to be out of reach of children.

12-9.5.7 Dome and Zone Lights Lamps.

Dome and zone lights must utilize LED lamps. Incandescent lamps are unacceptable.

12-9.5.8 Main Terminal and Equipment Panels.

Locate the main terminal and equipment panel for each NC system in the TR nearest the area serviced and provide for system wire termination, low-voltage power supply that provides power to all stations and lights, and circuitry for system operation, as determined by the system application design. Locate the main terminal equipment in the Server room if it is determined by DHA-FE and the DoD Project Sponsor to be a Server.

12-9.5.9 Standardized System Features and Capability.

All of the systems in each NC System category must have the same standardized performance features and capability. System features and capability not required in a particular patient care unit may not be activated at the time of installation. However, the facility maintenance staff must be able to activate inactive features and capability at any

time after installation without impacting the fundamental capabilities of the system, or without assistance from the system contractor.

12-9.5.10 Electrical Power.

The NC System and equipment must be powered per Table 12-1. AC powered equipment must be protected by a UPS unit providing at least 15 minutes full power during an AC power failure. UPS units must comply with UL 1778 and 47 CFR Part 15.

12-9.6 Networked NCAV System.

The NCAV Systems must include operational nodes of a totally integrated network of the major functional components and interfaces that provide a comprehensive facility-wide multimedia capability for the NC fundamental operations and enhanced supplemental operations.

12-9.6.1 Operations.

12-9.6.1.1 Fundamental Operations.

Provide for the communication of these calls from within a patient care unit:

a. Patient and caregiver calls for assistance and information

b. Auxiliary medical device alarm calls

c. Bed exit alarm calls

12-9.6.1.2 Enhanced Supplemental Operations.

Provide enhanced supplemental operations to the fundamental operation for the routing of calls, data, and messages within patient care units and over a system-wide network to facilitate:

a. Central annunciation of designated types of calls, including code calls and equipment failure alarms.

b. Automatic downloading of patient Admissions-Discharge-Transfer (ADT) module data via interface with the Medical Community of Interest (Med-COI). A Nurse Call system that will be connected to the Clinical Information System must meet the above requirements, be authorized for use via the RMF Process and be identified for use in a shared network environment. The Clinical Information System must be managed and controlled as prescribed in NFPA 99.

c. A central database for the logging of all calls and the generation of statistical management reports from a Call Logging Workstation and from designated computers on the hospital network.

d. System operational status monitoring and maintenance from a Central Maintenance Workstation.

e. Processing and transmission of NC data and messages to alphanumeric radio pagers or other wireless communications devices carried by staff, and processing of NC data and messages to GFGI-wide area alphanumeric pagers leased from a local Radio Common Carrier that are carried by staff.

f. Swing routing of calls from any call station to any Master Station in the unit or in adjacent areas.

12-9.6.2 NCAV System Network.

The NC network must be an adjunct network of the facility LAN. Whether the Nurse Call system design provides a Med-COI connected or a Stand-alone Information System (SIS), provide an industry standard network architecture that includes industry standard LAN technology, software, protocols, equipment, and cabling to interconnect all NC major functional components and major interfaces into an integrated NC capability that supports facility-wide communications and all NC functions. When possible, all network management devices (switches, routers, firewall, etc.) must be on the DoDIN Approved Products List (APL).

The Nurse Call System will require an Authority to Operate (ATO) and must comply with DoDI 8510.01 and UFC 4-010-06. As discussed in paragraph 12-9.1, the contractor must consult with the DoD Project Sponsor to determine if the NC System is required to interface with the Medical Community of Interest (Med-COI) network. **\1** All NC systems that connect to the Med-COI must be in accordance with the DHA Procedural Instruction (PI), “Standard Isolation Architecture for Cybersecurity of Facility Related Control Systems (FRCS)”. Nurse Call systems that are connected to the Clinical Information System must meet the above requirements and be identified for use in a shared network environment. The Clinical Information System must be managed and controlled as prescribed in NFPA 99.

12-9.6.2.1 NCAV Servers. /1/

Servers must include the appropriate DHA approved operating system (OS) and application software. Servers must also provide central databases for all of the systems’ application programs and data, call logging data, interface with the facility RP or other wireless personal communications device system, and interface with the facility NTS System. Servers must also meet the RMF Requirements for an ATO and be capable of interface with the Med-COI in accordance with the DHA Procedural Instruction (PI), “Standard Isolation Architecture for Cybersecurity of Facility Related Control Systems (FRCS)”.

12-9.6.3 NCAV System Major Components.

Provide the following NCAV System major components at the locations indicated. Also refer to paragraph 12-9.5.

12-9.6.3.1 Bed interface outlet stations.

A bed interface outlet station must be located behind each inpatient bed equipped with a communications side rail or bed exit alarm system. The station connector must be compatible with the connector on the bed communications cable.

12-9.6.3.2 Patient Stations.

Single Patient Stations must be provided for each medical/surgical unit patient bed, each critical care unit patient bed, each LDR/LDRP bedroom, each inpatient unit exam, procedure, and treatment room, each emergency exam treatment room and patient care station, each pre-operative patient care station, Phase I post-anesthesia recovery patient care station, and Phase II recovery patient care station.

12-9.6.3.3 Cord Sets and Holders.

Provide the following types of cord sets for each location, except where noted:

a. Pillow Speaker Cord Sets. A pillow speaker cord set must be provided for each patient station in all inpatient bedroom types, excluding inpatient behavioral health bedrooms. In these locations, the patient station cord set receptacle must accommodate the simultaneous use of both a pillow speaker cord set and a push button or pneumatic cord set. The cord set must be a component in the UL 1069 Listing for the system or be approved by the Nurse Call Manufacturer for use with their system.

b. Push Button Cord Sets. A push button cord set must be provided for each patient station in each inpatient unit exam, treatment and procedure room, each emergency exam treatment room, each patient station in the pre-operative holding and the post-operative recovery areas. Provide push button cord sets for 25 percent of the patient stations in all other locations. The cord set must be a component in the UL 1069 Listing for the system or be approved by the Nurse Call Manufacturer for use with their system.

c. Pneumatic Cord Sets. Pneumatic cord sets must be provided for 25 percent of the patient stations in all rooms and cubicles. Cord set must be a component in the UL 1069 Listing for the system or be approved by the Nurse Call Manufacturer for use with their system.

d. Cord Set Holder. A wall bracket must be provided to hold cord sets when not in use.

e. Push Button Stations. Only push button stations will be provided in Behavioral Health areas as required by Appendix A.

12-9.6.3.4 Code Blue Stations.

Code Blue Stations must be provided as a minimum, in the following locations: each medical/surgical unit patient bed, each critical care unit patient bed, each LDR/LDRP bedroom, newborn/well baby nursery, each inpatient unit exam, procedure and

treatment room, Cesarean delivery rooms, diagnostic radiography and fluoroscopy rooms, CT scanner rooms, MRI scanner rooms, stereotactic mammography rooms, ultrasound rooms, cystoscopy rooms, bronchoscopy rooms, endoscopy rooms, oral surgery dental operatories, emergency exam treatment rooms and each emergency patient care station, emergency treatment and procedure room, pre-operative patient care station, Phase I post-anesthetic (PACU) patient care station, and Phase II recovery patient care station. Code Blue stations in Behavioral Health units must be in accordance with Appendix A.

12-9.6.3.5 Device Alarm Jack Stations.

Device alarm jack stations must be adjacent to each patient station.

12-9.6.3.6 Duty Stations.

Duty Stations must be provided, as a minimum, in staff lounges, clean core areas, clean and soiled workrooms and storage, nourishment pantry, medication preparation room, changing locker and other areas identified by the DoD Project Sponsor. Each duty station will provide an audible tone without voice, and visual indication that a call has been initiated on the NC system.

12-9.6.3.7 Emergency Pull Cord Stations.

Emergency Pull Cord Stations must be adjacent to each toilet in public, patient and staff restrooms, and in each patient shower and tub, each medical/surgical unit patient, critical care unit and each LDR/LDRP toilet/lavatory location. In showers, locate the station on the shower head wall and above the shower head; these stations must be water resistant. In Behavioral Health settings emergency pull cord stations must be replaced with emergency push button stations.

12-9.6.3.8 Emergency Push Button Stations.

Emergency Push Button Stations must be provided, as a minimum, in each; Intensive, Continuing Care, and Isolation bassinet location; Level 1 Holding Nursery, Admissions.

12-9.6.3.9 Staff Assistance Stations.

Staff assistance stations must be provided, as a minimum, in dayrooms, conference rooms, waiting rooms, interview rooms, emergency procedure and trauma rooms, and Nursery parent teaching and feeding rooms. Each staff station will include the functionality of a duty station plus two-way voice communication.

12-9.6.3.10 Staff Assistance Stations with Emergency Call Button.

Staff assistance stations with an emergency call button must be provided, as a minimum, in each OR, cystoscopy room, cardiac catheterization room, angiography procedure room, Nursery procedure room, isolation and seclusion anterooms, day rooms, interventional procedure room, Dialysis Stations, Blood Donor Stations,

Immunization rooms, and inpatient pediatric play rooms. Behavioral Health inpatient and outpatient settings must be equipped in accordance with Appendix A.

12-9.6.3.11 Master Stations.

Master stations must be provided, as a minimum, at the following nurse stations: all inpatient care units, Emergency Department, pre-operative unit, Phase I post-anesthetic (PACU) unit, Phase II recovery unit, and at the control desk in the surgical suite.

12-9.6.4 Peripheral Equipment.

Provide the Networked NCAV System peripheral equipment defined here at the locations indicated.

12-9.6.4.1 Main Central Annunciator.

Provide a Main Central Annunciator Station to annunciate all Code calls and failure alarms throughout the entire NC System until the call is cancelled at the initiation point. The main central Annunciator Station location must be approved by the Design and Construction Agent in coordination with the DoD Project Sponsor.

12-9.6.4.2 Call Logging Workstation.

A Call Logging Workstation must be provided for the collection, processing, storage, statistical analysis, report generation, and archiving of call data. The Call Logging Workstation must be capable of printing real-time call data by patient's name, sex, age, room, and bed, the time each call is placed, answered, set on service reminder, or canceled at the Master Station or when logged at the Central Annunciator Station. This workstation must be located in an area approved by the Design and Construction Agent in coordination with the DoD Project Sponsor.

12-9.6.4.3 Maintenance Workstations.

Two Maintenance Workstations must be provided to support remote monitoring, diagnostics, and troubleshooting of failures throughout the system, testing of major NC System components, and for the downloading and installation of software upgrades from the manufacturer. One workstation will support the maintenance of the system stations and lights and must be located in the Facility Management Department. The other workstation must be located in a designated area identified by the DoD Project Sponsor.

12-9.6.5 Duplex Voice Intercom.

Provide a full duplex, non-blocking voice intercom between Master Stations and Voice Calling Stations (patient stations, staff stations, and duty stations) and for voice communications on the NCAV System. A simplex intercom that utilizes voice activation or other switching circuits to permit transmission in only one direction at a time, or that may clip portions of a two-way conversation, are not permitted.

12-9.6.6 Networked NCAV System Interfaces.

Provide the following interfaces at the locations indicated.

12-9.6.6.1 Bed Side Rail Communications and Bed Exit System Interface.

Provide interface at the Bed Interface Outlet Station via the bed communications cable. Side rail controls must allow initiation and routing of a patient call, and provide on/off control of room and reading lights. A bed exit system must initiate a bed exit alarm when the patient exits the bed.

12-9.6.6.2 Interface for Remote Control of Over-Bed Lights.

Provide an interface for on/off remote control of the inpatient bedroom reading and room lights at each bed location via an interconnection to a solid-state, low-voltage light controller. (Reference Chapter 11 Electrical)

12-9.6.6.3 ITV System Interface.

Provide pillow speaker interface in accordance with paragraph 12-12 at each inpatient bed station and the associated patient flat-panel, high-definition television (HDTV) for these functions: HDTV on/off and channel selection control, and remote sound from a pillow speaker cord set. If requested by the DoD Project Sponsor, pillow speaker must also interface with patient interactive access to on-demand and scheduled education and message channels, and interactive access to programs such as patient surveys or food service menu.

12-9.6.6.4 RP Interface.

Provide a networked NCAV System RP server interface to the RP Systems (reference paragraph 12-11) that will automatically route calls to the RP System for transmission to radio pagers assigned to staff.

12-9.6.6.5 Medical Community of Interest (Med-COI) Interface.

When directed by the DoD Project Sponsor, the Networked NCAV System server must interface directly to the Med-COI and the Clinical Information System to automatically download patient ADT module data for use by master stations and whiteboards and to interface with hands free wireless communications devices carried by the staff. A Nurse Call system that is connected to the Clinical Information System must meet the requirements associated with the RMF Process, obtain an ATO and connect in accordance with the DHA PI, “Standard Isolation Architecture for Cybersecurity of Facility Related Control Systems (FRCS)”. A Nurse Call system that is connected to the Clinical information system must meet the above requirements and be identified for use in a shared network environment. The Clinical Information System must be managed and controlled as prescribed in NFPA 99.

12-9.6.6.6 NCTV System Interface.

Provide a networked NCAV System interface to the NCTV System (reference paragraph 12-9.7) to integrate the NCTV System with the enhanced supplemental operations of the Networked NCAV System. This requires the NCTV System to add a network capability that will link the network to the NCAV System LAN.

12-9.6.6.7 NTS System Interface.

Provide an NTS System (reference paragraph 12-5) interface with a NCAV System network server for time and date synchronization.

12-9.6.7 NCAV System Call Types.

The following are NCAV System call types:

a. Patient Routine Call
b. Patient Priority Call
c. Cord Disconnect Call
d. Bed Disconnect Call
e. Emergency Call
f. Staff Assistance Call
g. Code Blue Call
h. Other Code Call
i. Medical Device Service Alarm Call
j. Bed Exit Alarm Call
k. Duplex Voice Intercom Call
l. Service Dispatch and Reminder Call
m. Information Message Call
n. Failure Alarm Call

12-9.6.8 Call Annunciation Modes.

Each call must annunciate throughout the system by various combinations of alert tones, visual and video indications, and the digital display of alphanumeric data and text messages. The specific annunciation for each call type must be as described herein for each type and source of call.

12-9.6.8.1 Master Stations.

On Master Stations, an intermittent call alert tone must sound. A touch-screen color video monitor must graphically and digitally display the call type and call initiation room

and bed location. Alphanumeric data and text message information must indicate associated patient data, associated staff assignment data, and associated radio pager assignment data. The facility room name and number must identify the call initiation room. Call data, information, and status must remain displayed on the video monitor until the call is cancelled.

12-9.6.8.2 Central Annunciator Stations.

On Central Annunciator Stations, an intermittent call alert tone must sound. A touch-screen color video monitor must alphanumerically indicate the call type and call initiation patient care unit and room location, or failure alarm call type and equipment location. The video monitor display must indicate at least ten calls simultaneously and include a scrolling feature that will display additional calls that are not simultaneously displayed. The facility room name and number must identify the call initiation room location. Call data, information, and status must remain displayed on the video monitor until the call is cancelled.

12-9.6.8.3 Duty Stations.

On duty stations, LED lamp(s) with steady or flashing illumination must indicate calls by the call priority level and sound an alert tone.

12-9.6.8.4 Pagers and Other Devices.

On pagers or other networked wireless personal communications devices carried by the staff, an alert tone or vibration must activate, and an alphanumeric data and text message must indicate the call type, and identify the room and bed location where the call was initiated. For routine calls that are first answered by an attendant, the pager or other networked wireless personal communication device must also indicate that a service dispatch message has been sent by the attendant. The room name and number must identify the call initiation room and bed.

12-9.6.8.5 Annunciation.

The alert tones, and visual and video indication displays for all types and priorities of calls must continue to alert until the call has been answered and cancelled. Except for routine calls, all other calls must be cancelled at the initiating call station. Routine calls may be cancelled at either the initiating station or at the answering Master Station on audio equipped systems. NCTV calls must be cancelled at the initiating station.

12-9.6.9 Call Annunciation Priorities.

The annunciation of all call types must be sequenced in a four level priority rank order, from a high priority, Number 1, to a low priority, Number 4, as listed in Table 12-2. Coordinate Code Call names, meanings, and priority levels with the DoD Project Sponsor.

Table 12-2 Call Annunciation Priorities

Priority Level	Call Type
#1 Code	Code Blue
	Other Code Calls
#2 Emergency	Emergency
	Bed Exit Alarm
	Medical Device Emergency Alarm
	Staff Assistance
	Failure Alarm
#3 Priority	Patient Priority
	Call Cord Disconnect
	Bed Cable Disconnect
#4 Routine	Patient Routine
	Medical Device Routine Alarm
	Voice Intercom - Staff and Duty Stations

12-9.6.9.1 Call Types.

All call types must be simultaneously processed regardless of the priority level. However, when several different priority level calls are present on the system at any one time, the highest priority call must take precedence over lower priority calls. For Master Stations and Annunciator Stations that display calls in a list, the displayed list of calls must be in priority order, with the highest priority calls at the top. All call types, regardless of the priority level, must remain indicated until cancelled.

12-9.6.10 Call Routing.

Call routing throughout the networked system must be software programmable to provide the selectable call routing defined here. All patient data and caregiver data associated with any call must automatically accompany the call routing.

a. Calls initiated from a patient toilet or shower room that is entered directly from within the patient bedroom must visually annunciate on the dome light located outside the entry into the patient bedroom.

b. Calls from a dedicated patient toilet room that is entered directly from within another room must visually and audibly annunciate on the dome light located outside the entry door into the toilet room, and visually on the dome light located outside the entry into the other room.

12-9.6.10.1 Call Routing – Master Stations.

Master Station features must allow the attendant to select a call routing, to include the routing of voice intercom between any Master Station and any audio call station, as defined here. If the network or call routing feature should fail, all calls must revert to the original UL 1069 designated Master Station.

a. A default call routing scheme within each patient care zone must be established for calls between each call initiating station and the Master Station(s) in the NCAV System. If there is more than one Master Station in the NCAV System, then the default call routing to each Master Station must be user defined and approved by the User Representative.

b. Any call from a call initiating station can be selectively routed to, and answered from, any Master Station in the NCAV System.

c. Any one Master Station in the NCAV System must be able to handle any combination of calls, or all of the calls, from any call initiating station in the NCAV System.

d. Any combination of Master Stations throughout the NCAV System can be programmed to operate in a parallel mode. When operating in a parallel mode, all calls that would normally be routed to a Master Station must now be routed to all Master Stations at the same time. The parallel mode feature can be either a default setting or an attendant selectable mode at any Master Station.

e. An authorized attendant, using password protection, must be able to perform at any Master Station, a selective call capture function whereby any call initiating station that has been default programmed for call routing to another Master Station must be rerouted to the capturing Master Station. The attendant must be able to selectively capture a single room, groups of rooms, or all of the rooms that have been default assigned to another Master Station. The rerouting of calls from any room must include all associated patient and staff data that has been programmed for the room, including staff assignments.

f. Master Stations that have relinquished reception of calls to another Master Station via the call capture function must retain the manual capability to announce a RP.

g. An authorized attendant, using password protection, must be able to perform a selectable recapture function at any Master Station, of all calls from the NCAV System, or any call station that has been captured by another Master Station by performing a selectable recapture function.

h. All call routing, call capturing, and call recapturing operations must be password protected.

12-9.6.10.2 Call Routing – Main Central Annunciator Station.

The annunciation of a normal local call on a Master Station, the RP of the call, and the call types listed here must be automatically routed to the Main Central Annunciator Station located in an area identified by the DoD Project Sponsor.

a. Code Blue calls

b. Other Code calls

c. Failure alarm calls

12-9.6.10.3 Call Routing – Infant Distress Central Annunciator Station.

In addition to the normal local call annunciation on a Master Station, and the radio page of the call, all infant distress calls must also be automatically routed to the Infant Distress Central Annunciator Station.

12-9.6.10.4 Call Routing – Duty Stations.

All duty stations must be equipped to annunciate all call types.

12-9.6.10.5 Call Routing – Call Logging Server and Call Logging Workstation.

All call data from the NCAV System must be routed to the call logging database in the call logging server. The call logging database will be accessed from the NCAV System Call Logging Workstation and any additional location identified by the DoD Project Sponsor in coordination with the facility Information Technology Representative. Call logging application programs used to access the call logging database and to generate call data reports must be installed on designated computers on the hospital network. Failure of the Call Routing or Call Logging feature, to include, but not limited to, out of logging space conditions or a network failure, must not cause degradation of the basic services as defined in UL 1069.

12-9.6.10.6 Call Routing – Maintenance Workstations.

All failure alarm calls from all major functional components of the network and all systems must be routed to the Maintenance Workstation(s). Failure of the Call Routing or Call Logging feature, to include, but not limited to, out of logging space conditions or a network failure, must not cause degradation of the basic services as defined in UL 1069.

12-9.6.10.7 Call Routing – RP System Pagers.

All calls and failure alarms on the Networked NCAV System must be routed by NC selectable duty assignment programming via the NCAV RP Server interface (reference paragraph 12-11), for transmission to RP System Pagers assigned to designated staff. Failure of the Call Routing Radio Page feature must not cause degradation of basic services as defined in UL 1069.

12-9.7 NCTV System.

12-9.7.1 Overall Configuration and Capability.

There are two typical configurations for the application of the NCTV System: one configuration is for installation in ACCs to include blood donor centers and the second configuration is for installation in inpatient MTFs. Both configurations must provide the same fundamental operations for patient and staff calls, and communications operations. However, the configuration for inpatient MTFs must provide enhanced supplemental operations for signaling and data handling from the NCTV System when it is integrated with the enhanced supplemental operations of the NCAV System in the facility. The common fundamental operations of both configurations, and the enhanced supplemental operations for inpatient MTFs must be as defined here.

An inpatient MTF that is equipped with a Networked NCAV System (reference paragraph 12-9.6) that provides enhanced supplemental operations, must be linked as nodes on a network provided as part of the NCTV System., with the NCTV network linked to the Networked NCAV Systems network. The NCTV System must have the same enhanced supplemental communications capabilities as the NCAV System, to include alphanumeric RP or other wired networked personal communications devices, central annunciation of code and failure calls, and the central logging of all call transactions.

12-9.7.2 NCTV System Major Components and Locations.

Provide the following NCTV System major components at the locations indicated.

12-9.7.2.1 Emergency Call Stations.

Emergency Call Stations must be located as directed herein.

a. Patient toilets (beside and toward the front of each toilet)
b. Staff toilets that may be used by patients (beside and toward the front of each toilet)
c. Public toilets (beside and toward the front of each toilet)
d. Patient showers (waterproof unit on shower head wall above shower head)
e. Phase II recovery patient care stations (adjacent to the patient's head)
f. Phase I post-anesthesia recovery (PACU) patient care stations
g. Pre-operative patient care stations
h. Emergency Laboratory Phlebotomy area or rooms
i. Blood Donor stations
j. Physical Therapy treatment stations and the exercise gym

k. Special Procedure rooms: coronary, neurological or peripheral angiography, electrophysiology procedures, cystoscopy, bronchoscopy, colonoscopy, and endoscopy

l. Operating rooms

m. Pulmonary function laboratory and testing rooms

n. Immunization and Allergy injection rooms

o. Dialysis patient care stations

p. Cardiac Rehab Exercise gym

q. Electroencephalogram (EEG) Testing rooms

r. Stress Electrocardiogram (ECG) and Echocardiogram rooms

s. Medical Radioisotope Laboratories

t. Patient dressing rooms and locker area

u. Dental oral surgery rooms

v. CT Scanner rooms

w. MRI Scanner rooms

12-9.7.2.2 Code Blue Station Locations.

The minimum required locations must be located as directed herein.

a. Procedure rooms that utilize high-level disinfection or sterile instruments, and some environmental controls that are not required to support an operating room or Dental oral surgery rooms

b. ECG Echocardiogram rooms

c. Physical Therapy Exercise gym

d. Laboratory Phlebotomy areas or room

e. Blood Donor rooms

f. Renal dialysis rooms

g. Immunization and Allergy Injection rooms

h. Chemotherapy infusion rooms

i. CT Scanner rooms

j. MRI Scanner rooms

12-9.7.2.3 Dome Lights and Whiteboard Locations.

Locate a dome light above or beside the entry to each room and each patient care station that will be equipped with an Emergency Call Station or Code Blue Station. Dome lights without a tone device must be located above or beside the entry to each

room and each patient care station that will be outfitted with any of these NC System components: patient station, emergency pull cord station, emergency push button station, or Code Blue station. Dome lights with a tone device must be located outside the door to a dedicated toilet room that is accessed from within another room.

Zone lights must be located at each corridor intersection within multi-corridor units. White Board (WB) Stations must be located at the Nurse Station or Team Center in each patient care unit.

12-9.7.2.4 Zone Lights with Tone Locations.

Locate a ceiling mounted zone light with tone at each corridor intersection within multi-corridor areas.

12-9.7.2.5 System Annunciator Station Location.

The system annunciator station will be located in an area that is continuously monitored by staff.

12-9.7.3 Call Types and Alarms Signaled.

Call types and alarms signaled will include:

a. Call from a patient or staff for emergency assistance from an emergency pull cord station or an emergency push button station

b. Call from staff for Code Blue assistance from a Code Blue station

c. Call from staff for Other Code assistance from Other Code stations

d. Failure alarms from electronically supervised wiring, Code Blue Stations, Other Code Stations, and Annunciator Stations

12-9.7.4 Call Priorities.

The processing of calls must be sequenced in a two-level priority rank order, from a high priority, Number 1, to a low priority, Number 2, as listed here:

Priority Number	Call Categories
1	Code Blue and Other Codes
2	Emergency and Failure Alarm

12-9.7.5 Annunciator Station Function and Call Routing.

When a call is activated on the NCTV System, an intermittent call alert tone will sound on the system Annunciator Station. The Annunciator Station touch-screen color video monitor screen must alphanumerically identify the call type and call initiation room. The

Annunciator Station must simultaneously process and display multiple calls. All calls must continue to be indicated until cancelled at the call initiation station.

A call signal cannot be cancelled at any Annunciator Station; it must be cancelled at the initiating call station. A tone mute icon may be used to temporarily silence a current call tone signal. The tone signal circuit must have an automatic reset feature that allows the tone signal to sound when the next call is placed.

12-9.8 Enhanced Supplemental Operations.

An MTF that is equipped with a Networked NCAV System (reference paragraph 12-9.6) that provides enhanced supplemental operations, to include an onsite RP System, the NCTV System must be configured with an integrated network that will be interconnected with the Networked NCAV System to fully utilize these NCAV enhanced supplemental operations for the routing of calls and data to facilitate:

a. The processing and transmission of call data and messages to alphanumeric pagers or other wireless networked personal communications devices carried by the staff

b. Central annunciation of code calls and failure alarms

c. The logging of all calls, and the generation of statistical management reports by a central database

d. Central system operational status monitoring and maintenance from a Maintenance Workstation

This enhancement will require the NCTV System to have the fundamental capability to be upgraded with all necessary networking hardware and software, and will include the provision of identical Radio Pagers for the NCTV System. The NCTV System Annunciator Stations must be upgraded with the hardware and software, to include a keyboard and a mouse, to allow manual alphanumeric RP from the Annunciator Stations.

12-10 INTERNAL CELLULAR ANTENNA SYSTEMS (IRES).

Provide a RF Distribution System to support communications from fire, emergency, and other first responder systems in accordance with NFPA Section 11.10 and NFPA 1225 for all facilities greater than 50,000 GSF (4645 GSM). Permitted operations include the RP System and the local fire service radio system. The signal sources may be either external or internal to the facility and the service will be capable of bi-directional services internally or externally. Systems that service fire radios must meet cabling and battery backup requirements per the local Installation Fire Marshall. Other frequencies and system requirements will be identified by the DoD Project Sponsor. Site requirements, field strength surveys, engineering & design documents, and test results will be provided as part of the system.

12-11 RADIO PAGING SYSTEM.

12-11.1 Radio Paging (RP).

\4 When required by the DoD Project Sponsor, provide **/4/\1** a paging system with paging receivers to support 100 percent coverage within the MTF. **/1/** The RP system design must provide 100 percent coverage within the MTF.

12-11.2 Page System Interfaces.

The RP System must interface with these following systems as noted in their respective sections of this chapter: Telephone System (numeric paging only) (reference paragraph 12-6), NC System (reference paragraph 12-9), Electronic Security System (reference Chapter 5, and IRES (reference paragraph 12-10).

12-11.3 System Function.

The RP system must utilize tone and vibration alert paging receivers that display an alphanumeric message. Each pager must be accessible by dialing a discrete set of digits via the telephone system. Access to the RP system must also be available at the central control console within the health facility when provided and at each NCAV System control station. The DoR must provide space for control and coaxial cables as well as the AC power, and the conduit for the system. Location of head end equipment and system components must be coordinated with the DoD Project Sponsor.

12-11.4 Emergency Response Team Pagers.

Pagers assigned to members of the code and other emergency response teams must have at least two separate and distinct alert tones: one for routine and priority calls and one for emergency calls. These pagers must also have two separate access codes: one for calls to individual pagers, and one for group alerts. The group alert code must signal all pagers in a group simultaneously.

12-11.5 Antennae Type and Mounting.

The antenna type selection, and the mounting height determination must provide complete facility coverage. Provide an antenna and mast that conforms to TIA-222 and TIA-329. A wireway, conduit, or cable tray must be provided from the transmitter location to the antenna. In the presence of an IRES, an appropriate low-level signal from the RP System transmitter must be directly injected into the IRES to supply coverage. With this type of design, an external antenna is not required.

12-11.6 Power Requirements.

All RP equipment must be connected to the life safety branch of the EPS and rated for continuous duty.

12-11.7 Transmitter and Encoder.

The transmitter must comply with FCC Emission Designator 11K0F2D for 12.5 KHz Narrow Band Transmission and appear as a listed device with the JITC. Provide two transmitters and encoders in a hot-swap configuration. Provide a Maintenance and Programming station.

12-12 INTERACTIVE TELEVISION (ITV) SYSTEM.

The ITV system is a proponent funded television receiver system used for patient entertainment and education and funded separately from MILCON.

Provide the following to support this system:

12-12.1 Electrical Power.

Provide electrical power to support the requested ITV systems in accordance with the electrical code and Table 12-1, and the device location provided by the System Contractor.

12-12.2 Empty Conduit and Boxes and Cable Trays.

Provide junction boxes and empty conduits with pull strings for the installation of cables. Calculate cable requirements into cable tray capacity calculations and provide adequate cable tray capacity to support these systems. Where system wiring will be designed to be connected utilizing the facility TIS, the specific location must be identified. Provide outlets, wiring and patch panel capacity in TRs to support these systems. Provide conduits from head end equipment location to the antennas mounted on the roof and, if required, conduits for coaxial and control cables for all system components associated with the Ambulance Dispatch.

12-12.3 Structural Support.

Provide structural support and sufficient mounting space for the antennas.

12-12.4 Equipment Space Support.

Provide floor space and racks as required in Communications Radio Equipment Room (COM04). Include this equipment in the TR Floor Space Calculations where equipment is located in TRs.

12-13 TV BROADBAND DISTRIBUTION NETWORK.

12-13.1 Purpose.

Provide a TV broadband distribution network to receive and distribute TV program channels from a commercial TV service to flat-panel HDTVs throughout a stand-alone facility.

12-13.2 Procurement.

Procure the entire TV network as a turn-key system from a single qualified TV network contractor.

12-13.3 Commercial TV Service.

The DoD Project Sponsor must select and separately contract for the provision of TV program channels from a locally available commercial TV service.

The system application designer must request and obtain from the DoD Project Sponsor the ID of the TV service that must be used, and obtain a detailed description of the facility space and infrastructure requirements that must be provided to accommodate the TV service signal reception or entry and any headend equipment to be installed in the facility.

12-13.3.1 Facilities and Infrastructure for the TV Service.

Provide the facilities, space, and infrastructure to accommodate the installation requirements of the commercial TV service. **\1**

12-13.3.1.1 CATV Facilities and Infrastructure. /1/

For CATV service, provide the facilities and infrastructure to accommodate the routing of the CATV service trunk-line entry from the nearest source on the Installation to the network headend in a facility TR, including the CATV trunk-line and trunk amplifier (as may be required). The trunk-line routing into the facility may be via an underground duct or an underground cable link from an overhead pole adjacent to the facility site. **\1**

12-13.3.1.2 SATV Facilities and Infrastructure. /1/

For SATV service, provide the facilities and infrastructure to accommodate the installation of an SATV service roof-top antenna, cable entry into a facility TR, and any required headend equipment provided by the SATV service.

12-13.4 Broadband Distribution Network.

The broadband distribution network must consist of cable and equipment to receive, process, and distribute all TV program channels received from the TV service. The TV distribution network can be configured either as a broadband coaxial network or a gigabit Ethernet network for the communication of all TV channels to all TV outlets throughout the facility. The distribution network must conform to the radiation standards specified in 47 CFR Part 76. **\1**

12-13.4.1.1 RF Broadband Coaxial Cable Distribution Network. /1/

An RF broadband coaxial cable distribution network must include quad shield coaxial cables, power supplies, amplifiers, splitters, directional couplers and taps, attenuators, terminators, TV outlets, and any other required equipment. **\1**

12-13.4.1.2 Ethernet Network. /1/

A gigabit Ethernet network must be configured as a dedicated network including network switches, patch panels, FO and UTP cable, modular TV outlets, and equipment racks for the mounting of all equipment. The network must conform to TIA/EIA criteria standards. The fiber and copper cabling and network outlets required for this system are in addition to those required for the Telecommunications Infrastructure System (TIS) in this chapter.

12-13.5 TV Outlets and Signal Level.

TV outlets must be provided in these locations:

a. Waiting Rooms
b. Conference Rooms
c. Classrooms
d. Patient Education rooms
e. Lounges
f. Inpatient Behavioral Health Activity rooms
g. Behavioral Health Group Therapy rooms
h. Patient bedrooms
i. Emergency exam treatment rooms

For Coaxial/RF based systems, the TV signal level at each TV outlet must be between +3 dBmV and +9 dBmV.

12-13.6 Flat-Panel HDTVs and Connecting and Mounting Items Configuration.

Provide devices to interface the flat-panel HDTVs with the TV distribution network. **\1\ /1/** Provide jumper cables for connection of the flat-panel HDTVs to the TV outlet jack and any network interface devices. The cable between the network interface device and the HDTV must be an HDMI cable.

Provide wall brackets and furniture mounts for the mounting of all flat-panel HDTVs. Coordinate the requirements for in-wall support plates for wall mounting brackets with the architectural and structural design, and the requirements for casework or furniture mounts with the architectural design and the PRC List.

12-13.7 Electrical Power.

Provide a quad AC power receptacle at all TV outlet locations. The AC power receptacle must be mounted in a separate back box from the TV outlet back box and be located adjacent to the TV outlet.

12-14 ELECTRONIC SECURITY SYSTEM (ESS).

Electronic security system requirements are included in Chapter 5 Antiterrorism (AT) and Physical Security and in Appendix A.

12-15 RADIO AND PUBLIC ADDRESS (PA) SYSTEM.

12-15.1 System Purpose.

Provide a zoned loudspeaker paging and zoned music program system that must evenly distribute recorded or live voice messages or recorded music throughout designated areas of the facility. The distributed sound must be free of noise and distortion. It must be balanced and highly intelligible per the Modified Rhyme Test (MRT) of ANSI/ASA S3.2. The system must be capable of individually and simultaneously paging all separate independent zones provided by the system configuration.

12-15.2 System Components.

Provide the following system components:

12-15.2.1 Headend Equipment.

12-15.2.1.1 Equipment Racks.

Provide floor-mounted equipment racks and double sided cable management to house all headend equipment.

12-15.2.1.2 Auxiliary Inputs.

Provide rack space and preamplifier input ports to support the specified number of auxiliary inputs identified by the DoD Project Sponsor in coordination with the facility Information Technology Representative. The rack space and input ports must support a minimum of two auxiliary inputs.

12-15.2.1.3 Distribution Equipment.

Provide mixer-preamplifiers, power amplifiers, mixer amplifiers, input modules, partial octave graphic equalizers, and input selection switches for connecting program inputs to the distribution system.

12-15.2.1.4 Monitor Panel.

Provide a system monitor panel with selector switch and speaker to check each zone output, voice input, and zone selection.

12-15.2.1.5 Telephone Interface Couplers.

Provide telephone interface couplers for loudspeaker paging. The telephone interface must be coordinated with Installation Telecommunications service provider. The number and type of telephone lines provided must be based on the system configuration. There must be one unique telephone number provided for each local loudspeaker paging zone and the all-call loudspeaker paging to all zones in the system. Telephone system interface equipment must be provided as part of the PA system. Loudspeaker paging control functions such as call answer, tone announcement before the page, and automatic preset time out must be accomplished by the telephone interface couplers.

a. Coordinate and define the telephone system interface and programming requirements for loudspeaker paging access with the DoD Project Sponsor.

b. Local zone loudspeaker paging access from the telephone system must be programmed for access only from telephones within the local zone.

c. Wide area and all-call loudspeaker paging access from the telephone system must be restricted to selected telephones as defined by the DoD Project Sponsor.

12-15.2.2 Loudspeaker System.

Provide low power loudspeakers for uniform sound distribution at low volume levels. For maximum coverage, corridor speakers must be spaced apart at a maximum distance that is twice the ceiling height. Provide speakers with separate volume controls in individual rooms. Volume control and bypass relay features must be provided for paging speakers in designated areas as defined by the DoD Project Sponsor. The bypass relay must allow for all-call paging to bypass the local volume control and be audible at normal system volume. Speakers will not be provided in normally occupied spaces such as patient bedrooms, offices, exam rooms, procedure rooms, Emergency exam treatment rooms, and procedure rooms. Provide speakers that are designed to provide even sound dispersion over the 20 Hz–20 KHz frequency range within the entire speaker coverage area.

12-15.2.2.1 Indoor Loudspeaker Assemblies.

Provide cone speakers with enclosures and baffles in all indoor locations.

12-15.2.2.2 Outdoor Loudspeaker Assemblies.

Provide weather resistant cone speakers with enclosures and baffles in outdoor ceiling locations. Provide horn speakers in outdoor wall mount locations.

12-15.2.3 Microphones.

Provide the type and quantity of microphones with control switches and mounts identified by the DoD Project Sponsor in coordination with the facility Information Technology Representative.

12-15.3 System Configuration.

Provide a system configured in accordance with these specifications:

12-15.3.1 All Call Capability.

Provide an 'all zone' paging capability, which will have priority over all other paging functions in the facility except the Mass Notification System, as described in Chapter 14 Fire Protection and Life Safety. The All Call capability may be accessed via a microphone, telephone, or both. The microphone access must have priority over the telephone access for all zone types.

12-15.3.2 Local Zones.

Provide local loudspeaker paging zones for all areas and services of the facility where patients are seen for diagnosis or treatment. Local zones must be accessed using the telephone system, microphones, or both, as defined by the DoD Project Sponsor in coordination with the facility Information Technology Representative. All Call paging must override local and zone paging. The ability to control loudspeaker volume must be provided from a controlled access area inside the local zone floor space.

12-15.3.3 Medical/Dental Zoning.

Provide two separate wide area zones, one for medical and one for dental, where these services are combined in a facility. An All Call for the entire facility must be provided.

12-15.3.4 Auditorium Zone.

In a facility that has an auditorium equipped with an AV system (reference paragraph 12-17), loudspeaker paging in the auditorium must be limited to only the All Call loudspeaker paging.

12-15.3.5 Microphone Applications.

Telephone system input is the preferred method and must be provided for all systems and zones. The DoD Project Sponsor in coordination with the facility Information

Technology Representative provides guidance on the number and location of microphone stations, which must be limited.

12-15.4 System Performance.

The loudspeaker system must provide even sound distribution throughout the designated area, +/-3 decibel (dB) for the 1/1 octave band centered at 4,000 Hz. The system must provide uniform frequency response throughout the designated area, +/-3 dB as measured with 1/3-octave bands of pink noise at locations across the designated area selected by the Contracting Officer. The system must be capable of delivering 75 dB average program level with additional 10 dB peaking margin sound pressure level (SPL) in the area without causing the associated amplifier to exceed normal operating specifications for power or distortion. Unless otherwise specified, the reference SPL is 20 micro pascal. The minimum audio SPL to ambient noise ratio must be at least +15 dB in all areas. The system must not have any audible hum, noise, buzz, or rattle at a loudspeaker. The electrical/acoustic signal-to-noise ratio for the entire system must be a minimum of 66 dB.

12-15.5 Electrical Power.

PA system equipment in inpatient MTFs must be powered from the essential electrical system emergency power life safety branch per Table 12-1. AC powered equipment must be protected by a UPS unit that must provide a minimum of 15 minutes of full power during an AC power failure. All UPS units must comply with UL 1778 and 47 CFR Part 15.

12-16 SOUND REINFORCEMENT SYSTEM.

12-16.1 Purpose.

Provide distortion and noise-free, highly intelligible (per the MRT of ANSI/ASA S3.2), balanced, and evenly dispersed sound reproduction and reinforcement from multiple sources to an audience in auditoriums and large conference rooms as required by the DoD Project Sponsor.

12-16.2 Inputs.

The sound reinforcement system must accept input from multiple sources such as wired and wireless microphones, digital audio, video programming and playback devices, and PC-based programming. **\1\ /1/** The system must address the specific functions of the space where it will be located in relation to the number and types of inputs.

The major components of the system must consist of, but not be limited to:

a. Preamplifiers and power amplifiers

b. Partial octave graphic equalizers

c. Sound mixer/amplifier

d. Wired microphones with goose neck stands

e. Wired handheld microphones

f. Wireless microphones and wireless receivers

g. Compact disc (CD)/digital video disc (Blu-Ray) recorders/players

h. Auditorium wireless hearing assistance systems

i. Auditorium sound combiner and switching

j. Volume controls

k. Auxiliary input ports to support a minimum of two sources with preamplifiers and rack space for auxiliary source equipment

l. Speakers to include enclosures and baffles

12-16.3 Headroom.

Provide a system with a minimum of 3 dB of headroom.

12-17 INTEGRATED AUDIO VIDEO SYSTEMS (AV).

Provide an integrated AV system for an auditorium or a large conference center. The auditorium or conference center will have the ability to simultaneously perform all required functions in all sections of the auditorium, or in the conference center that may be divided into multiple spaces by moveable partitions.

a. Audio functions must be provided to allow for the functions described in paragraph 12-16. In addition to those functions, provide monitor speakers for the stage area. Provide for sound feedback monitoring and stabilization. Provide wireless hearing assistance systems in auditoriums with receivers for a total of 5 percent of the auditorium capacity. Provide surround sound capability.

b. Provide the ability to display video from various sources and ensure that the display will be visible from all areas of the auditorium or conference center. Provide a video feedback screen that will allow the presenter to see what is being displayed. Provide a motorized screen and data projectors or appropriate large flat-panel displays as specified by the DoD Project Sponsor and per the PRC. Provide a control room to house equipment and a control console station. Provide the capability to record and reproduce presentations.

c. Provide a control console that includes video switching capability, audio switching and mixing, pan tilt zoom (PTZ) camera controls, motorized screen control, and lighting control for the auditorium or conference center.

d. Provide the capability to control motorized screens, audio volume, recording capability, and microphones from a podium or control station.

e. Provide the capability to interface with the ITV System for the live broadcast of programs when indicated by the DoD Project Sponsor.

12-18 PHYSIOLOGICAL PATIENT MONITORING SYSTEM.

An empty conduit system with pull cords must be provided for the installation of the physiological patient monitoring system equipment and cabling. All equipment including monitors, computers, and printers must be connected to the critical branch of the EPS. A GFGI UPS must be provided by the DoD Project Sponsor and comply with the DHA Performance Standard Section 27 52.13.

12-18.1 System Requirements.

Data entry points must be monitored by a central computer. A minimum of one **\1** 4 11/16 in. (120 mm) by 4 11/16 in. (120 mm) by 2 1/8 in. (55 mm) deep back box and one 1 in. (25 mm) conduit with pull cord **/1/** must be provided from each data entry point to the communication system cable tray. Conduits with pull cords must be provided from the central physiological monitor computer location to the communication system cable tray.

12-18.1.1 Locations.

At a minimum, data entry and monitor points must be provided as specified here. Provide conduit to the printer and monitor at each Nurse Station if the system is not networked.

a. Emergency trauma rooms, exam treatment rooms and patient care stations, nurse stations

b. Patient bedrooms to include critical care, medical/surgical, L&D, and post-partum

c. Surgical Services Operating rooms with outlet located in the ceiling service console, Phase I and II post-anesthesia recovery patient care stations and nurse stations, and the anesthesia work room

d. Special Procedure rooms to include coronary, neurological or peripheral angiography, electrophysiology procedures, cystoscopy, bronchoscopy, colonoscopy, and endoscopy

e. C-Section Delivery rooms and associated recovery patient care stations

12-18.2 Fetal Monitoring.

A conduit with pull wire must be provided from each L&D patient labor and delivery room (LDR/LDRP, C-section OR), antepartum bedroom, L&D stress testing room and triage exam room, to a pull box above the ceiling at the associated Nurse Station. A minimum of one conduit with pull wire must be provided from the pull box to the Nurse Station for the monitors.

12-18.3 Neonatal Monitoring.

A conduit with pull wire must be provided from each NICU, isolation and newborn nursery bassinet location, LDR/ LDRP, and postpartum bedroom to a pull box above the ceiling at the associated Nurse Station.

12-18.4 Anesthesia and Respiratory Gas Analysis System.

Conduit with pull wire must be provided to the anesthesia workroom, where the analyzer and central processing unit are to be located, from:

a. Each OR ceiling column

b. 25 percent of the patient service consoles serving each Phase I and II post anesthesia recovery patient care station, to include isolation rooms

c. Each special procedure room at the head of the table

d. Each C-section delivery recovery patient care station service console

Conduit must be provided to the anesthesia administrative suite and to the blood gas lab for printer or cathode ray tube units. All conduit must be installed from the outlet to the cable tray system.

12-19 EMERGENCY MEDICAL SERVICE (EMS) COMMUNICATIONS.

The EMS system consists primarily of GFGI radio equipment, which is used for voice and telemetry communications with military and civilian ground and air ambulances.

12-19.1 Electrical Power.

Provide power for all radios and remote control units from the life safety branch of the emergency system.

12-19.2 Empty Conduit and Boxes.

Provide junction boxes and empty conduits with pull strings for the installation of cables. Identify system(s) and their location(s) as indicated by the DoD Project Sponsor, that must be connected utilizing the facility TIS. Provide conduits from the EMS communications equipment to the antennas mounted on the roof and conduits for coaxial and control cables from the Ambulance Dispatch to the associated head end equipment.

12-19.3 Structural Support.

Provide structural support and sufficient mounting space for the antennas.

12-20 EMS RECORDER SYSTEM.

Provide a multichannel recorder system as required by the DoD Project Sponsor for inpatient Facilities. The system must include these functions and features:

12-20.1 EMS Recorder Function and Features.

The EMS recorder must typically be installed in the Ambulance Dispatch area. The system must be used to record voice communications on selected telephone lines and all EMS radios. The telephone lines recorded must include, but are not limited to, all active lines of the Emergency Department Nurse Station and the Ambulance Dispatch telephones. The actual lines to be recorded must be defined by the DoD Project Sponsor. Two-way audio communications from each of the EMS radios must be recorded. The recorder must, at a minimum, have these features:

a. Recording media must have a minimum of 24 hours of recording capacity.

b. A minimum of ten channels plus one channel that records time in hours, minutes, and seconds for record retrieval. Channels must be calculated as one channel per each monitored telephone line, and one additional channel for each radio service monitored.

c. A microprocessor-based control system that provides system control and diagnostics.

d. A rapid search system that enables fast retrieval of time-dated information.

e. Search and playback capability from digital memory while the system continues to record the prescribed channels.

12-20.2 System Inputs and Mounting.

The system must accommodate multiple input impedances to allow recording from the varied media components. The system must be rack-mounted in a free-standing cabinet.

12-21 OTHER PROVIDED SYSTEMS.

Reference MIL-STD 1691, Section 6 for a full list of RPIE and PP systems provided on individual projects under separate funding from MILCON.

For RPIE and PP systems, provide electrical power to support the identified additional systems in accordance with the electrical code and Table 12-1.

12-21.1 Empty Conduit and Boxes and Cable Trays.

Provide junction boxes and empty conduits with pull strings for the installation of cables. Calculate cable requirements into cable tray capacity calculations and provide adequate cable tray capacity to support any of additional systems. Identify the additional

system(s) and the location(s) that is to be connected utilizing the facility TIS. Provide outlets, wiring and patch panel capacity in TRs to support these systems.

12-21.2 Structural Support.

Provide structural support and sufficient mounting space for the antennas.

12-21.3 Equipment Space Support.

Provide floor space, port capacity, rack space, etc. as required to support these systems. Include this equipment in the Server Room (CMP01), head end equipment room (COM04) and Telecommunications Room Floor Space Calculations as required.

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CHAPTER 13 ACCESSIBILITY PROVISIONS FOR THE DISABLED

13-1 GENERAL.

This chapter provides design guidance on the application of accessibility provisions within DoDM MILCON. All applicable facilities must be designed and constructed to be accessible to persons with physical disabilities in accordance with the ABA Accessibility Standard for DoD Facilities (DoD Standards) and implemented by DoD Policy Memorandum (Subject: Access for People with Disabilities) dated 31 October 2008.

13-2 GENERAL EXCEPTIONS.

Sites, buildings, and facilities are exempt to the extent specified by the ABA Accessibility Standard for DoD Facilities (DoD Standards).

13-3 DOD EXCEPTIONS/EXCLUSIONS.

Facility exceptions and exclusions to the DoD Standards are outlined in the DoD Policy Memorandum.

13-4 SPECIFIC MILITARY MEDICAL FACILITY REQUIREMENTS.

13-4.1 Parking.

Provide accessible parking and passenger loading zone facilities as required by paragraphs F208.2.1, Hospital Outpatient Facilities; F208.2.2, Rehabilitation Facilities and Outpatient Physical Therapy Facilities; F209.3, Medical Care and Long-Term Care Facilities; and complying with Section 502, Parking Spaces, and Section 503, Passenger Loading Zones, of the DoD Standards.

13-4.2 Patient Sleeping Rooms.

All patient bedrooms (sleeping rooms) and bedroom toilet rooms are to be accessible. Turning space, clear floor or ground space, and toilet and bathing rooms within patient sleeping rooms are to comply with Section 805, Medical Care and Long-Term Care Facilities, of the DoD Standards.

13-4.3 Patient Dressing Rooms.

All patient dressing rooms are to be accessible and located on an accessible route. In renovation projects, where structurally impracticable to make all dressing rooms accessible, one patient dressing room for each sex (or a unisex) on each accessible floor or level are to be made accessible.

13-4.4 Telephones.

If pay telephones are provided, comply with Section F217, Telephones, of the DoD Stand

13-5 WAIVERS.

Any other deviation from the ABA Accessibility Standard for DoD Facilities must be made through the waiver process in accordance with the DoD Policy Memorandum.

CHAPTER 14 FIRE PROTECTION AND LIFE SAFETY

14-1 GENERAL.

This chapter provides policy and design guidance related to fire protection engineering and life safety for applicable facilities.

14-2 FACILITY FIRE PLAN.

Prepare the facility fire plan (as defined in NFPA 99) in accordance with the minimum requirements for “emergency action plan” in NFPA 101, which includes direct participation by designated stakeholders from the Installation, in order for a complete design to be executed and delivered.

14-3 LIFE SAFETY COMPLIANCE FOR BUILDING REHABILITATION.

Building rehabilitation will comply with the minimum requirements established in the chapter for “Existing Facilities” of UFC 3-600-01 as well as the contents of this section. For all projects involving rehabilitation work in facilities with either health care or ambulatory health care occupancies, where the classification of the work category includes extensive modification; reconstruction; changes of use; changes of occupancy classification; or addition in accordance with NFPA 101, the DoD Project Sponsor may evaluate existing facilities in accordance with the conditions established in this section to determine and document the original level of fire protection and life safety afforded the occupants in a report as part of the project initiation process.

14-3.1 Life Safety Assessment.

The preparation of a Life Safety Assessment (or LSA) is required for all projects in accordance with paragraph 14-3. Provide the LSA, including life safety plans, to the DoD Project Sponsor as well as to the facility for upload to the TJC electronic Statement of Conditions (eSOC) account as required to assist in the accreditation process at beneficial occupancy. For the purposes of meeting the requirement to prepare the LSA, the DoD Project Sponsor may require that the preparer of the LSA meet not only the minimum qualifications for the “Qualified Fire Protection Engineer” in UFC 3-600-01 but also has a minimum of seven years of experience in the design and review of medical facilities.

14-3.2 Health Care and Ambulatory Health Care Occupancies.

For health care and ambulatory health care occupancies as established by NFPA 101, it is acceptable to use a copy of the most recent TJC eSOC or Life Safety Assessment, provided either one has been updated within 12 months or less prior to project initiation for this specific facility.

14-3.3 Interim Life Safety Measures.

Develop and implement a specific set of safety measures, also referred to as Interim Life Safety Measures (or ILSMs) by TJC. Such safety measures consist of a series of administrative actions intended to temporarily compensate for significant hazards posed either by existing fire protection or life safety deficiencies to NFPA 101 or by such hazards resulting from construction activities. The ILSMs will be incorporated into the accompanying report to assist the project delivery team with scope of work development, design development, and construction execution.

14-4 AUTOMATIC SPRINKLER PROTECTION.

Provide automatic sprinkler protection as required by UFC 3-600-01, except as modified below in this section.

14-4.1 Components and Hardware.

Provide components and hardware for automatic sprinkler protection in accordance with UFC 3-600-01 unless otherwise modified herein.

14-4.1.1 MRI Shielded Enclosures.

Provide non-ferrous piping for all areas of MRI shielded enclosures.

14-4.1.2 Behavioral Health.

Provide quick-response “institutional sprinklers” throughout the fire compartment(s) or floor(s) in behavioral health areas that require hard ceilings (for example gypsum wallboard or plaster) and, these sprinklers must have the following performance characteristics.

a. Tamper-resistant features designed to make them more suitable than other types of sprinklers for installation in environments where vandalism is a concern, in order to reduce the likelihood of false activation and the possibility of the escutcheon (or any components of the sprinkler itself) from being removed and used as a weapon.

b. Ligature-resistant features designed to reduce the likelihood of attaching heavy loads to the sprinkler assembly and being able to use any component as an anchor point prior to failure of the sprinkler assembly.

c. However, in such areas with suspended ceilings (for example lay-in acoustical tile), develop and implement additional safeguards with approval from the Design and Construction Agent.

14-4.2 Audiometric Booths.

Extend automatic sprinkler protection into audiometric booths 16 sf (1.5 sm) or greater in area.

14-4.3 Defend in Place.

Where buildings are required to be separated into smoke compartments (as established by NFPA 101), subdivide and electronically supervise the automatic sprinkler protection accordingly (per smoke compartment). Provide all piping for automatic sprinklers in a given smoke compartment as one system and electronically supervise each compartment (or zone) using a dedicated control valve assembly (with associated check valve, waterflow indicator, and tamper supervision).

14-5 FIRE ALARM, FIRE DETECTION, AND MASS NOTIFICATION.

Provide fire alarm and fire detection, as required by UFC 3-600-01, and mass notification, as required by UFC 4-010-01, except as modified below in this section.

14-5.1 Autonomous Control Unit and Local Operating Console.

Provide autonomous control units (or ACUs). However, due to the nature of operations in medical facilities, provide accompanying local operating consoles (or LOCs) as directed by the Design and Construction Agent. Also, do not provide LOCs in normally unoccupied building service equipment support areas (or NUBSESAs) as established by NFPA 101.

14-5.2 Occupant Notification.

Provide occupant notification in accordance with NFPA 72 and NFPA 99 unless otherwise modified herein.

14-5.2.1 Direct Viewing.

Provide visual notification appliances in direct view of all exits, all nurses' stations, and at all locations, such as in mechanical equipment rooms, where the operating noise level exceeds the level of the audible alarm as permitted by NFPA 72.

14-5.2.2 Audiometric Booths.

Provide visual notification inside of an audiometric booth except where visual notification already being installed outside of the booth can be seen from an occupant within the booth.

14-5.2.3 Private Operating Mode.

Provide occupant notification, where the defend-in-place strategy is employed, in accordance with this subsection.

a. Permit the use of private operating mode, as defined and established in NFPA 72, in all facilities, excluding those facilities not rendering medical treatment to patients, for example, medical warehouses, central utility plants, and telecommunication buildings.

b. Carefully review and incorporate occupant notification, where the private operating mode is used, during the design, with a special emphasis on the additional duties, responsibilities, and associated training expected for the staff at the facility to learn and maintain.

c. Provide audible notification for all facilities in accordance with NFPA 72, except within Category 1 spaces (as defined in NFPA 99), such as surgical operating rooms, critical care rooms, or similar areas, where alarm activation is likely to cause injury or death to a patient.

d. Upon operation of a fire alarm initiating device, notify staff and occupants only in the zone of alarm origin via audible signaling using three-pulse temporal pattern, visible signaling, and textual signaling (where mass notification is either required or is being provided).

e. Simultaneously transmit a voice message to the rest of the building (and other buildings) as necessary in an effort to notify enough staff to respond to the zone of alarm origin. Do not activate visible appliances outside of the zone of alarm origin.

f. Subsequent activations of initiating devices in the same zone of alarm origin will not initiate any new alarm outputs but will appear at the fire alarm control unit and printer. Subsequent to the original alarm, activation of initiating devices in a different zone will initiate the audible three-pulse temporal signal and other related visual and textual notification appliances in the new zone and will initiate a new voice message to the locations, as determined above, to identify the new location of alarm.

g. Program both audible and visual signals to continue to operate for five minutes or until the system is acknowledged and silenced by an operator. Only activate the visual notification appliances in the zone of alarm origin and not in the zones where the voice message is used.

h. The voice message is to be preceded by a tone alert and must be announced with no less than three rounds of it to bring staff to the zone of alarm origin.

i. Manual operation of the voice system will override all automatic voice messages in the system.

14-5.3 Smoke Detection Used in Conjunction with Smoke Compartmentation.

Where smoke detectors are provided to hold doors open between smoke compartments, provide them on both sides of the opening between smoke compartments. Program such smoke detectors for their respective zone to initiate the proper alarm as well as to close the door(s) served.

14-5.4 Behavioral Health.

Provide institutional-style manual pull stations in behavioral health areas, where keys are used to operate or lock covers.

14-6 MANAGEMENT OF SMOKE.

Provide smoke management and control systems in accordance with NFPA 92 and the appropriate sections of NFPA 101.

14-6.1 New Smoke Control Systems.

Zoned smoke control systems, as defined in NFPA 92, are not required for new projects.

14-6.2 Existing Smoke Control Systems.

Existing smoke control systems must comply with NFPA 92 or at the time of contractual acquisition of the system(s). Decommission zoned smoke control systems not in compliance with NFPA 92.

14-7 WATER SUPPLY.

Where the seismic chapter in this UFC requires on-site storage to be provided, design the secondary water supply to meet the largest expected demand for fire suppression purposes.

14-8 INTERSTITIAL BUILDING SYSTEM (IBS).

Comply with the related appendix in this UFC for projects incorporating IBS design concepts.

14-9 SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY.

This section provides specific criteria for medically unique occupancies and hazards. However, when this section does not otherwise address a particular occupancy or hazard, comply with NFPA 101.

14-9.1 Dental Treatment.

The following rooms are used to perform treatment or provide anesthesia, or both, which render the patient incapable of taking action for self-preservation under emergency conditions without assistance of others in facilities providing dental treatment:

a. Dental Treatment Room, Comprehensive [DNTC1]

b. Dental Treatment Room, Periodontics [DNTP2]

c. Dental Treatment Room, Oral Surgery [DNTS1]

d. Dental Treatment Room, Recovery [DNTR1] when provided in support of one of the above rooms.

When more than three of any combination of patient chairs, either in dental treatment rooms or associated recovery rooms, are located in a single facility; an occupancy classification of ambulatory health care is considered present and must be applied to either the entire facility or the portion(s) thereof containing these rooms.

14-9.2 Research Facilities.

Comply with the minimum requirements in NFPA 45 for laboratories where chemicals are used or handled. Comply with the minimum requirements of NFPA 2 in laboratories where hydrogen is used or handled.

14-9.2.1 Flame Spread and Smoke Developed Indices.

Provide and document flame spread and smoke developed indices for the interior finish installation for all walls, ceilings and floors in laboratories categorized as either Biosafety Level 3 (BSL-3) or Biosafety Level 4 (BSL-4), as established in Biosafety in Microbiological and Biomedical Laboratories, to ensure compliance with NFPA 101.

14-9.2.2 Spot-Type Photoelectric Detection.

Provide spot-type photoelectric smoke detection throughout laboratory spaces in facilities where laboratory function protocol requires occupants to be suited, for example, wearing positive-pressure, supplied-air protective suits.

14-9.3 Veterinary Care and Animal Research Facilities.

Throughout animal housing facilities classified as Animal Health Care (Category 1) or Research (Category 3), comply with the minimum requirements in NFPA 150 except as modified in this section. Since UFC 3-600-01 establishes that NFPA 5000 must not be used in projects for DoD, all references to NFPA 5000 in NFPA 150 are instead to be considered references to UFC 3-600-01, which identifies NFPA 101.

a. With regard to the provision of occupant notification, assume that evacuation of animals is not practical in animal research facilities (subclassified as Category 3 by NFPA 150).

b. Where fire alarm notification would adversely affect the needs of the animals and occupants subject to approval from the Design and Construction Agent and where private mode is already being employed, provide alternative notification devices (for example private-mode flashing lights or beacons) in animal areas.

14-9.4 Pharmacy Storage.

Storage spaces of pharmacies, including receiving areas and main shelving spaces, within health care and ambulatory health care occupancies are considered hazardous areas as defined by NFPA 101. Separate such storage spaces within pharmacies using one-hour fire-rated construction. Where pharmacy storage spaces are open to dispensing or other pharmacy work areas, provide the one-hour fire-rated separation at the pharmacy perimeter walls.

14-9.5 Areas with Heat-Producing Appliances.

Apply the minimum requirements from NFPA 101 for “special hazard protection” to any area(s) being served by Bunsen burners, which includes providing smoke partitions having passive fire protection features, such as automatic or self-closing door assemblies and protection of penetrations to limit the transfer of smoke.

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CHAPTER 15 FURNITURE, FIXTURES AND EQUIPMENT

15-1 GENERAL.

This chapter provides guidance on furniture, fixtures, and equipment (FF&E) for facilities. FF&E procurement and installation responsibility for project planning and execution must be in accordance with MIL-STD-1691 and this chapter. These sources provide a uniform basis to identify items of construction and material, and to identify logistical and financial responsibility.

15-1.1 IDENTIFICATION of FF&E.

The DoD Project Sponsor develops a PRC report of FF&E using the SEPS program report module. The determination of FF&E requirements must be made not later than the end of the 20% design period or final Request for Proposal (RFP) submission timeline, depending on project delivery method, and must be complete by the time the floor plan is locked. Consideration to reuse FF&E are dependent on the age, condition, remaining service life, and other maintenance considerations to the extent practical for the project. Final decisions on FF&E acquisition or reuse in support of all Initial Outfitting (I/O) activities must be completed as late as possible in project development but scheduled to align with facility operational milestones and project delivery method.

15-1.2 APPROVAL of SUBSTITUTIONS.

When design and space planning changes necessitate substitution of FF&E, the Design and Construction Agent must coordinate change details with the DoD Project Sponsor. When the substitution results in a change in the Logistical Category (LOGCAT) or equipment funding source as defined in the MIL-STD-1691, the change is coordinated with the DoD Project Sponsor.

15-2 PROCUREMENT.

Provide FF&E in accordance with MIL-STD-1691 and applicable project specific guidance. Procurement includes applicable manufacturer’s literature for installation, user operation and service/maintenance (including schematics). The DoD Project Sponsor determines which items of existing FF&E transfer to the new, altered, or temporary facility whenever feasible and economical.

15-3 FUNDING SOURCE

The Funding Source identifies the appropriation fund used to program, purchase and install building systems, FF&E, and control systems in Defense Health Program (DHP) project delivery. There are two property designations: “RPIE” (Real Property Installed Equipment), which are resources using “Project Funds”, and “PP” (Personal Property, sometimes referred to as operational equipment), generally referenced as “Initial Outfitting and Transition” or IO&T funds. Use of appropriations for outfitting of facilities is prescribed in Federal Management Regulation (FMR) Volume 03, Chapter 17.

15-4 LOGISTICAL RESPONSIBILITY.

Equipment is procured and installed in accordance with the LOGCAT as defined in the MIL STD 1691 Policy, and this document. The policy document can be found on the World Class Facility Toolkit.

The LOGCAT codes shown in Table 15-1 are used to identify procurement and installation responsibility. The responsibility column contains the acronym used to identify responsibilities of Government and Contractor relative to procurement and installation. The description column provides a definition of the LOGCAT code.

Table 15-1 Logistical Responsibility (LOGCAT)

LOGCAT	Responsibility	Description
A	CFCI	Contractor Furnished Contractor Installed. Equipment purchased and installed by the construction contractor.
B	GFCI	Government Furnished Contractor Installed. Equipment purchased or provided by the Government (or entity conducting business on behalf of the Government) and installed by the construction contractor.
C	GFGI	Government Furnished Government Installed. Equipment is provided by the Government and installed by the Government (equipment vendor, Initial Outfitting contractor).
D	Leased (VFVI)	Vendor Furnished Vendor Installed. Leased or rented equipment, arranged by the Government, or any similar type arrangement requiring special funding and/or condition.
R	GFCI or GFGI	Reuse. Transferred and reused equipment assets. May be Government Furnished Contractor Installed or Government Furnished Government Installed

15-5 DESIGN.

15-5.1 Casework.

All built-in casework must be fabricated and designated by materials, construction methods, and fabrication that align with the highest grade quality and infection control standards for casework for use in high-performing healthcare building applications. Typical industry standards for medical/laboratory grade materiel applied in the absence of project specific requirements/guidance. Corrosion resistant steel (CRS) or other nonporous, seamless joint casework are mandatory in these areas: operating and C-section rooms; their sub-sterile and clean-up areas; laboratory (as required by the DoD Project Sponsor); central sterile supply, decontamination and clean-up areas (including Dental); Autopsy and its associated clean-up areas.

Movable, modular (“systems”) casework systems may be used in projects deemed appropriate by the DoD Project Sponsor.

15-5.2 Technically Complex Equipment and Medical System.

Planning for and inclusion of complex medical technologies, to include but not limited to linear accelerators, positron emission tomography (PET), lithotripsy units, MRI systems, hyper and hypo baric chambers, robotic surgical systems, and automated product delivery systems, in a MILCON project is the responsibility of the DoD Project Sponsor. Design must be in accordance with the appropriate Code of Federal Regulations (CFR), National Council on Radiation Protection and Measurements (NCRP) guidelines, associated non-governmental standards for unique technologies, the recommendations and guidance of the respective manufacturer, Facility Guidelines Institute (FGI) and other federal entities as applicable. Close coordination by the DoD Project Sponsor, design team, and manufacturer’s technical representatives is critical to ensure staff and patient safety measures are in place, and all clinical functionality and capability is met.

15-5.2.1 Shielding Requirements.

When equipment or systems require shielding to minimize exposure to primary and secondary radiation, the DoR is responsible to include on the design team a qualified expert (medical or health physicist) who is regularly engaged in the design of radiation shielding, and certified by American Board of Radiology, American Board of Medical Physics, American Board of Health Physics, or Canadian College of Physicists in Medicine. The using MilDep’s Health Physicist or their qualified representative must be consulted during the early planning and/or design stages to ensure all aspects of the design, both clinical and technical, are met, and shielding reports are retained by the DoD Project Sponsor for audit purposes.

The Construction Contractor is responsible for the shielding system installation and integrity certification by a qualified expert. It is highly recommended that the Construction Contractor consult with the using MilDep’s Health Physicist or their qualified representative during design and construction to ensure continuity from planning and design through final building acceptance.

15-5.3 Equipment Connectivity.

The project delivery team (PDT) must work closely with Health Information Technology and Logistics staff early in planning and throughout the design and construction phases to make every effort to comply with cybersecurity requirements for Facility-Related Control Systems and Medical Devices and Equipment. The design for equipment and utilities that support active and passive medical devices must comply with the Standard Isolation Architecture for Cybersecurity of Medical Devices and Equipment (MDE) as well as cybersecurity principles based on medical cybersecurity industry best practices.

15-5.4 Automatic External Defibrillator (AED).

The location and number of recessed or semi-recessed Automatic External Defibrillator (AED) cabinets is determined during project design. The DoR is responsible to ensure quantity, placement, and all appropriate markings (signage) are shown in the final design solution. The DoR coordinates with the Design and Construction Agent and DoD Project Sponsor clinical representative to ensure adequate placement and facility coverage.

15-5.5 Hyperbaric Medicine.

Hyperbaric oxygen therapy is used as an adjunct to the clinical and surgical treatment of wounds and certain diseases. It consists of administering oxygen to the patient at pressures greater than 1 atmosphere (atm) in a compressed air multi-person chamber or oxygen mono-chamber. The DoD agency responsible for design requirements and certification is the Naval Facilities Engineering Command. This agency is available to assist the Design and Construction Agent, DoD Project Sponsor, and DoR as needed. Reference UFC 4-159-01N.

CHAPTER 16 TRANSPORTATION AND LOGISTICS

16-1 GENERAL.

This chapter provides guidance for the study, selection, and design of transportation and logistics systems including but not limited to; elevators, escalators, dumbwaiters, material delivery equipment (automatic guided vehicles [AGVs] and Autonomous Mobile Robots [AMRs]), pedestrian traffic, service cart systems, pneumatic tube station (PTS), gravity and pneumatic chute return systems for linen and trash, and Central Material Management Systems in CAT 500 facilities. The elevator UFC 3-490-06, in conjunction with criteria in this chapter, establish minimum design requirements. In the event of conflict this UFC is the ruling criteria.

16-1.1 Scope.

This chapter applies to horizontal and vertical circulation within facilities, and the transportation devices, equipment, and methodologies required for efficient, cost-effective, and timely movement of people, equipment, materials, and related materials-management logistical functions. Addition/alteration projects are to meet these guidelines to the extent practical and provide a holistic design approach in addressing correction of existing facility shortcomings.

This chapter does not prescribe when systems are required or where they should be employed. Table 16-1 prescribes when different technical analyses are required based on a facility's size; depending on the results of the analysis different transportation systems may be required. It is the responsibility of the DoR to develop a holistic and efficient design incorporating the DoD Project Sponsor's operational and functional needs.

16-1.2 Transportation Systems Evaluation.

For all projects requiring a Transportation Logistics Analysis (TLA) as described in paragraph 16-2.1, the Design and Construction Agent must ensure the services of a qualified Medical Transportation and Logistics Consultant (MTLC) are included in the request for planning and architectural services. The MTLC must be an integral part of the design team and be involved in every aspect of the design as it relates to transportation and logistics. This includes, but is not limited to, departmental adjacencies, vertical and horizontal circulation, facility logistics, and waste management. Refer to Table 16-1 for project analysis requirements.

The Design and Construction Agent must ensure all transportation and material handlings systems selected are procured, installed, and commissioned in accordance with design documents and applicable codes and standards.

16-1.3 Medical Transportation and Logistics Consultant.

A qualified MTLC to the DoR is an individual who has received comprehensive training and experience in the areas of materials management, food and nutrition, solid waste

management, horizontal and vertical transportation, central sterile processing, and materials handling for a period of not less than five years. These services should be specific to transportation and logistics and must be documented. The MTLC must demonstrate prior experience on projects that relate to the scope and nature of the project to include OCONUS locations, if applicable. The MTLC must not be involved in the sale, installation, distribution, manufacture, or representation of conveyance or material management equipment.

Table 16-1 Analysis Requirements

Analysis	Facility Characteristic
TLA	Any facility >200,000 BGSF (18,580 BGSM) All major renovations and new construction of ambulatory care clinics, hospitals, and medical centers
ETSA	All facilities >1 story
MMA	All facilities >100,000 BGSF (9290 BGSM)
WMA	All facilities >100,000 BGSF (9290 BGDM)
Notes: Facilities include medical and dental clinics, research and laboratory buildings, ambulatory care clinics, ambulatory surgery centers, hospitals, and medical centers.	
ETSA	Elevator Traffic Study and Analysis
MMA	Material Management Analysis
TLA	Transportation Logistics Analysis
WMA	Waste Management Analysis

16-2 TRANSPORTATION AND LOGISTIC ANALYSIS REQUIREMENTS.

Different transportation and logistics analyses are required for facility designs as indicated in Table 16-1. These analyses must address the transportation, logistics, and waste management requirements of the project as required by this document. When required by Table 16-1, the different analyses must be submitted with the Design Analysis narratives beginning with the initial design submission and through the final design submission.

16-2.1 Transportation Logistic Analysis.

The MTLC must prepare a TLA in accordance with **\4** Table 16-2. **/4/** The analysis must take into account total staff and patient travel times and travel distance with the objective of minimizing both travel times and distances to achieve higher staff efficiencies and lower patient environmental exposure.

16-2.1.1 TLA Requirements.

The TLA must address all aspects of a facility's transportation, logistics, and waste management methodology to include but not limited to; traffic demand, vertical and horizontal travel distances, mix of traffic type in the areas to be served, mode of containerization, and items specifically addressed in the other studies. The TLA must document the following:

a. Elevator Traffic Study and Analysis (ETSA). Reference paragraph 16-2.2.

b. Material Management Analysis (MMA) to include a comparison of automatic vs. manual material handling systems. Automatic systems include: AGVs, AMRs, PTS, and pneumatic chutes in addition to other or newer technologies. Reference paragraph 16-2.3.

c. Waste Management Analysis (WMA). Reference paragraph 16-2.4.

d. Life cycle cost analysis (LCCA) to be used to evaluate the alternatives and to determine the appropriate system.

e. The MTLC to sign the TLA certifying the information contained therein is accurate, vendor neutral, and based on empirical data.

f. The TLA to take into account the existing transportation systems and processes for addition/alteration projects.

g. The TLA to describe in detail the MTLC recommendations to maximize the transportation and logistics efficiencies and how the recommendations are implemented into the design.

h. The TLA to focus on defining process methodologies that optimize spatial adjacencies and minimize overall patient, staff, and material movements in design.

i. When required by the Design and Construction Agent, the TLA to include the use of simulation to more accurately analyze and optimize departmental adjacencies and horizontal and vertical transportation solutions.

16-2.1.2 TLA supporting documents.

Base the TLA on:

a. Empirical data provided by the DoD Project Sponsor.

b. Site visits to an existing facility identified by the DoD Project Sponsor.

c. Data including site constraints, Design CONOPS (including CONOPS for the logistical departments like food service, linen and waste management, materials management, housekeeping, pharmacy, central sterile supply) and projected workload for the new facility.

d. Elevator loading density and the load/unload time based on site visits to account for unique conditions at a facility and the cultural aspects of the area, for example, amount of “personal space” required by individuals, number of visitors per patient, number of escorts or companions accompanying outpatients.

16-2.2 Elevator Traffic Study and Analysis.

Prepare the ETSA to determine the appropriate types, locations, sizes, speeds, and groupings of elevators that result in a cost-effective and efficient operation.

16-2.2.1 ETSA Requirements.

The ETSA must document the following:

a. ETSA to be prepared by an independent elevator consultant on all ambulatory care clinics, hospitals, and medical centers.

b. Conformance to Chapter 16, specifically paragraphs 16-3 and 16-4.

c. A description of the elevator systems proposed (each elevator type should be broken down separately based on types per Table 16-4), function, travel, stops, building population, handling capacity, interval, etc.,) including an analysis with drawings of the walking distances, elevator types, and locations as described in paragraph 16-4.3. Prohibit the use of general terminology of “electric traction”. MRL elevators are to be separate and specifically identified. Otherwise, the default for language associated with electric traction would be geared or gearless traction with machine room.

d. The population (number of working and visiting population within the facility).

e. The number and average size of material movements within the facility.

f. The peak hours of vertical transportation, including but not limited to: Morning Shift Change Peak (primarily a peak period in upward travel), Lunch Peak (heavy two-way traffic), Afternoon Shift Change Peak (primarily a peak period in downward travel, with moderate opposing traffic).

g. The elevator loading densities used for each proposed elevator for working and visiting population, for example, pedestrians, person on crutches/walker, wheelchairs, gurneys, beds, and carts. Include extra “spare capacity” when determining the aggregate elevator cab size.

h. In determining the proposed elevator speeds provide:

i. The handling capacity calculations

j. The assumed population load/unload times

k. The proposed elevator wait and response times

Table 16-2 Elevator Performance Guide

Table presents minimum acceptable elevator performance based on elevator type and building type.

PASSENGER ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Hospital, medical center, or ambulatory surgery center	30 to 35 Seconds	13 - 15% of the calculated building elevator population for the area served (plus 20% migration for multiple elevator groups)
Medical clinic, dental clinic, or ambulatory care clinic	35 to 40 Seconds	11 - 13% of the calculated building elevator population for the area served (plus 20% migration for multiple elevator groups)
Research or laboratory building	40 to 45 Seconds	11 - 13% of the calculated building elevator population for the area served (plus 10% migration for multiple elevator groups)
Admin building	40 to 45 Seconds	10 - 12% of the calculated building population
Parking garage	45 to 50 Seconds	110% of the calculated elevator population for the area serviced
Notes:		
1	Passenger elevators are intended for use by the public. (See paragraph 16-4.2 and **\4** Appendix I **/4/** for definitions)	
2	Passenger elevators to be Class “A” loading as a minimum	

PATIENT SERVICE ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Hospital, medical center, or ambulatory surgery center	35 to 40 Seconds	115% of the calculated traffic
Medical clinic, dental clinic, or ambulatory care clinic	40 to 45 Seconds	110% of the calculated traffic
Notes:		
1	Patient Service elevators are intended for use by staff movement and for the transport of bed-bound inpatients. (See paragraph 16-4.2 and **\4** Appendix I **/4/** for definitions)	
2	Service/Staff elevators to be Class “C3” as a minimum	

MATERIALS HANDLING SERVICE ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Hospital, medical center, or ambulatory surgery center	35 to 40 Seconds	13 -15% of the calculated elevator population for the area served (plus migration)
Medical clinic, dental clinic, or ambulatory care clinic	40 to 45 Seconds	11 - 13% of the calculated elevator population for the area served (plus migration)
Research or laboratory building	45 to 50 Seconds	11 - 13% of the calculated elevator population for the area served (plus migration)
Notes:		
1	Logistics elevators are intended for use by staff for material and equipment movement. (See paragraph 16-4.2 and **\4** Appendix I **/4/** for definitions)	
2	Logistics elevators to be Class “C1” as a minimum	

MATERIALS HANDLING SERVICE ELEVATORS			
Building Type	**Average Interval Required**		**Handling Capacity**
3	Average Loading Density. An average person will require about 3 sf (0.28 sm) of floor area to feel comfortable (18 in. (460 mm) body depth x 24 in. (610 mm) shoulder breadth). Reference paragraph 16-2.2.1(g).		
4	Normal Loading Density. Normal loading to be based on 2.3 sf (0.21 sm) per person which is generally accepted as the norm for crowded elevators. Reference paragraph 16-2.2.1(g).		
5	Extreme Loading Density. Extreme loading to be based on 1.5 sf (0.14 sm) per person. Reference paragraph 16-2.2.1(g).		
6	Door Opening Speed. Passenger and Service elevator door operator to be capable of opening doors at the rate of 2.5 fps (0.76 m/s), with actual speed being adjusted to meet requirements of the specific installation.		
7	Door Closing Speed. Closing speed to be 1 fps. All power operated doors to be equipped with an automatic reopening device for passenger protection.		
8	Average Interval Performance Standards	PASSENGER ELEVATOR (General Hospital) Excellent – 30 to 35 Good – 35 to 40 Fair – 40 to 50 Poor – Over 50	SERVICE/PATIENT ELEVATOR (General Hospital) Excellent – 40 to 45 Good – 45 to 55 Fair – 55 to 60 Poor – Over 60
9	Average Handling Capacity Performance Standards		Excellent – Over 14% Good – 12 to 14% Fair – 10 to 12% Poor – Under 10%

16-2.3 Material Management Analysis (MMA).

Material to be manually moved throughout a facility unless the designer can show an automated system is physically, safely, and economically justified. The specific systems included in a project must be determined by detailed physical, functional, and economic factors including LCCA. Prepare the MMA to determine the appropriate types, locations, sizes, speeds, and design of MMA that result in a cost-effective and efficient operation.

16-2.3.1 MMA Requirements.

The MMA must document when the DoD Project Sponsor does not require an automated system and continue no further. When required, the MMA must document the following:

a. Conformance to Chapter 16, specifically paragraphs 16-3 and 16-5.

b. Proposed automated systems including but not limited to AGV, PTS, and mobile robots.

c. The users of the proposed systems.

d. The number of Full-Time Equivalent (FTE) on staff for the movement of materials.

e. Location, size, speeds of proposed systems.

f. Specific requirements for each type of system, for example, dry vs. wet PTS.

g. An LCCA comparing manual movement vs. proposed alternatives.

16-2.4 Waste Management Analysis (WMA).

The preliminary design of a waste management system requires consideration of the operational and mission characteristics of the facility, the existing waste disposal practices of the facility or base/post, the governmental regulations affecting the design, and the costs and application of system handling and disposal technologies.

16-2.4.1 WMA Requirements.

When required, the WMA must document the following:

a. Conformance to Chapter 16, specifically paragraphs 16-3 and 16-6.

b. Determination of the waste stream components and soiled linen types.

c. Estimation of waste and soiled linen volumes.

d. Concepts for segregation, holding at the generating departments, and central bulk holding.

e. Space, utility, and life safety requirements for departmental holding rooms.

f. Concepts for collecting and transporting waste and soiled materials within the facility.

g. Soiled dock arrangement, layout, and equipment.

h. Waste Management Center (WMC) space, layout, equipment, and support utility requirements.

i. Concepts for the disposal of each waste category.

j. Proposed Waste Management Systems including, but not limited to, gravity chutes and pneumatic trash/linen systems.

k. Life-cycle costing studies including Regulated Medical Waste (RMW) processing equipment.

l. Aspects of RMW processing; O&M, safety, infection control.

m. Accommodations for empty wood pallet(s) storage and pick up area

16-3 FACILITY DESIGN.

Transportation and logistics requirements must be integrated into the overall facility design. Design the overall floor plan and circulation to provide the most direct routing practical. Separate different types of traffic as required in paragraph 16-3.1.

16-3.1 Traffic Separation.

Establish traffic patterns to separate the various traffic types in an efficient, logical, safe, and secure manner, while maintaining levels of aseptic control consistent with the requirements of the facility. Consider all of these factors for separation for horizontal and vertical circulation: patient privacy; accessible access; aseptic control; routing efficiency; utilization of appropriate hardware systems, safety, and security. Where circulation conflicts occur, prioritize traffic as listed here:

a. Patient

b. Staff

c. Equipment

d. Visitors

e. Materials/logistics (may be combined use – supply elevators with staff)

16-3.2 Transportation Systems.

The DoR must consider traffic demand, vertical travel distance, mix of traffic type in the areas to be served, and mode of containerization. Traffic demand and vertical travel distance must determine equipment type and speed required. Traffic mix and mode of containerization must determine load capacity, platform size, configuration, and door type.

16-3.3 Vertical Automation.

Systems designed exclusively for vertical only transportation of materials on carts must use elevators, guide path, and other devices, as applicable. Designs must consider future upgrade to allow horizontal travel.

16-3.4 Equipment/Materials Separation.

Separate the equipment/materials traffic from patient and visitor traffic as noted on the Elevator Traffic Separation Guide, Table 16-3, which presents recommended arrangement of elevators by facility configuration and mission. Where separate elevators are not required, separate the materials traffic by schedule and policy. Maximize separation between visitor/patient and staff/materials/logistics. Primary horizontal materials circulation should occur on a single level, with vertical penetrations that are convenient to heavy use areas. Do not move AGVs, carts, pallet trucks, and similar material carriers long distances on floors and corridors routinely traveled by patients or visitors. Use two (or more) single elevators in distributed areas if traffic needs dictate more than one service/AGV elevator.

16-3.5 Clean and Soiled Material Separation.

Materials management programs must provide for clean and soiled separation consistent with all applicable codes and standards, including those of TJC.

16-3.5.1 Soiled Material.

Soiled materials are normally transported in separate covered or closed carts designed to provide containment of the material and to maintain infection control. Soiled material transport may occur in the same corridor and elevator systems that handle other traffic. However, soiled materials are not transported on the same elevator at the same time with patients, visitors, or clean or sterile materials. Transport circulation design must allow soiled carts to be properly washed prior to reuse as a soiled container and washed and sanitized prior to use for transporting clean materials.

16-3.5.2 Sterile Material.

Transport all sterile material for use in Surgery, Catheterization, and Labor/Delivery or other areas requiring sound aseptic controls from the sterile processing/storage area to its destination via a clean route that must not compromise the integrity of the material. Where case carts are used, they must be transported from sterile storage to the clean surgical core by means that protect the cart and its contents from contact with less clean environments.

16-3.6 Escalators.

Escalators may be considered if justified by traffic studies. Design escalators in accordance with all applicable codes, including UFC 3-490-06, IBC and ASME A17.1, A17.3, and A17.5.

Table 16-3 Elevator Traffic Separation Guide

Facility Characteristics	Facility Types				
	Hospital, medical center, or ambulatory surgery center	**Medical clinic, dental clinic, or ambulatory care clinic**	**Research or laboratory building**	**Admin building**	**Warehouse or parking garage**
Facilities <50,000 BGSF (4645 BGSM)	Separate Passenger. Separate Inpatient. Separate Materials Traffic	Combine regardless of traffic types	Combine regardless of traffic types	Combine regardless of traffic types	Combine regardless of traffic types
Facilities >50,000 but <100,000 BGSF (>4645 BGSM but < 9290 BGSM)	Separate Passenger. Separate Inpatient. Separate Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic
Facilities >100,000 but <200,000 BGSF (>9290 BGSM but < 18580 BGSM)	Separate Passenger Traffic. Separate Inpatient Traffic. Separate Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic	Separate Passenger. Combine Materials and Special Use Traffic	Combine elevators or Separate Passenger and Materials Traffic	Not Applicable
Facilities >200,000 BGSF (> 18580 BGSM)	Separate Passenger. Separate Inpatient. Separate Materials Traffic	Combine elevators or Separate Passenger and Materials Traffic	Separate Passenger Traffic. Combine Logistic Traffic	Not Applicable	Not Applicable

Notes:
1. The decision to separate or combine any elevator function must be supported in the ETSA.
2. Combined passenger and service elevators may be installed where combined use is possible without interfering with normal activities in the healthcare facility. Avoid mixing patient transport with any other traffic.

16-4 ELEVATOR DESIGN.

All multistory facilities must have at least two elevators. The ETSA must include a risk assessment to determine if at least one is to be sized to accommodate a gurney (see **\4** appendix I **/4/** for definition). All multistory inpatient and surgical facilities must have not less than two elevators sized to accommodate a gurney.

16-4.1 Codes.

Elevators to be designed in accordance with UFC 3-490-06 where applicable, all applicable Federal, state, and local codes, including ASME A17.1, A17.3, 17.5, and elevator design requirements for earthquake/seismic loads in accordance with ASCE 7. This includes designing to the appropriate rating/load classification for the intended application. Elevators must be designed to meet all DoD and ABA provisions applicable to the project.

16-4.2 Elevator Selection.

Elevators in medical facilities provide for three major functions: passenger movement, inpatient movement, and material handling. Passenger elevators are intended for use by the public, staff, and other ambulatory patients. Patient Service elevators are intended for use by staff movement and for the transport of patients (wheelchair and/or bed-bound inpatients). Dedicated elevators are patient assist/trauma elevators intended for patient transport from Critical Care Areas, for example ER trauma rooms, to the ORs. Materials Handling Service elevators are intended for use by staff for material, supplies and equipment movement. Special Use elevators are intended for loading docks, mortuary, or the transport of animals. Where allowed by Table 16-3, a single set of elevators can serve multiple functions. All elevators must meet the following:

16-4.2.1 Elevator Types and Speed.

Elevator types and speed guidelines are shown in Table 16-4. Higher speeds may be used if needed to satisfy traffic demands. Elevator selections must not exceed the elevator rise criteria given in Table 16-4.

16-4.2.2 Elevators for Inpatient Facilities.

Inpatient facility Patient Service elevators to have interior car dimensions that accommodates a patient bed/ gurney with attendants. Cars to be a minimum 5 ft 8 in. (1727 mm) wide by 8 ft 5 in. (2565 mm) deep. Car doors are to provide a minimum clear opening of 4 ft 6 in. (1372 mm) wide and 7 ft (2134 mm) high. All other elevator dimensions to meet the requirements of Tables 16-5 and 16-6.

16-4.2.3 Elevators for Existing Facility.

Do not resize existing elevators that can accommodate patient beds. Other existing elevators may require renovation depending on the results of the ETSA.

16-4.2.4 Elevators for Hospital and Ambulatory Surgery Centers (Front and Rear Opening).

Front and rear opening hospital and ambulatory surgery center elevators may be used as combined use for passenger and service/staff traffic when space or budget restrictions limit use of separate passenger elevators.

16-4.2.5 Passenger Elevators.

Passenger elevators are required to be wide car configuration, have center opening doors, be a minimum 4000 lb (1815 kg) capacity, and have a minimum 4 ft 0 in. (1220 mm) wide door opening. See additional elevator minimum dimensions and requirements in Tables 16-5 and 16-6.

16-4.2.6 Patient Service Elevators.

Patient Service elevators are required to be deep car configuration, have side opening or center opening doors, be a minimum 5000 lb (2270 kg) capacity, and have a minimum 4 ft 6 in. (1372 mm) wide door opening. See additional minimum elevator dimensions and requirements in Tables 16-5 and 16-6.

16-4.2.7 Materials Handling Service Elevators.

Material Handling Service elevators are required to be deep car configuration, have side opening or center opening doors, be a minimum 5000 lb (2270 kg) capacity and have a minimum 4 ft 6 in. (1372 mm) wide door opening. See additional minimum elevator dimension and requirements in Table 16-5 and 16-6.

16-4.2.8 Trauma Elevators.

Trauma elevators are required to be deep car configuration, have center opening doors, be a minimum of 6000 lb (2720 Kg) capacity and have a minimum 5 ft 0 in. (1525 mm) wide door opening. Larger capacity and car sizes to be used for facilities that require three or more attendants and possibly equipment to accompany patient transport.

16-4.2.9 Traction Elevators.

Specify overhead machine room geared hoisting machine elevators for up to four stops with a minimum rise of 32 ft (9.7 m) and minimum rated speed of 200 fpm (61.0 m/min). Specify overhead machine room geared hoisting machine elevators for up to ten stops with a minimum rise of 64 ft (19.5 m) and minimum rated speed of 350 fpm (106.9 m/min) in coordination with Table 16-4.

16-4.2.10 Hydraulic Elevators.

Specify oil hydraulic direct plunger elevators for up to four stops with a minimum rise of 16 ft (4.88 m) and minimum rated speed of 150 fpm (45.7 m/min) in coordination with Table 16-4. Holeless plunger will be considered for difficult site conditions. Provide

necessary machine room ventilation and equipment cooling, overload protection with a preferred 120 starts per hour.

16-4.2.11 Machine Room-Less (MRL) Elevators.

MRL elevators are only allowed where deemed appropriate by the Design and Construction Agent in coordination with the DoD Project Sponsor. Provide written justification and Life Cycle Cost Analysis (LCAA). If allowed, they are be used for passenger elevators ONLY with minimum capacity limitation of 4000 lb (1815 Kg) with 3 stops or more in coordination with Table 16-4 and Table 16-5 or Table 16-6.

16-4.3 Elevator Location and Travel Distances.

Elevators must be designed, arranged, and placed within the building to; minimize patient/staff travel distance and time, provide convenient access to healthcare delivery services, and provide cost-effective elevator performance (direct capital cost of elevators, indirect cost of the space dedicated to their function, and O&M are major cost components of any building). The walking distance from the elevator doors to the center point of the farthest occupied room should not exceed 200 ft (61 m) unless there is adverse impact to operational functionality or elevator locations. The A/E must provide a description of the elevator system(s) proposed, including an analysis of the walking distances, elevator types, and locations for evaluation. The DoD Project Sponsor, in coordination with the Design and Construction Agent, must evaluate the proposed elevator system(s) to determine if proposed travel distances from elevators to healthcare delivery services and administrative areas are acceptable based upon the mission, population served, and operational concepts.

Additional elevators may be required based upon an assessment by the DoD Project Sponsor in coordination with the Design and Construction Agent. These elevators must be in addition to the main elevators provided for efficient and effective travel throughout the building, in compliance with Section 16-4. These additional elevators are intended for staff use only, thus should be located away from main thoroughfares and should not be located where the public can interfere with clinical activities. These elevators must provide average intervals of under 45 seconds and provide a handling capacity equal to 10 percent of the population within the area of service provided. Elevators added for this purpose must be of service type and be access controlled by staff.

16-4.4 Elevator Location, Lobbies, and Groupings.

Placement of elevators must meet the travel distance requirements of paragraph 16-4.3, Material and traffic separation of paragraphs 16-3.1 through 16-3.5 while considering the requirements of paragraphs 16-4.4.1 through 16-4.4.3.

16-4.4.1 Elevator Location.

Place elevators on the direct horizontal path between the areas they serve, wherever possible. Locate elevators so that visitors do not normally pass service, material, or convenience cars enroute to passenger cars, unless those cars are substantially hidden

Table 16-4 Elevator Selection Guide

Table presents minimum elevator types and performance parameters by elevator travel distance.

Elevator Rise		Speed in Feet / Minute (Meter / Minute)				Capacities in Pounds (Kilogram)	
		Elevator Types					
Stops	Travel Distance in feet (meter)	Hydraulic	MRL[6]	Geared Traction (w/MR)	Gearless Traction (w/MR)	Passenger	Service
2	<16 (4.9)	125[4] (38.1)	NA	NA	NA	4000[2] (1815)	5000[3] [5] (2270)
3–4	32-48 (9.8 - 14.6)	150[4] (45.7)	350 (106.7)	200[4] (61.0)	NA	4000[2] (1815)	5000[3] [5] (2270)
5–10	64-144 (19.5 - 44.0)	NA	350 (106.7)	350[4] (106.7)	NA	4000[2] (1815)	5000[3] [5] (2270)
11–17	160-256 (48.8 - 78.0)	NA	350-500 (106.7 - 152.4)	350[4] (106.7)	500[4] (152.4)	4000[2] (1815)	5000[3] [5] (2270)
18+	272 (82.9)	NA	NA	NA	500–700[4] (152.4 - 213.4)	4000[2] (1815)	5000[3] [5] (2270)

Notes:

1. This table identifies the type of equipment and the associated speed based solely on the Rule of Thumb of the height of the building.
2. Wide Car configuration required with passenger elevators.
3. Deep Car configuration required with service and combination elevators.
4. Application to be utilized by elevator consultant in preparation of ETSA.
5. 6000 lb (2720 kg) capacity minimum required if facility has motorized beds or as determined by the ETSA.
6. Only where deemed appropriate by the Design and Construction Agent in coordination with the DoD Project Sponsor. Provide written justification and Life Cycle Cost Analysis (LCAA).

NA – Not allowed

Table 16-5 Elevator Dimension – Front Openings Guide

Table presents minimum elevator dimensional parameters for front opening elevator types.

Capacity	Hostway Width(7)	Hostway Depth(7)	Clear Interior Width(4)	Clear Interior Depth(4)	Clear Door Width(4)	Clear Door Height(4)	Door Type
6000 lb (2720 kg) Deep Car	9’-1” (2768 mm)	11’-5” (3480 mm)	6’-0” (1829 mm)	9’-8” (2946 mm)	5’-0” (1525 mm)	7’-0”(3) (2134 mm)	Side Opening or Center Opening(5)
5000 lb (2270 kg) Deep Car	8’-2” (2489 mm)	10’-1” (3073 mm)	5’-8” (1728 mm)	8’-5” (2565 mm)	4’-6” (1372 mm)	7’-0”(3) (2134 mm)	Side Opening
4500 lb (2040 kg) Deep Car	8’-2” (2489 mm)	9’-6” (2896 mm)	5’-8” (1728 mm)	7’-9” (2362 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Side Opening
4000 lb (1815 kg) Deep Car	8’-2” (2489 mm)	9’-0” (2743 mm)	5’-8” (1728 mm)	7’-3” (2210 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Side Opening
4000 lb (1815 kg) Wide Car	9’-4” (2845 mm)	7’-8” (2337 mm)	7’-8” (2337 mm)	5’-5” (1651 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Center Opening

Notes:

1. All dimensions are for non-seismic zone.
2. All dimensions do not include counterweight safeties.
3. 8 ft 0 in. (2438 mm) also available.
4. All elevator car/cab minimum dimensions listed are pre-determined to accommodate ABA standards, ambulance stretcher and/or other requirements.
5. Elevators dedicated only to AGV system operation (not shared with people) to have a minimum 4 ft 0 in. (1220 mm) clear door width, minimum 5 ft 0 in. (1525 mm) clear interior width, minimum 8 ft 5 in. (2565 mm) clear interior depth, and allow for a maximum single AGV wheel load of 1,050 pounds (476 kg), except for fork style AGV, which requires minimum 10 ft 7 in. (3227 mm) clear interior depth and has maximum single AGV wheel load of 1,150 lb (522 kg). Minimum capacity for AGV system-dedicated elevators to be 5000 lb (2270 kg).
6. Center opening doors are preferred, unless annotated otherwise in the table above. Center-opening doors take less time to operate than single-slide doors of the same width. Center-opening doors are also more efficient as they provide two-way traffic.
7. Hoistway dimensions may vary based on manufacturer **\4** and entrapment area requirements per UFC 3-490-06. ***/4/*** A/E or DoR to coordinate.

Table 16-6 Elevator Dimension – Front and Rear Openings Guide

Table presents minimum elevator dimensional parameters for front and rear opening elevator types.

Capacity	Hostway Width(7)	Hostway Depth(7)	Clear Interior Width(4)	Clear Interior Depth(4)	Clear Door Width(4)	Clear Door Height(4)	Door Type
6000 lb (2720 kg) Deep Car	9’-1” (2768 mm)	12’-4” (3759 mm)	6’-0” (1829 mm)	9’-8” (2946 mm)	5’-0” (1525 mm)	7’-0”(3) (2134 mm)	Side Opening or Center Opening(5)
5000 lb (2270 kg) Deep Car	8’-2” (2489 mm)	10’-11” (3327 mm)	5’-8” (1728 mm)	8’-6” (2590 mm)	4’6” (1372 mm)	7’-0”(3) (2134 mm)	Side Opening
4500 lb (2040 kg) Deep Car	8’-2” (2489 mm)	10’-4” (3150 mm)	5’-8” (1728 mm)	7’-10” (2387 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Side Opening
4000 lb (1815 kg) Deep Car	8’-2” (2489 mm)	9’-10” (2997 mm)	5’-8” (1728 mm)	7’-4” (2235 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Side Opening
4000 lb (1815 kg) Wide Car	9’-4” (2845 mm)	7’-4” (2235 mm)	7’-8” (2337 mm)	5’-5” (1651 mm)	4’-0” (1220 mm)	7’-0”(3) (2134 mm)	Center Opening

Notes:

1. All dimensions are for non-seismic zone.
2. All dimensions do not include counterweight safeties.
3. 8 ft 0 in. (2438 mm) also available.
4. All elevator car/cab minimum dimensions listed are pre-determined to accommodate ABA standards, ambulance stretcher and/or other requirements.
5. Elevators dedicated only to AGV system operation (not shared with people) to have a minimum 4 ft 0 in. (1220 mm) clear door width, minimum 5 ft 0 in. (1525 mm) clear interior width, minimum 8 ft 5 in. (2565 mm) clear interior depth, and allow for a maximum single AGV wheel load of 1,050 pounds (476 kg), except for fork style AGV, which requires minimum 10 ft 7 in. (3227 mm) clear interior depth and has maximum single AGV wheel load of 1150 lb (522 kg). Minimum capacity for AGV system-dedicated elevators to be 5000 lb (2270 kg).
6. Center opening doors are preferred, unless annotated otherwise in the table above. Center-opening doors take less time to operate than single-slide doors of the same width. Center-opening doors are also more efficient as they provide two-way traffic.
7. Hoistway dimensions may vary based on manufacturer **\4** and entrapment area requirements per UFC 3-490-06. ***/4/*** AE/DoR to coordinate.

from view. Consider operational impacts such as noise, vibration, temperature, and other environmental factors when adjacent to critical treatment areas or those having sensitive equipment. Place adjacent car entrances either in straight lines or in opposite banks to each other.

Where AGV systems are used that require more than one elevator, single elevators must be distributed to minimize horizontal travel on patient floors. On the service levels, consideration should be given to open both sides to allow drive-through capability to achieve higher throughput. On the patient floors, there must be two openings (front and rear) into secure access AGV lobbies/vestibules used for the primary purpose of temporary staging, picking up, and delivering carts. Adequate space inside these lobbies should be coordinated with AGV system vendors prior to finalizing the design.

16-4.4.2 Elevator Lobbies.

Elevator ingress/egress should be from a distinct elevator lobby and not directly from a corridor. Minimum/maximum lobby depth for service cars are 12–14 ft (3.7–4.3 m) when the opening opposes a wall and 14–16 ft (4.3–4.9 m) when the opening opposes another elevator. Minimum/maximum lobby depth for passenger cars are 10–12 ft (3.1–3.7 m) when the opening opposes a wall and 12–14 ft (3.7–4.3 m) when the opening opposes another elevator.

16-4.4.2.1 Elevator Access.

Where elevators are accessed from corridors, they must be located on one side of the corridor only with a maximum of three cars. Elevators must be set back 8–12 ft (2.5–3.7 m) for service and combined use cars and 4–8 ft (1.2–2.4 m) for passenger cars.

16-4.4.2.2 Elevator Separation.

Where two or more elevator group lobbies are adjacent, provide walls or other building features to prevent a free flow of traffic between those lobbies (to minimize one user from placing calls to both groups). Where Table 16-3 requires separation of elevators, passenger elevators must not share the same lobby with service and materials handling elevators. Acoustically isolate all elevator lobbies from Critical Care Areas.

16-4.4.3 Elevator Groupings.

For service and combined use cars, two in a row are preferred and not more than three in a row should be used; for passenger cars three in a row are preferred and not more than four in a row should be used.

If more than six service cars or eight passenger cars are required in one area, provide two smaller, strategic groups.

16-4.5 Passenger and Service Elevator Features.

Passenger and service elevators must meet the requirements of the subparagraph below.

16-4.5.1 Operation.

Elevators are to be arranged to operate with or without attendants and be provided with key operated switches for hospital priority service. Each elevator bank to be equipped for emergency operation by means of a key operated switch at each landing. This switch must cause the closest available car to bypass all other calls in response to an emergency call. Duplex collective operation to be provided for two-car banks. Three- or four-car banks must be a group operation. An on-demand microprocessor system must be provided for all elevator controls.

16-4.5.2 Code Blue Controls.

Provide medical emergency elevator control, sometimes called Code Blue Control, as a means of overriding normal operation of elevators capable of medical emergency transportation of a patient in bed, accompanied by attendants. This control feature must be provided in conjunction with, or in addition to, controls provided for fire department emergency use. Firefighters' operation, as defined in ASME A17.1, must override Code Blue Control.

16-4.5.3 Doors.

Passenger elevators to have center opening doors unless allowed by the Design and Construction Agent. Two-speed side opening doors may be provided in facilities with separate material handling systems (reference Table 16-3). Door closing time must comply with ASME code requirements. Minimum door opening speed to be 2.5 fps (0.8 m/s) except for high speed elevators (500 fpm (152.4 m/min) and over) where the door opening speed to be 2.5-3.0 fps (0.8 – 0.9 m/s). Equip service elevators with buttons to extend door open time, adjustable between 0 to 30 seconds. All elevator car doors must be provided with infrared screen detectors.

16-4.5.4 Signals.

Install hall position indicators at the main floor(s) containing the command and outpatient entrances. Provide hall push-button stations with call register lights. Install hall lanterns with an audible signal on all elevators. Install car position indicators in each car with floor designations, a floor directory signal, and direction arrows. Car operating panels must use car register-type floor buttons. Provide a lobby control panel on elevator banks with two or more cars.

16-4.5.5 Emergency Power.

When otherwise required, connect elevators to operate on alternate source emergency power in conformance with electric power and lighting criteria. Emergency power

selection switches are required for each bank of elevators. The elevator control system must have an ATS which returns each elevator to the main egress level, one car at a time. The last car to arrive at the main floor must automatically be selected to operate at normal design speed.

During an emergency power condition, ASME A17.1 requires all groups of elevators, which are supplied with an alternate power source, to automatically sequence one at a time to the main egress level. Once all cars have reached the designated level, the elevator system must automatically select one car within the group to operate. A manual override switch must also be provided, so emergency personnel may select a particular car if desired.

16-4.5.6 Machine Rooms, Control Rooms, and Machinery Spaces.

Locate electric traction elevator machine rooms above elevator hoist ways. Machine rooms must be sized to accommodate the maximum space requirements anticipated from competitively bid projects, including provisions of space to service and maintain equipment, as well as any additional DoD required equipment and functions including, but not limited to emergency descent to fire fighters' designated level for elevators that are not served by an emergency generator. In the event of a flood zone location, the Machine Room can be located on the first floor above the flood zone. Provide air conditioning in machine rooms to maintain ambient temperature below 85 ^{o}F (29.4 ^{o}C) and above 60 ^{o}F (15.6 ^{o}C). Provide filters to remove dust. Size hydraulic elevator rooms accordingly for the equipment, place them adjacent to the elevator, and on the lowest served floor. Electrically and acoustically isolate all elevator equipment rooms to prevent interference with building electronic equipment and objectionable noises.

The MRL control room closet must be located adjacent to the elevator hoistway and accessible from the corridor. Follow UFC 3-490-06 requirements for elevator control rooms and elevator machinery spaces except for the following:

a. The MRL elevator control equipment must be located in a dedicated control room/closet. The use of door jamb control equipment is prohibited. Control rooms must be sized to accommodate the elevator panels, disconnects, controller and other related equipment. It must be possible to remove major equipment components of each elevator for repair or replacement without dismantling components of an adjacent elevator.

b. Proprietary elevator systems, components, parts, motors, and software is strictly prohibited.

16-4.5.7 Elevator Car Enclosure.

Car lighting to be either indirect or of the luminous ceiling type. Provide mechanical exhaust for elevator cars. Provide protective cab interior blanket hooks and one set of full-height blankets per cab.

16-4.5.8 AGV System Elevator Features.

When determining elevator usage requirements for AGV systems, consideration must be given to whether the elevator is to be dedicated for exclusive use of the AGV system. The elevator must be dedicated to sole use by the AGV system if the AGV system requires greater than 50–60 percent of any single elevator. If the AGV system usage is less than 50–60 percent of the elevator, then the AGV/elevator interface must allow for a manual mode of operation to accommodate other material conveyances.

16-4.5.8.1 Shared Use Elevators.

For shared (automatic and manual) use elevators, the AGV system must release the elevator for manual movements when all automatic transports have been completed. The AGV system must request automatic mode when needed and the elevator controls must disable hall call buttons and flash “Elevator in Automatic Mode” warning signs in the halls. After all cabin calls are answered and the doors close, the elevator must change from manual mode to automatic mode. The specific signals and sequencing of them for AGV/elevator interface must be specified by the AGV system vendor after selection and the elevator manufacturer must conform to it as well as maximum leveling and gap tolerances. Fire service level and alternate fire service levels must be identified in the TLA.

16-4.5.8.2 Shared Mode Elevators.

Shared Mode Elevators must include flashing lights with the words “Elevator in Automatic Mode” on all landings to indicate when the AGV system has requested use of the elevator. A flashing sign with audible warning must activate inside the cabin after the elevator doors have closed, there are no more cabin calls, and the elevator control changes from manual mode to automatic mode.

16-4.5.8.3 AGV System Interface.

The elevator controls must include an AGV system interface terminal strip to which discrete, potential free contacts rated for 24 volts are wired in the machine room. Supporting elevator software/logic must control the contacts inputs and outputs (I/O) in accordance with a specification to be provided by the selected AGV system vendor. A manual key switch for entering automatic mode must be located in the elevator cabin.

Each AGV system elevator controller must have discrete I/O terminals to receive and transmit.

AGV elevator doors must have switches on each door to signal when the doors are completely closed as well as completely open so as not to restrict the clear opening. Leveling circuitry must be incorporated to prevent signaling the arrival of the cabin to a floor when the cabin is not within the leveling tolerance.

16-5 MATERIAL MANAGEMENT DESIGN.

16-5.1 AGV Systems.

Design the AGV systems to incorporate the latest state-of-the-art in proven technology; systems not proven in at least five previous similar applications must be avoided. System must be an integrated turnkey automated cart transportation system.

AGV systems may utilize a variety of transportation vehicles (transporters) including “cart carrying” type and forklift type; towing type transporters are not desired because they do not transport carts with the casters off the floor.

16-5.1.1 Design.

The design must establish horizontal rights-of-way to:

a. Aid in directing traffic to the appropriate vertical core, while avoiding inappropriate elevators and other building areas;

b. Provide high levels of patient privacy and protection from high noise levels; and

c. Eliminate potential contamination of clean and sterile areas.

16-5.1.2 AGV Elevators.

The elevators that provide vertical transport for AGVs must open into enclosed pickup and delivery (P&D) lobbies with motorized door access to the main circulation corridors on the patient floors. Consider two vestibules - one accessible from each elevator door - for separate soiled and clean cart staging areas. Where higher cart transport volumes exist, a path must be included for AGV vehicle travel from the clean side to the soiled side without having to use the elevator cabin. Recommendations for positive/negative air pressure or motorized doors between these areas must be included.

16-5.2 Pneumatic Tubes.

Provision of PTSs must be consistent with requirements for a particular facility regardless of the size of the facility. No specific correlation can be made between the number of beds in a MTF and the need for a PTS. Facility parameters and FTE usage are the primary drivers for the use of pneumatic tubes.

a. Design systems to reach individual project peak traffic requirements, plus a minimum spare capacity of 20 percent. Designs must provide for soft handling of all systems where laboratory specimens and other delicate items are transmitted.

b. Select tube systems that provide automatic control of carrier movement. A selector device that permits correspondence with any station served by the system must set the destination of the carrier. **\4**

c. Tubing for carrier transmission lines shall be 6 inch (150 mm) in size, 16 gauge minimum (galvanized or stainless steel), conforming to ASTM A123/A123M. PVC is not allowed on DoD healthcare/ medical projects. **/4/**

16-5.3 Mobile Robots.

Mobile robots must be considered only when they have been proven in other similar applications in at least five similar hospitals and can be considered for travel through any corridor to nursing units and to patient rooms.

Mobile robots that interface with elevators must use a similar interface method to the AGV system interface described elsewhere. Mobile robot travel must be segregated from AGV system traffic routes and AGV elevators unless they use the same control system.

16-5.4 Dumbwaiters and Cart Lifts.

Dumbwaiters must meet the requirements of the following subparagraphs.

16-5.4.1 Codes.

Dumbwaiters to comply with applicable Federal, State, Local and Elevator codes including ASME A17.1, A17.2, A17.5, NFPA 70, ASME/UL – 10B and 508.

16-5.4.2 Dumbwaiters, Counter Loading.

Automatic loading and unloading are to be considered. Dumbwaiters without automated devices to have powered or manual doors. Provide bi-parting type powered doors with door safety reversing edges. Locate machine at the bottom of the hoistway.

16-5.4.3 Dumbwaiters, Floor Loading.

Floor loading dumbwaiters to have powered vertical panel slide-up door with safety reversing edge. Bi-parting doors can be utilized in conjunction with a larger pit depth along with drawbridges to provide a smooth entrance for wheeled carts. Locate machine at top of hoistway.

16-5.4.4 Dumbwaiter Platform Size.

Dumbwaiter systems are to be limited to a maximum platform size of 1550 in^2 (1 m^2) x 48 in. (1219 mm) high and maximum capacity of 500 lb (227 kg). A platform size of 30 by 48 in. (762 by 1219 mm) is acceptable. Automatic loading and ejection devices of larger capacity and size, used in conjunction with automatic cart lifts, and conform to the ASME standards for elevators. Determine the dimensions of the car lift platform by the largest cart selected for dietary, linen, or other materials distribution.

16-5.4.5 Dumbwaiter and Cart Lift Control.

Distribution and return programs must be provided for dumbwaiter and cart lift operation. The control station must contain a switch for program selection and a series of dispatch buttons that correspond to the floors served. Design the system to permit dispatching carts to any landing from the central dispatching area and to provide for return of carts only to the central dispatching area.

16-5.4.6 Dumbwaiter and Cart Lift Signals.

Stations at each floor or landing must contain lights to indicate which program is in effect.

Table 16-7 Dumbwaiter and Cart Lift Parameters

Dumbwaiter Rise		Type				Speed	
Stops	**Travel Distance in feet (meter)**	**Motor**	**Light**	**Medium**	**Heavy**	**fpm (m/min)**	**Notes**
2	<16 (4.88)	Winding Drum	X	X	NA	50 (15.2)	(2)
3-4	32-48 (9.75 - 14.63)	Traction		X	NA	200 (61.0)	(2)
5-10	64-144 (19.51 - 43.89)	Traction		X	NA	300 (91.4)	(2)
11+	135+ (41.15)+	Traction		X	NA	300 (91.4)	(2)
Notes:							
Light-Duty Dumbwaiter 100 - 200 lb (45 – 91 kg) (up to 24” wide x 24” deep x 36” high) (610 mm wide x 610 mm deep x 915 mm high)							
Medium-Duty Dumbwaiter 200 - 750 lb (91 – 340 kg) (up to 38” wide x 38” deep x 48” high) (965 mm wide x 965 mm deep x 1219 mm high)							
Heavy-Duty Material Lift 750 - 2500 lb (340 – 1134 kg) (up to 60” wide x 96” deep x 96” high) (1524 mm wide x 2438 mm deep x 2438 mm high)							
NA – Not Applicable							
1.	This table identifies the type of equipment and the associated speed based solely on the Rule of Thumb of the height of the building.						
2.	Application to be determined by elevator consultant in preparation of ETSA.						

16-5.4.7 Cart Lifts with Automated Transfer Devices.

Doors must be power operated with upper and lower safety edges. Maximum cart lift capacity to be 1000 lb (453 kg).

16-6 WASTE MANAGEMENT DESIGN.

The waste management system must be designed to help maintain aseptic environments in the hospital, and to minimize or eliminate physical and infection hazards to patients, hospital staff, and the general public, at the lowest LCC to the Government. The design objectives should include hazardous waste optimization/process improvements, recycling, waste minimization, and hazardous material substitution to more environmentally friendly products/processes.

16-6.1 Waste Categories.

The categories of medical facility waste are: Regulated Medical Waste (RMW), Hazardous Waste (HW), Recyclable Materials (RM), and general waste. Each of the categories of waste requires individual design consideration of handling, storage, and disposal by the facility. In addition, regulatory requirements differ for each category dependent upon the geographic location (state or country), relative personnel and public hazards and environmental impact.

16-6.2 Waste Collection and Transport.

The waste management system must be fully coordinated with the transportation design to determine the most appropriate means and routing of transport of wastes inside and outside of the facility. Consideration should include regional waste collection service provider to account for dumpster sizes (usually provided by the Installation / DPW); dumpster loading/unloading offsets; and minimum turning radius of waste removal trucks. Automatic or manual systems should be considered. The design must avoid creating conditions that require or involve the double-handling of waste, especially RMW and HW.

a. Where facilities receive palletized supplies, designate an exterior area for the storage of empty/idle pallets waiting for disposal.

b. Provide easy access to dumpsters from back-of-house materials management/waste management areas. If dumpsters are located at a distance from the facility due to ATFP or other reasons, ensure ramps or other means are provided to allow the transport of wheeled trash carts from the facility to the dumpster.

c. Supply and loading dock areas should be provided with overhead weather protection by either a canopy or overhang.

d. If Nuclear Medicine, Decay Storage (NMDS1) and Nuclear Medicine, Decay Calibration (NMDC1) rooms are included in the Program for Design (PFD), coordinate the location with the DoD Project Sponsor and identify

the path of travel to meet 10 CFR 35.92, 10 CFR 20.1201, and 10 CFR 20.1301.

16-6.3 Regulations, Codes, and Standards.

The preliminary design of the waste management system must comply with all applicable Federal, state, and local codes and regulations, including Nuclear Regulatory Commission (NRC) guidelines; NFPA 82; 40 CFR 261–265 and 40 CFR Part 22; 49 CFR 171–180; 29 CFR 1910.1200, 29 CFR 1910.1030, and 29 CFR 1910.134. Guidelines and advisory standards available from the NFPA, the CDC, National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services (HHS), and TJC must be utilized as applicable and considered minimum criteria for facility design. The WMA must be based on regulations and standards enforced by the local authority.

16-6.4 Gravity Chutes.

Gravity chutes to comply with NFPA 82 unless otherwise modified herein.

a. Consider gravity chutes either alone or in combination with horizontal pneumatic chutes, for internal general and soiled linen transportation (down only) in multistory facilities. Also, consider hospital service elevators, AGVs, and cart lifts for internal transportation of solid wastes in multistory buildings. Consider that the AGV system has to move empty linen carts down from patient areas and these movements can be used for transport of soiled linen at very little, if any, incremental cost.

b. Collection areas for soiled linen to be located near the loading dock.

c. Provide chute access on user levels through a separate room with dimensions adequate for holding the collection cart, with room doors closed, while the attendant is charging the chute.

d. Size terminal rooms to accumulate the amount of materials dictated by the WMA. Minimum dimension must allow accumulation of 24 hours of collected materials. Design must ensure that collected material does not block the entrance door or hinder the pickup operation.

e. Masonry waste chutes are prohibited. Refractory lined chutes are prohibited. Automatic sprinklers are required in all chutes regardless of construction.

16-6.5 Pneumatic Trash/Linen.

Pneumatic trash/linen systems to comply with NFPA 82 unless otherwise modified herein.

a. Pneumatic trash/linen systems are either fully pneumatic or gravity pneumatic. In general, no station to be designed that is “up send” in nature. All materials should travel in the down direction after first being

loaded into the system. Verify system traffic capabilities by detailed traffic studies.

b. Fully pneumatic systems are continuous sealed transport systems (run) from source (material loading) to disposition (collection room or compactors) consisting of full vacuum stations equipped with interlocked doors, an air source, and the same size diameter transport piping throughout.

c. Vertically aligned charging doors of the same chute system must be interlocked so that only one station can be charged at one time, thereby reducing the possibility of charges jamming within the chute. Provide gravity chutes with negative pressure, relative to the charging area, to eliminate aerosol discharged into the charging areas when charging doors are opened.

d. Fully pneumatic systems are allowed where deemed appropriate by the Design and Construction Agent in coordination with the DoD Project Sponsor. Provide written justification and LCCA.

e. Gravity-pneumatic systems, a combination of gravity chutes for vertical transportation, and pneumatic chutes for horizontal transportation are subject to the same fire protection requirements as gravity systems.

f. Gravity chutes must be equipped with a storage section at the bottom of the chute. Gravity chute charging stations equipped with electric control systems may be loaded with as many bags of waste or linen as necessary. Bags are accumulated in the storage section and are removed as a single load on demand.

g. Both gravity-pneumatic and fully-pneumatic chutes must be manually charged, enclose charging doors and frames in fire-rated rooms. Sprinklers in the charging stations must protect pneumatic chutes. Charging stations must have a receiving compartment with an outer and inner door. When the door is opened to put in a load, the inner door must be automatically locked so that the load cannot freely enter the chute. When the outer door is closed, the inner door must open in its sequential turn and the load to be automatically transported by negative pressure to its point of discharge. Only one load to move through each leg of a pneumatic chute system at one time.

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CHAPTER 17 CONSTRUCTION

17-1 CONTRACT AWARD.

The DoD Project Sponsor will provide authority to the Design and Construction Agent to award a construction contract in accordance with Chapter 3 Design.

17-2 COMMISSIONING DURING CONSTRUCTION.

Reference Chapter 19 Commissioning.

17-3 CONSTRUCTION CONTRACT CHANGES.

17-3.1 Process for Reporting Changes.

The Design and Construction Agent specifies reporting procedures as follows:

b. For projects assigned to USACE, proposed project changes impacting unique medical technical criteria covered under this document must be coordinated with the CEHNC-EDX for their comment and recommendation.

b. For projects assigned to NAVFAC HQ MFPO, they have responsibility for changes as they require and deem appropriate.

c. For projects in the United Kingdom, the AFCEC has responsibility for changes as they require and deem appropriate.

17-3.2 Process for Approving Funds.

Changes must be submitted for approval to the designated Design and Construction Agent (USACE, NAVFAC HQ MFPO, or AFCEC/CFM) in accordance with their established business practices. All discretionary changes must be submitted in accordance with DoD Project Sponsor policy.

17-4 CONSTRUCTION FUNDS.

17-4.1 Funds Management.

The DoD Project Sponsor will sub-allocate all of the appropriated design and construction funds to the Design and Construction Agent who must manage the funds at the project level.

17-4.2 Funds Availability.

If funds are required for changes that exceed the amount available and the authorized contingency is inadequate, the Design and Construction Agent must notify and request additional funds from the DoD Project Sponsor in writing, along with justification for additional contingency funds, and cite source of funds. The Design and Construction

Agent must notify the DoD Project Sponsor if actual requirements exceed the appropriated amount.

17-5 NOTIFICATION OF CONTRACTOR CLAIMS.

The Design and Construction Agent must notify the DoD Project Sponsor of submitted contractor claims that have been approved by the Contracting Officer or the Board of Contract Appeals within 30 working days of date of the determination to reimburse the contractor for claims that require additional funding. Such claims must be accompanied with a narrative explanation, recommended resolution, and estimated final cost.

17-6 LIFE SAFETY ASSESSMENT.

Refer to Chapter 14 for LSA requirements.

17-7 DEMOLITION OF VACATED FACILITIES.

The demolition of vacated facilities must be reported on the project DD Form 1354 in accordance with UFC 1-300-08.

CHAPTER 18 BUILDING INFORMATION MODELING (BIM)

18-1 GENERAL.

BIM is an enabling tool and process for facilities projects within the MHS to more effectively achieve current requirements described throughout this document and assist the MHS in achieving fundamental Facility Life Cycle Management (FLCM) requirements in supporting the delivery of applicable facilities.

18-1.1 MHS BIM Objectives.

The MHS BIM objectives support and provide improvements for:

a. Clearly and concisely defining the requirements for models, facility data, processes, and respective deliverables.

b. Interoperability and analysis across the FLCM.

   i. Automated SEPS to BIM PFD analysis for validation to actual design/construction.

   ii. Automated SEPS to BIM PRC analysis for validation.

   iii. Defense Medical Logistics Standard Support - Facilities Management (DMLSS-FM) and future LogiCole integration.

   iv. Defense Medical Logistics Standard Support - Equipment and Technology Management (DMLSS-E&TM) and future LogiCole Medical Equipment integration.

c. Planning and programming analysis.

d. Design coordination/process and design criteria validation.

e. Construction and commissioning execution and QA/QC.

f. Risk management from Interference Management through virtual design and construction processes.

g. Simulation and visualization of healthcare operations.

h. IO&T efforts.

i. Quality and efficiency enhancements distributed across all current and future projects for continual process and product improvements.

j. Data-enhanced deliverables for facility owners, users, and operations and maintenance available prior to handover.

18-1.2 Corresponding Project Model Uses.

The United States National BIM Standard (NBIMS–US™) defines standard “BIM Uses” (also referred to as “Model Uses”). Each of the MHS BIM Objective have corresponding Model Uses as identified below as the minimum mandatory model uses required for

every project. Contractor selected elective model uses are encouraged to provide enhanced project outcomes and additional consideration for contractor selection.

18-1.2.1 Design Phase Model Uses.

The Design Phase Model uses include:

a. Design Authoring

b. Progress Reviews

c. Interference Management or Clash Detection (3D Coordination)

d. Program Validation

e. Construction and Operations Building information exchange (COBie) for the MHS (COBie-MHS)

18-1.2.2 Construction phase Model Uses.

The Construction Phase Model Uses include:

a. Interference Management or Clash Detection (3D Coordination)

b. Program Verification

c. Record Modeling

d. COBie-MHS

18-1.3 Applicability.

To ensure these objectives are uniformly achieved, all projects are required to implement the MHS BIM Minimum Requirements established for projects funded, or to be operated and maintained, under DHP funds. This applies to all projects CONUS or OCONUS, except Unspecified Minor Construction (UMC). The MHS BIM Minimum Requirements are located at http://facilities.health.mil/repository/getfile/1463.

CHAPTER 19 COMMISSIONING

19-1 GENERAL.

This chapter addresses the Total Building Commissioning (TBCx) requirements and the process to be implemented as required by Federal regulations and the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding.

Upon receipt of DA for A/E Award (for the A/E that develops full design for DBB projects or the DoR that develops the RFP for DB projects), the Design and Construction Agent and DoD Project Sponsor must jointly determine the commissioning leadership structure, the extent, and the level of commissioning services required during all project phases as appropriate for the specific project; this must be communicated in the project requirements documents.

19-2 SUPPLEMENTAL CRITERIA.

Guidance for the Commissioning process is contained in ASHRAE Standard 202, ASHRAE Guideline 0, ASHRAE Guideline 1.1, ASTM E2813, **\1** ASTM E2947, **/1/** and NFPA 4. Other references are available that describe similar processes that may be used at the DoD Project Sponsor and Design and Construction Agent's discretion.

19-3 PRELIMINARY COMMISSIONING REQUIREMENTS.

In order to verify design and performance, and ensure that the Government requirements are met, employ commissioning practices appropriate to the size and complexity of the building and its system components and document specific roles and responsibilities for key commissioning participants.

19-3.1 Level of Commissioning.

Provide Commissioning for projects that are greater than 10,000 GSF (92.9 GSM) with a Construction cost of greater than $3 million dollars as described in paragraph 19-4. For small, non-complex, projects provide commissioning as described in paragraph 19-5.

Exception: When deemed appropriate by the DoD Project Sponsor and recommended by the Design and Construction Agent based on the project size and complexity, the commissioning requirements to be used (paragraph 19-4 or 19-5) shall be as directed by the DoD Project Sponsor.

19-3.2 Roles and Responsibilities.

Based on the commissioning leadership structure determined for the project, clearly define the roles and responsibilities of key commissioning participants to ensure that all required tasks are provided and that responsibility is appropriately assigned.

19-4 TOTAL BUILDING COMMISSIONING.

19-4.1 Process Overview.

TBCx must be executed during all project phases, including the design, construction, post-construction, and warranty phases. TBCx must at a minimum include the commissioning requirements of this chapter. TBCx must verify that building systems perform interactively according to the intent of the design, and that the systems meet the DoD Project Sponsor's operational needs. The Commissioning process must execute and document the commissioning activities required to comply with the Third-Party Certification (TPC) requirements for the Project. Provide all commissioning documentation required to meet the TPC requirements.

The minimum systems listed here must be commissioned as appropriate for the specific project:

a. HVAC systems, including electronic digital control systems and building energy management systems.

b. Plumbing systems and associated controls.

c. Medical and dental gas, compressed air, and vacuum systems.

d. Steam (high, medium, and low pressure), clean steam, and other major energy plant equipment.

e. EPSs and their interfaces to other critical building system operations.

f. Lighting systems: automatic daylighting controls, manual daylighting controls, occupancy sensing devices, and automatic shut-off controls.

g. Fire suppression, smoke control, smoke or fire dampers, fire detection and alarm systems, and mass notification systems, and their interfaces to other building system components.

h. Communication systems including telecommunication infrastructure, NC, ITV, intrusion detection, infant abduction, other ESSs, and other communication systems.

i. Building systems that are incrementally constructed and commissioned, such as in phased construction projects.

j. Energy conservation equipment and systems, including solar hot water system and any renewable energy systems.

k. Water and energy measurement devices.

l. Building envelope, including exterior walls, fenestration, roofs, and openings.

19-4.2 Commissioning Leadership Structure.

The Commissioning leadership structure, including roles and responsibilities, must be fully defined in the project requirements documents, as the structure may vary depending on the acquisition strategy, size, complexity of the project, and expertise of the participants. Regardless of leadership structure, the process requires full and open communication for all parties to maximize the benefits of the process. The principal Commissioning Lead definitions and roles are noted here:

19-4.2.1 Commissioning Specialist for the Government (CxG).

The CxG is an entity having expertise in the commissioning of medical facilities of a scope and complexity comparable to the individual project, and employed regularly in building commissioning. Refer to paragraph 19-4.2.5 for additional qualifications.

a. The CxG may be person(s) employed by the Design and Construction Agent, or an entity directly contracted by the Design and Construction Agent, but not affiliated with the construction contractor. The CxG must provide management and oversight of the Commissioning process through the design, construction, and warranty phases to ensure it is effectively and thoroughly implemented.

b. The CxG must have documented commissioning authority experience in at least two building projects and be independent of the work of design and construction.

c. The CxG must meet the requirements and perform the roles specified for the commissioning authority required by the project's TPC. For small DB projects, the commissioning authority role may be provided by an independent third-party commissioning agent hired as a first tier subcontractor to the DB contractor as defined in paragraph 19-4.2.3 and they must meet the requirements and perform the additional roles defined for the CxG in this paragraph. Specific roles include the development and maintenance of the Owner's Project Requirements (OPR), development of the draft Commissioning Plan, and assisting in the development of Systems Manuals for the commissioned systems. At the discretion of the Design and Construction Agent and DoD Project Sponsor, the CxG must conduct a Lessons-Observed meeting at the end of the Commissioning process to discuss the process used, discuss what worked well and what could be improved, develop recommended improvements for future similar projects, and document the meeting in a closeout report.

19-4.2.2 Commissioning Specialist for the Design Phase (CxD).

The CxD must be an entity on the Design A/E staff, or directly contracted by the A/E, having expertise in the commissioning of medical facilities of a scope and complexity

comparable to the individual project, and employed regularly in building commissioning. Refer to paragraph 19-4.2.5 for additional qualifications.

For DBB projects, the CxD must be responsible for development of all design phase commissioning documentation, including hands-on development of the Commissioning Plan, and commissioning specifications to include Pre-Functional Checklists (PFCs) and Functional Performance Tests (FPTs). For DB projects, the CxD must be responsible for developing commissioning scope requirements for inclusion in the RFP.

19-4.2.3 Commissioning Specialist for the Construction Phase (CxC).

The CxC must be an entity employed as a first-tier subcontractor by the construction contractor, independent from the installing contractors, having expertise in the commissioning of medical facilities of a scope and complexity comparable to the individual project, and employed regularly in building commissioning. Refer to paragraph 19-4.2.5 for additional qualifications.

The CxC must be responsible for scheduling and coordinating all construction phase commissioning activities, refinement of PFCs and FPTs to match the specific purchased equipment, and direct oversight and reporting of the execution of the Commissioning process.

19-4.2.3.1 Design After Award CxC Responsibilities.

For projects which include design-after-award activities (for example Design-Build), the CxC must additionally be responsible for development of all commissioning documents required during design, including the Commissioning Plan and commissioning specifications to include PFCs and FPTs.

19-4.2.4 Commissioning Lead Role Application.

The CxG is required for all project procurement methods. The CxD is typically required for DBB projects and may be utilized during DB RFP preparation for DB projects. The CxC is typically required for DBB and DB projects.

19-4.2.5 Commissioning Lead Qualifications.

The Commissioning Specialist entities must be members of, or certified by, a nationally recognized commissioning organization. Each entity must employ a commissioning professional who must be the Commissioning Lead for their area of responsibility. In addition, each entity must employ additional staff to ensure adequate attention to all systems requiring commissioning as identified in paragraph 19-4.1.

Table 19-1 provides the minimum qualification requirements for Commissioning Lead personnel:

Table 19-1 Commissioning Lead Personnel Qualifications

Qualification	CxG	CxD	CxC
Registered Professional Engineer (P.E.)	YES	YES	
Proven hands-on experience in the commissioning of projects of equivalent scope	YES	YES	YES
Certified as a commissioning professional by a nationally recognized commissioning organization	YES	YES	YES

19-4.3 Commissioning During Design.

The Commissioning process must be fully defined in the design phase for each project. The CxG should be involved early in project development to facilitate the development of the DoD Project Sponsor's OPR document, which records the expectations and requirements for the commissioned systems, and the Commissioning Plan, which outlines the process, commissioned systems, participants, roles and responsibilities, communication procedures, and deliverables. The scope and rigor of Commissioning activities to be completed during construction need to be defined in the contract documents so that they are clearly understood and can be adequately bid. The CxG should review the design documents at various stages of development to verify that the designed systems are commissionable, and suggest alternative designs that would save energy, allow for system optimization, and decrease overall LCC. The CxG must oversee the development of the Commissioning Specifications by the CxD and/or CxC for design after award work features, which define the specific SOW and the roles, responsibilities, and requirements of the construction contractor's commissioning team members. The specifications must also include draft PFC and FPT procedures for each system to be commissioned to adequately define the scope and rigor required.

19-4.4 Commissioning During Construction.

During the construction project, it is necessary for the CxG to oversee the contractor's commissioning execution as managed by the CxC to verify that the contractor's proposed testing procedures, personnel, and instrumentation fully meet the design document requirements, that the tests are properly conducted, and results documented. As part of the commissioning process, verify that adequate training has been provided on all commissioned systems.

19-5 SMALL PROJECT COMMISSIONING.

19-5.1 Process overview.

Perform Functional Performance Testing/Acceptance Testing (FPT/AT) in accordance with this section using generally accepted engineering standards. Incorporate FPT/AT into the design and construction of the project to verify systems specified in this section perform in accordance with construction documents.

The minimum systems listed in paragraph 19-4.1 must be covered by FPT/AT as appropriate for the specific project.

19-5.2 Oversight of the testing.

The Government will designate an Acceptance Representative to lead, review, and oversee completion of FPT/AT activities. The Acceptance Representative will review construction documents to verify relevant sensor locations, devices, and control sequences are properly documented.

The construction documents must indicate who is to perform acceptance tests and the details of the tests to be performed.

19-5.3 Requirements during construction.

Verify proper installation and start-up of the systems. Provide a minimum 7 day trend log of the system operation prior to the FPT/AT. Perform FPT/AT, complete test forms and include a signature and license number, as appropriate, for the party who has performed the test.

Verify a system manual has been prepared that includes O&M documentation, full warranty information, and provides operating staff the information needed to understand and optimally operate building systems.

19-6 SPECIFIC SYSTEM REQUIREMENTS.

19-6.1 Interoperability.

Various systems, such as HVAC systems, fire alarm and fire detection systems, EPSs, communication systems, and others, have complex, interwoven operational requirements in medical facilities. For each project where applicable, designers must develop new and modify existing specifications as needed to provide for integrated systems testing to validate interoperability of these systems and to verify correct function, acceptable speed of response, operation in normal and failure modes, and restoration to normal operation. Integrated systems testing of fire systems and life safety systems must be provided in accordance with NFPA 4. In all cases, detailed testing protocols or system diagrams must be developed to clearly convey the required scope of the commissioning effort.

19-6.2 Addition and Alteration Considerations.

For addition and alteration projects, commissioning specifications must be developed to describe the step-by-step procedures required for interim, as well as final, commissioning for systems constructed (or altered) and placed in operation on a temporary, or sequential, basis.

APPENDIX A BEHAVIORAL HEALTH DESIGN

A-1 GENERAL.

This appendix provides mandatory criteria for the design and development of the built environment for Behavioral Health (BH) functions in new and existing MTFs.

A-2 SCOPE OF BEHAVIORAL HEALTH SERVICES.

A-2.1 Inpatient Functions.

DoD Space Planning Criteria Chapter 460 outlines BH services and programs provided in MTFs in the Military Health System (MHS).

Services specifically covered in Chapter 460 are for 24-hour healthcare operations that are provided on inpatient units for Behavioral Health and Substance Abuse / Alcohol Rehabilitation programs. Additionally, Partial Hospitalization Program, which is a day treatment program for patients who need intensive treatment but not 24 hour care, is often collocated with an inpatient BH Unit. The Partial Hospitalization Program will follow the requirements specified for inpatient BH Units in this appendix if the Program is located in an inpatient MTF.

A-2.2 Outpatient Functions.

DoD Space Planning Criteria Chapter 318 outlines services and programs provided in an outpatient BH setting. Where outpatient is used in this appendix, it includes freestanding BH facilities that include the services noted below, as well as BH clinics located within a hospital or medical center. Services specifically covered in this chapter are Behavioral Health, Child and Adolescent BH Services, the Family Advocacy Program, and the Substance Use Disorder Clinic.

DoD Space Planning Criteria Chapter 350 includes spaces that support the care of BH patients who seek treatment at the Emergency Department (ED).

A-3 BEHAVIORAL HEALTH PROGRAM.

A-3.1 Concept.

In accordance with specific BH project requirements, the DoD Project Sponsor will develop the Functional Program to describe how the inpatient BH Unit, or outpatient clinic, will function within the physical environment. The MilDep's Surgeon General's BH Consultant and facility end users will also assist with developing the Functional Program to identify how the design criteria, as outlined in this appendix, will be implemented and identified when developing the scope of work for the project.

A-3.2 Behavioral Health Design Guide.

Design the inpatient BH Unit, and where appropriate the outpatient BH clinic to meet all of the requirements of the Behavioral Health Design Guide (BHDG), which is available from Behavioral Health Facility Consulting, LLC.

Exception: Due to the changing nature of behavioral health design, consider using the most current BHDG for product selections and finishes. The DoD Project Sponsor may require specific safety features from the current BHDG.

A-3.3 Functional Program and Safety Risk Assessment.

Develop the Functional Program in conjunction with the BH Safety Risk Assessment (SRA), also available at the link, to identify project specific design requirements. Safety levels identified by the BH SRA for the inpatient unit may not be the same in all areas nor be the same for each unit/population; and are fundamentally correlated to an understanding by the facility staff of a patient's intent for self-harm. For example, during the day the activity room may be Level 2, however at night on the weekends, it may be a Level 3. The Functional Program and SRA should take into account the number and location of staff in regard to specific areas or spaces. Review and update the Functional Program and the SRA during development of the RFP, and throughout the design and construction phases of the project. The A/E of Record is responsible for maintaining and updating the SRA during design and construction. Refer to Chapter 3 for specific SRA requirements and Appendix C for design submittal requirements.

A-4 CONSULTING SERVICES.

For BH projects, the A/E of Record must provide the services of a qualified behavioral health consultant at project initiation. The consultant must provide design, FF&E, and Low Voltage Systems input to inform the 35 percent design effort. The consultant must also provide input on the project SRA throughout the design process to identify potential safety concerns, review for compliance with the Functional Program, in relation to adjacencies, flow, and with the BHDG for product selection related to interior finishes, toilet accessories, hardware, electrical fixtures, etc. The consultant will present possible solutions, and explain the positive and negative elements of each, in collaboration with the DoD Project Sponsor. A qualified BH consultant is one who has been in business or employed as a BH professional or provider, for a period of not less than five years, and has had experience with the planning and design of inpatient and outpatient BH medical facilities. The consultant must not be involved in the sale, installation, distribution, manufacture, or representation of BH equipment. Furthermore, the consultant must demonstrate prior experience with DoD MTFs that relates to the scope and nature of the project to include locations OCONUS, if applicable.

A-5 DESIGN CRITERIA.

A-5.1 Environment.

Design a safe, functional, therapeutic, and aesthetically pleasing, non-institutional BH environment that “normalizes life” for patients, staff, and visitors. There are four “areas of concern” that must be considered when designing a BH environment: 1) Patient Safety – reducing risks for suicide/self-harm or harm to other patients; 2) Staff Safety – reducing risks or opportunities for patients to harm attending staff; 3) Structural Resistance – reducing damage to facilities and preventing an increase in maintenance costs; and 4) Life Safety - egress for inpatient behavioral health may include delayed egress locking devices, for patients, staff and visitors. The Functional Program will include the following: applicable codes and regulations, to include operational risk mitigation strategies (for example staff rounding, monitoring by staff, and doors-open policy during daytime hours), the findings of the BH SRA, and include the implementation of the design criteria set forth in this appendix to provide direction on several means of improving safety of staff and patients in BH settings. The Functional Program will state unequivocally that, whereas safety of staff and patients is paramount, the design intent is to limit the “institutional” look of the BH environment. Generally speaking, the using MilDep Surgeon General’s BH Consultants have not supported such measures as bullet-proof glass surrounding reception desks, or security staff and metal detectors at entrances to Outpatient BH Clinics. The implementation of such extraordinary measures will be identified early and incorporated into the SRA and project documents following full discussion with the Design and Construction Agent and the DoD Project Sponsor.

A-5.1.1 Exterior Spaces.

Consider the inclusion of an outdoor area during project design to support respite and group activities as a component of the inpatient BH therapeutic environment. This outdoor area, which may have attached or unattached canopies or overhangs, will comply with Chapter 3 for scope and cost estimating. Plan the location and design of this outdoor space to reduce the risk of elopement, climbing, jumping, impalement and concealment in relation to wall surfaces, furniture selection and placement, sufficient lighting for nighttime, staff sight lines and video surveillance use, and landscaping features are essential. Include the outdoor area in the SRA. Apply design considerations and safety features noted in the sections below.

A-5.1.2 Interior Spaces.

Drivers that influence the selection of materials include safety, durability and maintenance, infection control, integrated wayfinding, and sustainability. Every effort must be made to eliminate ligature points, sharp edges, and the potential to make weapons out of objects or materials. The term ligature resistant as used in this appendix is defined as “without points where a cord, rope, bed sheet, or other fabric/material can be looped or tied to create a sustainable point of attachment that

may result in self-harm or loss of life." This is consistent with The Joint Commission's definition.

The DoD Project Sponsor are responsible for the validation of the SEPS generated PRC to ensure JSNs reflect the BHDG requirements and support the SRA.

A-5.1.3 Architecture.

Incorporate the following guidance when developing the design and layout of spaces for BH care for inpatient and outpatient settings:

a. Avoid dead-end corridors, alcoves or other architectural features that provide concealment or blind spots.

b. Provide column-free spaces in patient bedrooms, group therapy or counseling rooms, activity rooms and other rooms where patients and staff interact.

c. Provide staff areas that promote team collaboration and HIPAA compliance while maintaining visibility and connection between the care team and patients. Design staff areas to provide an area of refuge (but not as used in the context of NFPA 101) for staff safety.

d. Maximize windows to exterior and interior spaces to create a sense of transparency, openness, and safety.

e. Segregate noisy activities (art therapy) and quiet activities (patient bedrooms or counseling spaces) to improve processes and consolidate disciplines.

f. Outfit the "transition zone" between the inpatient bathroom and the bedroom with ligature resistant fixtures and features and select a bathroom door that aligns with the SRA requirements specific to a particular patient or groups of patients who may not be permitted access to the inpatient bathroom.

g. Locate staff support spaces such as janitor closets and soiled utility rooms, in an area that promotes access without having to enter secure patient areas. To enhance safety, provide self-closing and self-locking mechanisms on the doors of staff rooms that are directly accessible from the secure patient care area. Mount the closer on the staff side of the door. Provide tamper-resistant locksets and a vision panel in the door of electrical and communications rooms that are located in the secure patient area of an inpatient unit.

h. Orient and layout furniture and equipment in BH provider/counselor offices, group therapy rooms and other locations where staff and patients interact to provide a clear path of egress or an "escape corridor."

i. Locate two means of egress for each group therapy room (OPMH1), either on opposite ends or sides of the room.

j. Do not reduce the size of BH counseling rooms (OFDC1, OFDC2) from 120 NSF, as noted in DoD Space Planning Criteria Chapters 460 and 318.

A-5.1.4 Furniture, Fixtures and Artwork.

For the inpatient BH Unit, provide furniture and fixtures that have rounded edges and curves and meets or exceeds the requirements noted in the BHDG to maximize safety for patients, staff, and visitors. Minimize the amount of furniture in BH patient bedrooms and outfit with furniture that is heavily weighted or fixed to the floor, is non-breakable and contains no compartments for hiding. Utilize ligature resistant clothes hooks. Coordinate the placement of inpatient BH Unit furniture with the ceiling plan to avoid patients gaining access to ceiling fixtures or ligature points. Select artwork for all BH settings that is soothing and provides a connection to nature. Avoid abstract artwork or finishes that produce animated or other illusions. The DoD Project Sponsor will define specific inpatient BH Unit requirements for location of artwork as well as provide instructions for mounting and hanging of artwork to avoid ligature risks or detachment from the wall. Provide wall mural artwork in BH patient bedrooms, and elsewhere in the BH setting to minimize safety risks. Shower curtains are prohibited in inpatient bathrooms. Provide cabinet and drawer locks for all areas where patients may be unsupervised for even short durations as identified in the Functional Program and the SRA.

A-5.1.5 Finishes.

Incorporate colors, textures and surfaces that are soothing, do not produce a harsh glare, shiny surface, or distorted reflections, and provide a connection to nature. Construct wall and other room finish materials to resist intentional damage or removal. For the Inpatient BH setting incorporate wall and ceiling finishes that are abrasion and indention resistant; wood veneer products that have a natural finish and meet or exceed the latest ANSI/HPVA HP-1 tolerance standards. For other specific finishes, provide products that meet or exceed the minimum requirements as noted in the BHDG.

A-5.1.6 Walls.

For inpatient BH settings, construct wall assemblies with impact and abrasion resistant gypsum board. Utilize heavier construction materials, as recommended by the safety guidelines in the BHDG, for the inpatient BH Unit seclusion room(s) and Emergency Department secure holding room(s). Wall cove base used for inpatient BH Units should be cut into short lengths not to exceed 14 in (360 mm). Secure the base along the edge with pick resistant caulk to prevent tampering or hiding contraband. Do not use metal trim wall cove base. Do not use wall cove base in seclusion or secure hold rooms; extend wall gypsum to the floor and finish with pick resistant caulk.

Construct outdoor areas dedicated to the inpatient BH unit with smooth wall surfaces that have no grooves or crevices to prevent climbing and are ligature-resistant. Wall height must be a minimum of 14 ft (4.27 m) above the outdoor finished floor area.

A-5.1.7 Ceilings.

Apply the Appendix B requirements specified for ceiling type and height to all room codes noted in the project specific Program for Design (PFD). Where hard ceilings are specified for the inpatient BH setting per the Functional Program and SRA, provide impact resistant gypsum board with key lockable access panels that comply with the BHDG. Where lay-in ceilings are permitted, provide security clips to restrict access to ligature points in the space above the drop ceiling. The installation of motion sensors above lay-in ceilings to alert staff to patient tampering is not a mandatory safety measure and should only be used where required by the project SRA. Coordinate the location of ceiling fixtures such as overhead lights, sprinklers, and registers on an inpatient BH Unit with room furniture plans and the safety guidelines in the current BHDG. Ensure furniture cannot be moved, stacked, or climbed upon to access any ceiling fixtures or materials. Wherever devices and accessories (for example lights, air grilles, access panels, toilet accessories, etc.) are mounted on the ceiling or wall and they do not fit securely, finish the edges or flanges with pick resistant caulk to fill the gaps.

A-5.1.8 Floors.

Apply the Appendix B requirements specified for flooring material to all BH room codes in both inpatient and outpatient settings. Minimize joints and seams to the furthest extent possible in all BH rooms outfitted with tile or sheeting to enhance safety.

A-5.1.9 Doors.

Apply requirements for door locking, latching, and access control arrangements (for example fail-safe electronic locks and fail-secure electronic locks) in accordance with Chapter 5 and UFC 3-600-01. Wherever a BH inpatient crosses the threshold of a door, utilize ligature resistant hardware. Design a sally port at the primary entry to the inpatient BH Unit that locks and unlocks in sequence to optimize access control. Apply the requirements for sequential locking to a sally port at any secondary entries. Where patient bedroom doors require locking, provide ligature resistant “classroom” type door locks. All inpatient BH Unit doors and hardware, including, but not limited to, hinges and handles, must comply with the requirements in the current BHDG. Identify which doors on the inpatient BH Unit require risk-mitigation devices installed to decrease the risk that the top of a corridor door will be used as a ligature point; and which doors require barricade risk mitigation strategies such as outward swinging doors; double-acting doors; a door in a door; an unequal pair of double egress doors, or an additional door with outward swing. Provide additional risk mitigation strategies, such as appropriate rounding and monitoring by staff, or requiring that doors be left open during certain hours. All solid doors installed in a BH setting will be outward swinging or utilize rescue hardware that provides double acting, continuous pivot hinges.

Reevaluate inpatient BH Unit door types and hardware requirements as needed, and document in the Functional Program and SRA prior to finalizing the contract documents.

A-5.1.10 Windows and Glazing.

Glazing thickness will be calculated by the manufacturer. Laminated glazing is the preferred alternative to glass-clad polycarbonate glazing.

A-5.1.10.1 Interior windows.

Install impact-resistant glass products in all patient accessible areas inclusive of interior window surfaces in all inpatient BH Units. Impact-resistant glass products are recommended for outpatient facilities in areas where patients may be left unattended. Test interior windows in accordance with American Architectural Manufacturers Association AAMA 501.8-13: Standard Test Method for Determination of Resistance to Human Impact of Window Systems Intended for Use in Psychiatric Applications.

A-5.1.10.2 Exterior Windows.

Install impact-resistant glass products on the interior face of exterior windows where the window sill is 6 ft 6 in. (1961 mm) or less. Design exterior windows to resist impact loads of 2000 ft-lb (2712 N·m) applied from the inside. Where operable windows are used, also test hinges and locking devices. Install integral blinds and ligature resistant blind hardware for the exterior windows in BH patient bedrooms. For other inpatient BH areas or outpatient settings, install window roller shade treatments specifically manufactured for use in the BH setting that meet or exceed the current safety requirements of the BHDG.

A-5.1.11 Mechanical HVAC.

HVAC Air Diffusion Devices (for example grilles, registers, etc.): Install tamper and ligature resistant air diffusion devices in accordance with the current BHDG. Where perforated diffusion devices are required, perforations must be a maximum of 3/16 in. (5 mm).

A-5.1.11.1 Thermostats.

Install thermostats in accordance with the current BHDG.

A-5.1.11.2 CO2 sensors.

CO2 sensors may not currently be available in a ligature resistant style and should only be installed where permitted by the project SRA. CO2 sensors may be installed within ducts.

A-5.1.12 Plumbing.

Install ligature resistant plumbing fixtures in inpatient BH settings; include floor mounted toilets with back water supply constructed of high impact resistant materials that promote a residential versus institutional setting. Shut-off valves and cleanouts for fixtures in BH patient bedrooms must be directly accessible from the corridor. Install

tamper / vandal resistant drains in all inpatient bathrooms, toilet/showers, kitchenettes, and laundry rooms. Install a floor drain for each shower and a second floor drain for the bathroom area. Select drain types (standard round or trench drains) that are tamper and ligature resistant and that minimize opportunities for intentional blockage. At locations where inpatients will be unsupervised during showering, install a “timing” system that has a re-set capability to limit the length of time that shower water may continuously flow.

A-5.1.13 Electrical.

Install electrical power outlets in all areas of the inpatient BH setting that are tamper / vandal resistant and GFCI. Install in inpatient BH settings electrical switches and outlets made of polycarbonate material that are affixed with tamper / vandal resistant screws to reduce the risk of exposing the wiring. The Functional Program and SRA should indicate if outlets will be installed in the BH Unit patient bedrooms and toilet/showers. Wherever outlets are installed in these inpatient rooms, they must have a dedicated **\4** Class A, GFCI circuit breaker and circuit controlled by a single switch outside the room under staff control. **/4/** Do not install outlets in the BH Unit seclusion room(s) or the ED secure holding room(s). In the outpatient setting, install tamper resistant outlets.

A-5.1.14 Lighting.

Identify the use of, and placement of table lamps for the outpatient setting in the Functional Program and SRA. Do not outfit the secure area of inpatient BH Unit with table lamps. Install tamper / vandal resistant and ligature resistant light fixtures with impact resistant lenses in the inpatient BH setting. Install light fixtures in all inpatient BH areas, including corridors, counseling, interview, activity, patient bedrooms, and all areas not under direct observation by staff, including blind spots and areas not under video surveillance. In the BH patient bedroom, install a tamper/vandal resistant, ligature resistant night light that is situated close to floor level to light the path of travel from the patient bed into the patient bathroom. Activation of the night light will be by room lighting level and by a switch exterior to the patient bedroom. Install interior lights in painted hollow metal frames with laminated glazing in inpatient BH settings. Calculate the glazing thickness and the size of the glazing stop based on the size of the light. Secure the glazing stops with tamper/vandal resistant screws to secure the glazing stops. The Functional Program to identify all BH rooms that require dimming beyond those that are already required to have dimming capability per Appendix B. Install impact and tamper / vandal resistant device plates (switches, receptacles, covers) secured with tamper resistant fasteners all areas where BH light fixtures are required per the Functional Program and SRA. Securely mount and fasten emergency exit signs to walls with tamper-resistant screws. Do not mount emergency exit signs to ceilings.

A-5.1.15 Communication.

A-5.1.15.1 Audio/Visual.

At the primary entry to a BH Unit, install an audio/visual communications system that will connect this entrance to the staff /nurse station, or another location as directed in the Functional Program, to provide call-to-enter capability.

A-5.1.15.2 Nurse Call.

Install Nurse Call push buttons in BH patient bedrooms and the associated bedroom toilet area and the shower, and in patient toilets in all BH settings. Pull cords are prohibited. On the inpatient BH Unit, install ceiling mounted speakers and microphones to facilitate the staff call-back function. Do not install a dome light over the inpatient toilet/shower door. Install a Nurse Call override switch outside each BH Unit bedroom and seclusion room, and each ED secure holding room.

A-5.1.15.3 Behavioral Health Staff Assist Alarm System.

Install a standalone BHSA Alarm system in all BH settings that complies with the DHA Performance Standard 28-26-36. The BHSA Alarm system is a component of the Electronic Security system and is categorized as Personal Property according to Section 6 of MIL-STD-1691. The BHSA Alarm system is independent of the Nurse Call system, the Intrusion Detection system, and the Duress Alarm system. Additionally, DO NOT connect the BHSA Alarm system to the facility local area network (LAN) or the wireless local area network (WLAN). Incorporate wireless BHSA alarm pendants to be worn by the staff, and wall mounted wireless or wired devices. The Functional Program and the SRA to indicate the locations of the wall mounted devices, to include specific rooms, corridors, and areas throughout the BH setting. Install ligature resistant wall mounted devices adjacent to the door inside an enclosed room. Transmit all BHSA Alarm device signals to the same annunciator station located at the reception point, nurse station, or other location identified in the Functional Program. When a signal is activated, an alarm tone will sound, and a graphical display at the BHSA alarm annunciator station will indicate the signal origination point, and the location of the staff member sending the alarm. The wireless pendant must comply with the DHA Performance Standard 28-26-36. The location feature will be deactivated when the staff member is outside of the BHSA alarm zone. The components of the BHSA Alarm system provide an opportunity for BH staff to be “first” responders and intervene in situations that do not require assistance from the facility security office or the Installation Provost Marshall. If a situation escalates and an emergency arises, the Duress Alarm system will be activated.

A-5.1.15.4 Wi-Fi Transmitters.

Install recessed, ligature resistant ceiling mounted Wi-Fi transmitters with a break-away feature to support the wireless IT system and the BHSA Alarm system.

A-5.1.15.5 Duress Alarm System.

Install a Duress Alarm system that allows staff to immediately activate a Duress Alarm button or equivalent in the event that a situation requires an elevated level of response from either the Facility Security office or Installation security. Integrate communication capabilities between the Duress Alarm system and other entities on the Installation as determined by the Functional Program and the SRA. Install wiring, conduit, power supply, buttons, and other appurtenances to support the Duress Alarm system at each Duress Alarm annunciator station. Install Duress Alarm buttons in areas where staff are present at all times; for inpatient BH Units, this is the staff / nurse station, and for outpatient BH settings it is the reception desk.

A-5.1.16 Video Surveillance System.

For inpatient BH units, install Video Surveillance System (VSS) cameras at locations determined by the DoD Project Sponsor, and identified in the Functional Program. Install VSS cameras that capture video monitoring only; no audio recording function is permitted for BH settings. Install monitoring stations on the inpatient BH Unit and at a central security location in the inpatient MTF, as directed in the Functional Program. As a minimum, install cameras in locations to assist with supervision of the admissions / triage area, group activity areas, corridors, entrances, fire exits, staff / nurse station(s), exercise areas (interior and exterior), and patient laundry. DO NOT install VSS cameras in BH patient bedrooms; however, they may be installed in the seclusion room(s) on the BH Unit or in the secure holding room(s) in the ED. Cameras must be tamper /vandal resistant, and they may be unique for the BH Unit or ED BH spaces rather than integrated with the MTF security system. Install ligature resistant, wall or ceiling mounted VSS cameras mounted with tamper resistant fasteners. Install camera cases and lenses that are impact resistant or shatter proof.

A-5.1.17 Televisions.

Do not install Televisions (TVs) in BH patient bedrooms. Locate TVs in other spaces for inpatient and outpatient settings as reflected in the project's PRC. Install wall mounted TVs that meet or exceed the current safety requirements noted in the BHDG.

A-5.1.18 Security.

In accordance with the Functional Program and SRA, install a small safe in a secured location close to, but outside, the primary entrance of the inpatient BH Unit to allow security personnel to stow side arms prior to entering the Unit. Remote release of BH Unit entry doors is prohibited. For inpatient BH settings, provide the following minimum security requirements: control of corridor lighting including motion detectors, securing of patient bedroom doors, notification of patient bedroom door switch position to staff / nurse station, incorporation of a sally port at the secondary BH Unit entrance(s), VSS monitoring activated by motion detectors, and Electronic Security System access control at entrances/exits (interior and exterior), staff-only spaces, stairwells, etc. For outpatient settings, install as part of the Electronic Security System, electronic access

control from reception/waiting to treatment areas and from the treatment areas to any back-of-house corridors. For outpatient BH settings, provide VSS cameras associated with the duress alarm button located at reception.

A-5.1.19 Fire Protection and Life Safety.

See Chapter 14 for additional requirements. Design specific fire protection and life safety features to support the BH environment (for example eliminating strobes or fire alarms from Child Observation, Group Therapy, and other rooms where these devices may lead to panic, or trigger undue stress in BH patients).

A-6 EQUIPMENT SPECIFICATIONS.

Specify equipment requirements that meet or exceed the standards as noted in the current BHDG. Vendors will often use the terms “tamper-proof”, “tamper-resistant”, “vandal proof”, and “institutional,” and apply them arbitrarily. Closely examine the specifications and equipment submittals provided by both the construction contractor and for initial outfitting purchases to ensure they meet the requirements of the BHDG, the Functional Program, and the SRA.

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APPENDIX B ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

B-1 GENERAL.

Appendix B is a compilation of mandatory architectural and engineering design criteria organized by standard Room Codes. The Design and Construction Agent, in conjunction with the DoD Project Sponsor, may provide additional criteria to meet special needs, for example, bariatric design, demountable partitions, contingency facilities. The Room Codes used to organize this appendix are the same as the codes used to organize the PFD and the Equipment List so that the initial design requirements should be well established for the A/E. For Room Codes that are used but are not included in Table B-1, the room criteria must be obtained from the DoD Project Sponsor. A period (".") indicates that there is no specific requirement for this parameter or the parameter matches the ambient conditions.

B-2 LEGEND & NOTES.

B-2.1 Room Code.

Room identifier from DoD Space Planning Criteria. This five-digit Code is the reference key that ties the criteria to the project PFD.

- * An asterisk (*) prior to the Room Code indicates that it is a new Room Code added since the previous UFC version.
- The letter "X" in the fifth digit indicates that the criteria applies to multiple spaces/room codes in accordance with PFD.

B-2.2 Room Function.

Room function from DoD Space Planning Criteria.

B-2.2.1 Code.

Category of Patient Care Space in accordance with NFPA 99. The listed code defines the category for the expected Patient Care Space function. The DoD Project Sponsor must define room function and reassess codes to be used for the specific project. The A/E must validate the room function and propose appropriate changes to a room category for Patient Care Spaces. The A/E will ensure the architectural and engineering criteria are appropriate for the code used. A waiver will be required for changes to room categories.

The categories of Patient Care Spaces are independent from and should not be confused with Building System Categories. Building System Categories must be as defined in NFPA 99.

1 Category 1 – Critical Care Space

2 Category 2 – General Care Space

3 Category 3 – Basic Care Space

4 Category 4 – Support Space

C Category to be determined by the DoD Project Sponsor

N Not applicable. This room is not intended for patient examination or treatment.

B-2.3 Space Parameter Notes.

For room codes that do not have Architectural and Engineering design parameters listed, utilize the following notes:

a. For this room code, utilize the Architectural and Engineering parameters of the room where this area is located unless otherwise directed by the DoD Project Sponsor.

b. This new room code is under development. Architectural and Engineering parameters must be provided by the Design and Construction Agent and DoD Project Sponsor.

c. Provide emergency power for selected electrical receptacles.

d. Provide essential power only as required by the DoD Project Sponsor for selected equipment connections.

e. Provide dedicated exhaust for this area.

f. Provide minimum of 700 lux for this area.

B-3 ARCHITECTURAL.

B-3.1 Materials and Finishes.

FL Floor and base finishes. See Architectural Note 1.

Poured flooring finishes **\4**

ER Poured epoxy resin system with integral coved base. See Architectural Note 9.

PS Poured specialty flooring with integral base. Coordinate with the DoD Project Sponsor for specific requirements.

TR Epoxy terrazzo flooring system with integral coved base. See Architectural Note 9. ***/4/***

Tile flooring finishes

CP Carpet Tile with rubber base. See Architectural Note 2 and 12. **\4**

LV Luxury vinyl tile with rubber base. See Architectural Note 2.

PC Porcelain tile with through body color and porcelain tile base.

RT Rubber tile with rubber base. Note: for rooms that are a portion of a larger room, match adjacent area floor finish.

SD Static Dissipative Tile with rubber base. **/4/**

Sheet flooring finishes

SM Sheet material: either SR or SV, consistent in rooms with the same room code. **\4**

SR Sheet rubber with integral rubber base. **\1** See architectural note 6. **/1/**

SV Sheet vinyl with integral vinyl base. See Architectural Note 3. **/4/**

Other flooring finishes

CS Concrete sealer. Resilient base on gypsum wallboard and plaster walls. No base on concrete or block walls.

MA Match finishes of the adjacent area where this space is located.

PF Prefabricated.

SF Safety Flooring with rubber base or integral base for wet areas.

SP Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor. Describe specific finish requirements in the final RFP for DB projects or by the 35% design submittal for DBB projects.

WL Wall Material & Finish. First character is wall material. Second and third characters are finish. See Architectural Note 1.

Wall Material (first character)

C Concrete.

B Concrete block or clay tile.

G Gypsum wallboard. See Architectural Note 4.

L Lead lined gypsum wallboard. See Architectural Note 11.

S Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

Wall finish material (second and third characters)

AT Acoustical wall treatment, such as fabric, panels, or alternate material on painted finish.

CS Concrete sealer.

CT Ceramic or Porcelain tile. **\4\ /4/**

PF Prefabricated.

PT Paint. **\4\ /4/**

EP Epoxy coating, seamless **\4**. See Architectural Note 5.

RE Trowel applied resin epoxy. **/4/**

SP Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

SS Solid surface material wall cladding. See Architectural Note 13.

CLG Ceiling Material and Finish. See Architectural Note 1. First character is ceiling material. Second and third characters are finish.

Ceiling material (first character)

A Acoustic ceiling tile.

C Concrete.

E No ceiling required, exposed to floor/roof above.

G Gypsum wallboard.

S Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

Ceiling Finish Material (Second and third characters)

CS Concrete sealer.

LG Liquid Glaze Coat.

PF Prefabricated.

PT Paint.

SP Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

EP Epoxy coating, seamless **\4\./4/**

T1 Standard finish.

T2 Waterproof finish.

XP No ceiling or finish required, exposed to floor/roof above.

B-3.2 CEILING HEIGHT.

CLG HT Ceiling height in feet and inches (millimeters), unless noted otherwise.

A 10 ft (3050 mm) minimum.

B If ceiling is provided, 10 ft (3050 mm) minimum.

C No ceiling required, exposed to floor/roof above.

D 9 ft (2750 mm) minimum or as required to accommodate equipment usage.

VAR Varies (Designer's choice).

B-3.3 DOOR SIZE.

DR SIZE Door width in feet and inches (millimeters), unless noted otherwise.

A Pair 30 in. (760 mm) doors

B Pair 36 in. (915 mm) doors

C { not used }

D Double doors, uneven: 48 in. (1220 mm) and 18 in. (460 mm)

E Pair 36 in. (915 mm) doors or 48 in. (1220 mm) doors as directed by the DoD Project Sponsor. **\4**

F Provide door width(s) as needed to accommodate equipment removal/replacement. Minimum door size of 42 in. (1065 mm) required. **/4/**

G In clinics, provide 42 in. **\4** (1065 mm) **/4/** doors
In hospitals, provide uneven double doors, 42 in. **\4** (1065 mm) **/4/** and 18 in. (459 mm)

H Pair 48 in. (1220 mm) doors, 8 ft - 6 in. (2591 mm) breakaway glass doors, or uneven double doors (48 in. (1220 mm) and 18 in. (458 mm)) as directed by the DoD Project Sponsor.

I 10 ft (3050 mm) by 10 ft (3050 mm) minimum. Number as required by dock.

J Main OR door, pair 36 in. (915 mm) doors. Staff door from clean corridor, 48 in. (1220 mm) door. Door to sub-sterile, 42 in. **\4** (1065 mm) **/4/** door.

K Main OR door, pair 36 in. (915 mm) doors or 48 in. (1220 mm) and 18 in. (458 mm) uneven doors or 42 in. **\4** (1065 mm) **/4/** and 18 in. (458 mm) uneven doors as directed by the DoD Project Sponsor. Staff door from clean corridor, 48 in. (1220 mm) door. Door to sub-sterile, 42 in. **\4** (1065 mm) **/4/** door.

L Open (no door).

M Open (no door) or 36 in. (915 mm) door as directed by the DoD Project Sponsor.

N Open (no door) or 48 in. (1220 mm) door as directed by the DoD Project Sponsor.

O Open (no door) unless directed otherwise by the DoD Project Sponsor.

P Open (no door). Provide cubicle curtain only at entrance to cubicle and minimum 48 in. (1220 mm) door into area where the cubicles are located.

Q Open (no door). Provide cubicle curtain only at entrance to cubicle and minimum 48 in. (1220 mm) door into area where the cubicles are located.

SP Special. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

VAR Varies (Designer's choice).

VET Special door in veterinary facility. See Architectural Note 10.

B-3.4 NOISE.

NC The first line indicates the allowable range (minimum to maximum) noise coefficient (NC) required in the room. See Architectural Note 7.

STC The second line indicates the composite Sound Transmission Class (STC) required. See Architectural Note 8.

SP Special requirements. Determined by the Design and Construction Agent in coordination with the DoD Project Sponsor.

STC 50* An asterisk after the 50 designates that the STC requirement is 50 for all facilities except those where Navy provides facility maintenance, in which case the STC requirement is 40.

B-4 ARCHITECTURAL NOTES.

1. When two finishes are appropriate for a room, provide the preferred finish (1st line) shown in Table B-1, unless the Design and Construction Agent selects the alternate finish (2nd line) after coordinating with the DoD Project Sponsor. Provide the finishes shown in **\4** Table B-1 **/4/**unless otherwise coordinated and approved by the DoD Project Sponsor and directed by the Design and Construction Agent.

2. Rubber Base. Rubber coved base for use with resilient tile and carpet. Coved base must terminate and butt at the face return of steel door jambs. Fire-retardant wood blocking or metal runners must be provided at the steel stud base channel runner for all gypsum board corridor walls.

3. Sheet Vinyl. Solid, seamless **\4**, no wax, **/4/** vinyl in roll format with routed, welded, grooved seams where melted vinyl is used for an impervious, waterproof seal. Chemical sealants are unacceptable. Cushioned sheet vinyl may not be used. Provide seamless sheet vinyl base integral with the flooring, using the same joint sealing application technique of grooved, melted, welded, vinyl, for an impervious waterproof

seal. **\4** Do not wax sheet flooring or apply additional topical treatments, which would void the manufacturer's warranty. **/4/**

4. Gypsum wallboard. Minimum 5/8 in. (15.9 mm). Ensure that the proper gypsum wallboard product used is appropriate for the application (wet areas, fire resistance, damp conditions, radiation protection, etc.). Utilize lead lined gypsum board where lead lined walls are determined to be required, reference Architectural Note 11. **\4**

5. Epoxy Coating (EP). In humid climates, avoid the use of EP **/4/** on interior surface of exterior wall.

6. Sheet Rubber. Solid, seamless **\4**, no wax, **/4/** rubber in roll format with routed, welded, grooved seams where melted rubber is used for an impervious, waterproof seal. Provide seamless sheet rubber base integral with the flooring, using the same joint sealing application technique of grooved, melted, welded, rubber for an impervious waterproof seal. Sheet rubber flooring requires heat and chemical welds for a proper installation (chemical welds for vertical seams and sanitary wall base applications). Provide thickness of sheet rubber flooring as required for the space or application, with a minimum thickness of 1/8 in. (3.0 mm). **\4** Do not wax sheet flooring or apply additional topical treatments, which would void the manufacturer's warranty. **/4/**

7. The acoustical noise level range in the room is the design value for the NC-level for the background (ambient) noise level.

8. The STC specifies the performance of the room enclosure in isolating against airborne sound. The wall partition/ceiling system, including penetrations, must be designed to this composite value. This design value is generally considered as a minimum rating. For corridor walls that contain a door, window, or other penetration, a composite STC 35 may be used, unless the room has special acoustical privacy concerns as determined by the DoD Project Sponsor. The composite STC rating is the calculated value that considers the STC rating and the area percentages of the individual wall, door, and other components. Maintain the specified STC for common walls with public spaces, service areas, and rooms with higher STC requirements.

9. Provide non-slip finishes in corridors and all areas where pedestrian traffic is anticipated. Provide smooth finish where greater degree of cleanability is required (under cage racks, for example). **\4** Coordinate with the DoD Project Sponsor and recommend the proper poured resinous flooring appropriate for the space for approval by the Design and Construction Agent. **/4/**

10. Provide vermin-proof hollow metal doors, 48 x 96 in (1220 x 2440 mm), with 12 x 12 in (305 x 305 mm) red glass vision panel and recessed hardware. Provide door seals. Do not provide door lock.

11. A health physicist must determine the required degree of protection to minimize exposure to primary and secondary radiation, as required to achieve compliance with NCRP Report No. 147. Shielding must be designed by the health physicist. Due to the intended use, rooms BMCW2, XDR01 and XDRF1 require a minimum of 1/16-inch thick lead shielding, or more if so determined by the health physicist. Rooms requiring shielding must be certified in accordance with NCRP Report No.102 and the MilDep qualified expert.
12. Carpet Tile must meet TARR (Texture Appearance Retention Rating) classification ratings based on location areas where it is being used. **\4** Follow UFC 3-120-10 requirements for Traffic Classifications and TARR Classifications. **/4/** Reference the Carpet and Rug Institute (CRI) Fact Sheet for more information. **\4\ /4/**
13. Solid surface material wall cladding. Minimum ¼ in. (6.4 mm) thickness and full height wall application. Follow manufacturer's recommended installation methods for seaming and for properly integrating wall cladding with flooring materials and ceilings.

B-5 STRUCTURAL.

Minimum uniformly distributed live load in psf (kpa), unless noted otherwise.

A Design for minimum of actual wheel loads or 150 psf (7.2 kpa).

B Design for minimum actual equipment loads or 150 psf (7.2 kpa).

C Design for minimum actual equipment loads or 100 psf (4.8 kpa).

D Design for minimum actual weight of shelves plus 3.1 lb/filling inch (55 kg/filling meter) or 150 psf (7.2 ka).

E Floor loading is being reviewed. Obtain required floor loading from the Design and Construction Agent.

F Reference UFC 3-301-01 for floor loading requirements.

B-6 ELECTRICAL.

B-6.1 LIGHTING.

LEV Maintained **\4** horizontal average lighting level in lux provided by permanently installed building fixtures. The first line is the general lighting level (ambient) and the second line is the task illumination level unless otherwise noted. Lighting level is measured at 3 ft (900 mm) above finished floor unless otherwise noted. Where multi-level lighting levels are indicated, provide multi-level switching for fluorescent fixtures and full range dimming for LED fixtures with conventional on/off switching unless otherwise noted. These lighting levels are in addition to supplemental lighting provided by furniture, fixtures, and equipment. However, the DoD

Project Sponsor may direct task lighting be provided with office furniture in administrative areas, except for dual purpose clinical/administrative rooms, rather than permanently installed light fixtures. See Chapter 11 for CCT, TM30 metrics, and CRI.

UNI Uniformity ratio for the light level, expressed as average:minimum, unless otherwise noted. The first line is the general lighting (ambient) uniformity ratio and the second line is the task illumination uniformity ratio. For example, a 3:1 uniformity ratio indicates that the average light level (within a specific area) can be no more than three times (3x) the minimum light level (within the same area).

N Lighting Notes. The first line is the general lighting (ambient) notes and the second line is the task illumination notes.

a1 Provide Explosion Proof fixtures.

a2 Provide sealed and gasketed recessed troffers, suitable for use in operating rooms. Fixtures with battery backup are required to have full illumination when energized by battery or UPS.

a3 Provide fixtures with a CRI of 90 or greater and a violet fraction between 4% and 6% in this space. Reference chapter 11 for violet fraction requirements.

b1 Medical/Surgical Bedroom task lighting: Provide recessed ceiling fixture for patient examination controlled at the headwall. Patient Bedrooms have multiple task light levels in the patient and family zones. See table for permanently installed task lighting.

Medical/Surgical Bedroom task lighting	**LEV**	**UNI**	**Horizontal Light Level**
Patient Zone task lighting			
Examination:	1000	2:1	at 3’ (0.91m) AFF
Reading:	500	3:1	at 3’ (0.91m) AFF
Television viewing:	50	4:1	at 3’ (0.91m) AFF
Night observation:	30	4:1	at 3’ (0.91m) AFF
Night light:	4		at floor level
Family zone task lighting			
Casual chair:	300	3:1	at 2.5’ (0.79m) AFF
Desk:	400	3:1	at 2.5’ (0.79m) AFF

b2 ICU/CCU Bedroom task lighting: Provide recessed ceiling exam fixture for patient examination controlled at the headwall. ICU/CCU Patient Bedrooms have multiple task light levels in the patient zone. See table for permanently installed task lighting.

ICU/CCU task lighting	LEV	UNI	Horizontal Light Level
Examination:	1000	2:1	at 3’ (0.91m) AFF
Night observation:	100	4:1	at 3’ (0.91m) AFF
Night light:	2		at floor level

b3 Recovery room task lighting: Provide recessed ceiling exam fixture for patient examination controlled at the headwall. Recovery rooms have multiple task light levels in the patient zone. See table for permanently installed task lighting.

Recovery Room task lighting	LEV	UNI	Horizontal Light Level
Pre-operative Observation:	500	2:1	at 3’ (0.91m) AFF
Pre-operative Rest:	200	2:1	at 3’ (0.91m) AFF
Post-operative Examination:	1000	2:1	at 3’ (0.91m) AFF
Post-operative Observation:	500	2:1	at 3’ (0.91m) AFF
Post-operative Rest:	200	2:1	at 3’ (0.91m) AFF

b4 LDR and LDRP Task Lighting: Provide recessed ceiling exam fixture for patient examination controlled at the headwall. LDR and LDRP Bedrooms have multiple task light levels in the patient and family zones. See table for permanently installed task lighting.

LDR and LDRP task lighting	LEV	UNI	Horizontal Light Level
Patient Zone task lighting			
Examination:	1000	2:1	at 3’ (0.91m) AFF
Reading:	500	3:1	at 3’ (0.91m) AFF
Television viewing:	50	4:1	at 3’ (0.91m) AFF
Night observation:	30	4:1	at 3’ (0.91m) AFF
Night light:	4		at floor level
Family zone task lighting			
Casual chair:	300	3:1	at 2.5’ (0.79m) AFF
Desk:	400	3:1	at 2.5’ (0.79m) AFF

b5 Behavioral Health Bedroom task lighting: Provide recessed lighting fixtures for required task illumination controlled outside of the bedroom. See table for permanently installed task lighting.

Behavioral Health Bedroom task lighting	LEV	UNI	Horizontal Light Level
Night observation:	30	4:1	at 3’ (0.91m) AFF
Night light:	4		at floor level

c1 Provide full range dimming in room.

c2 Provide full range dimming at task location.

c3 Provide recessed ceiling mounted task illumination with full range dimming.

c4 Provide lighting control at individual task location in lieu of multi-level switching.

c5 Ceiling mounted lights to be switch controlled to achieve 50% and 100% illumination levels.

h1 Horizontal light level is to be calculated and measured at grade or at finished floor level.

h2 Horizontal light level is to be calculated and measured at 1.5’ or 0.46m above finished floor level.

h3 Horizontal light level is to be calculated and measured at 2.0’ or 0.61m above finished floor level.

h4 Horizontal light level is to be calculated and measured at 2.5’ or 0.79m above finished floor level.

h5 Horizontal light level is to be calculated and measured at 3.5’ or 1.07m above finished floor level.

h6 Horizontal light level is to be calculated and measured at the task surface.

m1 Lighting Level is the maintained minimum light level at area/task.

m2 Lighting level is the maintained maximum light level at area/task.

m3 Lighting level is night time level.

m4 Task level applies to secondary function within room. For example, a pool is the primary function and the deck is the secondary function.

u1 Uniformity ratio is expressed as maximum:average.

u2 Uniformity ratio is expressed as maximum:minimum.

x1 Follow ASHRAE 90.1 exemption 9.4.1.1(a)

x2 Follow ASHRAE 90.1 exemptions 9.4.1.1(h,i) 1,3

x3 Follow ASHRAE 90.1 exemption 9.4.1.1(h,i) 2

x4 Follow ASHRAE 90.1 exemption 9.4.1.1(h,i) 3

x5 Follow ASHRAE 90.1 exemptions 9.4.1.1(a) and 9.4.1.1(h,i) 2

x6 Follow ASHRAE 90.1 exemptions 9.4.1.1(a) and 9.4.1.1(h,i) 1,3 **/4/**

B-6.2 ESSENTIAL POWER.

ES PWR Essential power required in room. Provide additional essential power as required by NFPA 99.

PW Approximate percentage of general power outlets on essential system or note as listed below.

R Selected receptacles (not less than 50 percent of the receptacles).

R1 One receptacle per bed.

RA All receptacles.

RC Dedicated receptacles for critical care (reference NFPA 70, Article 517).

LT Approximate percentage of lighting on essential system or note as listed below.

L Task Lighting.

LB Task Lighting, General Illumination, and battery powered lighting. Reference Chapter 11.

LG General Illumination.

LS Task Lighting and Selected General Illumination identified and coordinated with the DoD Project Sponsor.

N Essential Power notes.

E Selected equipment connections.

U Provide essential power only as required by the DoD Project Sponsor.

S Special (Non-standard areas).

B-7 MEDICAL GASES.

The number of outlets/inlets required for each gas type is listed in the appropriate column **\4** if served by a centrally piped system. **/4/** The number of outlets/inlets must be increased as required to support the equipment listed in the PRC.

MA Medical Compressed Air

DA Dental Compressed Air

LA Laboratory Compressed Air

PA Process Compressed Air

MV Medical Vacuum

DSV Dental Surgical Vacuum

OE Oral Evacuation

LDE Laboratory Dust Evacuation

O Oxygen

NO Nitrous Oxide

CO2 Carbon Dioxide

IA Instrument Compressed Air

WAGD Waste Anesthetic Gas Disposal

N See Medical Gas Notes.

B-7.1 MEDICAL GAS NOTES.

N Notes

A. Each patient is provided with the number of outlet(s) listed.

Each patient is provided medical vacuum inlet(s). See individual listing.

Each patient is provided access to a medical air outlet. Where two patients share a common wall, they may share a single outlet, excluding behavioral health patients. Do not provide in pediatric play area.

B. The medical gases specified must be per patient station, workstation, etc.

C. Coordinate with the DoD Project Sponsor for location of outlets/inlets.

D. All anesthetizing locations must have a WAGD system. Use of medical vacuum system is not recommended for evacuation in DoD facilities. DSV may be used in DTRs for anesthesia scavenging where a central system is installed.

E. One each O, MA, and MV is required at the headwall unit and the infant resuscitation area of the birthing room.

F. { not used }

G. The medical gases specified must be per bassinet or infant station.

H. The medical gases specified must be per 4 bassinets or infant stations. Where the LDR birthing room concept is used, a minimum of one grouping must be provided in each LDR.

I. For equipment testing and calibration, equipment must be tested with the specific gas used in normal operation.

J. Provide valve regulator station for PA. **\1**

K. Locate 1 DA and 1 OE at each 12 o'clock column and each DTR chair as called out in the PRC. **/1/**

L. A natural gas outlet (mounted under counter) and a LA outlet (mounted under counter) must be provided at each dental workstation as shown in Table B-1.

M. All contingency beds require 1 O, 1 MV, and 1 MA per bed station. In bed expansion situations in "peace time" facilities also provide 1 O, 1 MV, and 1 MA per contingency bed expansion requirements noted in the PFD.

B-8 HVAC.

BL Air Balance

++ Room exhaust, return, or both, is 20 percent less than supply*

+ Room exhaust, return, or both, is 10 percent less than supply

nr No requirement. Room exhaust, return, or both, may equal supply **\1**

- **/1/** Room exhaust, return, or both, is 10 percent more than supply

- - Room exhaust, return, or both, is 20 percent more than supply*

EX Room exhausted. If supply is provided, exhaust room Air Change must be in addition to the amount of supply provided.

R Letter “r” indicates the HVAC Notes provide the required air balance

*Note: for “++” and “- -“spaces, the required differential pressurization is 0.02 inch water column, reference paragraph 10-7.5. Utilize the 20 percent offset as a baseline and adjust air flows and/or increase room integrity as required to achieve the required pressure differential.

AC Air Change is the minimum total air changes per hour (AC/H) required to meet ventilation requirements. These rates are considered the minimum required for normal health and comfort consideration. Additional air may be required for temperature, dilution, and odor control, as well as air requirements for such items as hoods, glove boxes, clean air stations, combustion equipment, and dust collectors.

A Letter “a” indicates that the total air changes must be based on calculations.

r Letter “r” indicates the HVAC Notes provide the required minimum air change.

OA Outdoor Air is the minimum outdoor air changes per hour required to meet ventilation requirements.

A Letter “a” Indicates that the outdoor air changes are to be based on ANSI/ASHRAE 62.1.

TEMP Interior design temperature in degrees Fahrenheit (degrees Celsius) for cooling and heating load calculations. When cooling is required during

winter, such as in interior zones, temperature listed under summer conditions should be used.

SM Design temperature for summer months.

WN Design temperature for the space during heating season.

* Summer Design Temperature must be 15 °F (8.3 °C) less than 1 percent Outside Design Temperature but must not be less than 75 °F (23.9 °C) or greater than 78 °F (25.6 °C) unless otherwise noted.

R Design must accommodate a variable (to user) temperature range of 68–75 °F (20.0–23.9 °C).

SP Special. Determined by the Design and Construction Agent.

RH Relative Humidity. This is the relative humidity to be maintained in a space as part of the designed conditions. Relative humidity range is 30–60 percent unless noted otherwise.

Y Provide relative humidity range of 30-60 percent

R Provide a user adjustable humidistat in the space, accommodating a variable humidity range of 30-60 percent

S Maintain relative humidity of 20-60 percent. Design to provide minimum 30% RH

T Maintain relative humidity of 55 percent, +/-5 percent

FL Filtration indicates the level and location of filtration required. See HVAC Note B.

IN. Intermediate filtration in MERV

FN. Final filtration in MERV

Hepa HEPA filter required

r Letter “r” indicates that the HVAC Notes provide the required filtration

EX Exhaust.

Y Indicates room air to be exhausted, not recirculated

R See HVAC Notes

B-8.1 HVAC Notes.

N Notes.

A. Nursery Isolation Room relative pressurization requirements may vary among individual facilities, depending upon functional requirements. A/Es must coordinate with the DoD Project Sponsor for each facility to determine whether disease isolation (negative pressurization) or protective isolation (positive pressurization) is required.

B. General Filtration. Filter efficiencies noted here are in accordance with the Minimum Efficiency Reporting Value (MERV) ratings of ANSI/ASHRAE Standard 52.2. Filters with a MERV rating of 8 must be provided for all outdoor air. These filters must be located upstream of air-conditioning equipment. Intermediate Filters indicated in column “IN” must be located downstream of the supply fan. Final filters indicated in column “FN” must be located at air outlets or in close proximity to outlets (coordinate with the DoD Project Sponsor). All filters should be installed to prevent leakage between the filter segments and between the filter and its supporting frame.

C. During periods of non-use, the air volume may be reduced to 6 air changes per hour, while maintaining the required air balance.

D. When the DoD Project Sponsor intends the routine usage of nitrous oxide in the DTR, routine being defined as exceeding 5 hours per week, this criteria must apply:

- DTR room air changes must be not less than 12 total AC/H.
- The room must be totally exhausted.
- Provide a minimum of one low-level exhaust register, sized to remove a minimum of 20 percent of the total room exhaust volume.
- During period of non-use, air change rate may be reduced to 3 total AC/H.

E. General, Isolation Rooms. For Airborne Infection Isolation Bedrooms, bedroom to be negative to anteroom, anteroom to be negative to corridor. For Protective Environment Bedrooms, bedroom to be positive to anteroom, anteroom to be positive to corridor.

F. Minimum air change and pressure relationship is based on this room supporting both bronchoscopy and endoscopy procedures. If

the facility CONOPS specifically states that this room is intended to provide both proctoscopy and endoscopy procedures, the minimum air change required is 10 AC/H and room exhaust is 10% more than the room supply. If the facility CONOPS specifically states that this room is intended to provide endoscopy procedures only, the minimum air change required is 6 AC/H and room exhaust is 10 percent more than the room supply.

G. Design in accordance with NFPA 99.

H. May require vehicle exhaust, carbon monoxide (CO) detection.

I. Same as Note D, except the following:

- During period of non-use, air change rate may be reduced to 5 total AC.
- Positive pressurization must be maintained.

J. For projects incorporating brace/appliance fitting or shop applications, evaluate room and equipment exhaust requirements for removal of toxic or flammable fumes and dust.

K. Consult manufacturer recommendations for temperature requirements for electrical/electronic equipment. In humid climates, fan rooms must not be ventilated with unconditioned outdoor air.

L. Up to 50 percent of supply air may be air that is transferred from administrative areas of the building.

M. Provide exhaust or fume hoods, and localized exhaust.

N. Verify computer heat load requirement.

O. Provide adjustable (to user) humidistat within the room.

P. Provide adjustable (to user) thermostat within the room.

Q. HEPA filtration of room exhaust is required unless an exhaust reentrainment analysis (wind tunnel or computational fluid dynamics modelling) demonstrates sufficient separation from public areas (for example sidewalks), building openings (for example windows, doors) and outdoor air intakes. Exhaust of tuberculosis (TB) isolation room, toilet, and anteroom to be by dedicated exhaust system, in other words exhaust system serving only TB isolation room(s). Isolation room pressure to remain constant—not switchable from Disease Isolation mode to Protective Isolation mode, or vice versa.

R. Consult with the Design and Construction Agent and DoD Project Sponsor to determine if compliance with USP 797 and/or USP 800 is required. If compliance is required, design in accordance with the applicable USP(s). Reference paragraph 10-16.11. If compliance is not required, then provide an air balance of "++", a minimum of 4 air changes per hour, minimum MERV 13 intermediate filtration and room air can be recirculated.

S. Provide emergency, pediatric, and radiology waiting rooms with 20% more exhaust than supply, 12 air changes, 2 outdoor air changes, and exhaust these rooms directly to the outside, independent from other exhausts. If the space is an enclosed room with a door, meet the requirements for a "room with critical pressurization" per paragraph 10-7.5. For all other waiting areas there is no requirement for pressure balance, provide 6 air changes, 1 outdoor air change, and the space may be recirculated.

T. Provide a minimum of one low-level exhaust register, sized to remove a minimum of 20 percent of the total room exhaust volume.

U. Comply with UFC 4-010-01 requirements for mail room and loading dock ventilation.

V. Provide ability for user to select temperature and humidity in the ranges specified. Once set, the temperature must not deviate from setpoint by more than 1 ^{o}F (0.6 ^{o}C) within a 10 minute period and the RH must not deviate from setpoint by more that 2 percent RH per 10 minute period. The temperature and RH must be maintained at all times (24/7/365). Also provide a fluorine gas detection system, alarms, and emergency exhaust system with low level exhaust inlets to evacuate the room in the event of a fluorine gas leak.

W. Design in accordance with the applicable USP 797 and/or USP 800. Reference paragraph 10-16.11.

X. Provide exhaust canopies near all steam utilizing equipment loading and unloading doors.

\4\ Table B-1 Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	DMAV	SVE	OE	LDE	OO	NO	IA	WAGD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
ANCW1	Anesthesia, Clean Workroom	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 750	3:1 2:1	h4 m1	R	L	.	1	.	.	.	1	.	.	.	1	1	.	1	D	-	4	1.5	75 (23.9)	68 (20.0)	Y	14	.	Y	.
ANSW1	Anesthesia, Soiled Workroom	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300	3:1	h1	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	75 (23.9)	68 (20.0)	Y	14	.	Y	.
APAM1	Appliance, Adjust / Modify	4	ER CS	GPT	AT1	8'-0" (2440)	48" (1220)	30-45 STC 40	C	150 500	3:1 3:1	h1,x4 h6,u2	R	.	.	.	.	1	1	.	.	.	1	.	.	.	.	J	nr	6	1.5	*	70 (21.1)	Y	13	.	.	J,M
APFB1	Appliance, Brace Shop	4	ER CS	GPT	AT2 AT1	8'-0" (2440)	48" (1220)	30-80 STC 40	100 (4.8)	150 500	3:1 3:1	h1,x4 h6,u2	.	.	.	.	.	1	1	.	.	.	1	.	.	.	.	J	nr	6	1.5	*	70 (21.1)	Y	13	.	.	J,M
APFR1	Appliance, Fitting Room	4	ER CS	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 40	60 (2.9)	150 500	3:1 3:1	h1,x4 h6,u2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	1.5	*	70 (21.1)	Y	13	.	.	J,M
APLA1	Appliance, Lamination / Molding	4	ER CS	GPT	AT1	8'-0" (2440)	48" (1220)	30-45 STC 40	C	150 500	3:1 3:1	h1,x4 h6,u2	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	J	-	6	1.5	*	70 (21.1)	Y	13	.	Y	J,M
APMS1	Appliance, Machine Shop	4	ER CS	GPT	AT2 AT1	8'-6" (2590)	48" (1220)	30-60 STC 40	D	150 500	3:1 3:1	h1,x4 h6,u2	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	J	-	6	1.5	*	70 (21.1)	Y	13	.	Y	J,M
APSH1	Appliance, Sewing / Shoe Shop	4	ER CS	GPT	AT1	8'-6" (2590)	48" (1220)	30-60 STC 40	C	500 750	3:1 3:1	m1,x4 m2	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	J	-	6	1.5	*	70 (21.1)	Y	13	.	Y	J,M
APWA1	Appliance, Welding Area	4	CS ER	GPT	AT2 AT1	8'-6" (2590)	48" (1220)	30-45 STC 40	D	300 3000	3:1 3:1	h6,u2,x4 c2,h6,u2	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	-	6	1.5	*	70 (21.1)	Y	13	.	Y	J,M
AUD01	Auditorium	N	CP	SSP	SSP	VAR	B	25-35 STC 50	100 (4.8)	300 500	2:1 3:1	c1,h1 c2,h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
AVB01	Projection Booth	N	SP	SPF	SPF	VAR	36" (915)	25-35 STC 50	60 (2.9)	2 400	2:1 2:1	h1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
BF000	Banking Facility (equipped by others)	N	SP	GPT	AT1	8'-6" (2590)	A	35-45 STC 40	60 (2.9)	500 1100	3:1 2:1	h4 c2,h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
BF001	ATM Alcove (equipped by others)	Space Parameter Notes: a and c						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BHVS1	Behavioral Health, Vestibule, Inpatient	4	SR	GPT	AT2 AT1	8'-6" (2590)	G	30-40 STC 45	60 (2.9)	400 100	4:1 4:1	h1,x1 h1,m3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
BLND1	Special Needs Vendor Area (equipped by others)	N	SP	SSP GPT	AT1	VAR	36" (915)	35-45 STC 45	60 (2.9)	500	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	1	*	68 (20.0)	Y	13	.	.	.
BMCW1	Biomedical, Common Work Area	4	SR CS	GPT GEP	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	C	500	3:1	.	.	.	.	1	.	.	.	1	.	.	.	1	.	1	.	D	nr	4	1	*	68 (20.0)	Y	13	.	.	M
BMCW2	Biomedical Work Area, All-Inclusive	4	SR CS	GPT GEP	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	C	500	3:1	.	.	.	.	1	.	.	.	1	.	.	.	1	.	1	.	D	nr	4	1	*	68 (20.0)	Y	13	.	.	M
BMER1	Biomedical, Electronic Repair	4	SR	GEP GPT	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	C	1000	3:1	h5,u2	.	.	.	1	.	.	.	1	.	.	.	1	.	1	.	D	-	4	1	*	68 (20.0)	Y	13	.	.	M
BMER2	Biomedical, Mobile Imaging Equipment Repair	4	SR RT	LEP LPT	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	C	1000	3:1	.	.	.	.	1	.	.	.	1	.	.	.	1	.	1	.	D	nr	4	1	*	68 (20.0)	Y	13	.	.	M
BMRA1	Biomedical, Receiving Area	4	SR CS	GPT GEP	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	60 (2.9)	300	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
BMWS1	Biomedical, Workstation	4	SR CS	GPT GEP	AT1	8'-6" (2590)	48" (1220)	35-45 STC 40	60 (2.9)	1000	3:1	.	.	.	.	1	.	.	.	1	.	.	.	1	.	1	.	D	nr	4	1	*	68 (20.0)	Y	13	.	.	M
BRAR1	Anteroom, Airborne Infection Isolation	4	SR	GEP GPT	GEP GPT	8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	100	4:1	h1	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	75 (23.9)	75 (23.9)	Y	14	.	Y	E,Q
BRAR2	Anteroom, Protective Environment	4	SR	GEP GPT	GEP GPT	8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	100	4:1	h1	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	10	2	75 (23.9)	75 (23.9)	Y	14	hepa	.	E
BRIC1	Bedroom, ICU / CCU	1	SR	GEP GPT	AT2 AT1	8'-6" (2590)	H	30-40 STC 45	60 (2.9)	300 1000	3:1 2:1	x3 b2	RC	L	.	1	.	.	.	6	.	.	.	3	.	.	.	.	+	6	2	75 (23.9)	75 (23.9)	T	14	.	.	P

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O V	L D E	O	N O	I O	W A G A	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
BRII1	Bedroom, ICU / CCU, Airborne Infection Isolation	2	SR GPT	GEP GPT		8'-6" (2590)	H	30-40 STC 45	60 (2.9)	300 1000	3:1 2:1	x3 b2	RC	L	.	1	.	.	.	6	.	.	.	3	.	.	.	.	- -	12	2	75 (23.9)	75 (23.9)	T	14	.	Y	E,P,Q
BRII2	Bedroom, ICU / CCU, Protective Environment	1	SR GPT	GEP GPT		8'-6" (2590)	H	30-40 STC 45	60 (2.9)	300 1000	3:1 2:1	x3 b2	RC	L	.	1	.	.	.	6	.	.	.	3	.	.	.	.	++	12	2	75 (23.9)	75 (23.9)	T	14	hepa	.	E,P
BRIT1	Bedroom, Airborne Infection Isolation	2	SR GPT	GEP GPT		8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	300 1000	4:1 2:1	h1,x3 b1	RC	L	.	1	.	.	.	2	.	.	.	2	.	.	.	.	- -	12	2	75 (23.9)	75 (23.9)	Y	14	.	Y	E,P,Q
BRIT2	Bedroom, Protective Environment	2	SR GPT	GPT GEP		8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	300 1000	4:1 2:1	h1,x3 b1	RC	L	.	1	.	.	.	2	.	.	.	2	.	.	.	.	++	12	2	75 (23.9)	75 (23.9)	Y	14	hepa	.	E,P
BRMS1	Bedroom, Medical / Surgical	2	SR RT GPT	AT1		8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	300 1000	2:1 2:1	h1,x3 b3	RC	L	.	1	.	.	.	2	.	.	.	2	.	.	.	A,M	nr	4	2	75 (23.9)	75 (23.9)	Y	14	.	.	P
BRNP1	Bedroom, Behavioral Health	3	SR ER	GPT GPT		8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	100 300	4:1 2:1	h1,x3 b1	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
BRNP2	Bedroom, Behavioral Health, 2 Beds	3	SR ER	GPT GPT		8'-6" (2590)	48" (1220)	30-40 STC 45	60 (2.9)	100 300	4:1 2:1	h1,x3 b1	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
BRNP5	Bedroom, Behavioral Health, Seclusion	3	ER	GPT GPT		9'-0" (2740)	48" (1220)	30-40 STC 45	60 (2.9)	100 300	4:1 2:1	h1,x5 b1	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
BRNP6	Anteroom, Behavioral Health, Seclusion	3	ER	GPT GPT	AT1	9'-0" (2740)	48" (1220)	30-40 STC 45	60 (2.9)	300 .	4:1 .	h1 .	.	LG	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
BRUN1	Bedroom, Acuity Adaptable	1	SR RT	GPT GEP	AT2 AT1	8'-6" (2590)	H	30-40 STC 45	60 (2.9)	300 1000	4:1 2:1	h1,x3 b1	RC	L	.	1	.	.	.	6	.	.	.	3	.	.	.	A	+	6	2	75 (23.9)	75 (23.9)	T	14	.	.	P
BSL03	Lab, Clinical, Biosafety Level 3	Space Parameter Notes: b						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BX000	Exchange, Retail (equipped by others)	N	SP	GPT	AT1	8'-6" (2590)	48" (1220)	35-45 STC 45	60 (2.9)	500 750	3:1 3:1	m1 m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	75 (23.9)	75 (23.9)	Y	13	.	.	.
BX001	Exchange, Vending (equipped by others)	N	SP	GPT	AT1	8'-6" (2590)	48" (1220)	35-45 STC 50	C	100 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	a	a	.	.	Y	13	.	.	.
CASH1	Cashier	N	SP	GPT	AT1	8'-0" (2440)	M	30-40 STC 50	60 (2.9)	300 400	2:1 2:1	m1 m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
CASH2	Cashier Station, Food Service	Space Parameter Notes: a and c						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CHC01	Cart Holding, Clean	4	RT	GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	50 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
CHS01	Cart Holding, Soiled	4	SR	GEP	AT2	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	50 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	70 (21.1)	Y	13	.	Y	.
CLR01	Classroom, Table / Chair	N	CP RT	GPT	AT1	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	400 750	2:1 3:1	c1,h4 c1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
CLR02	Classroom, Writing Arm Chairs	N	CP RT	GPT	AT1	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	400 750	2:1 3:1	c1,h4 c1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
CLR03	Classroom, Computer Training	N	CP RT	GPT	AT1	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	150 750	2:1 3:1	c1,h4 c1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	N
CLR04	Classroom, Bedroom Mock-Up	N	RT	GPT	AT1	8'-6" (2590)	48" (1220)	25-35 STC 45	60 (2.9)	200 750	4:1 2:1	h1,x3 b1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
CLR06	Simulation Control Room	4	SR RT	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300 .	3:1 .	c1,h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	13	.	.	.
CLR07	Classroom, Simulation Lab, Multifunction	N	RT SR	GPT	AT1	8'-6" (2590)	48" (1220)	25-35 STC 45	100 (4.8)	500 1000	3:1 2:1	c1,h4 c1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
CLR08	Classroom, Practical Training	N	RT SR	GPT	AT1	8'-6" (2590)	48" (1220)	25-35 STC 45	60 (2.9)	400 750	2:1 3:1	c1,h4 c1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O A	W A I	A D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
CLSC1	Kiosk, Patient		Space Parameter Notes: a					.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CLSC2	Cubicle, Patient Education		Space Parameter Notes: a					.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CLSC3	Patient Education	N	RT CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50	60 (2.9)	400	3:1	c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	a	a	*	70 (21.1)	Y	13	.	.	.
CMP01	Server Room	N	CS SD	GPT	AT1	10'-0" (3050)	36" (915)	30-40 STC 50	C	100 500	2:1 2:1	h1 h4	R	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	1	68 (20.0)	68 (20.0)	Y	13	.	.	N
CMP03	Computer, Archive Storage	4	CS SD	GPT	AT1	10'-0" (3050)	36" (915)	30-40 STC 50	D	100 500	2:1 2:1	h2 c1,h2	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	1	68 (20.0)	68 (20.0)	Y	13	.	.	N
CMP04	Communications, Server Support Equipment	4	CS SD	GPT	EXP AT1	B	36" (915)	30-40 STC 50*	C	100 500	2:1 2:1	h1 h4	R	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	1	* 68 (20.0)		Y	13	.	.	N
COM02	Communications, Ambulance Dispatch	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	150 .	2:1 .	u1 .	.	L	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	* 70 (21.1)		Y	13	.	.	.
COM03	Communications, Security, Central Alarm	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	25-35 STC 40	60 (2.9)	150 .	2:1 .	h6,u1 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	* 70 (21.1)		Y	13	.	.	.
COM04	Communications, Radio Equipment	4	CS	GPT	EXP	C	36" (915)	25-45 STC 40	C	100 500	2:1 2:1	h1 h4	R	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	* 68 (20.0)		Y	13	.	.	N
COMC1	Communications Room	4	CS	GPT	EXP	C	36" (915)	25-45 STC 40	B	100 500	2:1 2:1	h1 h4	R	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	* 68 (20.0)		Y	13	.	.	N
COMC2	Communications, Service Entrance Facility	4	CS	GPT	EXP	C	36" (915)	25-45 STC 40	C	500 .	4:1 .	h1 .	R	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	* 68 (20.0)		Y	13	.	.	N
CRA01	Conference Room, Small	N	CP RT	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 400	3:1 3:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CRA02	Conference Room, Medium	N	CP RT	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 400	3:1 3:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CRA03	Conference Room, Large	N	CP RT	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 700	3:1 3:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CRC01	Conference Room, Commanders	N	CP	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 700	3:1 3:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CROP1	Conference Room, Emergency Operations	4	SP CP	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 700	3:1 3:1	c1,h4 c1,h4	.	L	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CRR01	Conference Room, Radiology	N	CP RT	GPT	AT1 SSP	8'-6" (2590)	36" (915)	25-35 STC 45	60 (2.9)	300 400	3:1 3:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	* 70 (21.1)		Y	13	.	.	P
CSCQ1	Central Sterile, Clean Cart, Queuing	4	ER SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	50 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	* 68 (20.0)		Y	14	.	.	.
CSCR1	Central Sterile, Soiled Cart, Receiving	4	ER SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	200 .	4:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	* 68 (20.0)		Y	13	.	Y	.
CSDE1	Central Sterile, Decontamination, Small	4	ER SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	700 .	4:1 .	h4 .	.	LS	U	.	.	.	.	.	.	.	.	.	1	.	.	.	-	10	2	73 (22.8)	68 (20.0)	Y	14	.	Y	.
CSDE2	Central Sterile, Decontamination, Medium	4	ER SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	700 .	4:1 .	h4 .	.	LS	U	.	.	.	.	.	.	.	.	.	1	.	.	.	-	10	2	73 (22.8)	68 (20.0)	Y	14	.	Y	.
CSDE3	Central Sterile, Decontamination, Large	4	ER SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	700 .	4:1 .	h4 .	.	LS	U	.	.	.	.	.	.	.	.	.	1	.	.	.	-	10	2	73 (22.8)	68 (20.0)	Y	14	.	Y	.
CSIA1	Central Sterile, Assembly, Small	4	ER SR	GEP	GEP GPT AT2	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	700 1100	3:1 2:1	h1 h4	.	.	U	.	.	.	.	1	.	.	.	.	1	.	F	+	6	2	73 (22.8)	68 (20.0)	Y	14	.	.	.
CSIA2	Central Sterile, Assembly, Medium	4	ER SR	GEP	GEP GPT AT2	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	700 1100	3:1 2:1	h1 h4	.	.	U	.	.	.	.	1	.	.	.	.	1	.	F	+	6	2	73 (22.8)	68 (20.0)	Y	14	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OVE	LDE	EO	NO	IA	WAGD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
CSIA3	Central Sterile, Assembly, Large	4	ER	GEP	GEP	9'-0"	48"	30-50	100	700	3:1	h1	.	.	U	.	.	.	.	1	.	.	.	.	.	1	.	F	+	6	2	73	68	Y	14	.	.	.
			SR	GPT	AT2	(2740)	(1220)	STC 40	(4.8)	1100	2:1	h4																				(22.8)	(20.0)					
CSSS1	Central Sterile, Sterilization Equipment, Small	4	ER	GEP	EXP	C	36"	30-50	100	700	3:1	h1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	73	68	Y	14	.	Y	M
			SR				(915)	STC 40	(4.8)	1100	2:1	h4																				(22.8)	(20.0)					
CSSS2	Central Sterile, Sterilization Equipment, Medium	4	ER	GEP	EXP	C	36"	30-50	100	700	3:1	h1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	73	68	Y	14	.	Y	M
			SR				(915)	STC 40	(4.8)	1100	2:1	h4																				(22.8)	(20.0)					
CSSS3	Central Sterile, Sterilization Equipment, Large	4	ER	GEP	EXP	C	36"	30-50	100	700	3:1	h1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	73	68	Y	14	.	Y	M
			SR				(915)	STC 40	(4.8)	1100	2:1	h4																				(22.8)	(20.0)					
CSSS4	Clinic Sterilization Room, Ophthalmological Instrument	4	ER	GEP	GEP	9'-0"	48"	30-50	100	700	4:1	h4	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	*	68	Y	14	.	Y	M
			SR			(2740)	(1220)	STC 40	(4.8)	1100	2:1	h4																					(20.0)					
CSWS1	Central Sterile, Scope / Wash	4	ER	GEP	GEP	9'-0"	48"	30-50	100	700	4:1	h4	.	.	U	.	.	.	.	1	.	.	.	.	.	.	.	F	-	10	2	*	68	Y	14	.	Y	M
			SR		AT2	(2740)	(1220)	STC 40	(4.8)	.	.	.																					(20.0)					
CWSH1	Cart Wash, Manual (Steam Gun)	4	ER	GCT	GEP	9'-0"	48"	30-50	100	500	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68	Y	14	.	Y	M
			SF	SSS		(2740)	(1220)	STC 40	(4.8)	.	.	.																					(20.0)					
CWSH2	Cart Wash, Automated (Washer)	4	ER	GSS	GSS	9'-0"	48"	30-50	C	300	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68	Y	14	.	Y	M
			PF	SRE	SRE	(2740)	(1220)	STC 40		.	.	.																					(20.0)					
DAYR1	Dayroom	3	SM	GPT	AT1	10'-0"	48"	30-40	60	300	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68	Y	14	.	.	.
					GPT	(3050)	(1220)	STC 40	(2.9)	.	.	.																					(20.0)					
DNMS1	Dental, Model Storage	4	SR	GEP	AT1	8'-6"	36"	30-50	60	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68	Y	13	.	.	.
			RT	GPT		(2590)	(915)	STC 50	(2.9)	.	.	.																					(20.0)					
DNPB1	Dental, Prosthodontic / Orthodontic, Laboratory	4	SR	GEP	AT2	8'-6"	36"	30-45	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	-	6	2	*	68	Y	13	.	Y	M
			RT	GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																				(20.0)					
DNPC1	Dental, Porcelain / Ceramics, Small	4	ER	GEP	AT2	8'-6"	36"	30-45	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	+	10	2.5	*	68	Y	13	.	Y	M
				GPT	AT1	(2590)	(915)	STC 50	(2.9)	1500	2:1	a3																					(20.0)					
DNPC2	Dental, Porcelain / Ceramics, Medium	4	ER	GEP	AT2	8'-6"	36"	30-50	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	+	10	2.5	*	68	Y	13	.	Y	M
				GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																					(20.0)					
DNPC3	Dental, Porcelain / Ceramics, Large	4	ER	GEP	AT2	8'-6"	36"	30-50	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	+	10	2.5	*	68	Y	13	.	Y	M
				GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																					(20.0)					
DNPL1	Dental, Prosthodontic Laboratory, Small	4	SR	GEP	AT2	8'-6"	36"	30-50	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	-	10	2.5	*	68	Y	13	.	Y	M
			RT	GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																					(20.0)					
DNPL2	Dental, Prosthodontic Laboratory, Medium	4	SR	GEP	AT2	8'-6"	36"	30-50	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	-	10	2.5	*	68	Y	13	.	Y	M
			RT	GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																					(20.0)					
DNPL3	Dental, Prosthodontic Laboratory, Large	4	SR	GEP	AT2	8'-6"	36"	30-50	60	500	4:1	a3	.	.	U	.	1	.	.	.	.	.	1	.	.	.	.	B,L	-	10	2.5	*	68	Y	13	.	Y	M
			RT	GPT	AT1	(2590)	(915)	STC 40	(2.9)	1500	2:1	a3																					(20.0)					
DNSC1	Dental, Instrument Decontamination, Small	4	ER	GEP	GEP	8'-6"	36"	30-45	60	700	3:1	h4	.	.	U	.	1	.	.	.	.	.	.	.	.	.	.	B	-	-	10	2	73	68	Y	14	.	Y	P
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(22.8)	(20.0)					
DNSC2	Dental, Instrument Sterilization, Small	4	ER	GEP	GEP	8'-6"	36"	30-45	60	700	3:1	h4	.	.	U	.	1	.	.	.	.	.	.	.	.	.	.	B	++	6	2	73	68	Y	14	.	.	P,X
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(22.8)	(20.0)					
DNSC3	Dental, Instrument Storage, Small	4	ER	GEP	GEP	8'-6"	36"	30-50	60	700	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	++	6	2	75	68	Y	13	.	.	P,X
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(23.9)	(20.0)					
DNSC4	Dental, Instrument Decontamination, Medium	4	ER	GEP	GEP	8'-6"	36"	30-50	60	700	3:1	h4	.	.	U	.	1	.	.	.	.	.	.	.	.	.	.	B	-	-	10	2	73	68	Y	13	.	Y	P
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(22.8)	(20.0)					
DNSC5	Dental, Instrument Sterilization, Medium	4	ER	GEP	GEP	8'-6"	36"	30-50	60	700	3:1	h4	.	.	U	.	1	.	.	.	.	.	.	.	.	.	.	B	++	6	2	73	68	Y	13	.	.	P,X
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(22.8)	(20.0)					
DNSC6	Dental, Instrument Storage, Medium	4	ER	GEP	GEP	8'-6"	36"	30-50	60	700	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	++	6	2	75	68	Y	13	.	.	P,X
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(23.9)	(20.0)					
DNSC7	Dental, Instrument Decontamination, Large	4	ER	GEP	GEP	8'-6"	36"	30-50	60	700	3:1	h4	.	.	U	.	1	.	.	.	.	.	.	.	.	.	.	B	-	-	10	2	73	68	Y	13	.	Y	P
			SR		AT2	(2590)	(915)	STC 40	(2.9)	.	.	.																					(22.8)	(20.0)					

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O	I A	WAG D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
DNSC8	Dental, Instrument Sterilization, Large	4	ER SR	GEP	GEP AT2	8'-6" (2590)	36" (915)	30-50 STC 40	60 (2.9)	700	3:1	h4			U	.	1	.	.	.	.	.	.	.	.	.	B	++	6	2	73 (22.8)	68 (20.0)	Y	13	.	.	P,X
DNSC9	Dental, Instrument Storage, Large	4	ER SR	GEP	GEP AT2	8'-6" (2590)	36" (915)	30-50 STC 40	60 (2.9)	700	3:1	h1				.	.	.	.	.	.	.	.	.	.	.	.	++	6	2	75 (23.9)	68 (20.0)	Y	13	.	.	P,X
DNSS1	Dental, Support, Substerile	4	SR	GEP	AT2 AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	500	3:1	h4				.	1	.	.	.	.	1	.	.	.	.	B	nr	6	2	*	68 (20.0)	Y	13	.	.	.
DNTB1	Dental Treatment Room, Orthodontic	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	1	.	.	.	.	1	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DNTC1	Dental Treatment Room, Comprehensive	2	SR	GEP	AT2 AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	2000 3000	3:1 2:1	a2,a3,c1,x3 a2,a3,c1	R	LB	U	.	1	.	.	1	1	.	1	1	1	1	D	++	12	3	75 (23.9)	68 (20.0)	Y	14	.	.	I
DNTE1	Dental Treatment Room, Endodontic	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	1	.	.	.	.	1	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	I
DNTG1	Dental Treatment Room, General	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	1	.	.	.	.	1	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNTG2	Dental Treatment Room, Oral Hygiene	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	1	.	.	.	.	1	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNTG3	Dental Treatment Room, Two Chair	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	35-45 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	4	.	.	.	.	4	.	.	.	.	K	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNTG4	Dental Treatment Room, Multi-Chair	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	35-45 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	6	.	.	.	.	6	.	.	.	.	K	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNTP1	Dental Treatment Room, Prosthodontic	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	a3,c1,x3			U	.	1	1	.	.	.	1	.	.	.	.	L	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNTP2	Dental Treatment Room, Periodontic	2	SR	GEP	AT2 AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	2000 3000	3:1 2:1	a2,a3,c1,x3 a2,a3,c1	R	LB	U	.	1	.	.	1	1	.	1	1	1	1	D	++	12	3	68 (20.0)	75 (23.9)	Y	14	.	.	I
DNTR1	Dental, Recovery	3	SR	GEP	AT2 GPT AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	200 500	2:1 2:1	x3			U	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DNTS1	Dental Treatment Room, Oral Surgery	2	SR	GEP	GEP	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	2000 3000	2:1 2:1	a2,a3,c1,x3 a2,a3,c1	R	LB	U	.	2	.	.	1	2	.	1	1	1	1	D	++	12	3	68 (20.0)	75 (23.9)	Y	14	.	.	I
DNTS2	Dental Treatment Room, Oral Surgery Support	4	SR	GEP	AT2 GPT AT1	8'-6" (2590)	42" (1065)	30-40 STC 40	60 (2.9)	700	3:1	h1,x3			U	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DNTT1	Dental Treatment Room, Training	3	SR	GEP	AT1 GPT	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	c1,x3			U	.	2	.	.	.	.	2	.	.	.	.	K	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	D
DNXC1	Dental X-Ray, Cone Beam CT	3	RT SR	LPT	AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	50 500	4:1 4:1	.				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DNXR1	Dental X-Ray, PACS	N	RT SR	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	50 500	4:1 4:1	.				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DNXS1	Dental X-Ray, Intraoral / Panoramic / Cephalometric	3	RT SR	GPT	AT1	8'-6" (2590)	36" (915)	30-40 STC 40	60 (2.9)	50 500	4:1 4:1	.				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	68 (20.0)	Y	14	.	.	.
DOCK1	Loading Dock	N	CS ER	SSP	SSP EXP	VAR	I	.	200 (9.6)	100	2:1	h1				.	.	.	.	.	.	.	.	.	.	.	.	.	a	a	.	.	Y	.	.	.	.
DR001	Dressing Room / Cubicle	4	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	25-40 STC 40	60 (2.9)	150	3:1	h1				.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
DUTY1	On-Call Room	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 45	60 (2.9)	200	4:1	h1				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
EVPR1	Evoked Potential Response	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	100 (4.8)	500	3:1	c1,h4,x3				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EXB01	Exam, Bariatric	3	RT	GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 50*	E	100 500	3:1 2:1	x3				.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LD	EO	NO	NA	WAID	GN	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
EXEB1	Exam / Treatment, Emergency Department, Bariatric	2	SR RT	GEP GPT	GEP AT2	8'-0" (2440)	H	30-40 STC 50*	E	500 1100	3:1 2:1	x3 .	R	LB	.	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXEN1	Exam, ENT	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXEN2	Exam / Treatment, Emergency Department, ENT	2	SR ER	GEP GPT	GEP AT2	8'-0" (2440)	H	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	x3 .	R	LB	.	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXER1	Exam / Treatment, Emergency Department	2	SR ER	GEP GPT	GEP AT2	8'-0" (2440)	H	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	x3 .	R	LB	.	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXER2	Exam / Treatment, Emergency Department, Airborne Infection Isolation	2	SR ER	GEP GPT	GEP GPT	8'-0" (2440)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	x3 .	R	LB	.	1	.	.	.	1	.	.	.	1	.	.	.	.	--	12	2	*	73 (22.8)	Y	14	.	Y	Q
EXOS1	Exam, Speech-Language Pathology	3	CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXP01	Exam, Podiatry	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXR10	Exam, Consult	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXR11	Alcove, Height / Weight	Space Parameter Notes: a						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
EXRG1	Exam	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXRG4	Exam, Screening	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXRG5	Exam, Screening, Height/ Weight, Alcove	Space Parameter Notes: a						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
EXRG6	Exam, Airborne Infection Isolation	3	SR	GEP GPT	GEP GPT	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	--	12	2	*	73 (22.8)	Y	14	.	Y	Q
EXRG7	Exam, Protective Environment	3	SR	GEP GPT	GEP GPT	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	++	12	2	*	73 (22.8)	Y	14	hepa	.	.
EXRG8	Exam, OB / GYN	3	SR SV	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXRG9	Exam, Forensics	3	TR CS	GEP GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXTH1	Exam, Telehealth	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXUD1	Exam, Urodynamics	3	SR RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EXVE1	Exam, Vestibular	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	25-35 STC 50*	60 (2.9)	100 500	3:1 2:1	c1,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
EYCL1	Eye, Contact Lens Fitting / Dispensing	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYCT1	Eye, Diagnostic, Optical Coherence Tomography	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200 .	3:1 .	c1,h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYCT2	Eye, Procedure, Optical Coherence Tomography	2	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200 .	3:1 .	c1,h4,x3 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYEL1	Eye Lane	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200 500	3:1 3:1	h4,x3 c2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
EYEL2	Eye Lane, Electronic	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200	3:1	h4,x3 c2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYER1	Eye, Electroretinography	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200	3:1	c1,h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYFC1	Eye, Fundus Camera	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200	3:1	c1,h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYFD1	Eyeglass, Fitting and Dispensing	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500	3:1	h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	14	.	.	.
EYOF1	Eye, Laboratory, Optical Fabrication	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 1000	3:1 2:1	c4,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	M
EYOT2	Eye, Exam, Ophthalmology	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200 500	3:1 3:1	c1,h4,x3 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYOT3	Eye, PRK / Lasik Evaluation	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 1100	3:1 2:1	c1,h4,x3	R	LB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYVF1	Eye, Visual Field / Perimetry	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500	3:1	c1,h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
EYVS1	Eye, Vision Screening	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500	3:1	c4,h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
FILE1	File, General Use	N	RT CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	150 (7.2)	150	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
FSBR1	Food Service, Bake and Roast Center	N	PS SF	GEP	GEP AT2	9'-0" (2740)	B	30-45 STC 50	F	500	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	68 (20.0)	Y	13	.	Y	M
FSCB1	Food Service, Carbonated Beverage	N	PS SF	GEP	GEP AT2	9'-0" (2740)	B	30-45 STC 50	F	200	3:1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	68 (20.0)	Y	13	.	.	.
FSCD1	Food Service, Cafeteria Dining Room	N	ER PC	GPT	AT1 SSP	9'-0" (2740)	B	30-45 STC 50	F	200	3:1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	12	2	*	68 (20.0)	Y	13	.	.	.
FSCD2	Food Service, Executive Dining Area	N	ER LV	GPT	AT1	9'-0" (2740)	B	30-45 STC 50	F	200	3:1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	12	2	*	68 (20.0)	Y	13	.	.	.
FSCN1	Food Service, Condiment Area	Space Parameter Notes: a						.		.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FSCS1	Food Service, Cart Storage	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	F	200	2:1	h4,m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	.	.
FSCS2	Food Service, Tray Retherm Cart Area, Centralized	Space Parameter Notes: a						.		.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FSDA1	Food Service, Dessert Assembly	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	F	500	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	68 (20.0)	Y	13	.	.	.
FSDS1	Food Service, Dish Storage Area	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	F	200	2:1	h4,m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	.	.
FSDW1	Food Service, Dish Washing	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	2:1	h4,m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	M
FSDW2	Food Service, Dish / Tray Handling, Remote	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	M
FSFC1	Food Service, Fry Center	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	M
FSFPX	Food Preparation / Production Areas	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	M
FSFV1	Food Service, Fresh Fruit / Vegetable	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	68 (20.0)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAGD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
FSGB1	Food Service, Grill and Broil Area	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																-	10	2	*	68 (20.0)	Y	13		Y	M
FSIR1	Food Service, Ingredient Room	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	F	150	3:1	h4,m1																nr	10	2	*	68 (20.0)	Y	13			
FSMC1	Food Service, Mixing Center	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSMP1	Food Service, Meat Processing	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSNP1	Food Service, Nourishment Preparation Area	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSPP1	Food Service, Pastry Preparation	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSPT1	Food Service, Patient Tray Line	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1	R															nr	10	2	*	68 (20.0)	Y	13			
FSPT2	Food Service, Patient Tray Carousel	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	150	3:1		R															nr	10	2	*	68 (20.0)	Y	13		Y	
FSPW1	Food Service, Pot Washing	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	300	2:1	h4,m1																-	10	2	*	68 (20.0)	Y	13		Y	M
FSRC1	Food Service, Rapid Chill / Freeze	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	h4,m1																nr	10	2	*	68 (20.0)	Y	13			
FSRH1	Food Service, Clean Pots / Pans Holding Area	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	2:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSRT1	Food Service, Bulk Food Rethermalization	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSSA1	Food Service, Salad Assembly	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																nr	10	2	*	68 (20.0)	Y	13			
FSSC1	Food Service, Steam Center	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1																-	10	2	*	68 (20.0)	Y	13		Y	M
FSSLX	Food Service Servery Areas	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1																nr	12	2	*	68 (20.0)	Y	13		Y	
FSSSX	Food Service Station Areas	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	500	3:1	m1																nr	12	2	*	68 (20.0)	Y	13		Y	M
FSTAX	Food Service, Tray Assembly Areas	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 50	F	700	3:1	m1																-	10	2	*	68 (20.0)	Y	13		Y	
FSTD1	Food Service, Therapeutic Diet Preparation	N	PS SF	GEP	GEP	9'-0" (2740)	36" (915)	30-40 STC 50	F	500	3:1	m1																nr	10	2	*	68 (20.0)	Y	13		Y	
HAFR1	Hearing Aid Fitting	3	CP	GPT	AT1	8'-6" (2590)	36" (915)	20-25 STC 40	60 (2.9)	500	3:1	h4																nr	6	2	*	68 (20.0)	Y	13			
HATL1	Hearing Aid Testing Lab / Shop	4	CP RT	GPT	AT1	8'-6" (2590)	36" (915)	25-35 STC 40	60 (2.9)	700	3:1	h4																nr	4	1	*	68 (20.0)	Y	13			
HYPR1	Hyperbaric Chamber	C	SP	SSP	SSP	VAR	VAR	SP SP	100 (4.8)	300 1100	4:1 3:1	h4,x3 c1,h4	RA	LB														nr	4	1	*	68 (20.0)	Y	13			
ICE01	Alcove, Ice Machine	Space Parameter Notes: a, d and e																																		
ICHT1	Alcove, Hydocollator	Space Parameter Notes: a																																		
IPK01	Kitchenette	4	MA RT	GEP	GEP	VAR	36" (915)	35-45 STC 50	150 (7.2)	200 500	3:1 3:1	h6																nr	4	2	*	68 (20.0)	Y	13			

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	ES POWER N	PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
JANC1	Janitor Closet	N	CS PC	GEP GPT	GPT AT1	8'-0" (2440)	36" (915)	35-45 STC 40	100 (4.8)	100 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	.	.	.	Y	13	.	Y	.
KEY01	Key / Access Control	N	RT MA	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	2:1 .	h5 .	.	.	S	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LAC01	Lactation Room	3	RT SM	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 45	60 (2.9)	500 .	3:1 .	c1,h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
LAUN1	Laundry Room, Inpatient	N	SM CS	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	150 (7.2)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	.	.
LAUN2	Laundry Room, Inpatient, Behavioral Health	N	SM CS	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	150 (7.2)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	.	.
LBAL1	Laboratory, Automated, Small	4	SR	GEP GPT	AT2	9'-0" (2740)	G	30-40 STC 40	100 (4.8)	500 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBAL2	Laboratory, Automated, Medium	4	SR	GEP GPT	AT2	9'-0" (2740)	G	30-40 STC 40	100 (4.8)	500 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBAL3	Laboratory, Automated, Large	4	SR	GEP GPT	AT2	9'-0" (2740)	G	30-40 STC 40	100 (4.8)	500 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBAP1	Allergen Preparation	4	SR	GEP GPT	AT2 AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	1000 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	14	14	.	M
LBAR1	Laboratory, Autopsy	4	TR CS	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	60 (2.9)	1000 2000	4:1 2:1	a2 a2	.	.	.	.	.	2	.	2	.	.	.	.	.	.	.	F	- -	12	3	R	R	Y	13	.	Y	M,T
LBBD1	Laboratory, Blood Donor Station	3	ER SR	GEP GPT	AT2	8'-6" (2590)	48" (1220)	35-45 STC 40	60 (2.9)	1000 .	2:1 .	h6,x3 .	.	LS	.	.	.	.	.	1	.	.	.	1	.	.	.	.	-	6	2	R	R	Y	14	.	.	.
LBBD2	Laboratory, Blood / Phoresis Processing	4	ER SR	GEP GPT	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 750	3:1 2:1	h4 m1	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	.
LBBG2	Laboratory, Blood Gas	4	SR	GEP GPT	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	.
LBBP1	Laboratory, Body Preparation	4	ER	GEP	GEP	9'-0" (2740)	48" (1220)	30-50 STC 40	100 (4.8)	500 750	3:1 2:1	h4 m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	R	R	Y	13	.	Y	M
LBBS1	Laboratory, Blood Shipping	4	ER SR	GEP GPT	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 750	3:1 2:1	h4 m1	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	M
LBBS2	Laboratory, Blood Shipping - Frozen Blood	4	ER SR	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	M
LBBV1	Laboratory, Body Viewing	4	TR CS	GEP GPT	AT2	9'-0" (2740)	48" (1220)	30-40 STC 40	100 (4.8)	500 750	3:1 2:1	h4 m1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	3	R	R	Y	13	.	Y	M
LBCP1	Laboratory, Cytogenetics Preparation	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBCR1	Laboratory, Cytogenetics Reading	4	SR	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	500 1000	3:1 2:1	c1,h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBDE1	Laboratory, Dermatology	4	SR	GPT GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	M
LBDR1	Laboratory, Decontamination	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	1	.	.	.	1	.	1	.	B,F	-	10	2	R	R	Y	13	.	Y	M
LBDS1	Laboratory, Bone Dissection (ENT use)	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	.	U	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LBEM2	Laboratory, Electron Microscope	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 .	3:1 .	c1,h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O	W A I	A D	G N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
LBEM3	Laboratory, Electron Microscope, Specimen Preparation	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.
LBEN1	Laboratory, Entomology	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LBFC1	Laboratory, Flow Cytometer	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBGW1	Laboratory, Glassware Washing	4	SR	GEP	GEP	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	200 .	2:1 .	h4,m1 .	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2.5	R	R	Y	13	.	Y	M
LBIH1	Laboratory, Industrial Hygiene	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBIR1	Laboratory, Incubation Room, Walk-In	4	SP	GEP	GEP	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBMH1	Laboratory, Multi-Head Microscope And Collaboration Room	4	SR	GPT	AT1	8'-0" (2440)	36" (915)	30-50 STC 40	100 (4.8)	500 .	3:1 .	c1,h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.
LBMR1	Laboratory, Morgue Refrigerator	4	SP MA	GEP SPF	GEP SSP	9'-0" (2740)	SP	30-50 STC 40	C	200 .	4:1 .	. .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	SP	SP	Y	13	.	Y	.
LBMR2	Laboratory, Morgue Refrigerator, Walk-In	4	SP MA	GEP	GEP	9'-0" (2740)	SP	30-50 STC 40	C	200 .	4:1 .	. .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	2	SP	SP	Y	13	.	.	.
LBOB1	Laboratory, OB / GYN Clinic - Specimens	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBPC1	Laboratory, Point of Care	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	60 (2.9)	500 .	3:1 .	h4 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	.
LBRB1	Laboratory, Research Biochemistry	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LBRC1	Laboratory, Research Clean	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	.	M
LBRC2	Laboratory, Research Containment	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	60 (2.9)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LBRI1	Laboratory, Radioimmunoassay	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	1	.	1	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	.	.
LBRP1	Laboratory, Radiation Protection	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	.
LBSC1	Laboratory, Small Clinic - Standard	4	SM	GEP	AT2	8'-0" (2440)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBSH1	Laboratory, Specimen Holding	4	SM	GEP SSP	GEP SSP	9'-0" (2740)	36" (915)	30-45 STC 40	60 (2.9)	200 500	3:1 3:1	h1 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	M
LBSM1	Laboratory, Solution and Media Preparation	4	SM	GEP GPT	AT2 AT1	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 750	3:1 2:1	h4 m1	R	L	.	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	14	hepa	.	M
LBSP1	Laboratory, Satellite	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	.
LBSP2	Laboratory, Satellite, Operating Room	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	.
LBSSX	Laboratory, Shipping and Receiving Areas	4	SM	GPT	AT1	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	300 .	2:1 .	h1 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	.
LBTS1	Laboratory, Tissue Storage	4	SM	GEP GPT	AT2 AT1	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	200 500	3:1 2:1	h1 h4	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O	I A	WAG D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
LBUL1	Laboratory, Ultra Low Temp Freezer	4	PF	SPF	SPF	9'-0" (2740)	36" (915)	. .	100 (4.8)	200 .	3:1 .	. .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	SP	SP	Y	13	.	.	.
LBUR1	Laboratory, Urology	4	SM	GEP	AT2 AT1	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	Y	M
LBVP1	Laboratory, Venipuncture	3	SM	GEP GPT	AT2 AT1	9'-0" (2740)	42" (1065)	35-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	14	.	.	.
LBVP2	Laboratory, Venipuncture, Multi-Station	3	SM	GEP GPT	AT2 AT1	9'-0" (2740)	42" (1065)	35-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	14	.	.	.
LBWA1	Laboratory, Water	4	SM	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	100 (4.8)	500 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	R	R	Y	13	.	.	.
LCCL1	Linen Control, Clean	4	SM RT	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 40	150 (7.2)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
LCCL2	Linen Room, Clean	4	SM RT	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 40	150 (7.2)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
LCCL3	Linen Alcove, Clean	Space Parameter Notes: a						.		. .	. .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LCCL4	Linen Room, Clean, Scrubs Distribution	4	SM RT	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 40	100 (4.8)	500 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
LCCL5	Linen, Medical Attire, Distribution Conveyor	4	SM RT	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 40	B	500 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
LCFA1	Linen Control, Folding Area	4	SM RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	150 (7.2)	500 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	14	.	.	.
LCSL1	Linen Control, Soiled	4	SM	GPT GEP	AT2	8'-0" (2440)	36" (915)	30-45 STC 40	100 (4.8)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
LCSL2	Linen Room, Soiled	4	SM	GPT GEP	AT2	8'-0" (2440)	36" (915)	30-45 STC 40	100 (4.8)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
LCSL3	Linen Alcove, Soiled	Space Parameter Notes: a						.		. .	. .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LDAT1	Antepartum Testing	3	RT SR	GEP GPT	AT1 AT2	9'-0" (2740)	42" (1065)	30-40 STC 45	60 (2.9)	300 1000	2:1 2:1	c1,x3 c1	R	L	.	1	.	.	1	.	.	1	.	.	.	.	.	B	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
LDAT2	Antepartum Testing, Multi-Station	3	RT SR	GEP GPT	AT1 AT2	9'-0" (2740)	42" (1065)	30-40 STC 45	60 (2.9)	300 1000	2:1 2:1	c1,x3 c1	R	L	.	1	.	.	1	.	.	1	.	.	.	.	.	B	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
LDDR1	Operating Room, Labor and Delivery, C Section	1	ER PS	GSS GRE	GEP	10'-0" (3050)	J	30-40 STC 45	60 (2.9)	2000 .	2:1 .	a2,a3,c1,x3 .	RA	LB	.	7	.	.	13	.	.	5	2	2	2	C,D	++	20	4	R	R	S	14	hepa	.	C,O,P
LDEP1	Labor and Delivery, Exam and Preparation	3	SR	GEP	AT2	8'-0" (2440)	48" (1220)	30-40 STC 50*	60 (2.9)	300 1000	2:1 2:1	c1,x3 c1	R	L	.	1	.	.	1	.	.	1	.	.	.	.	.	B	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
LDPR1	Labor and Delivery, Infant Preparation Room	4	SM	GEP	AT1 AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
LDRP1	Labor and Delivery, LDR / LDRP	1	SR SP	GEP SSP	AT2	9'-0" (2740)	48" (1220)	30-40 STC 45	60 (2.9)	300 1000	2:1 2:1	a2,c1,c4 a2,b4	RA	LB	.	2	.	.	2	.	.	2	.	.	.	.	.	E	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	P
LDRP3	Labor and Delivery, LDR / LDRP, Airborne Infection Isolation	1	SR SP	GEP SSP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 45	60 (2.9)	300 1000	2:1 2:1	a2,c1,c4 a2,b4	RA	LB	.	2	.	.	2	.	.	2	.	.	.	.	.	E	- -	12	2	75 (23.9)	75 (23.9)	Y	14	.	Y	E,P,Q
LIBB1	Library, Book / Periodical, Stacks	N	CP	GPT	AT1	10'-0" (3050)	L	20-30 STC 45	D	200 300	2:1 2:1	h1,m1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LIBD1	Library, Reference Desk	N	CP	GPT	AT1	10'-0" (3050)	36" (915)	20-30 STC 45	100 (4.8)	500 .	2:1 .	h6 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
LIBV1	Library, Education / Resource	N	CP RT	GPT	AT1	10'-0" (3050)	36" (915)	20-30 STC 45	150 (7.2)	500 .	2:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LIBW1	Library, Staff Workroom	N	CP RT	GPT	AT1	9'-0" (2740)	36" (915)	20-30 STC 45	100 (4.8)	500 .	2:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LMAB1	Laboratory, Anaerobic Bacteria -TB	4	SR	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LMBB1	Laboratory, Blood Bank, Small	4	SR	GEP	AT2	9'-0" (2740)	42" (1065)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.
LMBB2	Laboratory, Blood Bank, Medium	4	SR	GEP	AT2	9'-0" (2740)	42" (1065)	30-45 STC 40	C	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.
LMBB3	Laboratory, Blood Bank, Large	4	SR	GEP	AT2	9'-0" (2740)	42" (1065)	30-45 STC 40	C	500 1000	3:1 2:1	h4 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	R	R	Y	13	.	.	.
LMCH2	Laboratory, Chemistry, Small	4	SR	GEP	AT2	9'-0" (2740)	G	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMCH3	Laboratory, Chemistry, Medium	4	SR	GEP	AT2	9'-0" (2740)	G	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMCH4	Laboratory, Chemistry, Large	4	SR	GEP	AT2	9'-0" (2740)	G	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMCY1	Laboratory, Cytology, Small	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMCY2	Laboratory, Cytology, Medium	4	SR	GEP	AT2	9'-0'' (2740)	36'' (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMCY3	Laboratory, Cytology, Large	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHC1	Laboratory, Histopathology, Medium	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHC2	Laboratory, Histopathology, Large	4	SR	GEP	AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHI2	Laboratory, Hematology, Small	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHI3	Laboratory, Hematology, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHI4	Laboratory, Hematology, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHS1	Laboratory, Histology, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMHS2	Laboratory, Histology, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMM02	Laboratory, Microbiology, Small	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMM03	Laboratory, Microbiology, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMM04	Laboratory, Microbiology, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LMML1	Laboratory, Automated, Molecular,Diagnostic	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LD	NO	NO	IA	WAD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
LMML2	Laboratory, Reagent Preparation, Amplification Room	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LMML3	Laboratory, Specimen Processing, Preamplification Room	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	-	6	2	R	R	Y	13	.	Y	M
LMML4	Laboratory, Amplification / Instrument Room	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	E	.	.	1	.	1	.	.	.	.	.	.	.	B,F	- -	6	2	R	R	Y	13	.	Y	M
LMMP1	Laboratory Microbiology / Parasitiology	4	SR	GEP	GEP	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMMY1	Laboratory Mycology	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMS01	Laboratory, Serology, Small	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMS02	Laboratory, Serology, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMS03	Laboratory, Serology, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMT01	Laboratory, Toxicology	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMU02	Laboratory, Urinalysis, Small	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMU03	Laboratory, Urinalysis, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMU04	Laboratory, Urinalysis, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMV01	Laboratory, Virology, Medium	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LMV02	Laboratory, Virology, Large	4	SR	GEP	GEP AT2	9'-0" (2740)	36" (915)	30-45 STC 40	100 (4.8)	500 1000	3:1 2:1	h4 .	R	L	.	.	.	1	.	.	.	.	.	.	.	.	.	B	-	6	2	R	R	Y	13	.	Y	M
LOB01	Lobby, Seating Area	N	ER SP	GPT SSP	AT1 SSP	VAR	SP	35-45 STC 40	100 (4.8)	300 .	4:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LOB02	Lobby, Vestibule	N	SP	GPT SSP	AT1 SSP	VAR	SP	. .	100 (4.8)	400 100	4:1 4:1	h1,x1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	a	a	*	68 (20.0)	Y	13	.	.	.
LOB03	Lobby, Main	N	ER SP	GPT SSP	AT1 SSP	VAR	SP	35-45 STC 40	100 (4.8)	100 .	4:1 .	h1,x1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
LOB05	Lobby, Vestibule, Ambulance Entrance	N	SP	GPT SSP	AT1 SSP	VAR	SP	. .	100 (4.8)	300 150	3:1 3:1	h4,x6 h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	a	a	*	68 (20.0)	Y	13	.	.	.
LR001	Lockers, Personal Property	Space Parameter Notes: a						. .		. .	. .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LR002	Lockers, Changing	N	PC RT	GEP GCT	GEP AT2	8'-0" (2440)	36" (915)	30-45 STC 40	100 (4.8)	200 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	.	.
MAGV1	Medical Material AGV Charging Station	4	RT MA	GPT	AT1	10'-0" (3050)	E	30-45 STC 40	C	50 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MAGV2	Medical Material AGV Dispatch	4	RT MA	GPT	AT1	10'-0" (3050)	E	30-45 STC 40	C	500 .	3:1 .	h6 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MAGV3	Medical Material AGV Repair	4	RT MA	GPT	AT1	10'-0" (3050)	E	30-45 STC 40	C	500 .	3:1 .	h6 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O	W A I	A D	G N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
MECH1	Mechanical Rooms / Electrical Rooms	N	CS	SSP	EXP	C	F	40-70 STC 55	B	300	2:1	h4	R	LS	S	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	a	a	.	50 (10.0)	M	13	.	.	K
MECH2	Air Handling Rooms	N	CS	SSP	EXP	C	VAR	40-70 STC 55	B	300	2:1	h1,u1	R	LS	S	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	a	a	.	50 (10.0)	M	13	.	.	K
MEDP1	Medication Room	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 45	100 (4.8)	1100	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	70 (21.1)	Y	13	.	.	.
MMCR1	Medical Material, Cart Receiving	4	ER CS	GPT	AT1	10'-0" (3050)	E	30-45 STC 40	100 (4.8)	50	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MMCR2	Medical Material, Cart Restocking	4	RT CS	GPT	AT1	10'-0" (3050)	E	30-45 STC 40	100 (4.8)	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MMGS1	Medical Material, General Storage	4	RT CS	GPT	AT1	10'-0" (3050)	48" (1220)	30-45 STC 40	125	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MMRP1	Medical Material, Receiving / Process	4	CS RT	GPT	AT1	10'-0" (3050)	48" (1220)	30-45 STC 40	100 (4.8)	300	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	75 (23.9)	55 (12.8)	Y	13	.	.	.
MRMB1	Mail Room, Distribution Area	N	RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 50	100 (4.8)	500	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MRPS1	Mail Room, U.S. Post Office	N	RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 50	100 (4.8)	500	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	4	1	*	68 (20.0)	Y	13	.	Y	U
MRRS1	Mail Room, Receiving / Sorting	N	RT	GPT	AT1	9'-0" (2740)	B	30-40 STC 50	125	300 1000	3:1 3:1	h4 h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MRS01	Med Records, Storage, Fixed	4	RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	150 (7.2)	300	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MRS02	Med Records, Storage, Movable	4	RT CP	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	D	300	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
MRWK1	Med Records, Workroom	Space Parameter Notes: a and f						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NBCD1	NBC Decontamination Suite	3	CS	SSP	SSP	VAR	VAR	30-40 STC 50	100 (4.8)	500	4:1	h4	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	2	*	68 (20.0)	Y	14	.	Y	M
NBCD2	NBC Decontamination, Shower	3	ER PC	SSP GEP	SSP GEP	VAR	VAR	30-40 STC 40	60 (2.9)	200	2:1	h1,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	2	*	68 (20.0)	Y	14	.	Y	M
NBCD3	NBC Decontamination, Anteroom	4	ER PC	SSP GEP	SSP GEP	VAR	VAR	30-40 STC 40	100 (4.8)	300	4:1	h1,x3	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	2	*	68 (20.0)	Y	14	.	Y	M
NBCD4	NBC Decontamination, Patient Preparation	3	ER	SSP	SSP	VAR	VAR	30-40 STC 40	100 (4.8)	500	3:1	h4,x3	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	2	*	68 (20.0)	Y	14	.	Y	M
NBCD5	NBC Decontamination, Patient Transition	3	ER	SSP	SSP	VAR	VAR	30-40 STC 40	100 (4.8)	500	3:1	h4,x3	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	12	2	*	68 (20.0)	Y	14	.	Y	M
NCWD1	Nourishment Center	4	RT SR	GEP GPT	AT2 AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	150 500	4:1 4:1	h1 .	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
NCWD4	Nourishment Alcove	Space Parameter Notes: a						.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NMBP1	Nuclear Medicine, Blood Product Compounding	4	SR	LEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 1500	3:1 2:1	. .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	*	68 (20.0)	Y	r	r	Y	M,W
NMCR1	Nuclear Medicine, Computer Room	4	SR	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	100 500	2:1 2:1	h1 h4	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
NMDC1	Nuclear Medicine, Dose Calibration	4	SR	LEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 1000	3:1 3:1	. .	.	LS	.	1	.	.	1	.	.	1	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	14	.	Y	M
NMDS1	Nuclear Medicine, Decay Storage	4	SR	LEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200	3:1	h1	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	14	.	Y	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LD	EO	NO	WIA	WAD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
NMGS1	Nuclear Medicine, General Scanning	3	SR	GEP	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	100 (4.8)	500	3:1	c1,x3		LS						1			1					nr	6	2	*	68 (20.0)	Y	13			
NMIR1	Nuclear Medicine, Injection Room	3	SR	LEP	AT2	8'-0" (2440)	48" (1220)	30-40 STC 40	60 (2.9)	1000	3:1	c1,x3		LS		1				1			1					-	6	2	*	68 (20.0)	Y	14		Y	
NMLA1	Nuclear Medicine, Anteroom, Radiopharmacy	4	SR	GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500	3:1			LS														-	6	2	*	68 (20.0)	Y	14		Y	M
NMPC1	Nuclear Medicine, Radiopharmacy, Non-Sterile Compounding	4	SR	LEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 1500	3:1 2:1			LS														-	6	2	*	68 (20.0)	Y	14		Y	M
NMRP1	Nuclear Medicine, Radiopharmacy	C	SR	LEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500	3:1			LS														-	6	2	*	68 (20.0)	Y	13		Y	M
NMSS1	Nuclear Medicine, Special Scanning	3	SR	GEP	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	500	3:1	c1,x3		LS	E	1				1			1					-	6	2	*	68 (20.0)	Y	14		Y	
NMUR1	Nuclear Medicine, Uptake Room	3	SR	GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	200 1000	3:1 3:1	x3		LS	E	1				1			1					-	6	2	*	68 (20.0)	Y	13		Y	
NMVC1	Nuclear Medicine, Vestibule, Radiopharmacy	4	SR	GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500	3:1			LS														-	6	2	*	68 (20.0)	Y	14		Y	M
NMWB1	Nuclear Medicine, Whole Body	3	SR	GEP	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	100 (4.8)	200 500	3:1 3:1	x3		LS	E	1				1			1					-	6	2	*	68 (20.0)	Y	14		Y	
NMWR1	Nuclear Medicine, Waiting Room Hot	4	SR	LPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 45	60 (2.9)	200 100	4:1 4:1	h1 h1																-	6	1	*	68 (20.0)	Y	14		Y	
NSTA1	Nurse Station	4	MA	GPT	AT1	8'-0" (2440)	M	30-40 STC 40	100 (4.8)	300 700	3:1 3:1	c1,h1 h4	R	L														nr	6	2	*	68 (20.0)	Y	14			
NSTA3	Nurse Station, Substation	4	MA	GPT	AT1	8'-0" (2440)	M	30-40 STC 40	100 (4.8)	300 700	3:1 3:1	c1,h1 h4	R	L														nr	6	2	*	68 (20.0)	Y	14			
NSTA4	Nurse Station, Outpatient	4	MA	GPT SSP	AT1	9'-0" (2740)	M	35-45 STC 40	60 (2.9)	300 500	3:1 3:1	c1,h1 h4																nr	a	a	*	70 (21.1)	Y	14			
NSTA5	Nurse Station, Control, Operating Room	4	ER	GEP GEP SSP		9'-0" (2740)	M	30-45 STC 40	100 (4.8)	300 700	3:1 3:1	h1 h4	R	L														nr	6	2	75 (23.9)	75 (23.9)	Y	14			
NT001	Pneumatic Tube Station	Space Parameter Notes: a																																		
NYAF1	Nursery, Anteroom, Feeding Preparation	4	SR RT	GEP GPT	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500	4:1	x3		LS														+	6	2	*	68 (20.0)	Y	14			
NYAR1	Nursery, Anteroom With Scrub Sink	4	SR	GEP	AT2	8'-0" (2440)	48" (1220)	25-35 STC 45	60 (2.9)	500	3:1																	+	12	3	74 (23.3)	80 (26.7)	Y	14			P
NYEC1	Nursery, Extracorporeal Membrane Oxygenation (ECMO) Room	2	SR	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	500 1000	3:1 2:1	h1,x3 h6	R	L		3				3			3				G	++	6	2	74 (23.3)	80 (26.7)	T	14	14		P
NYFA1	Nursery, Feeding Area	3	SR GPT	GEP AT1	AT2	9'-0" (2740)	48" (1220)	25-35 STC 45	60 (2.9)	150	4:1	c1,h1,x3		LS						1			1					nr	6	1.5	74 (23.3)	80 (26.7)	Y	14			P
NYFP1	Nursery, Infant Feeding Preparation Room	4	SR	GEP GPT	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500	4:1	x3		LS														r	r	2	*	68 (20.0)	Y	r	r	r	M,R
NYFS1	Nursery, Storage, Breast Milk / Formula	4	SR	GEP GPT	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	200	3:1	h1		LS														+	6	2	*	68 (20.0)	Y	14			
NYIC1	Nursery, Level II	2	SR RT	GEP GPT	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	300 500	3:1 2:1	c1,x3 c1	R	L		2				2			2				G	++	6	2	74 (23.3)	80 (26.7)	T	14			P
NYIC2	Nursery, Level III	1	SR RT	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	300 500	3:1 2:1	c1,x3 c1	RC	L		3				3			3				G	++	12	4	74 (23.3)	80 (26.7)	T	14			O,P

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LDE	OO	NO	IA	WAGD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
NYIR1	Nursery, Isolation	2	SR	GEP	GEP	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	300 500	3:1 2:1	c1,x3 c1	R	L	.	3	.	.	.	3	.	.	.	3	.	.	.	A	- -	12	2	74 (23.3)	80 (26.7)	T	14	.	Y	A,P,Q
NYNN1	Nursery, Level I	3	SR RT	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	300 500	3:1 2:1	c1,x3 c1	R	L	.	1	.	.	.	1	.	.	.	1	.	.	.	H	++	6	2	74 (23.3)	80 (26.7)	T	14	.	.	P
NYPR1	Nursery, Procedure	2	SR	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	500 1000	3:1 2:1	a2,c1,h1,x3 a2,c1,h6	R	L	.	1	.	.	.	1	.	.	.	1	.	.	.	G	++	6	2	74 (23.3)	80 (26.7)	T	14	14	.	P
NYPT1	Nursery, Parent Education	4	CP RT	GPT	AT1	8'-0" (2440)	48" (1220)	25-35 STC 45	60 (2.9)	400 .	2:1 .	c1,h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	74 (23.3)	80 (26.7)	T	13	.	.	P
NYTU1	Nursery, Storage, Transport Unit	4	RT	GPT	AT1	8'-0" (2440)	L	35-45 STC 45	60 (2.9)	200 .	3:1 .	h1 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	14	.	.	.
NYUN1	Bedroom, NICU, Single Birth	1	SR	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	500 1000	3:1 2:1	a2,c1,h1,x3 a2,c1,h6	RC	L	.	3	.	.	.	3	.	.	.	3	.	.	.	G	++	12	4	74 (23.3)	80 (26.7)	T	14	.	.	O,P
NYUN2	Bedroom, NICU, Multiple Births	1	SR	GEP	AT2	9'-0" (2740)	48" (1220)	25-35 STC 50	60 (2.9)	500 1000	3:1 2:1	a2,c1,h1,x3 a2,c1,h6	RC	L	.	3	.	.	.	3	.	.	.	3	.	.	.	G	++	12	4	74 (23.3)	80 (26.7)	T	14	.	.	O,P
OFA03	Cubicle, Administrative	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFA04	Office, Administrative, Private	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFA05	Office, Administrative, Shared, 2-Person	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFC01	Office, Commander	N	CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFD01	Office, Provider, Private	3	SM	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OFD02	Office, Provider, Shared	3	SM	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	2:1 2:1	h4 h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OFDC1	Office, Provider, Behavioral Health	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	14	.	.	.
OFDC2	Office, Consultation	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	2:1 2:1	h4 h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	14	.	.	.
OFDR1	Office, Provider, Radiology	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFM01	Office, Executive	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h4 h4,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OFP01	Office, Pathologist	N	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	c1,h4 c1,h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
OOHR1	Observation / Hydration	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OOTR1	Observation / Treatment Room	2	SR RT	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	h5,x3 .	R	LB	.	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
OPAE1	Auditory Electrophysiological Lab	3	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPAI1	Allergy Injection Room	3	RT SR	GPT GEP	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	500 1000	3:1 3:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPAP1	Posturography	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
OPAR1	Rotary Chair	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
OPAS1	Allergy Skin Testing	3	RT SR	GPT GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 1000	3:1 3:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPCR1	Cast Room	3	RT SR	GEP GPT	AT1	9'-0" (2740)	G	30-40 STC 50	60 (2.9)	500 .	3:1 .	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	F	nr	10	2	*	70 (21.1)	Y	14	.	Y	.
OPCR2	Cast Room, Multi-Station	3	RT SR	GEP GPT	AT1	9'-0" (2740)	G	30-40 STC 50	60 (2.9)	500 1000	3:1 3:1	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	B,F	nr	10	2	*	70 (21.1)	Y	14	.	Y	.
OPCT1	Intravenous Infusion, Therapy	3	SR	GPT GEP	AT1 AT2	8'-0" (2440)	48" (1220)	30-40 STC 50*	60 (2.9)	1000 .	3:1 .	x3 .	.	.	.	.	.	.	1	.	.	1	.	.	.	.	B	+	6	2	*	68 (20.0)	Y	14	.	.	.
OPCT2	Intravenous Infusion, Preparation	4	SR	GPT GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	1000 .	3:1 .	h1,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPDC1	Dermatology, Cryotherapy	3	RT SR	GPT GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPDU1	Dermatology, UV Booth	3	RT	GPT	AT1	9'-0" (2740)	48" (1220)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPEC1	ECG (Electrocardiogram)	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	150 300	3:1 3:1	h4,x3 h4	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPEE1	EEG (Electroencephalogram)	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	300 500	3:1 3:1	c1,h4,x3 h4	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPHM1	Holter Monitor	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPIR1	Immunization Room	3	SR	GPT GEP	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	750 .	3:1 .	h4,x3 .	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPMH1	Group Therapy	3	SR RT	GPT	AT1	10'-0" (3050)	36" (915)	30-40 STC 50*	60 (2.9)	200 500	3:1 3:1	h1,x3 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OPMH2	Behavioral Health, Testing	3	SR RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPMH3	Biofeedback	3	SR RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	c1,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPMH4	Secured Observation	3	SR	GPT	GPT	9'-0" (2740)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	c1,x1 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
OPMP1	Outpatient, Group Therapy, Speech / Language	3	CP RT	GPT	AT1	VAR	36" (915)	30-40 STC 50	60 (2.9)	200 500	3:1 3:1	h1,x3 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OPNR1	Nephrology Renal Study	3	SR RT	GEP GPT	AT2 AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	100 500	3:1 2:1	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	.	+	6	2	*	70 (21.1)	Y	14	.	.	.
OPPE1	Echocardiograph	3	RT	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	150 300	3:1 3:1	c1,h4,x3 h4	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPE2	Echocardiograph, Stress	3	RT	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	150 300	3:1 3:1	h4,x3 h4	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPF1	Pulmonary Function, Screening	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50*	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPF2	Pulmonary Function, Analysis	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	B	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPF4	Pulmonary Function, Whole Body Analysis	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	B	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPF5	Pulmonary Function, Treadmill	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50	60 (2.9)	500 .	2:1 .	x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	B	nr	6	2	*	70 (21.1)	Y	14	.	.	.
OPPF6	Pulmonary Function, Sleep Study	3	CP	GPT	AT1	8'-6" (2590)	42" (1065)	30-40 STC 50	60 (2.9)	100 .	5:1 .	c1,h1,m1,x3 .	.	.	.	1	.	.	1	.	.	1	.	.	.	.	B	nr	6	2	*	70 (21.1)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	W A I	G D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
OPPF7	Pulmonary Function, Sleep Study, Monitoring	4	CP	GPT	AT1	8'-6" (2590)	36" (915)	30-40 STC 50	60 (2.9)	300	5:1	c1,h1,m1																	nr	6	2	*	70 (21.1)	Y	13			
OPPM1	Pacemaker Workroom	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	1000	3:1	h6,u2																	nr	6	2	*	70 (21.1)	Y	14			
OPRC1	Respiratory, Equipment, Clean	N	RT SR	GEP GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	1000	3:1	h6,u2				1			1			1					B	+	6	2	*	68 (20.0)	Y	14			
OPRS1	Respiratory, Equipment, Soiled	N	SR	GEP GPT	AT2	8'-0" (2440)	42" (1065)	30-40 STC 50*	60 (2.9)	1000	3:1	h6,u2				1			1									-	10	2	*	68 (20.0)	Y	14		Y	M
OPRT1	Respiratory, Treatment, Multi-Station	3	RT SR	GEP GPT	AT1	8'-0" (2440)	48" (1220)	35-45 STC 50*	60 (2.9)	500	2:1	x3				1			1			1					B	nr	6	2	*	70 (21.1)	Y	14			
OPTM1	Stress Testing, Treadmill	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50*	60 (2.9)	400	3:1	x3				1			1			1					B	nr	6	2	*	70 (21.1)	Y	14			
OPTM2	Cardiac, Tilt Table	3	RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50*	60 (2.9)	500	2:1	x3																	nr	6	2	*	70 (21.1)	Y	14			
OPTM3	Outpatient, Treadmill, Underwater Chamber	3	PC	GPT GCT	AT1 GEP	9'-0" (2740)	42" (1065)	35-45 STC 40	C	400	3:1	x3																	-	6	2	*	70 (21.1)	Y	13		Y	
OPVL1	Laboratory, Vascular	3	SR RT	GEP GPT	AT1	8'-0" (2440)	42" (1065)	30-45 STC 50*	60 (2.9)	500 1000	3:1 2:1	h4				1			1			1					B,F	nr	6	2	*	70 (21.1)	Y	14			
ORCC1	Operating Room, Clean Core	4	ER PS	GEP SSP	GEP	9'-0" (2740)	42" (1065)	30-45 STC 40	125	500	3:1	h1	RA	LB															+	6	2	75 (23.9)	75 (23.9)	Y	14			
ORCM1	Operating Room, Storage, Cardiac	4	PS SR	GPT GEP	AT1	9'-0" (2740)	36" (915)	30-45 STC 45	60 (2.9)	500	3:1	h1	R	LB															nr	6	2	75 (23.9)	68 (20.0)	Y	14			
ORCS1	Operating Room, Cystoscopic	1	ER PS	LSS LRE	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	2000	2:1	a2,a3,c5	RA	LB		6			12			8	2	4	2	C	++	20	4	R	R	S	14	hepa		C	
ORCT1	Operating Room, Cardiothoracic	1	ER PS	GSS GRE	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	2000	2:1	a2,a3,c5	RA	LB		6			12			8	2	4	2	C	++	20	4	R	R	S	14	hepa	Y	C	
ORCW1	Operating Room, Workroom, Clean	4	ER PS	GEP SSP	GEP	9'-0" (2740)	42" (1065)	30-45 STC 45	60 (2.9)	1000	3:1	a2	R	L		1			1			1					I	+	6	2	68 (20.0)	68 (20.0)	Y	14			
ORDA1	Operating Room, Decontamination	4	ER PS	GEP SSP	GEP	9'-0" (2740)	42" (1065)	30-45 STC 45	60 (2.9)	1000	3:1		R	L					1						1			-	6	2	*	68 (20.0)	Y	14		Y	M
OREC1	Operating Room, Equipment Cleanup	4	ER PS	GEP SSP	GEP	9'-0" (2740)	36" (915)	30-45 STC 45	60 (2.9)	1000	3:1		R	L		1			1						1			+	6	2	75 (23.9)	68 (20.0)	Y	14		Y	
ORGE1	Operating Room, General, Equipment Storage	4	ER PS	GEP SSP	GEP	9'-0" (2740)	48" (1220)	30-45 STC 40	125	200	3:1	h1		LS															+	6	1.5	75 (23.9)	75 (23.9)	Y	14			
ORGS1	Operating Room, Integrated	1	ER PS	GSS GRE	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	2000	2:1	a2,a3,c5	RA	LB		6			12			8	2	4	2	C	++	20	4	R	R	S	14	hepa		C	
ORHC1	Operating Room, Hybrid, Control	4	ER PS	GEP SSP	GEP	9'-0" (2740)	SP	30-45 STC 45	60 (2.9)	500	3:1	c1,h1	RA	LS															+	6	2	R	R	Y	14			N
ORHE1	Operating Room, Hybrid, Equipment Storage	4	ER PS	GEP SSP	GEP	9'-0" (2740)	48" (1220)	30-45 STC 40	125	200	3:1	h1		LS															+	6	1.5	75 (23.9)	68 (20.0)	Y	14			
ORHL1	Operating Room, Equipment, Heart Lung Pump	4	ER PS	GEP SSP	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	200	3:1	h1		LS															+	6	2	R	R	Y	14			
ORHY1	Operating Room, Hybrid	1	ER PS	LSS LRE	GEP	10'-0" (3050)	K	30-45 STC 40	60 (2.9)	2000	2:1	a2,c5	RA	LB		6			12			8	2	4	2	C	++	20	4	R	R	S	14	hepa		C,N	
ORNE1	Operating Room, Equipment, Neurology	4	ER PS	GEP SSP	GEP	10'-0" (3050)	48" (1220)	30-45 STC 45	125	200	3:1	h1		LS															+	6	1.5	75 (23.9)	75 (23.9)	Y	14			
ORNS1	Operating Room, Neurology	1	ER PS	GSS GRE	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	2000	2:1	a2,c5	RA	LB		6			12			8	2	4	2	C	++	20	4	R	R	S	14	hepa		C	

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	ES POWER N	PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	W A I	G D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
OROE1	Operating Room, Equipment, Orthopaedic	4	PS SR	GEP SSP	GEP	10'-0" (3050)	48" (1220)	30-45 STC 45	125	200 .	2:1 .	h1,u1 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	1.5	75 (23.9)	68 (20.0)	Y	14	.	.	.
OROS1	Operating Room, Orthopaedic	1	ER PS	GSS GRE	GEP	10'-0" (3050)	K	30-45 STC 45	60 (2.9)	2000 .	2:1 .	a2,c5 .	RA	LB	.	6	.	.	12	.	.	8	2	4	2	C	++	20	4	R	R	S	14	hepa	.	C
ORPC1	Operating Room, Storage, Plaster Cart	4	ER PS	GEP SSP	GEP	9'-0" (2740)	42" (1065)	30-45 STC 40	60 (2.9)	50 .	3:1 .	h1 .	.	LB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	75 (23.9)	68 (20.0)	Y	14	.	.	.
ORPH2	Operating Room, Workstation, Preparation / Hold	4	RT SR	GEP SSP	GEP	9'-0" (2740)	L	30-45 STC 40	60 (2.9)	500 .	3:1 .	h4 .	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
ORPP1	Operating Room, Patient Preparation / Induction	3	RT SR	GEP SSP	GEP	9'-0" (2740)	48" (1220)	30-45 STC 40	60 (2.9)	500 . 1000 .	2:1 2:1	a2 a2	R	L	.	1	.	.	1	.	.	1	.	.	.	B	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
ORPP2	Operating Room, Patient Preparation / Induction, Multi-Station	2	RT SR	GEP SSP	GEP	9'-0" (2740)	P	30-45 STC 40	60 (2.9)	500 . 1000 .	2:1 2:1	a2 a2	R	L	.	1	.	.	1	.	.	1	.	.	.	B	nr	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
ORSA1	Operating Room, Scrub Sink	4	ER PS	GEP SSP	GEP	9'-0" (2740)	L	30-45 STC 40	60 (2.9)	1100 .	3:1 .	. .	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
ORSR1	Operating Room, Sterile Processing	4	ER PS	GEP SSP	GEP	9'-0" (2740)	42" (1065)	30-45 STC 40	60 (2.9)	500 .	2:1 .	h4 .	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	75 (23.9)	75 (23.9)	Y	14	.	Y	.
ORSS1	Operating Room, Storage, Sterile	4	ER PS	GEP SSP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 45	125	200 .	3:1 .	h1 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
OTDL1	Occupational Therapy, Daily Living Skills	3	SP RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 45	60 (2.9)	400 .	3:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OTEV1	Occupational Therapy, Exam	3	RT CP	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 45	60 (2.9)	400 .	3:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OTGC1	Occupational Therapy, General Clinic Area	3	RT CP	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 45	60 (2.9)	400 .	3:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OTNR1	Occupational Therapy, Neuro-Rehab Training	3	CP RT	GPT	AT1	10'-0" (3050)	42" (1065)	30-40 STC 40	60 (2.9)	400 .	3:1 .	x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
OTWT1	Occupational Therapy, Simulation Laboratory	3	SP RT	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 50	60 (2.9)	400 .	3:1 .	c1,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
PAIA1	Patient Admin Interview Area	4	CP RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	400 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.
PEHS1	Hearing / Screening, Booth, 1-Person	3	CP RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
PEHS2	Hearing / Screening, Booth, Multi-Person	3	CP RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
PEHS3	Hearing / Diagnostic, Booth, 1-Person	3	CP RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
PEVH2	Vision / Hearing, Pediatric	3	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 50*	60 (2.9)	500 .	3:1 .	h4,x3 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
PHAR1	Pharmacy, Anteroom, Chemo-therapeudics Compounding Area	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 .	3:1 .	. .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	.	.	.	r	r	r	M,W
PHHR1	Pharmacy, Receiving / Unpacking, Hazardous Drug	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300 .	4:1 .	. .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	r	r	Y	W
PHBS1	Pharmacy, Storage, Bulk, Low Volume	4	SR RT	GPT	AT1	VAR	42" (1065)	30-40 STC 40	100 (4.8)	300 .	4:1 .	. .	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHBS2	Pharmacy, Storage, Bulk, Medium Volume	4	SR RT	GPT	AT1	VAR	42" (1065)	30-40 STC 40	100 (4.8)	300 .	4:1 .	. .	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
PHBS3	Pharmacy, Storage, Bulk, High Volume	4	SR RT	GPT	AT1	VAR	42" (1065)	30-40 STC 40	100 (4.8)	1500	2:1	.	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHC01	Pharmacy, Clean Room, Chemotherapeutics Compounding	4	SR	GEP GPT	GEP AT2	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	*	68 (20.0)	Y	r	r	r	M,W
PHDC1	Pharmacy, Dispensing / Consult Room	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 50	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	14	.	.	.
PHDS1	Pharmacy, Off Site Satellite, Medium Volume	4	SR RT	GPT	AT1	VAR	42" (1065)	30-40 STC 40	60 (2.9)	1000	3:1	.	R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHDS2	Pharmacy, Off Site Satellite, High Volume	4	SR RT	GPT	AT1	VAR	42" (1065)	30-40 STC 40	60 (2.9)	1000	3:1	.	R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHDS3	Pharmacy, On-Site, Satellite	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	100 (4.8)	750	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHEV1	Pharmacy, Documentation Station, Receiving	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	100 (4.8)	750	3:1	.	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHIV1	Pharmacy, IV Admixture, Low Volume	4	SR RT	GEP GPT	GEP AT2	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	h1	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	*	68 (20.0)	Y	r	r	r	M,R
PHIV2	Pharmacy, IV Admixture, Medium Volume	4	SR RT	GEP GPT	GEP AT2	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	h1	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	*	68 (20.0)	Y	r	r	r	M,R
PHIV3	Pharmacy, IV Admixture, High Volume	4	SR RT	GEP GPT	GEP AT2	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	h1	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	2	*	68 (20.0)	Y	r	r	r	M,R
PHMP1	Pharmacy, Manufacturing and Prepack, Low Volume	4	SR	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHMP2	Pharmacy, Manufacturing and Prepack, Medium Volume	4	SR RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHMP3	Pharmacy, Manufacturing and Prepack, High Volume	4	SR RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHOD1	Pharmacy, Storage / Dispensing, Low Volume	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHOD2	Pharmacy, Storage / Dispensing, Medium Volume	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHOD3	Pharmacy, Storage / Dispensing, High Volume	4	SR RT	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	100 (4.8)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHR01	Pharmacy, Prescription Assembly, Robotics / Automation	4	SR RT	GPT	AT1	9'-0" (2740)	N	30-40 STC 40	100 (4.8)	1000	3:1	.	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHUD1	Pharmacy, Unit Dose	4	SR RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	1000	3:1	.	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
PHVS1	Pharmacy, Inpatient, Vestibule	4	SR RT	GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	60 (2.9)	500	3:1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	.	.
PLAY1	Play Room	3	MA CP	GPT	AT1	9'-0" (2740)	36" (915)	35-45 STC 45	60 (2.9)	300	4:1	h1,x1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	1.5	*	70 (21.1)	Y	13	.	.	.
PMCC1	Plant Maintenance, Control Center	N	CS RT	GPT SSP	AT1 SSP	9'-0" (2740)	VAR	30-40 STC 50	100 (4.8)	500	3:1	h6	R	LS	S	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
PMCF1	Plant Maintenance, CADD / File Room	N	CS RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	D	150 500	2:1 3:1	c1,u1 c1,m2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
PMCW1	Plant Maintenance, Common Area	N	CS RT	GPT SSP	AT1 SSP	9'-0" (2740)	VAR	30-40 STC 50	100 (4.8)	500	3:1	h6	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	Y	M

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O V	L D E	O	N O	O	W A I	A D	G	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
PMWSX	Plant Maintenance Workstation Areas	N	CS PS	GPT SSP	AT1 SSP	9'-0" (2740)	VAR	30-40 STC 50	100 (4.8)	500	3:1	h6							1										nr	a	a	*	68 (20.0)	Y	13		Y	M
PTAP1	Physical Therapy, Aquatic Pool, Small	Space Parameter Notes: b																																				
PTAP2	Physical Therapy, Aquatic Pool, Medium	Space Parameter Notes: b																																				
PTAP3	Physical Therapy, Aquatic Pool, Large	Space Parameter Notes: b																																				
PTAT1	Physical Therapy, Amputee Training	3	SP	GPT	AT1	D	42" (1065)	30-40 STC 40	60 (2.9)	500	3:1	x3																	nr	a	a	75 (23.9)	70 (21.1)	Y	13			
PTBT1	Physical Therapy, Back Treatment	3	RT CP	GPT	AT1	D	42" (1065)	30-40 STC 40	60 (2.9)	500	3:1	x3																	nr	a	a	*	70 (21.1)	Y	13			
PTCW1	Physical Therapy, Tech Workstation	4	MA	GPT	AT1	D	L	30-40 STC 40	60 (2.9)	500	3:1	h4,x3																	nr	4	2	*	70 (21.1)	Y	13			
PTEA1	Physical Therapy, Exercise Gym	3	SR RT	GPT	AT1	D	48" (1220)	35-45 STC 40	60 (2.9)	400	3:1	x3																	-	6	2	*	70 (21.1)	Y	13		Y	
PTEM1	Physical Therapy, EMG (Electromyography)	3	RT	GPT	AT1	D	42" (1065)	35-45 STC 40	60 (2.9)	750	3:1	x3																	nr	6	2	*	70 (21.1)	Y	13			
PTES1	Physical Therapy, Exercise Stations	3	MA	GPT	AT1	D	L	35-45 STC 40	60 (2.9)	400	3:1	x3																	-	6	2	*	70 (21.1)	Y	13			
PTGL1	Physical Therapy, Gait Obs. Lane	3	SR RT	GPT	AT1	D	L	35-45 STC 40	60 (2.9)	400	3:1	x3																	nr	6	2	*	70 (21.1)	Y	13			
PTIS1	Physical Therapy, Isokinetic Station, Diagnostic	3	RT	GPT	AT1	D	42" (1065)	35-45 STC 40	C	400	3:1	x3																	-	6	2	*	70 (21.1)	Y	13		Y	
PTPR1	Physical Therapy, Rehab, Private	3	RT	GPT	AT1	D	42" (1065)	35-45 STC 40	60 (2.9)	500	3:1	x3																	nr	6	2	*	70 (21.1)	Y	13			
PTTC1	Physical Therapy, Treatment, Cubicle	3	MA	GPT	AT1	D	P	35-45 STC 40	60 (2.9)	500	3:1	x3																	nr	4	2	*	70 (21.1)	Y	13			
PTTS1	Physical Therapy, Treatment Support	3	MA	GPT	AT1	D	L	35-45 STC 40	60 (2.9)	500	3:1	x3																	nr	6	2	*	70 (21.1)	Y	13			
PTWT1	Physical Therapy, Whirlpool	3	PC	GPT GCT	AT1 GEP	9'-0" (2740)	42" (1065)	35-45 STC 40	C	300	3:1	h3,x3																	-	6	2	*	70 (21.1)	Y	13		Y	
RAA01	Chapel, Altar	N	CP SP	GPT SSP	AT1 SSP	9'-0" (2740)	L	20-30 STC 40	60 (2.9)	1000	4:1	c1,h6																	nr	a	a	*	68 (20.0)	Y	13			
RABS1	Chapel, Chancel	N	CP SP	GPT SSP	AT1 SSP	9'-0" (2740)	36" (915)	20-30 STC 40	60 (2.9)	750	4:1	c1,h6																	nr	a	a	*	68 (20.0)	Y	13			
RAMR1	Chapel, Meditation	N	CP SP	GPT SSP	AT1	9'-0" (2740)	36" (915)	20-30 STC 40	60 (2.9)	75	3:1	c1,h3																	nr	a	a	*	68 (20.0)	Y	13			
RAS01	Chapel, Seating	N	CP SP	GPT SSP	AT1	VAR	L	20-30 STC 40	60 (2.9)	200	3:1	c1																	nr	a	a	*	68 (20.0)	Y	13			
RASR1	Chapel, Storage, Sacristy	N	CP SP	GPT	AT1	9'-0" (2740)	36" (915)	20-30 STC 40	125	300	4:1	c1,h4																	nr	a	a	*	68 (20.0)	Y	13			
RCA01	Alcove, AED (Automatic External Defibrillator)	Space Parameter Notes: a and c																																				
RCA02	Alcove, Portable Patient Lift	Space Parameter Notes: a																																				
RCA04	Alcove, Warmer, Blanket / Fluid	Space Parameter Notes: a																																				

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	CODE	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	ES POWER N	PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LDE	OO	NIA	WAGD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
RDC01	Renal Dialysis, Airborne Infection Isolation	3	ER SM	GEP GPT	GEP GPT	8'-6" (2590)	48" (1220)	35-45 STC 40	60 (2.9)	500 1000	2:1 2:1	c1,h4,x3 .	R	L	.	2	.	.	.	1	.	.	1	.	.	.	- -	12	2	*	70 (21.1)	Y	14	.	Y	.
RDC02	Renal Dialysis, Multi-Station	3	SR RT	GPT GEP	AT2	8'-6" (2590)	P	35-45 STC 40	60 (2.9)	500 1000	2:1 2:1	c1,h4,x3 .	R	L	.	2	.	.	.	1	.	.	1	.	.	B	nr	6	2	*	70 (21.1)	Y	14	.	.	.
RDP01	Renal Dialysis, Storage, Equipment Portable	N	RT SR	GPT GEP	AT1 AT2	8'-6" (2590)	48" (1220)	35-45 STC 40	60 (2.9)	150 300	3:1 3:1	h4,x3 h4	R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	14	.	.	.
RDWT1	Renal Dialysis, Support, Reverse Osmosis	N	RT SR	GPT GEP	AT1 AT2	8'-6" (2590)	36" (915)	30-45 STC 40	60 (2.9)	300 .	3:1 .	h4 .	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	50 (10.0)	Y	.	.	Y	.
RECP1	Reception	4	SP RT	GPT SSP	AT1	9'-0" (2740)	36" (915)	35-45 STC 40	60 (2.9)	300 500	3:1 3:1	h5,x1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	14	.	.	.
RECP2	Reception, Administration	4	SP RT	GPT SSP	AT1	9'-0" (2740)	36" (915)	35-45 STC 40	60 (2.9)	300 500	3:1 3:1	h5 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	14	.	.	.
RECP3	Reception, Information Desk	4	SP RT	GPT SSP	AT1	VAR	L	35-45 STC 40	60 (2.9)	300 500	3:1 3:1	h5,x1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	14	.	.	.
RER01	Refrigeration Equipment Room	N	CS	GPT	SSP	VAR	48" (1220)	30-45 STC 50	B	200 .	2:1 .	h1,u1 .	.	LS	E	.	.	.	.	.	.	.	.	.	.	.	.	-	a	a	SP	SP	Y	13	.	.	.
RMF01	Mask Fit, Respirator	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 500	2:1 2:1	h1 h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	.
RPR01	Copier	N	RT MA	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 50	100 (4.8)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	70 (21.1)	Y	13	.	.	.
RPR02	Copier, High Volume	N	RT MA	GPT	AT1	8'-0" (2440)	36" (915)	30-45 STC 50	150 (7.2)	300 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	10	2	*	70 (21.1)	Y	13	.	.	.
RRIR1	Recovery, Isolation	2	SR	GEP	GEP GPT	9'-0" (2740)	48" (1220)	30-40 STC 40	60 (2.9)	500 1000	2:1 2:1	c1 b3	R	L	.	1	.	.	.	3	.	.	3	.	.	.	- -	12	2	75 (23.9)	70 (21.1)	S	14	.	Y	Q
RROP1	Recovery, Phase II	2	SR RT	GEP GPT	AT2 AT1	9'-0" (2740)	48" (1220)	35-45 STC 40	60 (2.9)	500 1000	2:1 2:1	c1 b3	R	L	.	1	.	.	.	3	.	.	3	.	.	B	+	6	2	*	70 (21.1)	S	14	.	.	.
RROP2	Recovery, Phase II, Multi-Station	2	SR RT	GEP GPT	AT2 AT1	9'-0" (2740)	P	35-45 STC 40	60 (2.9)	500 1000	2:1 2:1	a2,c1 a2,b3	R	L	.	1	.	.	.	3	.	.	3	.	.	B	+	6	2	*	70 (21.1)	S	14	.	.	.
RRSS1	Recovery, Phase I	1	SR RT	GEP	GEP AT2	9'-0" (2740)	48" (1220)	35-45 STC 40	60 (2.9)	500 1000	2:1 2:1	c1 b3	R	L	.	1	.	.	.	3	.	.	3	.	.	B	+	6	2	75 (23.9)	70 (21.1)	S	14	14	.	.
SEC01	Secretary	N	CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	3:1 .	h4,m2 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SEC02	Secretary, Command	N	CP	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	3:1 .	h4,m2 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SHWR1	Shower Room	4	PC	GCT SSP	GEP GPT	8'-0" (2440)	36" (915)	30-40 STC 45	75 (3.6)	100 .	2:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68 (20.0)	Y	13	.	Y	.
SINK1	Sink, Staff Handwashing	Space Parameter Notes: a						.		.	.	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SL001	Staff Lounge	N	LV RT	GPT	AT1	8'-0" (2440)	36" (915)	35-45 STC 45	60 (2.9)	300 .	5:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRCH1	Storage, Charging, Battery / Equipment	4	RT CS	GPT	AT1 GPT	8'-0" (2440)	42" (1065)	30-40 STC 40	200 (9.6)	100 .	3:1 .	h1 .	.	.	E	.	.	.	.	.	.	.	.	.	.	.	.	-	a	a	85 (29.4)	65 (18.3)	Y	13	.	Y	M
SRCS1	Storage, Crutch / Splint	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	100 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRE01	Storage Room, Equipment	4	RT CS	GPT	AT1	9'-0" (2740)	42" (1065)	35-45 STC 40	D	100 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRF01	Storage, Freezer, Walk-In	4	SP	SPF	SPF	VAR	SP	. .	275 (13.2)	100 .	3:1 .	h4 .	.	LB	E	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	SP	SP	Y	13	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	ES POWER N	PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG I	D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
SRF02	Storage, Freezers, Freestanding	4	RT	GEP GPT	GEP GPT	VAR	SP	30-45 STC 40	B	100	3:1	h4	.	LB	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	Y	.
SRGC1	Storage, Gas Cylinders, Exterior	4	CS	BPT GPT	GPT SSP	9'-0" (2740)	36" (915)	30-50 STC 40	150 (7.2)	300	3:1	h1	.	.	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	a	a	.	.	Y	.	.	Y	G
SRGC2	Storage, Gas Cylinders, Interior	4	CS RT	GEP GPT	GEP SSP	8'-0" (2440)	36" (915)	30-45 STC 40	150 (7.2)	300	3:1	h1	.	LB	E	.	.	.	.	.	.	.	.	.	.	.	.	.	-	a	a	*	68 (20.0)	Y	13	.	Y	G
SRHM1	Storage, Hazardous Material	4	CS	BPT GPT	GPT	8'-0" (2440)	36" (915)	30-50 STC 40	125	100	3:1	a1,h1	.	LB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	a	a	.	.	Y	13	.	Y	G
SRHM2	Storage, Hazardous Drug	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500	4:1	.	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	EX	12	.	.	.	Y	r	r	Y	W
SRL01	Storage, Laboratory, Microscope Slides	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	a	a	*	70 (21.1)	Y	13	.	.	.
SRL02	Storage, Laboratory, Paraffin Blocks	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	a	a	*	70 (21.1)	Y	13	.	.	.
SRLW1	Storage, Wheelchair	4	MA RT	GPT	AT1	8'-0" (2440)	L	30-40 STC 40	125	50	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
SRLW2	Storage, Litter	N	MA RT	GPT	AT1	8'-0" (2440)	L	30-40 STC 40	125	50	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	70 (21.1)	Y	13	.	.	.
SRPB1	Storage, Patient Baggage	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRPS1	Storage, Parts	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRR01	Storage, Refrigerator, Walk-In	4	SP	SPF	SPF	VAR	SP	.	275 (13.2)	100	3:1	h4	.	LB	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	.	.	Y	13	.	.	.
SRR02	Storage, Refrigerators, Freestanding	4	RT	GEP GPT	GEP GPT	VAR	SP	30-40 STC 40	B	100	3:1	h4	.	LB	E	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	.	.	Y	13	.	.	.
SRS01	Storage, Shelving	4	RT CS	GPT	AT1	9'-0" (2740)	36" (915)	35-45 STC 40	D	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRS02	Central Storage Room, Medium	4	RT CS	GPT	AT1	9'-0" (2740)	36" (915)	35-45 STC 40	D	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRS03	Central Storage Room, Large	4	RT CS	GPT	AT1	9'-0" (2740)	36" (915)	35-45 STC 40	D	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRS04	Storage Room, Sterile	4	SR ER	GEP	AT2	9'-0" (2740)	36" (915)	30-50 STC 40	D	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	75 (23.9)	68 (20.0)	Y	13	.	.	.
SRSE1	Storage, Equipment and Shelving	4	RT CS	GPT	AT1	9'-0" (2740)	42" (1065)	35-45 STC 40	D	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SRVE1	Storage Room, Ventilator	4	RT CS	GPT	AT1	9'-0" (2740)	42" (1065)	30-40 STC 40	150 (7.2)	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SSC01	Secure Storage, Cage	4	CS MA	GPT	AT1	9'-0" (2740)	SP	.	125	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
SSFE1	Secure Storage, Forensic Evidence	4	RT	GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	125	200	3:1	h1	.	R	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	68 (20.0)	Y	13	.	.	.
SSS01	Secure Storage, Safe	4	RT CS	SSP	SSP	VAR	SP	.	C	100	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	.	.	Y	13	.	.	.
SSV01	Secure Storage, Vault	4	CS	CCS SSP	CCS SSP	VAR	SP	.	125	200	3:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	a	a	*	68 (20.0)	Y	13	.	.	.
TLTB1	Toilet, Bariatric	N	PC	GEP GCT	GEP GPT	8'-0" (2440)	48" (1220)	30-40 STC 45	75 (3.6)	100 300	2:1 2:1	h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68 (20.0)	Y	13	.	Y	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	CODE	ARCHITECTURAL						STRUCTURAL	ELECTRICAL					MEDICAL GAS AND VACUUM														MECHANICAL										
			MATL & FIN			CLG HT	DOOR SIZE	NC & STC	FLR LD	LIGHT		ES POWER			M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	A	WAG D	N	TEMP										
			FL	WL	CLG					LEV	UNI	N	PW	LT	N													BL	AC	OA	SM	WN	RH	IN	FN	EX	N
TLTF2	Toilet, Public, Female	4	PC	GEP	GEP	8'-0"	36"	35-45	75	50	3:1	h1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
				GCT	GPT	(2440)	(915)	STC 45	(3.6)	200	2:1	.																			(20.0)					
TLTM2	Toilet, Public, Male	4	PC	GEP	GEP	8'-0"	36"	35-45	75	50	3:1	h1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
				GCT	GPT	(2440)	(915)	STC 45	(3.6)	200	2:1	.																			(20.0)					
TLTP1	Toilet, Behavioral Health	4	ER	GEP	GPT	8'-0"	42"	30-40	75	100	2:1	h1,x1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
			SP	GSS	SSP	(2440)	(1065)	STC 45	(3.6)	300	2:1	.																			(20.0)					
TLTP2	Toilet, Behavioral Health, Seclusion	4	ER	GEP	GPT	8'-0"	L	30-40	75	100	2:1	h1,x1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
			SP	GSS	SSP	(2440)		STC 45	(3.6)	300	2:1	.																			(20.0)					
TLTP3	Toilet / Shower, Behavioral Health	4	ER	GSS	GEP	8'-0"	42"	30-40	75	200	2:1	h1,x1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
			SP	GEP	SSP	(2440)	(1065)	STC 45	(3.6)	300	2:1	.																			(20.0)					
TLTS1	Toilet / Shower, Staff	N	PC	GCT	GEP	8'-0"	36"	30-40	75	100	2:1	h1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
			ER	GEP	SSP	(2440)	(915)	STC 45	(3.6)	200	2:1	.																			(20.0)					
TLTS2	Toilet / Shower, Inpatient	4	PC	GCT	GEP	8'-0"	36"	30-40	75	200	2:1	h1	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
			ER	GSS	SSP	(2440)	(915)	STC 45	(3.6)	300	2:1	.																			(20.0)					
TLTU1	Toilet	4	PC	GEP	GEP	8'-0"	36"	30-40	75	50	3:1	h1			.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68	Y	13	.	Y	.
				GCT	GPT	(2440)	(915)	STC 45	(3.6)	200	2:1	.																			(20.0)					
TRCS2	Procedure, Cystoscopic	2	SR	LEP	GEP	9'-0"	VAR	30-40	60	500	3:1	a2,x3	R	L	.	1	.	.	1	.	.	1	.	.	.	.	.	+	15	3	*	73	Y	14	.	.	.
						(2740)		STC 50	(2.9)	1100	2:1	c1																			(22.8)					
TREE1	Procedure, Endoscopy	2	SR	GEP	GEP	9'-0"	D	30-40	60	500	3:1	a2,x3	R	LS	.	1	.	.	2	.	.	1	.	.	.	.	.	- -	12	2	*	73	S	14	.	Y	F
						(2740)		STC 50*	(2.9)	1100	2:1	c1																			(22.8)					
TREN1	Treatment, ENT	3	SR	GEP	GEP	9'-0"	42"	25-35	60	500	3:1	a2,c1,x3	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	nr	6	2	*	73	S	14	.	.	.
						(2740)	(1065)	STC 50*	(2.9)	1100	2:1	a2																			(22.8)					
TREN2	Voice Lab	3	CP	GPT	AT1	VAR	36"	SP	60	500	3:1	h4,x3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT		GPT		(915)	STC 50	(2.9)	.	.	.																			(22.8)					
TRET1	Treatment, Emergency Trauma, Multi-Bed	1	SR	GEP	GEP	9'-0"	H	30-40	60	1000	3:1	a2,a3,c1,x3	RA	LB	.	1	.	.	3	.	.	2	.	.	B		+	15	3	75	82	S	14	.	.	.
				GPT	AT2	(2740)		STC 50	(2.9)	2000	2:1	a2																		(23.9)	(27.8)					
TRET3	Treatment, Emergency Trauma	1	SR	GEP	GEP	9'-0"	48"	30-40	60	1000	3:1	a2,c1,x3	RA	LB	.	1	.	.	3	.	.	2	.	.	B		+	15	3	75	82	S	14	.	.	.
				GPT	AT2	(2740)	(1220)	STC 50	(2.9)	2000	2:1	a2																		(23.9)	(27.8)					
TRET4	Treatment, Emergency Care	2	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2,x3	RA	LB	.	1	.	.	2	.	.	2	.	.	B		+	12	3	75	73	S	14	.	.	.
			RT	GPT	AT2	(2740)	(1220)	STC 50	(2.9)	1100	2:1	a2																		(23.9)	(22.8)					
TRET5	Treatment, Emergency Care, Multi-Bed	2	SR	GEP	GEP	9'-0"	P	30-40	60	500	3:1	a2,x3	RA	LB	.	1	.	.	2	.	.	2	.	.	B		+	12	3	75	73	S	14	.	.	.
			RT	GPT	AT2	(2740)		STC 50	(2.9)	1100	2:1	a2																		(23.9)	(22.8)					
TREY1	Treatment, Ophthalmology	3	SR	GPT	AT2	9'-0"	36"	30-40	60	500	3:1	a2,c1,h4,x3	.	LS	U	.	.	.	1	.	.	1	.	.	.		nr	6	2	*	73	S	14	.	.	.
					GPT	(2740)	(915)	STC 50*	(2.9)	1100	2:1	.																			(22.8)					
TREY2	Treatment, Eye - Laser	2	SR	GPT	AT2	8'-0"	36"	30-40	60	700	3:1	h4,x3	R	LS	U	.	.	.	1	.	.	1	.	.	.		+	15	3	R	R	S	14	.	.	.
						(2440)	(915)	STC 50*	(2.9)	.	.	.																									
TREY3	Treatment, Eye - Lasik / PRK	2	SR	GEP	AT2	8'-0"	42"	30-40	60	700	3:1	h4,x3	R	LS	U	.	.	.	1	.	.	1	.	.	.		+	15	3	R	R	R	14	hepa	.	O,P,V
			RT			(2440)	(1065)	STC 50*	(2.9)	.	.	.																									
TRGM1	Treatment, General	3	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2,x3	.	LS	U	.	.	.	1	.	.	1	.	.	.		nr	6	2	*	73	S	14	.	.	.
			RT	GPT	AT2	(2740)	(1220)	STC 50*	(2.9)	1100	2:1	a2																			(22.8)					
TRGM2	Treatment, General, Multi-Bed	3	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2,x3	.	.	.	1	.	.	1	.	.	1	.	.	B		nr	6	2	*	73	S	14	.	.	.
			RT	GPT	AT2	(2740)	(1220)	STC 50	(2.9)	1100	2:1	a2																			(22.8)					
TRGS1	Treatment, General Surgical	3	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2,x3	.	LS	U	1	.	.	1	.	.	1	.	.	.		nr	6	2	*	73	S	14	.	.	.
						(2740)	(1220)	STC 50*	(2.9)	1100	2:1	a2																			(22.8)					
TRGS2	Treatment, General Surgical, Airborne Infection Isolation	3	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2	.	LS	U	1	.	.	1	.	.	1	.	.	.		- -	12	2	*	73	S	14	.	Y	.
						(2740)	(1220)	STC 50*	(2.9)	1100	2:1	a2																			(22.8)					
TRGS3	Treatment, General Surgical, Laser	3	SR	GEP	GEP	9'-0"	48"	30-40	60	500	3:1	a2,c1	.	LS	U	1	.	.	1	.	.	1	.	.	.		nr	6	2	*	68	S	14	.	.	.
						(2740)	(1220)	STC 50*	(2.9)	1100	2:1	a2																			(20.0)					

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	CODE	ARCHITECTURAL						STRUCTURAL	ELECTRICAL					MEDICAL GAS AND VACUUM												MECHANICAL										
			MATL & FIN			CLG HT	DOOR SIZE	NC & STC	FLR LD	LIGHT		ES POWER			M A	D A	L A	P A	D M V	S O V	L O E	D E	N O	I O	W A I	G A D	N	TEMP										
			FL	WL	CLG					LEV	UNI	N	PW	LT	N													BL	AC	OA	SM	WN	RH	IN	FN	EX	N
TROB1	Treatment, OB / GYN	C	SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	a2,x3 a2	.	LS	U	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	S	14	.	.	.
TROR1	Procedure, Orthopaedic	3	SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	a2 a2	.	LS	U	1	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73 (22.8)	S	14	.	.	.
TRPE1	Procedure, Proctoscopy (LGI)	2	SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	a2 a2	R	LS	.	1	.	.	.	2	.	.	.	1	.	.	.	.	-	10	2	*	73 (22.8)	S	14	.	Y	.
TRPE2	Procedure, Bronchoscopy	2	SR	GEP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 50*	60 (2.9)	500 1100	3:1 2:1	a2 a2	R	LS	.	1	.	.	.	2	.	.	.	1	.	.	.	.	- -	12	2	*	73 (22.8)	S	14	.	Y	.
TUB01	Tub Room, Patient	3	PC	GCT GEP GPT	GEP GPT	8'-0" (2440)	48" (1220)	30-40 STC 45	C	200 .	2:1 .	h1 .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	EX	10	.	.	68 (20.0)	Y	13	.	Y	.
UCCL1	Utility, Clean	4	RT	GPT	AT1	8'-0" (2440)	42" (1065)	30-40 STC 40	100 (4.8)	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	14	.	.	.
UCCL2	Utility, Scope Wash, Clean	4	SR	GPT	AT1 AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	14	.	.	.
USCL1	Utility, Soiled	4	SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
USCL2	Utility, Scope Wash, Soiled	4	ER SM	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 .	3:1 .	h1 .	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	F	-	10	2	*	68 (20.0)	Y	14	.	Y	M
USDD1	Utility, Soiled, Detergent Dispensing	4	ER SM	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	C	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
UTC01	Utility, Trash Collection	4	CS	GEP SSP	GEP SSP	8'-0" (2440)	36" (915)	30-40 STC 40	125	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	1	*	68 (20.0)	Y	13	.	Y	.
UTC02	Utility, Trash Can Decon	4	CS	CCS SSP	GEP SSP	8'-0" (2440)	36" (915)	30-40 STC 40	B	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	1	.	.	Y	13	.	Y	.
UTLC1	Utility, Trash and Linen Collection	4	RT	GEP SSP	GEP SSP	8'-0" (2440)	36" (915)	30-40 STC 40	C	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	1	*	68 (20.0)	Y	13	.	Y	.
UTMW1	Utility, Medical Waste Holding	4	ER SM	GEP	AT1 AT2	8'-0" (2440)	42" (1065)	30-40 STC 40	100 (4.8)	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
UTR01	Utility, Waste Recycling	4	RT SR	GEP	AT1 AT2	8'-0" (2440)	42" (1065)	30-40 STC 40	125	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
UTR02	Utility Room, Waste Pulper System	4	RT SR	GEP	AT2	8'-0" (2440)	36" (915)	30-40 STC 40	F	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2	*	68 (20.0)	Y	13	.	Y	.
VCSS1	Veterinary, Instrument Preparation	N	TR	GEP	AT2 GEP	9'-0" (2740)	48" (1220)	30-40 STC 50	C	700 .	4:1 .	h4 .	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	-	10	2	*	68 (20.0)	Y	14	.	Y	.
VCWA1	Veterinary, Cage Wash	N	TR	BEP GEP	AT2	9'-0" (2740)	48" (1220)	30-40 STC 50	C	500 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	1	*	68 (20.0)	Y	13	.	Y	.
VEX01	Veterinary, Examination / Treatment	3	ER TR	GEP	AT2	9'-0" (2740)	36" (915)	30-40 STC 50	C	500 1100	3:1 2:1	a2,x3 a2	.	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	Y	.
VEX02	Veterinary, General Treatment	3	ER TR	GEP	AT2	9'-0" (2740)	48" (1220)	30-40 STC 50	C	500 1100	3:1 2:1	a2,x3 a2	.	LS	U	1	.	.	.	1	.	.	.	.	.	.	.	.	-	4	2	*	68 (20.0)	Y	13	.	Y	.
VFP01	Veterinary, Food Preparation	N	MA	GEP	AT2	9'-0" (2740)	48" (1220)	30-40 STC 50	C	500 .	4:1 .	. .	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	*	68 (20.0)	Y	14	.	Y	.
VHAU1	Veterinary, Holding Area Utility / Storage	N	TR	BEP GEP	AT2 GPT	9'-0" (2740)	48" (1220)	30-40 STC 50	C	200 .	3:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	.
VKAR1	Veterinary, Kennel Confine, Anteroom	N	TR	GEP	GEP	9'-0" (2740)	48" (1220)	30-40 STC 50	C	100 400	3:1 3:1	h6 h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	5	*	68 (20.0)	Y	13	.	Y	L
VKEN1	Veterinary, Kennel Area In / Outside	N	TR	BEP GEP	AT2 GEP	9'-0" (2740)	48" (1220)	30-40 STC 50	C	100 400	3:1 3:1	h6,x3 h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	5	*	68 (20.0)	Y	13	.	Y	L

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	I A	W A G D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
VKEN2	Veterinary, Kennel Confine Canine	N	TR BEP AT2 GEP GPT			9'-0" (2740)	48" (1220)	30-40 STC 50	C	100 400	3:1 3:1	h6,x3 h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	5	*	68 (20.0)	Y	13	.	Y	L
VKEN3	Veterinary, Kennel Confine Feline	N	TR BEP AT2 GEP GPT			9'-0" (2740)	48" (1220)	30-40 STC 50	C	100 400	3:1 3:1	h6,x3 h6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	5	*	79 (26.1)	Y	13	.	Y	L
VLAH1	Veterinary, Large Animal Holding	N	TR BEP AT2 GEP GPT			9'-0" (2740)	VET	30-40 STC 50	C	100 400	3:1 3:1	h6,x1 h6	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	5	*	79 (26.1)	Y	13	.	Y	L
VLB01	Veterinary, Laboratory	N	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	500 1000	3:1 2:1	h4 .	.	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	.	M
VLBF1	Veterinary, Lab, Food Inspection	N	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	500 1000	3:1 2:1	h4 .	.	LB	U	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	.
VLBF2	Veterinary, Lab, Food Testing	N	TR GEP AT2 GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	500 1000	3:1 2:1	h4 .	.	LB	U	.	.	.	.	.	.	.	.	.	.	.	.	-	6	2	*	68 (20.0)	Y	13	.	Y	.
VNEC1	Veterinary, Necropsy	4	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	1000 2000	4:1 4:1	a2 a2	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	-	12	3	R	R	Y	13	.	Y	M
VPH01	Veterinary, Pharmacy	N	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	1500 .	2:1 .	. .	.	LB	U	.	.	.	.	.	.	.	.	.	.	.	.	+	4	2	*	68 (20.0)	Y	13	.	.	.
VRHA1	Veterinary, Rodent Holding	N	TR BEP GEP			9'-0" (2740)	VET	30-40 STC 50	C	75 300	3:1 3:1	h6,m2,x1 .	.	LB	U	.	.	.	.	.	.	.	.	.	.	.	.	-	15	15	*	79 (26.1)	Y	13	.	Y	.
VRIC1	Veterinary, Recovery, Intensive Care	2	TR GEP AT2 GEP			9'-0" (2740)	48" (1220)	30-40 STC 50	C	500 1000	2:1 2:1	. .	R	LB	.	1	.	.	1	.	.	.	1	.	.	.	.	+	6	3	*	68 (20.0)	Y	13	.	Y	L
VRRP1	Veterinary, Recovery Room / Preparation	2	TR GEP AT1			9'-0" (2740)	48" (1220)	30-40 STC 40	C	500 .	2:1 .	. .	R	LB	.	1	.	.	1	.	.	.	1	.	.	.	.	+	6	3	64 (17.8)	79 (26.1)	Y	13	.	Y	.
VRUN1	Veterinary, Animal Run	N	TR BEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	100 .	4:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	3	*	68 (20.0)	Y	13	.	Y	L
VS001	Veterinary, Surgery	1	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	2000 3000	2:1 2:1	a2,c1,x3 a2,c1,x3	R	LB	.	1	.	.	2	.	.	.	1	.	.	1	.	+	15	7.5	64 (17.8)	79 (26.1)	Y	13	14	Y	C
VSPD1	Veterinary, Surgery, Preparation / Dental	1	TR GEP GEP			9'-0" (2740)	48" (1220)	30-40 STC 40	C	2000 3000	2:1 2:1	a2,c1,x3 a2,c1,x3	R	LB	.	1	1	.	1	1	.	.	.	1	1	.	.	+	6	2	64 (17.8)	79 (26.1)	Y	13	.	Y	.
VSSG1	Veterinary, Surgery, Scrub / Gown	N	TR GEP GEP			9'-0" (2740)	N	30-40 STC 40	C	1100 .	3:1 .	. .	.	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	75 (23.9)	75 (23.9)	Y	14	.	.	.
VXER1	Veterinary, X-Ray Exposure	N	TR LEP GEP			9'-6" (2900)	48" (1220)	30-40 STC 40	C	50 500	4:1 4:1	m1 c3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	Y	.
VXER2	Veterinary, Ultrasound	3	TR GEP AT2 GEP			9'-0" (2740)	VET	30-40 STC 50	C	300 500	3:1 2:1	x3 .	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	nr	4	2	*	68 (20.0)	Y	13	.	Y	.
WKTM1	Workroom, Team	4	RT GPT AT1 CP			8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	500 .	3:1 .	h4,m2 .	.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	70 (21.1)	Y	13	.	.	.
WRC01	Waiting	4	ER GPT AT1 RT SSP			9'-0" (2740)	O	35-45 STC 50*	100 (4.8)	200 100	4:1 4:1	h1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	r	*	68 (20.0)	Y	14	.	.	S
WRC02	Waiting, Isolation	4	SR GEP GEP GPT GPT			9'-0" (2740)	42" (1065)	35-45 STC 50*	100 (4.8)	200 100	4:1 4:1	h1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	12	2	*	68 (20.0)	Y	13	.	Y	Q
WRC03	Sub-Waiting	4	MA GPT AT1 RT			9'-0" (2740)	O	35-45 STC 50*	100 (4.8)	200 100	4:1 4:1	h1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	r	*	68 (20.0)	Y	14	.	.	S
WRCH1	Team Collaboration	4	RT GPT AT1 CP			8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 .	3:1 .	h4 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	70 (21.1)	Y	13	.	.	.
WRF01	Family Respite	4	CP GPT AT1 RT			9'-0" (2740)	36" (915)	35-45 STC 50*	60 (2.9)	200 100	4:1 4:1	h1 h1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	1	*	68 (20.0)	Y	14	.	.	S
WRL01	Litter, Patient Staging	4	RT GPT AT1			9'-0" (2740)	42" (1065)	35-45 STC 50*	60 (2.9)	300 .	4:1 .	h1 .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	70 (21.1)	Y	14	.	.	.

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	DMV	SVE	OE	LD	EE	OO	NA	IA	WAD	GN	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
XABP1	X-Ray, Angiographic, Procedure	1	SR	LEP	AT1	10'-0"	48"	30-40	100	50	4:1	a2,x3	R	LB	U	1	.	.	.	2	.	.	.	1	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT	LPT	GPT	(3050)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XACR1	X-Ray, Angiographic, Control	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	h4	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70	Y	13	.	.	.
			RT	GPT	GPT	(2440)	(915)	STC 40	(4.8)	.	.	.																					(21.1)					
XACV1	X-Ray, Angiographic, System Component	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	2:1	h1,u1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70	Y	13	.	.	N
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(21.1)					
XAIR1	X-Ray, Angiographic, Instrument	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	h1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70	Y	13	.	.	.
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(21.1)					
XCCA1	X-Ray, Cardiac, System Component	4	SR	GEP	AT1	8'-0"	36"	30-40	100	500	2:1	h1,u1	RA	LB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	68	75	Y	14	.	.	N
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(20.0)	(23.9)					
XCCC1	X-Ray, Cardiac Cath, Control	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	c1,h4	R	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	68	75	Y	14	.	.	N
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(20.0)	(23.9)					
XCCE1	X-Ray, Cardiac Cath, Procedure	1	SR	LEP	AT1	10'-0"	48"	30-40	100	50	4:1	a2,c1,x3	R	L	.	1	.	.	.	2	.	.	.	3	1	.	1	.	+	15	3	75	73	Y	14	.	.	C
			RT	LPT	GPT	(3050)	(1220)	STC 40	(4.8)	500	4:1	a2																					(23.9)	(22.8)					
XCCI1	X-Ray, Cardiac Cath, Instrument	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	h1	.	LS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	2	68	75	Y	14	.	.	.
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(20.0)	(23.9)					
XCTC1	X-Ray, Computed Tomography, Control	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	c1,h4	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70	Y	13	.	.	.
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(21.1)					
XCTC2	X-Ray, Computed Tomography, Component	4	SR	GEP	AT1	8'-0"	48"	30-40	C	300	2:1	h1,u1	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68	Y	13	.	.	N
			RT	GPT		(2440)	(1220)	STC 40		.	.	.																					(20.0)					
XCTI1	X-Ray, Computed Tomography, Independent View Console	4	SR	GEP	AT1	8'-0"	36"	30-40	100	300	3:1	c1,h4	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	70	Y	13	.	.	N
			RT	GPT		(2440)	(915)	STC 40	(4.8)	.	.	.																					(21.1)					
XCTS1	X-Ray, Computed Tomography, Scanner	C	SR	LEP	AT1	VAR	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT	LPT	GPT		(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDBD1	X-Ray, Bone Densitometer	3	SR	GEP	AT1	9'-0"	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT		GPT	(2740)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDCS1	X-Ray, Chest	3	SR	LEP	AT1	10'-0"	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT	LPT	GPT	(3050)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDCY1	X-Ray, Cystology / Radiology	2	SR	LEP	AT1	10'-0"	48"	30-40	100	50	4:1	a2,c1,x3	R	LB	.	1	.	.	.	3	.	.	.	1	.	.	.	D	nr	6	2	*	73	Y	14	.	.	.
			RT	LPT	GPT	(3050)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDM01	X-Ray, Mammo	3	SR	LEP	AT1	9'-0"	48"	30-40	100	50	4:1	a2,c1,x3	.	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	73	Y	14	.	.	.
			RT	LPT	GPT	(2740)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDM02	X-Ray, Mammo, Stereotactic	2	SR	LEP	AT1	9'-0"	48"	30-40	100	50	4:1	a2,c1,x3	.	LS	U	.	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
			RT	LPT		(2740)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDMP1	X-Ray, Mammo, Process	4	SR	GEP	AT1	8'-0"	36"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	-	10	2.5	*	73	Y	14	.	Y	M
			RT	GPT	GPT	(2440)	(915)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDR01	X-Ray, Radiographic, General	3	RT	LEP	AT1	9'-6"	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
				LPT		(2900)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDRF1	X-Ray, Rad / Fluoro	C	RT	LEP	AT1	9'-6"	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
				LPT		(2900)	(1220)	STC 40	(4.8)	500	4:1	a2,c3																					(22.8)					
XDUS1	X-Ray, Ultrasound	3	RT	GPT	AT1	8'-0"	48"	30-40	100	50	4:1	a2,c1,x3	.	.	U	.	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	73	Y	14	.	.	.
				GEP		(2440)	(1220)	STC 45	(4.8)	500	4:1	a2,c3																					(22.8)					
XFDS1	X-Ray, Storage, Digital Files	4	RT	GPT	AT1	8'-0"	36"	30-40	100	200	3:1	.	.	.	U	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6	1	*	68	Y	13	.	.	N
						(2440)	(915)	STC 40	(4.8)	.	.	.																					(20.0)					
XFFA1	X-Ray, Storage, Film Files, Fixed Shelves	4	RT	GPT	AT1	VAR	36"	30-40	250	500	3:1	h4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	2	*	68	Y	13	.	.	.
							(915)	STC 40	(12.0)	.	.	.																					(20.0)					

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM M A	D A	L A	P A	M V	D S V	O E	L D E	O	N O	O	I A	WAG D	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
XFFA2	X-Ray, Storage, Film Files, Mobile Shelves	4	RT SR	GPT GPT	AT1	VAR	36" (915)	30-40 STC 40	350 (16.8)	500	3:1	h4																	nr	4	2	*	68 (20.0)	Y	13			
XMRC1	X-Ray, Magnetic Resonance, Control	4	RT SR	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300	3:1	c1,h4			U														nr	4	2	*	68 (20.0)	Y	13			
XMRC2	X-Ray, Magnetic Resonance, System Component	4	RT SR	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	300	2:1	h1,u1			U														nr	4	2	*	68 (20.0)	Y	13			N
XMRE1	X-Ray, Magnetic Resonance, Equipment	4	RT SR	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	300	3:1	h1			U														nr	4	2	*	68 (20.0)	Y	13			
XMRF1	X-Ray, Magnetic Resonance, Ferromagnetic Detection	4	RT SR	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	300	3:1	c1,h1,u1,x3	R		U														nr	4	2	*	68 (20.0)	Y	13			
XMRS1	X-Ray, Magnetic Resonance, Scanner	3	RT SR	GEP GPT	AT1	VAR	48" (1220)	30-40 STC 50	C	300	3:1	c1,h1,u3,x3			U	1			1			1	1		1			nr	6	2	*	73 (22.8)	Y	14			
XMRV1	X-Ray, Magnetic Resonance, Viewing	4	RT SR	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300	3:1	h4			U														nr	4	2	*	68 (20.0)	Y	13			
XPCC1	X-Ray, SPECT / PET / CT Control	4	SR RT	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300	3:1	c1,h4	R		U														nr	4	2	*	70 (21.1)	Y	13			N
XPCC2	X-Ray, SPECT / PET / CT Component	4	SR RT	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	300	2:1	c1,h1,u1			U														nr	6	2	*	70 (21.1)	Y	13			N
XRM01	X-Ray, Storage, Mobile Rad Unit	4	RT SR	GPT	AT1	8'-0" (2440)	L	30-40 STC 40	100 (4.8)	200	3:1	h1			E														nr					Y	13			
XTBC1	X-Ray, Brachytherapy, Control	4	SR RT	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	E	300	3:1	c1,h4	R		U														nr	4	2	*	70 (21.1)	Y	13			N
XTBT1	X-Ray, Brachytherapy	2	RT SR	LEP LPT	AT1	8'-6" (2590)	48" (1220)	30-40 STC 40	100 (4.8)	100 500	3:1 2:1	c1,x3		LB	U	1			1			1						+	6	2	*	70 (21.1)	Y	14		Y	
XTEM1	X-Ray, Therapy, Entry Maze	4	SR RT	GEP GPT	AT1	10'-0" (3050)	SP	30-40 STC 40	C	200	3:1	h1,m1		LS															nr	6	2	*	68 (20.0)	Y	13			
XTLA1	X-Ray, Therapy, Linear Accelerator	3	SR RT	GEP GPT	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	C	500	3:1	a2,c1,h4,x3 a2,h4		LB					1			1						nr	6	2	*	73 (22.8)	Y	14		Y	
XTLA2	X-Ray, Therapy, Linear Accelerator, High Voltage	3	SR RT	GEP GPT	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	C	500	3:1	a2,c1,h4,x3 a2,h4		LB					1			1						nr	6	2	*	73 (22.8)	Y	14		Y	
XTLA3	X-Ray, Therapy, Linear Accelerator, Dual Voltage	3	SR RT	GEP GPT	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	C	500	3:1	a2,c1,h4,x3 a2,h4		LB					1			1						nr	6	2	*	73 (22.8)	Y	14		Y	
XTLB1	X-Ray, Therapy, Physics Laboratory	4	SR RT	GEP GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	500 1000	2:1 2:1																		-	6	2	*	70 (21.1)	Y	13			
XTLC1	X-Ray, Therapy, Linear Accelerator, Control	4	SR RT	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	100 (4.8)	300	3:1	c1,h4																	nr	6	2	*	68 (20.0)	Y	13			
XTLE1	X-Ray, Therapy, Linear Accelerator, System Component	4	SR RT	GEP GPT	AT1	VAR	36" (915)	30-40 STC 40	100 (4.8)	500	2:1	c1,h1,u1		LB	U														nr	4	2	*	68 (20.0)	Y	14			N
XTMF1	X-Ray, Therapy, Mold Fabrication Shop	4	SR RT	GEP GPT	AT1	9'-0" (2740)	36" (915)	30-40 STC 40	100 (4.8)	500	3:1	h6,u2																	-	6	2	*	68 (20.0)	Y	13		Y	M
XTRT1	X-Ray, Therapy, Radium Treatment Storage / Preparation	4	SR RT	LEP LPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 1100	3:1 3:1																		-	6	2	*	68 (20.0)	Y	13		Y	M
XTSC1	X-Ray, Therapy, Simulator Control	4	SR RT	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	300	3:1	c1,h4		LB															nr	6	2	*	68 (20.0)	Y	13			
XTSC2	X-Ray, Therapy, Simulator, System Component	4	SR RT	GEP GPT	AT1	8'-0" (2440)	48" (1220)	30-40 STC 40	C	300	2:1	c1,h1,u1			U														nr	4	2	*	68 (20.0)	Y	13			N

Table B-1 (cont.) Architectural and Engineering Design Criteria

Room Code	ROOM FUNCTION	COD E	ARCHITECTURAL MATL & FIN FL	WL	CLG	CLG HT	DOOR SIZE	NC & STC	STRUCTURAL FLR LD	ELECTRICAL LIGHT LEV	UNI	N	ES POWER PW	LT	N	MEDICAL GAS AND VACUUM MA	DA	LA	PA	MV	DSV	OE	LDE	OO	NO	IA	WAD	N	MECHANICAL TEMP BL	AC	OA	SM	WN	RH	IN	FN	EX	N
XTSG1	X-Ray, Therapy, Simulator Gantry	4	SR RT	GEP GPT	AT1	10'-0" (3050)	48" (1220)	30-40 STC 40	100 (4.8)	300 .	2:1 .	h1,u1,x3 .	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	nr	6	2	*	70 (21.1)	Y	13	.	.	.
XTSM1	X-Ray, Therapy, Simulator, Magnetic Resonance	4	RT SR	GEP GPT	AT1	VAR	48" (1220)	30-40 STC 50	E	300 .	2:1 .	c1,h1,u1,x3 .	.	.	.	1	.	.	.	1	.	.	.	1	1	.	1	.	nr	6	2	*	73 (22.8)	Y	14	.	.	.
XTTP1	X-Ray, Therapy, Treatment Planning	4	RT SR	GEP GPT	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	100 (4.8)	500 .	3:1 .	. .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	6	2	*	70 (21.1)	Y	13	.	.	.
XVC01	X-Ray, Viewing / Consultation	4	RT SR	GPT GEP	AT1	8'-0" (2440)	36" (915)	30-40 STC 40	60 (2.9)	300 .	3:1 .	c1 .	.	LS	U	.	.	.	.	.	.	.	.	.	.	.	.	.	nr	4	1	*	68 (20.0)	Y	13	.	.	.

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APPENDIX C DESIGN SUBMITTALS AND DOCUMENTATION

C-1 GENERAL.

This appendix contains mandatory criteria for design submittals and documentation. It addresses narratives, drawings, calculations, specifications, and cost estimates required at various submission levels during the production of contract documents for each project.

C-2 APPLICATION.

The submission requirements in this appendix identify minimum design deliverables related to medical-specific criteria. This list is not comprehensive and must be supplemented or incorporated into comprehensive project specific submission requirements by the Design and Construction Agent.

C-3 GENERAL REQUIREMENTS.

These general requirements apply to all projects, acquisition types and submissions.

C-3.1 Design Analysis.

The Design Analysis includes the narrative and calculations and serves as a documented design history of each technical discipline represented in the project. The descriptions of systems being proposed must continue to be elaborated and expanded through all subsequent design submissions. The Design Analysis must document all design directives provided to the designer(s) of record, as well as all major decisions by the designer(s) of record regarding the design for particular systems. Attention must be given to ensure that the Design Analysis provides a complete detailed narrative on the scope, equipment, function, operation, and design history of each system. The Design Analysis serves as the basic document against which the design shown on the drawings and in the specifications is checked.

Arrange the Design Analysis into indexed and tabulated PDF binders by discipline in the same order as the corresponding technical chapters of UFC 4-510-01 as well as a comprehensive binder with all disciplines. Identify and date all documents according to project title and level of submission. Project title must exactly reflect that which is noted on the enacted DD Form 1391.

C-3.2 Drawings and Format.

Drawing format and submissions must be as follows unless otherwise directed by the Design and Construction Agent.

C-3.2.1 Building Information Modeling (BIM).

Utilize BIM to develop all designs and produce all drawings. All plans must be of sufficient scale to be legible when printed at half size. Provide electronic drawings in

PDF, BIM, and CAD format. Provide PDF binders with all drawings in order as well as providing individual files. Provide electronic submissions on CD/DVD and via upload. Reference Chapter 18 for specific execution. Submittals to Health Information Technology (HIT) must commence with the 65% submittal stage.

C-3.2.2 Perspective Drawing Sketch and Final Rendering.

C-3.2.2.1 Perspective Drawing Sketch.

The perspective drawing sketch must best depict the proposed facility and its prominent design features as directed by the Design and Construction Agent. This sketch must be the basis for subsequent rendering requirements.

C-3.2.2.2 Rendering.

A final rendering must be prepared from the perspective drawing sketch that reflects all review comments. Digital copies of the photo-realistic rendering must be provided to the DoD Project Sponsor by the Design and Construction Agent via CD electronic format, or in framed format on a case-by-case basis when so requested by the DoD Project Sponsor. The framed photographs must be titled, single matted, framed, and glazed with non-glare tempered glass or plexiglass. The frame must be 28 in. by 20 in. (710 mm by 510 mm) in dimension and of a brushed aluminum finish. Other photographs must be distributed as determined by the Design and Construction Agent.

C-3.3 Specifications.

Provide specifications as required for each submission.

C-3.4 Cost Estimates.

Provide cost estimates as required for each submission in electronic format.

C-3.5 Building Systems Risk Assessment.

Not later than the 20 percent design (DBB process) submission, the Architect-Engineer (A/E) must conduct a risk assessment to confirm or establish the Building System Category for each of the various facility systems in accordance with NFPA 99. For the DB process, the assessment must be conducted by the A/E and included as part of the RFP development. In all cases, the assessment must be fully coordinated with the DoD Project Sponsor and the Design and Construction Agent at each submittal milestone, and document system requirements necessary to adequately safeguard occupant safety, health, and comfort based on the intended CONOPS and acuity of the patient population to be served by that facility. The completed Risk Assessment will be provided to the DoD Project Sponsor by the Design and Construction Agent for concurrence.

C-4 5 PERCENT SUBMITTAL.

C-4.1 5 Percent Submittal Design Analysis.

Include pros and cons of presented block plans, preliminary site information, and architectural, transportation, and engineering considerations. Provide an Executive Summary of the 5 Percent Report documenting the selected solution to be further developed to 20 percent design.

C-4.2 5 Percent Submittal Drawings.

C-4.2.1 Site Plans.

The A/E must develop and present alternative site plans supporting the three block plan proposals. For each site plan, show the following:

a. Site Master Plan of each alternative and include; location and orientation of all new building structures, Installation impacts, adjacent building/structures impact, environmental adjacencies, roads, paths and service access, previous demolished structures, potential site contaminants (firing range, fuel containment, etc.), known utilities location/layout overview, and any easements and land-use agreements. Include existing structures (note whether they are to remain or be considered for demolition).

b. Antiterrorism standoff distances.

c. Site views that will cause an impact to the orientation of the building such as, natural weather conditions, for example, wind/sandstorms and seasonal sun orientation.

d. Existing site topography that may impact building development.

e. Major utility connection locations (points of origin).

f. On- and offsite vehicular and service traffic patterns to include primary and secondary roadways surrounding the site.

g. Parking requirements as shown on the DD Form 1391 (surface or structured).

h. Future building expansion (20 percent of the enacted DD Form 1391 gross building area [in GSF (GSM)]); include future parking structure locations as applicable.

i. Site noise/sound, smell generating conditions, for example, proximity to major highway, adjacency to an airport, sewage treatment, etc.

j. Optional location or methodology to incorporate the VA or other organization’s program, if applicable.

C-4.2.2 Block Plans.

Up to three block plans and site access/orientation studies must be developed to convey the project requirements. Each block plan must show floor to floor and departmental relationships; exterior elevation views; location of vertical and horizontal transportation systems, for example, elevators, escalators, and stairs; interior circulation patterns; operational movement of materials, supplies and people; and impacts to corridor widths due to transportation solutions or other unique conditions, for example, AGVs, IBS, or similar systems. Include principle key dimensions. Site access/orientation must show placement of the facility and drives on the selected site, neighboring issues that may impact the project, and must convey pedestrian and vehicular movement across and within the site. The site plan should identify and convey restrictions that may impact the placement and orientation of the facility. The A/E must develop a final block plan representative of the selected solutions for the 20 percent submittal.

C-4.2.3 Rehabilitation Work.

Clearly delineate the extent and scope of rehabilitation work, including all associated work in these areas such as: connections, demolition, finishes, upgrades, utilities, ductwork, IT support, etc. Indicate limits of construction, access control means, interim life safety design, Infection Control Risk Assessment (ICRA) based temporary barriers, security monitoring, schematic HVAC reconfiguration, and any other relevant information to demonstrate how the rehabilitation work will be conducted without compromising life, health, or safety.

C-4.3 5 Percent Submittal Cost Estimates.

C-4.3.1 Parametric Cost Estimates.

Provide a parametric cost estimate for each block plan developed, including any requested design solution(s) that could exceed the budget.

C-5 20 PERCENT SUBMITTAL.

This Submittal includes development of the room-by-room floor plans, building elevations, and preliminary analysis of major architectural and engineering systems based on the selected block plan. It identifies and resolves all major PFD changes, solidifies all space requirements, coordinates departmental or mission realignment, and ensures that the designed scope complies with the appropriate authorization scope.

The Submittal must illustrate the building massing, aesthetics, exterior finishes, and identify specific architectural and engineering features. Include O&M access for primary MEP and communication equipment, primary distribution pathways, storm-water management strategy to meet the requirements of EISA, establish the cost and scope for providing necessary utility services to and from the building, and identify major building entrances from parking and pedestrian paths of travel. The Submittal must

consider and establish preliminary phasing considerations and scope impacts, and address transportation, logistics, and waste management requirements of the facility.

C-5.1 Scope Changes.

Scope changes must be submitted and authorized to the Design and Construction Agent by the DoD Project Sponsor with the 20 Percent Submittal. Scope changes are defined as those that materially affect the characteristics of the facilities (for example, Category Code) or increase the GSF as defined in Block 8 of the DD1391. Refer to Chapter 3. Provide a clear justification and basis for any increases to the GSF, for example, mission changes, workload increases, and increases in troop numbers due to troop or unit reassignments.

C-5.2 Record Copy.

The Design and Construction Agent must submit a record copy of the 20 percent submittal to the DoD Project Sponsor. No approval from the DoD Project Sponsor is required at the 20 percent submittal. However, a presentation to the DoD Project Sponsor will be required if the project has exceeded the authorized scope or is over budget.

C-5.3 20 Percent Design Analysis.

The following are minimum 20 Percent Design Analysis Submittal describing proposed architectural and engineering aspects of the project.

C-5.3.1 Executive Summary

The executive summary must include this narrative information:

a. Rationale for the selected block plan scheme,

b. Proposed architectural and engineering systems,

c. Approach to sustainable design, energy reduction, and other related energy compliant features to the project,

d. Designed scope and budget compared to the authorized scope and budget,

e. Specific military base requirements impacting the design of the project, for example, building exterior finishes, excessive noise factors, and other site/building constraints,

f. Utility services available and their points of entry into the project's site, including privatized utilities and their impact on scope and cost to the project.

C-5.3.2 Codes and Criteria

Include a separate chapter to identify a single, consolidated list of applicable criteria, with an effective date noted with each criterion, for all disciplines to follow in the project. List all mandatory criteria, codes, and standards with which the project must comply.

C-5.3.3 World-Class Checklist.

A World-Class Checklist in accordance with the World Class Toolkit requirements must be developed for every project providing direct patient care and must include all architectural and engineering disciplines. It must be applied across the entire life of a project, from conception to recapitalization, and apply to rehabilitation of a facility. For projects involving rehabilitation work including addition/renovation projects, refer to the original project's World-Class Checklist and documentation to ensure these standards are maintained and continued.

C-5.3.4 Civil.

Refine the 5 percent submittal site investigation and utilities report. Discuss approach to Storm-water Management and "Low Impact Development". Address pedestrian circulation, parking requirements, and vehicular circulation for all selected vehicle types. Refer to Chapter 2 and Appendix G.

C-5.3.5 Architectural.

Address the overall architectural concept including exterior wall systems and finish materials, acoustics (both exterior and interior), base architectural plan, floor-to-floor heights, roofing materials, slope(s), styles, energy conservation features, sustainable design, commissioning, as well as accessibility provisions for the disabled. Describe how proposed material selections and finishes must support aseptic environments, infection control and patient/staff safety.

Address impact of technically complex equipment and medical systems (for example imaging equipment; MRI, lithotripsy units; audiology booths; sterilizers, etc.) and determine scope in preparation for future design development requiring specialty consultant involvement (for example health physicist report). Refer to Chapter 15 and Appendix D.

Further develop the Safety Risk Assessment (SRA) initiated by the DoD Project Sponsor during predesign, as indicated in paragraph 3-7.7. Refer to Appendix A for requirements for Behavioral Health.

C-5.3.6 Interstitial Building System (IBS).

If applicable to the project, address IBS to include its design, documentation, and technical requirements in accordance with Appendix E.

C-5.3.7 Structural.

Discuss and describe the justification and basis for the proposed system.

C-5.3.8 Seismic.

Discuss the seismic design considerations and the level of protection required. Evaluate the seismic impacts to the structural design system being proposed for new facilities. For projects involving rehabilitation work including addition/alteration projects, provide a preliminary Facility Upgrade Report that includes a Seismic Structural Assessment and Evaluation Study.

C-5.3.9 Heating, Ventilation, and Air Conditioning.

Identify the project specific design weather data to be utilized. Discuss design considerations and space requirements for the primary and secondary HVAC systems being considered and how they compare based on Life Cycle cost Analysis. Identify equipment redundancies, continuity of service, spare capacity, and space provisions for future expansion of energy plants and mechanical rooms. Identify required minimum zoning to coordinate with continuity of service and smoke compartments (for example defend-in-place strategy). Also, demonstrate how the design will provide weather-protection; direct floor-to-ground access for equipment O&M, for example, pallet transport via hydraulic hand carts; and practical means of future replacement. Prepare a preliminary Air Balance Summary identifying each room in the project, corresponding room code, summer/winter design temperature and relative humidity, and applicable ventilation requirements such as the minimum total air changes, outdoor air changes, as well as special ventilation requirements to be developed in further design stages (for example USP 797, USP 800, BSL criteria etc.).

Perform a preliminary analysis of site specific and building specific considerations for air intakes and exhausts per paragraph 10-11.4 including considering the impacts of surrounding buildings. Address health and odor aspects for air intakes. Identify all intakes and exhaust sources which must be evaluated including those for surrounding buildings (for example laboratory exhaust, sanitary vents, standby generators exhaust, boiler exhaust, cooling tower discharge, kitchen exhaust, vehicle exhaust etc.). Provide any building siting or orientation recommendations to reduce noted risks. Provide a recommended analysis approach for the detailed 35% analysis (for example basic prescriptive separation, numerical dispersion modelling, computational fluid dynamics analysis, wind tunnel modeling analysis etc.) supported by the building and site-specific risks and considerations.

C-5.3.10 Plumbing and Medical Gas.

Discuss design considerations and space requirements for plumbing systems to include domestic hot, cold, recirculation water, high purity water systems, water supply, water quality, existing water management program coordination, conceptual water system analysis, waterborne pathogen control, water treatment, continuity of service, hot water

generation, storage requirements, temperatures; and distribution systems, fuel gas, sanitary waste and vent, and storm drains. Provide a water chemistry analysis IAW Chapter 9 or utilize local historical test data to conceptualize water treatment requirements. Address compliance with post-seismic storage and water conservation criteria and regulations, if applicable.

Discuss design considerations and space requirements for medical gas systems to include types, storage, and distribution systems. Identify the System Category of each medical gas system in accordance with the Risk Assessment. Identify all locations where medical gas is utilized and how it is to be served (and stored) whether provided centralized with on-site producers, bottle manifolds or with portable bottles, as coordinated with the DoD Project Sponsor.

C-5.3.11 Electrical.

The Design Analysis must present design considerations and interior/exterior space requirements for electrical systems as required by UFC 3-501-01, paragraphs 3-2.1, 3-2.2, and 3-2.3. Include voltage selection; availability of primary power as required by Chapter 11; reliability of the primary distribution system; normal and essential (Type 1 or 2) or standby (Emergency, Legally-Required, Non-Essential / Optional) electrical systems; and lighting systems. Address compliance with seismic requirements in Chapter 7.

C-5.3.12 Communications.

Discuss design considerations and space requirements for all communications systems required for the project. Include listing of each technology system to be included per the project room contents list and brief discussion of its functionality. Discuss method for inclusion of ports per room type and/or equipment requirements.

C-5.3.13 Fire Protection and Life Safety.

Address the fire detection, fire alarm, fire extinguishment, and fire suppression systems and features for the project. In addition, address life safety and means of egress.

Address anticipated active and passive fire protection features and systems, type(s) of construction, height, and area limitations, building separation, fire rating of materials, and occupancy classification(s) in the project. For projects involving rehabilitation work, provide an LSA as described in Chapter 14.

C-5.3.14 Physical Security.

Discuss the physical security system design, consideration, parameters, major features, and space requirements for the overall facility and specialized areas such as those processing classified or sensitive information. Refer to Appendix A for requirements for Behavioral Health.

C-5.3.15 Antiterrorism/Force Protection (AT/FP).

Discuss site, design, space considerations and requirements for AT/FP systems. Project must conform to requirements of UFC 4-010-01. Deviations to include improvements or detriments to the UFC 4-010-01 standards must remain within the limits specified by UFC 4-010-01 paragraph 1-1.3.2 and all requirements of the remaining document.

C-5.3.16 Sustainability and Energy Conservation Compliance.

Discuss status toward meeting the requirements of UFC 1-200-02; update sustainable rating system points; refine energy consumption status relative to achieving the required 30% (minimum) energy reduction as compared to the ANSI/ASHRAE 90.1 baseline; and update status of additional sustainability goals for the project. This narrative must include separate sections for Architecture, Site, Mechanical, and Electrical. Include proposed checklist.

C-5.3.17 Commissioning.

A preliminary Commissioning Plan must be developed and submitted that defines the method by which commissioning must be performed. The Commissioning Plan must outline and define its processes to include commissioned systems, participants, roles and responsibilities, communication procedures, and deliverables. Discuss procedures for achieving required commissioning of all commissioned systems. Reference Chapter 19 for additional information.

C-5.3.18 Transportation and Logistics.

Provide a preliminary, overall Transportation Logistics Analysis (TLA) that discusses the rationale for the proposed transportation, logistics, waste management, and food service solutions. The TLA must include impacts to programmed scope and cost and: (1) an Elevator Traffic Study and Analysis (ETSA); (2) an LCCA for automatic and manual material handling systems; (3) a Waste Management Analysis (WMA), and (4) a Food Service Study, as applicable. The WMA must include the major design parameters and features that address trash removal; hazardous, infectious, and biological waste; retort sterilizers; incinerators; and other waste handling features of the design. See Chapter 16 and Appendix F for additional requirements regarding these studies. In addition, address and discuss PTS's, as well as dumbwaiters and AGV systems.

C-5.3.19 Interior/Exterior Signage and Wayfinding.

A preliminary Interior/Exterior Signage and wayfinding master plan must be provided that addresses necessary orientation cues and information for patients, staff and visitors who navigate in and around a facility. Identify travel paths major interior intersections, and other benchmarks to successfully move from one destination to another. Analyze a facility's spatial organization and layout to identify specific areas, directional challenges, and wayfinding tools that can help in navigation. Consider all types of functions and

activities a person must perform when in a medical facility. Reference Chapter 6 for further requirements in developing this master plan.

C-5.3.20 Food Service.

If applicable, discuss the food service design and considerations to include optimal movement of food products to ensure effective monitoring and control of food temperatures through conventional flow while minimizing personnel cross-traffic, backtracking, and queuing conditions.

C-5.3.21 Specifications.

Provide a list of project specific specifications to be utilized.

C-5.3.22 Construction Phasing.

Develop a written narrative of the overall requirements for a phased approach to the construction that addresses all work associated with all the major disciplines. Develop a preliminary construction phasing plan that addresses “major” areas of work requiring specific parameters, sequence, or milestones. This phasing plan is not a detailed technical sequence of normal construction work but describes any constraints that would prevent the contractor from doing all areas of the work simultaneously or at his discretion. Preliminary identification of phased areas and durations should be identified with reference to scope, constructability, timing, and overall construction length. Provide duration for relocation where subsequent construction activity is dependent on staff relocation from existing facility to new facility. Requirements unique to phased projects such as swing space, utilities that must serve two areas simultaneously, demolition sequence, and engineering system support for isolated or independent areas, must be addressed in reference to the operational, constructability, and cost constraints of the project.

C-5.3.23 Rehabilitation Work.

For projects involving rehabilitation work including addition/alteration projects, develop and discuss a preliminary construction phasing plan that supports continued/uninterrupted operations of the existing facility during construction and associated impact on construction costs and scope. Identify the requirements for temporary buildings to serve as swing space. In addition, identify actions that reduce or interrupt service to an existing, occupied area. Identify potential temporary connections, extensions of service that increase system demand, locations of new connections, or other measures necessary to sustain service for engineering systems within the existing building.

C-5.4 20 Percent Submittal Design Drawings.

The following are minimum 20 percent submittal drawings depicting proposed architectural and engineering aspects of the project.

C-5.4.1 Civil Drawings.

Show building locations, future expansion, existing and proposed structures, topography, final master plan of the site, utilities (include point of origin), utility modifications, pedestrian paths, roads, parking (surface and structured), ATFP, and easements.

C-5.4.2 Architectural Drawings.

Provide floor plans for each floor showing all programmed spaces and corridors; key building dimensions; structural grid system (including columns and type of system proposed) and key building dimensions; electrical and mechanical equipment rooms; stairs, elevators, and escalators; transportation equipment for movement of material and supplies; and specific locations of vertical and horizontal transportation systems, for example, pneumatic tubes, dumb waiters, automated guidance systems. All spaces identified in the PFD must be labeled with the Room Name and Room Code, in addition to the programmed and designed net areas. Also, addition/alteration projects must include preliminary demolition drawings with photographs depicting existing conditions. Provide preliminary exterior elevations with proposed finishes, floor to floor heights and overall dimensions.

Utility Services Distribution / Physical Space Requirements for Equipment and Distribution Systems. Provide conceptual interdisciplinary cross section drawings of the most congested utility areas (for example near vertical chases, elevators, mechanical rooms, communications rooms, etc.) to demonstrate that the floor-to-floor heights, above ceiling space, crawl spaces and chase areas are sufficient for utility installation as well as future operations and maintenance activities. Designate installation zones for each utility. Include all technical systems in the congested areas (for example HVAC main ducts, heating and cooling mains, plumbing mains, fire sprinkler pipe, electrical cables and lighting, communications cable trays, pneumatic tube systems, seismic restraints and supports etc.). Include piping slope considerations where that may require additional clearances. Base HVAC utility sizing on block heating and cooling load estimates and zoning concept. Label each utility and show required clearances with measurements. Base cable tray dimensions on industry standard sizes per fill rate estimates.

C-5.4.3 Interstitial Building System (IBS).

If applicable, a preliminary IBS design must be developed. Establish the floor to ceiling heights for the IBS supported by the most stringent preliminary equipment, utility dimensions and crossings. Demonstrate that adequate space is provided for maintenance access and compliance with NFPA 101 Means of Egress requirements.

C-5.4.4 HVAC.

Establish the minimum size and number of mechanical rooms, utility tunnels, and utility pathways based on estimates of building demands and equipment capacities, zoning,

equipment redundancies, considering required components and clearances. Provide plans showing single line drawings of the HVAC distribution systems to the areas served. Establish minimum vertical space requirements clearances for any above ceiling space, crawl space or IBS based on required HVAC distribution system sizes, piping slopes etc., coordination with other discipline utilities. Provide conceptual AHU sizes and utility requirements based on the block load calculations.

C-5.4.5 Plumbing and Medical Gas.

Establish the minimum size of mechanical rooms based on estimates of demands, anticipated water treatment requirements, equipment capacities and considering mandatory components, redundancies, and clearances. Provide plans showing single line drawings of the plumbing distribution systems to the areas served. Demonstrate space provisions for all medical gas producers, bottle manifolds and storage locations as well as main distribution lines.

C-5.4.6 Electrical.

Submit drawings that are compliant with paragraph 3-3 of UFC 3-501-01. Submit the following drawings, at a minimum: 1) site plan showing existing utility primary power and preliminary locations of new exterior normal and essential / standby electrical equipment; 2) building floor plans for Power and Lighting showing size and location of electrical rooms; and 3) Single Line Diagram(s).

C-5.4.7 Communications.

Establish the minimum size and number of Telecommunications Rooms and Server rooms based on estimates of building demands and equipment capacities. Provide plans showing riser drawings of the distribution systems from Telecommunications Rooms to the areas served. Submit drawings utilizing diamond analysis assuming 180 ft sides for layout of information and communication technology (ICT) spaces. Identify aligned TR stacks within the facility free of any fixed adjacencies in Chapter 12. Provided initial estimate of total rack units per TR and total rack requirement for sizing efforts under the engineered solution. Identify location of entrance facility. Provide two EFs with greatest separation practical for NFPA 99 Category 1 and 2 facilities. Identify outside plant pathways to two separate installation/provider nodes for NFPA 99 Category 1 and 2 facilities. Submit drawings of initial fiber backbone riser indenting physically independent pathways for Category 1.

C-5.4.8 Food Service.

If applicable, provide plans showing an initial layout of food service areas. Show circulation paths from servers to seating, loading dock to storage, kitchen to inpatient units, general material movement, principal dimensions, and dining seating counts. Optimize movement of food products and minimize personnel cross-traffic, backtracking, and queuing conditions. Reference Appendix F for additional requirements.

C-5.4.9 Construction Phasing.

When required by the Design and Construction Agent, provide a graphic "Node" diagram of major elements and areas showing proposed sequential and parallel phased work. Indicate interim swing space, temporary facilities, and locations of existing and relocated functions with time duration for any Government moves.

C-5.4.10 Rehabilitation Work.

For projects involving rehabilitation work including addition/alteration projects, update and continue to differentiate where existing conditions end and new conditions begin. Define extent and scope of rehabilitation. Provide documentation of existing conditions.

a. Existing building as-builts.

b. Statement of conditions.

c. Existing/Prior hazardous material abatement reports and studies.

C-5.5 20 Percent Submittal Calculations.

C-5.5.1 A/E Calculations.

All calculations that support A/E features within the design must be provided including but not limited to those required in the Design Analysis. Supporting documentation must include life cycle cost analysis (LCCA) per UFC 1-200-02, to include energy systems, renewable systems, lighting, solar hot water use, and utility demand. Documentation should also include validation of the parking requirements.

C-5.5.2 Gross, Departmental & Net Area Tabulations.

Gross, departmental, and net area tabulations for all floors must be submitted with a small-scale, single-line, dimensioned key plan, and must be provided to reflect the total space required per Chapter 3. Provide a departmental area summary tabulation to include net areas, net to gross area and factor, and net area difference. Functional areas and or rooms must address room quantity, net area, and total area comparing the net as-designed area against the PFD values. Comparison must include net areas, departmental gross areas, minimum grossing ratios, and building gross area. Provide justification if deviation between as-designed and PFD values is greater than +/- 10 percent, except for rooms programmed for 50 SF or less.

C-5.5.3 20 Percent Submittal Cost Estimates.

Provide schematic cost estimates reflecting all design features and elements. Update all project costs based on refined project design details. Provide an updated DD Form 1391. Show Post Construction Award Services (PCAS) and "Other" special cost as separate line items.

C-6 35 PERCENT SUBMITTAL.

This submittal is a minimum 35 percent of the total design across all disciplines and incorporates response to all review comments. This is considered the "technical submission" in which all major architectural and engineering systems and A/E design decisions are finalized into the project scope and costs. Load demand, equipment sizing, energy consumption, LCC, NFPA 101 compliance, and other calculations for all building systems and features defined herein must be provided and reflected in the cost estimate. A formal 35 percent design presentation to the DoD Project Sponsor may be required. Final changes to the project's enacted DD Form 1391 description, justification, and execution timelines are made at this submittal level.

C-6.1 35 Percent Submittal Design Analysis.

Concept design narratives and related technical calculations further refining the 20 percent design requirements to a 35 percent design effort must be provided as noted here:

C-6.1.1 World-Class Checklist.

Update the draft World-Class Checklist.

C-6.1.2 Civil.

Include the site investigation, geotechnical investigation, and utilities reports. Summarize the civil design parameters, parking requirements in accordance with Appendix G, and major features of the design.

C-6.1.3 Architectural.

Address the overall architectural concept including interior design (in accordance with Appendix B) and exterior finish materials, wall systems, roofing systems, acoustics (exterior and interior), base architectural plan, floor-to-floor heights, and contingency and mobilization features. Shielding requirements based on a health physicist report for all radiation areas. Provide a final functional narrative that describes alignment of the design with the Functional Program developed for the project. Demonstrate through the required Dew Point Analysis (per UFC 3-410-01) how the proposed exterior building envelope systems are coordinated with space temperature and humidity requirements to prevent condensation and mold growth. Describe how proposed material selections and finishes promote aseptic environments and infection control and patient/staff safety.

C-6.1.4 Interstitial Building System (IBS).

If applicable, update the design parameters and major features, including interstitial space considerations.

C-6.1.5 Structural.

Address the selected structural foundation and framing systems considered and provide an economic basis for system selection. Summarize the structural design parameters and major features of the design.

C-6.1.6 Seismic.

Summarize the seismic design considerations including “S” values and the level of protection required. Discuss post-earthquake operation requirements. For projects involving rehabilitation work, complete the Facility Upgrade Report.

C-6.1.7 HVAC.

Provide a summary of the primary and secondary HVAC systems considered and the economic basis for system selection. Summarize the proposed control systems, building pressure control scheme, humidification features, and the energy conservation features being considered. Provide room-by-room and zone heating and cooling load calculations, AHU sizing and utility requirements. Interior equipment loads must be identified on a space-by-space basis. Provide a fully developed room-by-room Air Balance Summary including each room name, number, room code, number of people, summer/winter design temperatures and relative humidity, minimum outdoor air changes, minimum total air changes, space pressurization minimum load driven air flows, design supply/return/exhaust/transfer/exfiltration air flows and primary outdoor air fraction at design condition. Provide calculations for minimum outdoor air at each AHU in accordance with Chapter 10. Provide duct pressure drop calculations. Provide piping thermal expansion calculations (thermal stress and flexibility analysis) for all systems identified in UFC 3-410-01 plus all heating hot water and chilled water systems larger than 4 in. (100 mm) to support the proposed piping layout, supports and thermal expansion features. Provide catalog information for equipment used as the basis of design. Provide report on the detailed air intake and exhaust analysis including any resultant recommendations on building siting, orientation, intake or exhaust configurations, or special filtration.

C-6.1.8 Plumbing and Medical Gas.

Describe the plumbing systems to include domestic hot, cold, recirculating, high purity water, fuel gas, sanitary waste and vent, and storm drains. Summarize the water supply, quality, water treatment, required storage, distribution systems and all waterborne pathogen prevention features. Provide a water chemistry analysis IAW Chapter 9. Describe the water treatment requirements and arrangement (for example centralized, decentralized, redundancies etc.) necessary to meet the domestic water requirements as well as specialized medical equipment requirements (for example sterilizers, washer/disinfectors etc.). Discuss hot water generation, storage, temperatures, distribution systems. Provide the ASHRAE 188 Water Management Program and it’s required analyses. Provide the supplemental disinfection analysis to support the selection of waterborne pathogen control treatment system. Provide sizing

calculations for all plumbing systems including sizing of piping, booster pumps, treatment systems, storage etc. Provide catalog information for equipment used as the basis of design.

Identify the System Category of each medical gas system in accordance with the Risk Assessment. Identify all locations where medical gas is utilized and how it is to be served (and stored) whether provided centralized with on-site producers, bottle manifolds or with portable bottles, as coordinated with the DoD Project Sponsor. Provide source sizing calculations and node to node pipe sizing calculations for all medical gas systems. Provide historical use data where relevant to sizing. Provide catalog information for equipment used as the basis of design.

C-6.1.9 Electrical.

The Design Analysis must illustrate the further development of the design from the Concept Design phase, as required by UFC 3-501-01, paragraph 3-2. Include complete descriptions of required coordination with the utility, connection to primary power source, establishment of utilization voltage, routing of exterior power, and connections to the service equipment and all downstream distribution, and the essential (Type 1 or 2) or standby (Emergency, Legally-Required, Non-Essential / Optional) electrical system. Update the load analysis and all calculations as required by UFC 3-501-01, paragraph 3-2. Include NFPA 99 risk analysis for wet procedure locations in accordance with Chapter 11. Provide cut sheets for all electrical equipment.

C-6.1.10 Communications.

Summarize all communication system design parameters and major features. Provide cut sheets for all communication equipment. Discuss the general framework of the networking design or diagram including MEDCOI and traditional IT systems. Determine which systems require interconnectivity and identify if connection is physical or logical. Discuss location of installation nodes for end point destination and note how physical independent pathways will be ensured for NFPA 99 Category 1 and 2 systems.

C-6.1.11 Fire Protection and Life Safety.

Address and evaluate the fire protection and life safety design parameters and major features to include (but not limited to): fire detection, fire alarm, fire extinguishment, and fire suppression systems. Summarize the life safety considerations, design parameters, and major features. Address type of construction, height and area limitations, building separation, fire rating of materials, life safety features, and occupancy classification. For projects involving rehabilitation work, provide a summary of the analysis of the FSES Study and latest LSA Report. Include related design considerations and criteria that have been coordinated among all the affected disciplines.

Evaluate the fire protection and life safety features in accordance with UFC 3-600-01 in terms of what is required and what will be provided to accommodate the scope of the work for this project along with a drawing, or set of drawings, to support this analysis (in

the form of a narrative). Utilize the following requirements to further clarify the preparation of the fire protection and life safety design narrative (or FPLSDN).

a. Provide a description of the use(s) proposed in each facility, including all functions, operations, and procedures, to support the designer's determination of the occupancy classification(s) in accordance with NFPA 101 and the use and group classification(s) in accordance with IBC for all fire areas and smoke compartments of the proposed facility. Also, address the use of the IBS, high-rise provisions and any other features impacting the fire safety/protection design (as applicable).

b. Prepare a tabular summary to represent each proposed subdivision of building space [for each floor in multi-story facilities] to clearly identify all fire separations and smoke compartments required by either the IBC or NFPA 101.

c. Address interior wall and ceiling finish and interior floor finish identifying classification and flame spread ratings and smoke-developed indices and extent of plastics to be provided as finish materials.

d. Describe protection of all vertical openings, including enclosure requirements for stairs, elevators, escalators, conveyors, dumbwaiters, chutes, atriums, malls, and light wells (as applicable).

e. Describe provisions for life safety, especially in terms of the means of egress. Identify types and numbers of exits; capacity and arrangement of the means of egress; performance parameters of the means of egress, namely common path of travel, dead-end corridor, and total travel distance; discharge from exits; exit marking and illumination of means of egress; emergency lighting; opening protectives; and special security features.

f. Identify FAFDMN and voice communication requirements for field devices. Indicate facility operations that impact selection of FAFDMN with consideration given to type of evacuation, patient and staff evacuation procedures, and layout of fire separations and smoke compartments. Include functional description for alarm initiation, alarm indication and emergency notification; signaling circuits and appliances, sequences of operations, annunciation of alarm, trouble and supervisory signals, and interface with other building systems as well as other fire protection features (or systems). Indicate system configuration (for example conventional hardwired, addressable, multiplex, or intelligent) and type of signal communication (for example digital or analog). Indicate FAFDMN requirements as they relate to other building systems, for example, HVAC.

g. Describe the fire (or emergency) reporting system(s) in service at the Installation, for example, central station fire alarm reporting system.

h. Document the current conditions of the available water supply in terms of volumetric waterflow rates (in gallons per minute) and waterflow pressures

(in pounds per square inch), including a copy of the most current fire hydrant flow test report. This flow report shall be inserted as an attachment to the FPLSDN. If there is on-site water storage, identify its components and the available volumetric capacity. Provide a description for types and locations of system equipment and existing facility fire flow demands.

i. If fire hydrant water flow test results support the necessity to install a fire pump or a tank for water storage or both, indicate design criteria (for example NFPA 20 or NFPA 22), equipment type, arrangement, and capacity and pump ratings. Include pump equipment power, alarm and supervision requirements, automatic and manual fire pump control requirements, and FAFDMN interface and supervision requirements.

j. Identify objective and scope for smoke control or smoke management in the project, particularly the relevant performance criteria that the QFPE intends to meet. Indicate the type(s) of smoke control and management proposed to meet criteria. Identify building systems that must be interfaced to provide smoke management. Summarize design considerations, control parameters and operational features.

k. Identify layout and distribution parameters for fire extinguisher cabinets.

l. Elaborate upon facility features for emergency power distribution, including control and switching requirements for life safety, critical and equipment loads with load shedding and restoration features (as applicable).

m. Consider each of following special hazards and features, which may impact the overall level of fire protection being provided.

(1) Security (for example electric door releases, door hardware, and locking arrangements)

(2) Malls/atriums

(3) Automatic data processing and electronic facilities

(4) Elevator control/FAFDMN interface

(5) Emergency power

(6) Emergency vehicle easements

(7) Explosion prevention

(8) Flammable and combustible liquids handling and storage

(9) High-frequency electrical equipment

(10) Radio Frequency Interference (RFI) shielding

(11) Underground structures/areas, including crawlspace(s)

(12) Waste handling (medical and hazardous)

(13) Limited-access structures or areas

(14) Special storage arrangements and configurations

C-6.1.12 Physical Security.

Summarize the security system design parameters and major features.

C-6.1.13 Antiterrorism/Force Protection (AT/FP).

Summarize the AT/FP system design parameters and major features.

C-6.1.14 Sustainability and Energy Performance/Conservation Compliance.

Discuss status toward meeting the requirements of UFC 1-200-02; update sustainable rating system points; refine energy consumption status relative to achieving the required 30% (minimum) energy reduction as compared to the ANSI/ASHRAE 90.1 baseline; and update status of additional sustainability goals for the project. Discuss all energy conservation design features considered and those incorporated.

C-6.1.15 Commissioning.

Summarize the Commissioning Plan and process to achieve the required commissioning of all commissioned systems. Include the final Commissioning Plan incorporating comments received. Further clarify the process by which commissioning must be performed.

C-6.1.16 Transportation and Logistics.

Summarize the recommendations and analyses (pros and cons), rational, and scope and cost impacts of the overall Transportation and Logistics Study to include all sub-studies, for example, Elevator Traffic Study and Analysis, Life-Cycle Cost Analysis for automatic and manual material handling systems, a Waste Management Study, and a Food Service Study (include all food serve areas). The MTLC must also present at the 35 percent design meetings describing how the facility design addresses the transportation, logistics, and waste management requirements of the facility. The Transportation and Logistics Analysis (TLA) must be developed enough to finalize and address any functional requirements of the facility layout required at the 35 percent submission.

C-6.1.17 Interior/Exterior Signage and Wayfinding.

Summarize the Interior/Exterior Signage and wayfinding master plan recommendations, solutions, and tools for patients, staff, and visitors to navigate in and around a facility. Identify any scope and cost impacts to proposed recommendations, solutions, and tools. Summarize the types of functions and activities a person may perform in a medical facility.

C-6.1.18 Food Service.

If applicable, summarize the food service design. Discuss its parameters and major features to include optimal movement of food products to all designated locations; minimal cross-traffic, backtracking, and queuing conditions; and separation of personnel traffic.

C-6.1.19 Equipment Specifications.

Equipment List. The A/E must further refine the initial for-record equipment list into a viable medical facility room contents list or room-by-room contents listing. Coordinate all categories of equipment for each room identified on the list as well as substitutions or changes with the DoD Project Sponsor. The type, quantity, and location of biological, radioisotope, fume, canopy, and laminar air hoods must also be indicated in the equipment list. Provide appropriate equipment data and catalog cut sheet(s) for all items of equipment having unique utility requirements, heat loads, structural support, or space requirements.

Develop requirements for all equipment that does not have current information, as directed by the Design and Construction Agent.

C-6.1.20 Specifications.

Provide outline specifications.

C-6.1.21 Construction Phasing.

A written narrative must be provided, developed, and documented by the A/E that shows one overall workable phasing plan. This phasing plan must indicate proposed construction duration and describe major elements of the work and any impacts on or by the Government. The phasing plan must include the scope and timing sequence of each identifiable phase or major activity with required precedents, procurement, Government move durations, commissioning, and outfitting. Each phase must be described in terms of the work involved and what work has to come before and after the phase. Phasing elements affecting the Government but not the contractor, such as Government only actions, should be determined and documented.

C-6.1.22 Rehabilitation Work.

For projects involving rehabilitation work including addition/alteration projects, further identify work activities in a phasing plan that would impact any requirements for continued operation of a facility, including temporary utilities, swing space, implementation of hygienic barriers, and temporary access routing.

C-6.2 35 Percent Submittal Design Drawings.

C-6.2.1 Civil (Site).

Show building location, future expansion, existing and proposed structures, topography, final master plan of the site, utilities (include point of origin), utility modifications, roads, pedestrian paths, parking (surface and structured), and landscaping.

C-6.2.2 Architectural.

C-6.2.2.1 Floor.

For each floor, show floor elevation; all programmed spaces; corridors; structural grid systems (including columns); electrical/communications/mechanical equipment rooms; all vertical and horizontal transportation, for example, stairs, elevators, escalators, pneumatic tubes, dumbwaiters; and AGV to meet functional requirements and CONOPS for the building. All spaces identified in the PFD must be labeled with the Room Name and Room Code. Provide programmed and designed net area tabulations. Provide key building dimensions. Identify accessible maneuvering clearances (for example turning radius and door/fixture clearances, etc.) for all applicable spaces and components. Plans must be coordinated with the life safety-building code composite plans.

C-6.2.2.2 Reflected Ceiling.

Show ceiling grid and light fixture placement.

C-6.2.2.3 Exterior Elevations and Major Building and Wall Sections.

Include all exterior views and multiple cross sections through all unique building areas. Provide floor to floor, as well as roof and parapet heights. Wall sections must show and describe building envelope materials.

C-6.2.2.4 Utility Services Distribution / Physical Space Requirements for Equipment and Distribution Systems.

Provide interdisciplinary cross section drawings of the most congested utility areas (for example near vertical chases, elevators, mechanical rooms, communications rooms, etc.) to demonstrate that the floor-to-floor heights, above ceiling space, crawl spaces and chase areas are sufficient for utility installation as well as future operations and maintenance activities. Designate installation zones for each utility. Include all technical systems in the selected areas (for example HVAC main ducts, heating and cooling mains, plumbing mains, fire sprinkler pipe, electrical, telecommunications cable trays, pneumatic tube systems, seismic restraints and supports etc.). Include piping slope considerations where that may require additional clearances. Base HVAC utility sizing on room-by-room heating and cooling load calculations and the zoning concept. Label each utility and show required clearances with measurements.

C-6.2.3 Interstitial Building System (IBS).

If applicable, a conceptual IBS design must be developed, for example, plans and sections delineating interdisciplinary cross-sections at critical locations. Validate floor-to-ceiling heights for the IBS supported by the most stringent equipment and utility dimensions. Show defined maintenance access and Means of Egress in compliance with NFPA 101. Develop interdisciplinary crossings at congested areas to demonstrate sufficiency of space.

C-6.2.4 Structural.

Provide drawings of the selected structural system adequately developed so no additional major engineering decisions are required.

C-6.2.5 HVAC.

Provide equipment room drawings in plan and elevation showing major equipment of all disciplines including architectural and structural elements, and depict the required access, maintenance, and code clearances. Footprints of air handling and other major equipment must be established from catalog dimensional data of three manufacturers and demonstrate that all required AHU elements have been included. Include clearance space for component cleaning, removal, and maintenance. Provide AHU equipment schedules, AHU configuration plans and sections, control schematics and sequence of operations. Show coordinated distribution mains (dimensioned) on the floor plans. If integral sound attenuating devices are required in VAV/CAV terminal units, indicate these on the plans for the respective terminal unit(s). Design all aspects of the piping systems to control thermal expansion and distribution as supported by piping stress calculations. In the design drawings, show all control features such as pipe guides, anchors, expansion joints, expansion ells, offsets, flexible couplings, and other piping features that may affect expansion forces in the piping. For steam and condensate piping, show the required direction, degree of line slope, details of drip traps, and other drainage features.

Identify all HVAC control zones and the type of zone control devices to be used (VAV, CAV etc.). Provide air handling unit zoning diagrams identifying which areas are served by each AHU. Provide space pressurization and airflow diagrams. Provide single line dimensioned distribution drawings for all ductwork, and for the main heating, chilled water, and steam services, throughout the facility. Provide schematic diagrams for all piping systems; identify locations of all outdoor air intakes and exhaust air discharge points.

C-6.2.6 Plumbing and Medical Gas.

Provide plumbing and medical gas system plans, including central equipment, and main distribution lines. Show layout of the technical rooms in plan and elevation for plumbing and medical gas systems including architectural and structural elements and major equipment of all coordinating disciplines. Equipment dimensions must be based on the

catalog dimensional data of three manufacturers. Include clearance space for component cleaning, removal, and maintenance. Water supply and gravity drainage mains must be dimensioned. For sanitary piping and vacuum piping, show the required slope and cleanouts including access clearances. Provide schematic diagrams and riser diagrams for all plumbing and medical gas systems including all functional components and pipe sizes.

C-6.2.7 Electrical.

Show placement and location of electrical room layouts, light fixtures, receptacles, motor controls, panelboards, and distribution equipment. Provide single line diagrams of the normal/essential electrical systems, emergency power, and uninterruptable power supply (UPS). Include the grounding system design and initial testing requirements in the project design documents.

C-6.2.8 Communications.

Provide site utility plans for voice, data, security, and television (TV) systems indicating all communications ductwork, manholes, hand-holes, and cable routing required to tie the new facility into the existing installation-wide networks/systems. Indicate all existing communications cables on, or adjacent to, the immediate project site.

C-6.2.8.1 Facility Communications.

Show layout of communication equipment, devices, and closets. Develop, in detail, a nurse call Zone Light Activation Matrix (including identification numbers) must be detailed on the telecommunication systems project design documents. A matrix must be developed for each patient care unit served.

Provide enlarged communication room elevations to include equipment racks, wall mounted equipment and devices. Verify all drawings identify port locations to match project PRC. Provide heat maps for wireless access points. Provide heat maps for IRES emergency management radios if included or to verify not needed (facilities smaller than 50,000 sf (4650 sm) with signal strength of 80 dB).

Provide, for each communications system, riser diagrams; identification and associated proposed location for each major item of equipment; and identification of cable sizes and types and termination equipment. Provide initial rack layout based on standard medical device sizing such as switches and vendor equipment both contractor provided or government provided (estimated).

C-6.2.9 Physical Security.

If ESSs are included in the project design, these systems must be detailed in the project design documents. Include information such as sensor locations, floor plans, riser diagrams, security equipment schedules, monitoring and control equipment, alarm control panels, switches, and access control devices.

C-6.2.10 Fire Protection and Life Safety.

Coordinate all design features with applicable criteria and all architecture and engineering disciplines. At a minimum, the plans to graphically represent fire protection and life safety features shall identify the following. As appropriate, indicate both the minimum requirement and the actual provision being incorporated into the project.

a. Prepare life safety-building code composite plans at a minimum scale of 1/8” = 1’-0” (1:100) utilizing a set of architectural floor plans with room names and numbers, clearly identifying horizontal and vertical means of egress, any vertical openings, such as elevators and other shafts, utility rooms, and structural support elements. The following shall be indicated: occupancy classification and sub-classification per NFPA 101 and Use-Group Classification per IBC of all fire areas; delineation of smoke compartments (or barriers); location of all fire-rated separations, including fire-rated door assemblies and dampers with specific fire-resistance ratings identified; fire pumps; fire extinguishing cabinets; and number and locations of all required exits, exit capacities (number of people per exit), means of egress and travel distances of all fire areas and smoke compartments. Identify performance parameters of the means of egress, including proposed measurements and maximum limitations of travel distance, common path of travel, and dead-end corridor, on each floor and compartment, as well as the specific location where each measurement was taken. It is noted that any travel distance measurements shall be taken both to an exit and to a smoke barrier (where smoke compartments are required) in compliance with NFPA 101. Utilize egress tags at each interior exit to a vertical component of egress, like a stair, and at each exterior exit from the facility, which shall each identify the following four parameters: (1) minimum clear width required, (2) actual clear width proposed, (3) calculated maximum number of occupants that the particular component is capable of serving, and (4) estimated number of occupants anticipated to use that particular component based upon a reasonable distribution of occupants performed by the QFPE.

b. The following is the minimum information that shall be either graphically represented in the drawings or detailed in the specifications prepared for the performance-based fire suppression design in this project: fire hydrant waterflow data; location of area(s) to be protected by sprinklers or standpipes; identification of sprinkler system type, sprinkler hazard classification(s), and respective sprinkler design density, design area, hose stream demand (including location of the hose stream demand), duration of water supply, and sprinkler spacing and area of coverage, for each system proposed. The QFPE shall review the technical notes in UFGS 21 13 13 and incorporate those that apply as the specification section for automatic sprinkler protection is being developed. The zoning of automatic sprinkler protection shall be coordinated with the building smoke compartments, where applicable, and shall indicate locations of

other areas protected by other automatic extinguishing and suppression systems.

c. The following is the minimum information that shall be graphically represented in the drawings prepared for the performance-based fire suppression design in this project:

(1) Layout and distribution of all piping and equipment from the point of connection to the water supply to the sprinkler cross mains.

(2) Locations of service mains, interior feed mains, control valves, sprinkler risers, drain lines and discharge points, sectional valves, and inspector's test valves.

(3) Location of the backflow preventer (including provisions for draining and access for maintenance) where the potable water supply system is at risk of contamination from any fire suppression system.

(4) Details of pipe restraints for underground piping, for example, pipe clamps, tie rods, mechanical retainer glands, and thrust blocks. If required, identify size of wall or floor sleeve(s) to meet earthquake requirements.

(5) All concealed spaces requiring sprinkler protection, such as spaces above suspended ceilings, that are built of combustible material or that can contain combustible materials, such as storage and communication cabling without a fire rating.

d. Prepare fire alarm/fire detection/mass notification plans to graphically represent locations of all FAFDMN control and annunciation panels; all connections for notification, monitoring and control; all FAFDMN initiating and indicating circuits and locations of connected devices, including control of respective HVAC units for either smoke control (see NFPA 90A) or smoke management or both; and all interfaces with other building systems.

C-6.2.11 Interior/Exterior Signage and Wayfinding.

Graphically indicate specific interior/exterior signage and wayfinding locations, proposed solutions, and tools that relates to the facility.

C-6.2.12 Food Service.

Food service equipment items must be identified in detail in the project design documents and represent the latest available technology. Specific equipment locations, utility requirements including ventilation, and equipment installation must also be shown. Include mounting heights for all wall-hung equipment items.

C-6.2.13 Equipment (to include FFE).

Show all Categories of equipment. Show all equipment (to include FFE) on the equipment drawings and floor plans at a minimum scale of 1/4" = 1'-0" (1:50). Clearly identify and differentiate between RPIE and PP equipment. Provide plans showing Log Cat A and B items with heavy, solid lines and showing Log Cat C, D and R items with dashed lines. Provide JSNs as indicated in the PRC on floor plans, on all Interior Design FF&E sheets, and in tabular format for all applicable logistical categories. Provide separate Architectural equipment plans and Interior Design FF&E plans. Indicate and properly detail the type, quantity, and location of biological, radioisotope, fume, canopy, and laminar air hoods on the drawings. Coordinate all equipment locations and details to ensure adequate utility requirements, structural support, or space requirements are provided.

C-6.2.14 Structural Interior Design (SID).

Provide a 35 percent SID package. The SID package must be fully coordinated with all interior and exterior finishes, colors, and materials. Key the room finishes schedule to the plans by room number, room code, and room name, for each room labeled in the PFD. Include proposed SID color scheme/selections. Provide color boards (or binders) with samples of finishes or pictures - scanned pictures are not permitted. An aseptic environment ICRA must be coordinated with the SID package to define infection control risks associated within each project. Reference paragraph 6-5.1 for additional details. The wayfinding plan must also be an integral part of the facility's SID package and enhance the design features. The ICRA and the wayfinding plan are critical to begin early in the design process. See Glossary for expanded definitions of the SID.

C-6.2.15 Comprehensive Interior Design (CID).

Provide a 35 percent CID package for furniture and accessory selection. The CID package must be fully coordinated with all finishes, colors, and materials included in the SID package. Provide CID floor plans, table of all JSNs, and binders with samples of finishes - scanned pictures are not permitted. Provide description and cut sheets for all CID items. Include specific artwork selections. Reference paragraph 6-5.2 for additional details. See Glossary for expanded definitions of the CID.

C-6.2.16 Construction Phasing.

Provide a graphic "node" diagram (not a bar chart or time-scaled bar chart) to show the relationships established in the phasing narrative. The graphic representation of the phasing plan in the contract documents should not indicate durations (numerical or graphical) except for the contractually established durations such as Owner moves. Individual phase durations should be considered only in developing the Government's proposed overall contract duration. This phasing plan should not be confused with the requirement to determine the overall constructability and construction timeline that may involve a more detailed milestone chart. The phasing should be coordinated and documented in the design drawings either as a segregated set with all engineering

disciplines addressed or have associated drawings within each discipline. A separate overall phasing plan must be developed for the Government's use only to inform, educate, and track Government actions. It should include interaction of Government activities such as move times, swing space durations, and Government outfitting and training activities. This plan must further delineate the coordination of required actions of the Government that are not a part of the contractor's responsibility or contract.

C-6.2.17 Rehabilitation Work.

For projects involving rehabilitation work including addition/alteration projects, provide 35 percent demolition drawings indicating removal of structural, architectural, MEP, communications systems, and asbestos and other hazardous materials.

C-6.3 35 Percent Submittal Calculations.

C-6.3.1 Calculations.

Provide conceptual level calculations for all engineering systems being proposed as identified in the Design Analysis requirements and as required here.

C-6.3.2 Gross and Net Area Tabulations.

Update all gross and net area tabulations based on refined floor plans.

C-6.3.3 Health Physicist Report.

Provide a Health Physicist Report and coordinate with related design drawings and specifications. Refer to Chapter 15 and Appendix D.

C-6.3.4 Sustainability and Energy Performance/Conservation Compliance.

Discuss status toward meeting the requirements of UFC 1-200-02; update sustainable rating system points; refine energy consumption status relative to achieving the required 30% (minimum) energy reduction as compared to the ANSI/ASHRAE 90.1 baseline; and update status of additional sustainability goals for the project.

C-6.3.5 35 Percent Submittal Cost Estimates.

C-6.3.5.1 Cost Estimate.

Update all project costs. Align all revised costs in accordance with the DD Form 1391 format. Provide any changes to the project's DD Form 1391 description, justification, and execution timelines.

C-6.4 35 Percent Design Drawing Record Copy.

The record copy of the 35% design drawing submittal must be provided to the Design and Construction Agent documenting the outcome of the 35 percent meeting and must be submitted in accordance with the directives established above.

C-7 65 PERCENT DESIGN SUBMITTAL.

The Design and Construction Agent must develop the specific submittal requirements to define this level of effort. The project design documents must reflect a 65 percent level of coordination across all architecture, interior design, equipment, and engineering disciplines. Specifications should include a preliminary Division 01.

C-8 100 PERCENT AND FINAL DESIGN SUBMITTAL.

The Design and Construction Agent must develop the specific submittal requirements to define this level of effort. When the design is complete, the Design and Construction Agent must submit a complete copy of the final submittal documents, for example, drawings, specifications, equipment SID & CID packages, cost estimate, instructions to bidders. These documents must be fully coordinated across all architecture and engineering disciplines within 30 days of completing the 100 percent design documents.

C-9 REQUEST FOR PROPOSAL (RFP) FOR DESIGN-BUILD (DB) PROJECTS.

The RFP for Design/Build (DB) acquisition projects must clearly define all the requirements and background information that a DB contractor must have to estimate, bid, design, and construct the project. These requirements must be included in the RFP as appropriate to the project:

a. Project Technical Requirements

b. Updated DD Form 1391

c. Program for Design (PFD)

d. Medical Concept of Operations (CONOPS) for the facility

e. Project Room Contents (PRC)

f. Requirements for:

(1) Comprehensive Interior Design (CID)

(2) Structural Interior Design (SID)

(3) Additional requirements as determined by the Design and Construction Agent to facilitate fast track construction.

(4) User needs specific to the design of the facility

(5) Installation approved site location Base Commander signed document.

C-10 RFP DEVELOPMENT SUBMITTALS.

These submittals are required during the RFP development:

a. 5 Percent Level Design Report.

b. Draft RFP (RFP Development). If 20 percent design is provided, include all required submittal items in Section C-5.

c. Final RFP (RFP Development). If 35 percent design is provided, include all required submittal items in Section C-6.

C-11 AFTER CONTRACT AWARD.

Following the successful selection of a DB contractor and award of a DB contract, the DB contractor must provide these comprehensive submittals to include, but not limited to, the following as previously defined:

a. Final 35 Percent Design Submittal.

b. 65 Percent Design Submittal.

c. 100 Percent Design Submittal.

d. 100% Corrected Final.

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APPENDIX D UNIVERSAL X-RAY ROOM

D-1 GENERAL.

This appendix contains mandatory criteria for Universal X-ray Room design and construction. The Universal X-ray Room is capable of accepting radiographic and fluoroscopic equipment, regardless of manufacturer, with minimal facility modification.

D-1.1 Applications.

The Universal X-ray Room applies to Room Codes XDR01 and XDRF1 (see Appendix B). The DoR selects an X-ray system for a basis of design based on the JSN provided in the PRC. The DoR designs this room to accommodate the selected system, the criteria listed here, NCRP Report No. 147 Structural Shielding for Medical X-Ray Imaging Facilities, and using MilDep specific criteria (TB Med 521, AFI 48-148, etc.).

D-2 SPECIFIC REQUIREMENTS.

D-2.1 Electrical Raceway System.

The Electrical Raceway System includes a floor trench, wall ducts, and ceiling cable trays that meet the criteria listed here, and additional requirements of the X-ray system selected as a basis of design for installation (reference Figures D-1, D-2, and D-3). All raceways and cable trays must be UL-listed (CE for Europe) for enclosure of wiring to all X-ray system components and concealed in floors, walls or above the ceiling.

D-2.2 Floor Trench.

Floor trench is a bottom-type trench duct, with nominal 3.5 in. (89 mm) by 12 in. (300 mm) duct and a 12 in. (300 mm) wide by 1/4 in. (6 mm) thick steel cover plate. Cover plate is installed flush with the floor with the same finish insert as the floor. Provide a gasket on the cover plate to maintain water tightness. Location of floor trench to the radiology table is determined based on the X-ray system selected for the basis of design.

D-2.3 Core Drilling.

Provide oversized conduits below the floor deck in lieu of floor trench when the Universal X-Ray Room is located on a floor other than ground level.

D-2.4 Wall Ducts.

Wall ducts are nominal 3.5 in. (89 mm) by 10. in (250 mm) with 12 in. (300 mm) wide flush-mounted cover plates finished to match the walls. Transition wall ducts to the floor trench or the conduit below the floor deck.

D-2.4.1 Ceiling Cable Trays.

Ceiling cable trays are nominal 3.5 in. (89 mm) by 12 in. (300) with 3 in. (76 mm) load depth National Electrical Manufacturers Association (NEMA) Class 12A ladder type installed above the finished ceiling.

D-2.4.2 Partition Separation.

Provide partitions to separate high- and low-voltage cables in all trenches, ducts, and cable trays.

D-2.5 Electrical Service Requirements.

Provide copper feeder conductors and adequate power service to each Universal X-Ray Room to ensure the X-ray system can be installed without additional facility-related electrical work.

D-2.5.1 Power Quality.

Provide the specified nominal voltage (480 V) +/-5 percent to each Universal X-ray Room. Provide special power conditioning equipment, where required with the X-ray system installation.

D-2.5.2 X-Ray Equipment Service.

Provide 150 ampere, 480Y/277 V, 3 phase (5 wire, neutral, and ground) service to the room. Provide an adjustable trip, 150 ampere, 3 pole, shunt trip circuit breaker in a NEMA 1, flush-mounted enclosure.

D-2.5.3 Emergency Shutdown.

Provide a large, clearly identified push button to actuate the shunt trip circuit breaker to disconnect all power to the X-ray system.

D-2.5.4 Auxiliary Panelboard.

Provide a 120/208 V, single phase, 100 A panelboard with a 50 A shunt trip main breaker to support the single-phase loads in each room. Provide a 20 pole space panelboard with at least two 20 A, 2 pole circuit breakers, and five 20 A, 1 pole circuit breakers. This panelboard may be served from the nearest general-purpose 120/208 V transformer, or a dedicated step-down transformer fed from the 480 V service to the room. Calculations are based on 180 A maximum demand if fed from the 480 V service to the room.

D-2.5.5 Voltage Drop and Regulation.

Ensure total voltage drop in a branch circuit and feeder conductors does not exceed 2 percent from the facility distribution transformer to the Universal X ray Room. Total

voltage regulation of the distribution transformer, feeder, and branch circuit conductors will not exceed 5 percent. For circuits that serve only one room, this calculation is based on the maximum demand current of the single X-ray generator. For circuits that serve more than one room, this calculation is based on the maximum demand current of the two largest rooms. Calculations are based on 180 A minimum demand. Size wiring for a maximum of 1 percent impedance.

D-2.5.6 Distribution Transformers.

Distribution transformers are not dedicated solely to the X-ray system. Voltage regulation is better when an X-ray system is connected to a transformer that is partially loaded with other equipment. Connect X ray systems line to line, never line to neutral.

D-2.5.7 Essential Power.

Provide essential power for X-ray systems, illumination, and duplex receptacles in accordance with the using MilDep guidance documents.

D-3 WARNING LIGHTS.

Provide “X-ray In-Use” warning light outside and above patient entry door. The “X-ray In-Use” light is controlled by applying power to the X-ray system control console. Provide conduit and wiring from the “X-ray in Use” light to the X-ray unit control console.

D-4 OTHER REQUIREMENTS.

D-4.1 Walls.

Provide studs on either side of the vertical electrical raceways. Design walls to support 220 pounds vertical to horizontal pull. Provide double walls between adjacent X-ray rooms. Full height partitions with wall backing and support are required for wall bucky units and control panels, or any wall that supports radiographic and/or fluoroscopic equipment.

D-4.2 Ceiling Support System.

Provide an overhead tube mount support system with a load-bearing capacity of 1000 pounds vertical point load and 50 pounds per square foot uniformly distributed load. Ceiling support system to cover the complete ceiling area of the room. Spanning members are mounted perpendicular to the centerline of the X-ray table and positioned at 25 5/8 in. (67 mm) on center to provide 2 ft (610 mm) of clearance between members. Suspend acoustical ceiling from the spanning members. Bottom of spanning members are flush with the finished ceiling.

D-4.3 Floors.

When a floor trench is utilized, provide appropriately thickened slab to accommodate the floor trench.

D-4.4 Radiology Shielding.

Lead shielding will at a minimum meet the following requirements:

a. The design is certified by the DoR's health physicist to ensure that the required degree of protection is achieved in compliance with NCRP Report No. 147. Certify in accordance with NCRP Report No. 102 and the using MilDep qualified expert guidance. Lead shielding design and certification report is the responsibility of the DoR.

b. Provide Lead shielding of 1/16 in. (1.6 mm) lead or lead equivalent up to 7 ft (2.14 m) above the finished floor. Avoid penetrations through the shielding or mitigate penetrations when necessary.

c. Apply lead shielding to the Universal X-ray Room side of the wall partitions and laminated behind gypsum board for protection. The construction Contractor is responsible for the shielding installation in accordance with the approved plans and specifications and to provide the shielding integrity certification.

D-4.4.1 Additional Requirements.

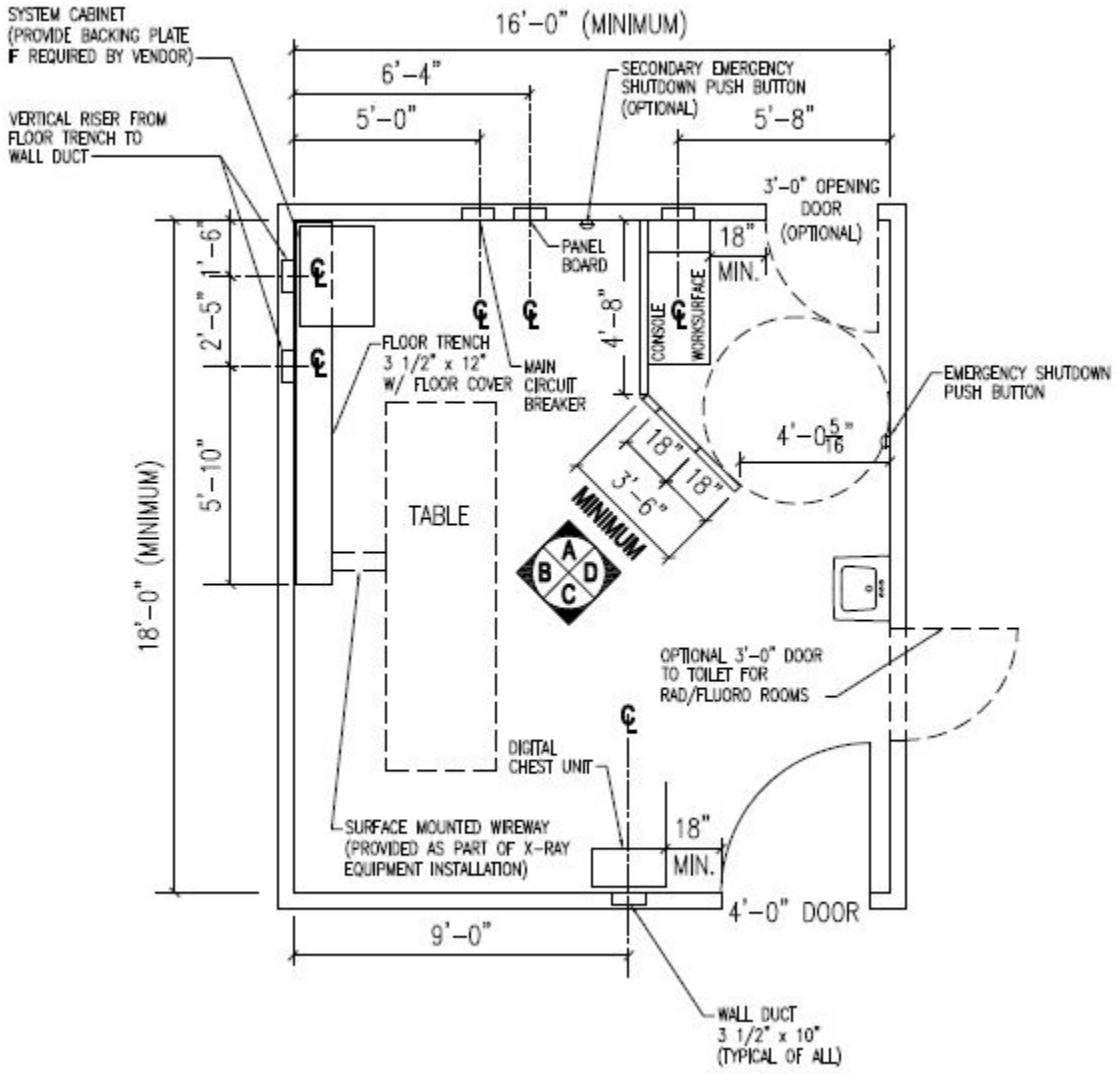
Use built-in or modular shielding for the control booth. Maximize viewing pane(s) where practical so that the operator has an unrestricted view of the patient, wall bucky and x-ray table during all x-ray exposures in the room.

Locate all ductwork, grilles, registers, and diffusers above or flush with the ceiling to avoid conflict with overhead equipment rail travel and shielding. Route thermostat transmission lines to avoid penetration of shielding.

D-4.5 Fire Protection.

Ensure all automatic sprinkler heads are recessed.

Figure D-1 Universal X-ray Room Floor Plan



Note: 1' = 304.5 mm

Figure D-2 Universal X-ray Room Above Ceiling Plan

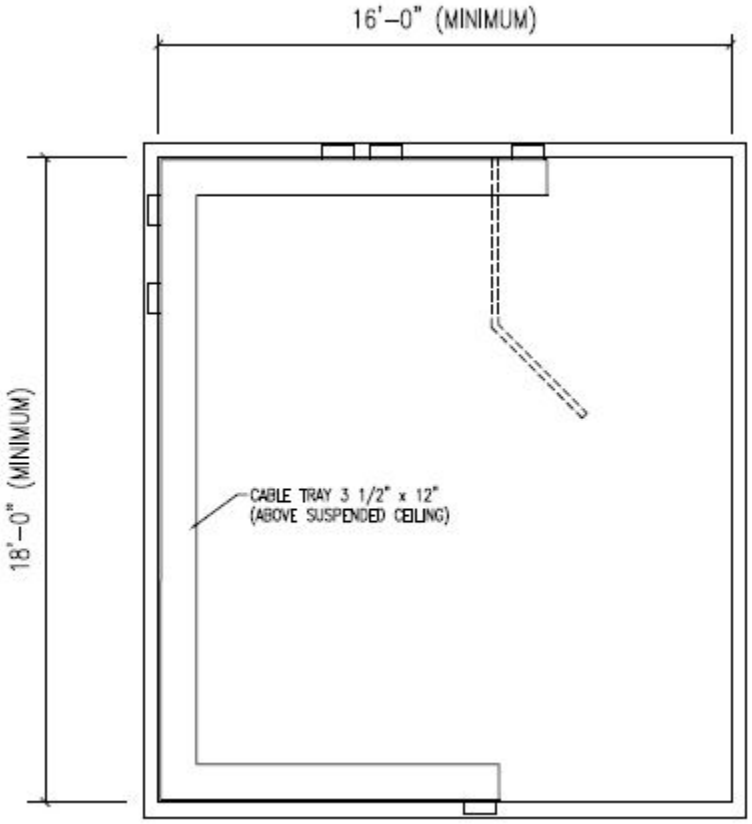
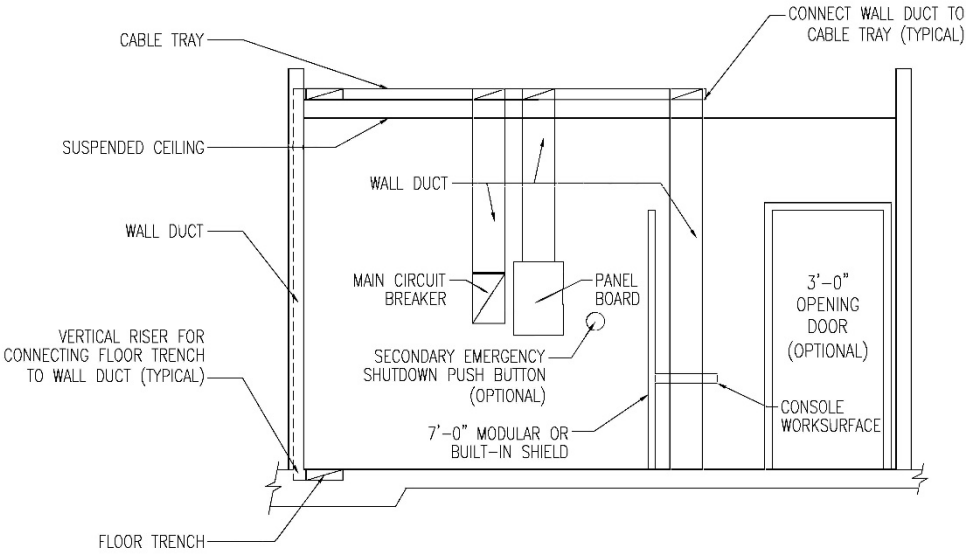
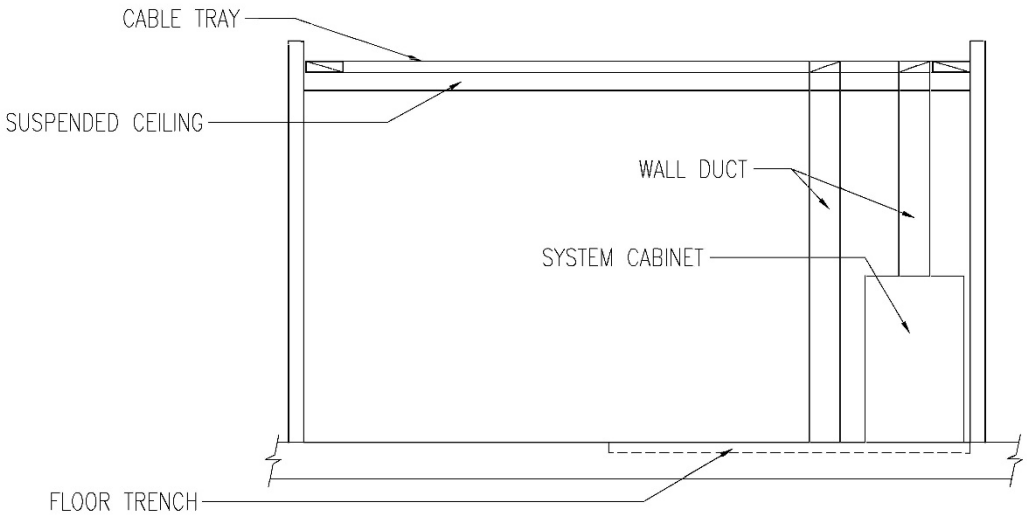


Figure D-3 Universal X-ray Room Elevations

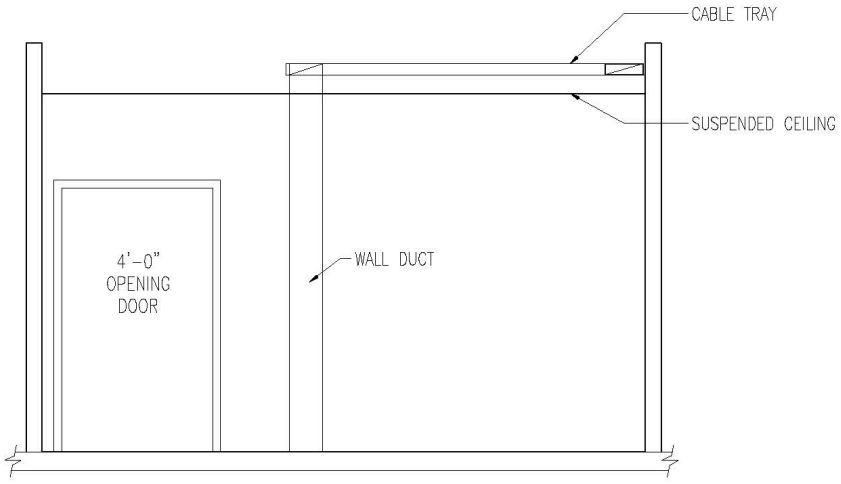


ELEVATION "A"

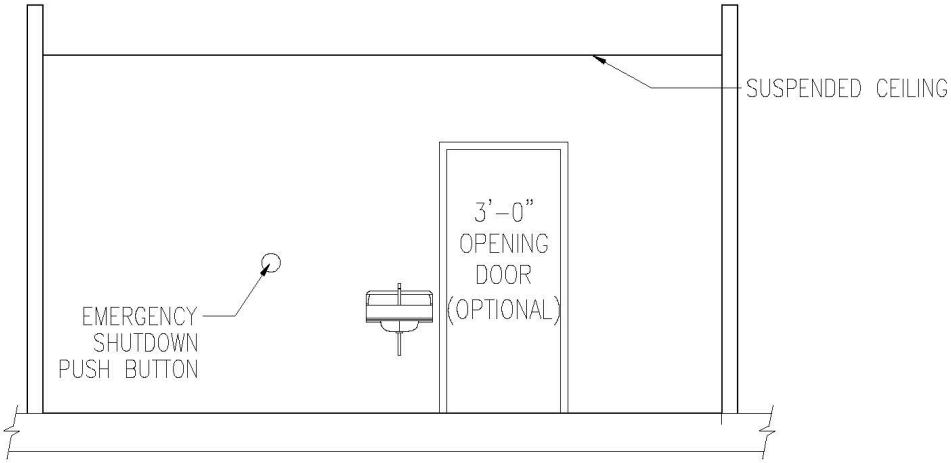


ELEVATION "B"

\4\ Figure D-3 (cont'd) Universal X-ray Room Elevations



ELEVATION "C"



ELEVATION "D"

/4/

APPENDIX E INTERSTITIAL BUILDING SYSTEM (IBS)

E-1 GENERAL.

This appendix provides mandatory criteria for the use and application of IBS concepts, including interstitial utility spaces.

E-2 IBS DESIGN CONCEPT.

The primary concept of interstitial spaces located between functional floor spaces is a non-traditional design feature that permits locating the majority of facility utility distribution and terminal equipment within the interstitial space, and not within functional spaces. This IBS concept offers the DoD several advantages over standard building design in providing convenient installation, maximizing utility access and maintainability, providing for future building flexibility, while minimizing disruption to medical or laboratory services.

E-2.1 DoD Systems Module Concept.

The fundamental approach to interstitial building design in DoD is the DoD Systems Module. The DoD Systems Module organizes building areas into discrete modules, normally defined by major medical department or occupancy boundary, and limited to the size of the relevant smoke compartment as permitted by NFPA 101. Each module is served by equipment, for example, mechanical, electrical, and piping, located in a dedicated utility pod, from which the services are distributed within the confines of the module boundaries via a dedicated distribution zone (interstitial space) and connection zone (above-ceiling space) to the occupied zone (functional space) associated with the respective module. (Refer to Figure E-1.) Having dedicated services for each module, the user has full knowledge of the areas affected by O&M services and by future system modifications. The DoD Systems Module concept also results in greater standardization of major MEP equipment (such as AHUs), reducing the storage of spare parts, and increasing the overall dependability of the systems.

E-2.2 Alternate Non-Modular Concept.

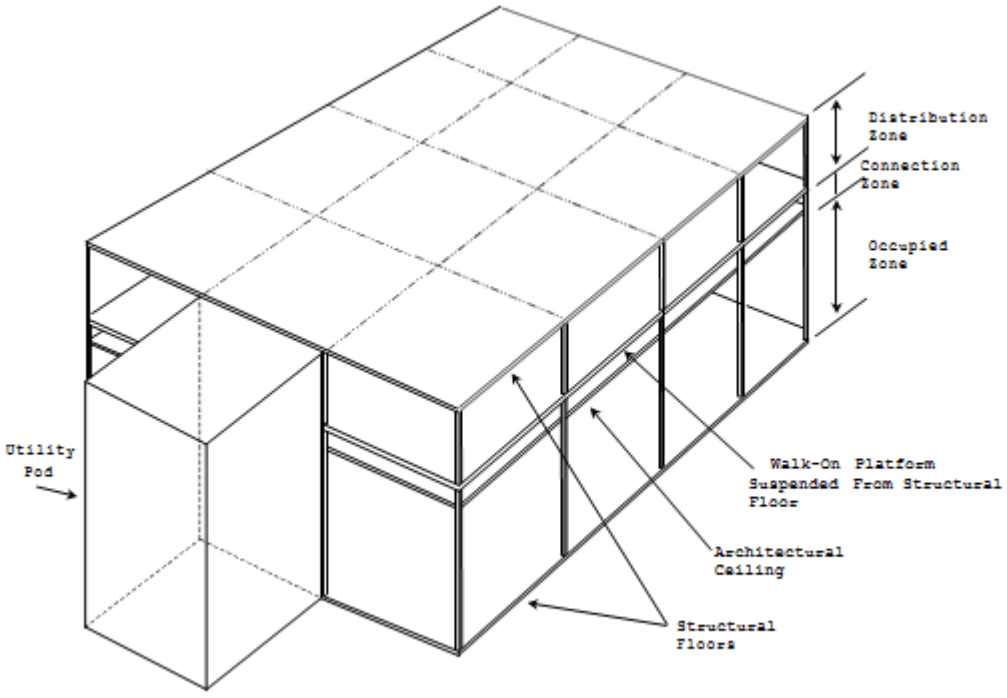
An alternative, non-modular approach, also with interstitial floors for utility distribution, may in some cases be utilized for some types of DoD facilities. In some instances, the DoD Systems Module design concept can be less economical than a non-modular approach, and is not ideally suited for all building types, for example, laboratories, in all locations. The non-modular designs typically differ from the DoD Systems Module in permitting equipment, such as AHUs, to serve different (multiple) functional areas, occupancies, or compartments. This can involve horizontal service distribution to differing parts of the building.

E-2.3 IBS Design Concept Approval.

For any IBS design, incorporate requirements in this appendix including those for construction of the interstitial floor (walk-on platform), utility penetrations, and the

organization of the distribution zone for accessibility and fire safety. Evaluate the decision as to whether an IBS building will follow the DoD Systems Module concept or an alternate non-modular design. Evaluation to occur following the 5 percent design submission and completed by the 20 percent submission. Include an economic comparison with alternatives considered with the 20 percent submission. Also include all costs associated with acquisition, operation, maintenance, and alteration for the designated service life of the proposed facility. Reference Appendix C for submission requirements. Approval of the IBS is documented on the DD Form 1391 as constructable building scope IAW Chapter 3.

Figure E-1 DoD IBS Systems Module (Typical)



TYPICAL SYSTEMS MODULE

E-3 IBS DESIGN.

E-3.1 DoD Systems Module Design.

The DoD Systems Module, a designated unit of space one story in height, is the basic building block of a DoD Systems Module facility, in other words the facility is composed of separately identifiable DoD Systems Modules each consisting of a utility pod, a distribution zone, a connection zone, and an occupied zone. Each DoD Systems Module is served by its own utility distribution systems. The relationship of the various zones is illustrated in Figures E-1 and E-2. Limit DoD Systems Modules to the size permitted by NFPA 101 for the smoke compartment associated with the relevant IBS system module, exclusive of the utility pod. Although there is a spatial discipline

associated with the DoD Systems Module, the overall organization and massing of a facility can be varied according to specific project requirements.

E-3.1.1 Utility Pod.

The utility pod contains AHUs and associated risers, fans, pumps, and other related equipment; electrical and heat exchange equipment; and associated risers serving the DoD Systems Module. Fresh air and exhaust openings are generally part of the utility pod enclosure. The utility pod is the space between two adjacent structural floors or between the highest structural floor and the roof. In multi-story buildings, stack utility pods from floor to floor so that plumbing and electrical risers can be efficiently and economically accommodated.

E-3.1.2 Distribution Zone.

The distribution zone is the space between the walk-on platform and the structural floor or roof above. The maximum height of the distribution zone measured from top of walk-on platform to underside of floor slab above is 9 ft (2.74 m). The distribution zone accommodates the horizontal distribution of main utility systems and provides convenient access to these systems by means of a walk-on platform. Central equipment for mechanical, electrical, plumbing, and communications systems, as well as motorized equipment, is not permitted in the distribution zone. Utility distribution systems enter and leave the utility pod through the distribution zone. Arrange the utilities (piping, ducts, VAV boxes, raceways, conduits, and cable trays) to minimize future modifications of the mains and to accommodate future modifications of branches and laterals. Except for gravity piping services, most systems in the distribution zone down-feed to the connection zone below. Finish the walk-on platform surface, or provide the capability of receiving finish materials, with sufficient bond strength and resistance to abrasion and impact to permit maintenance personnel to walk on the surface without affecting the structural integrity of the platform and without generating a dust problem. Seal all painted concrete surfaces.

E-3.1.3 Connection Zone.

The connection zone is the space between the walk-on platform and the architectural ceiling of the occupied zone below. The connection zone accommodates recessed lighting fixtures, sprinkler piping, and air diffusers and their supports, as well as the horizontal distribution of utilities to individual rooms or spaces. Provide access the connection zone from the occupied zone, usually through the architectural ceiling.

E-3.1.4 Occupied Zone.

The occupied zone is the space of functional activity. The occupied zone is defined by the structural floor and the architectural ceiling above.

E-3.2 Alternate (Non-DoD) IBS Design.

E-3.2.1 Use of Mechanical Rooms or Penthouse.

When utility pods are not provided, AHUs are typically located on the roof (in an enclosed, conditioned penthouse) or on another floor level in a mechanical equipment room. Remotely locating AHUs from the serviced area, compartment, occupancy, or smoke compartment boundary can require vertical distribution of ductwork passing through multiple floors. Also, to reach the intended serviced location, HVAC ductwork may be run horizontally through more than one smoke zone.

E-3.2.2 AHU Serving More Than One Area, Occupancy, or Smoke Zone.

Where air handling systems are designed to serve multiple areas, occupancies, or compartments, design the primary supply and return ductwork to enter each individual smoke zone boundary at a single point. Provide isolation smoke dampers to allow modifications in that smoke compartment to occur without impact on adjacent compartments. Provide smoke dampers, similar to a non-IBS facility, when crossing smoke compartment separation barriers.

E-3.2.3 Duct Smoke Dampers.

Provide smoke dampers in ducts in the distribution zone where a duct serves more than one smoke compartment. Where required, locate the smoke damper in the duct at the approximate location where the smoke barrier is located below in the occupied zone.

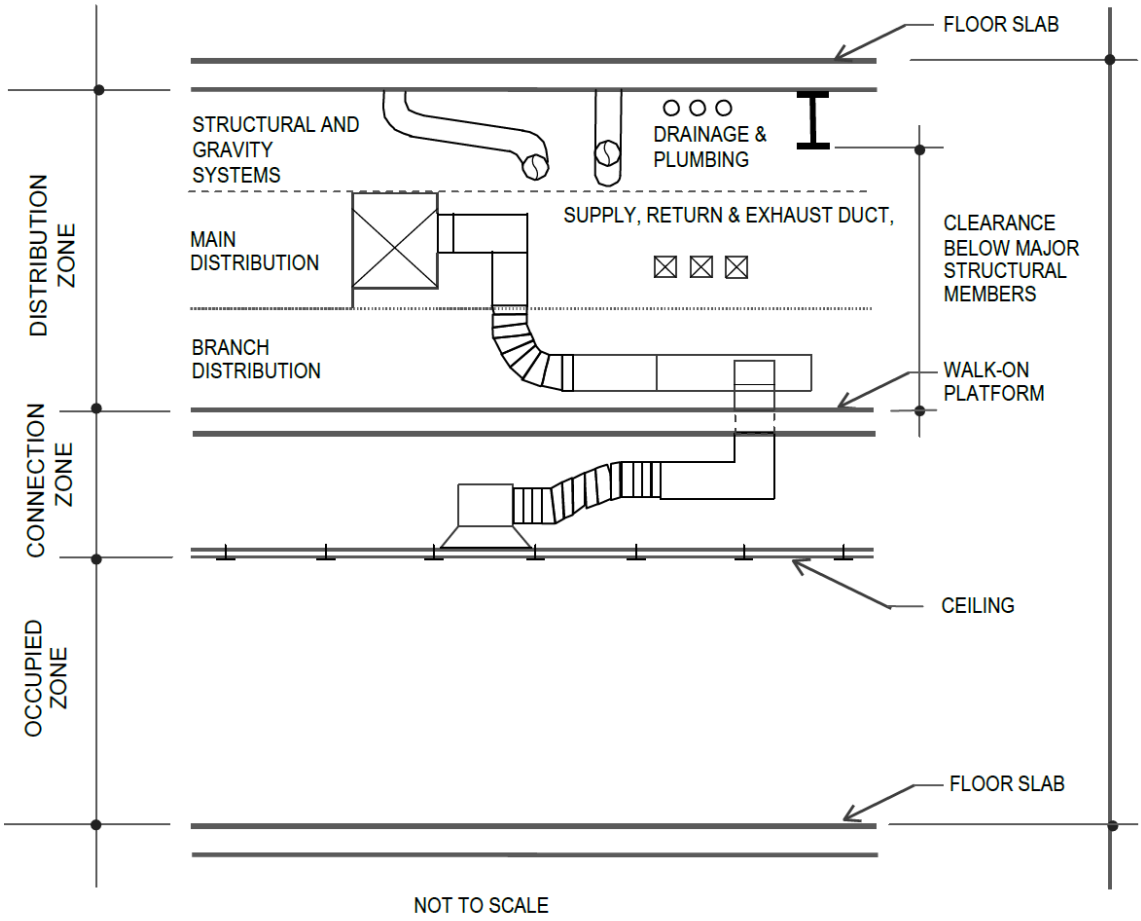
E-3.2.4 Boundary Partitions.

To manage systems distribution, partitions relative to the boundary of the predominant occupancy are required in the same locations of the distribution zone as located below in the occupied zone. This non-rated partition extends from the surface of the walk-on platform to the underside of the occupied zone above. This partition is required to maintain the separation of the support area relative to the boundaries of only the predominant occupancies, rather than every possible occupancy separation. In addition to utility management, another benefit is the added perimeter wall space for locating additional means of egress paths for the distribution zone.

E-3.3 General IBS Design Requirements.

Design requirements for the distribution zone, connection zone, and occupied zone are the same as defined and described for DoD Systems Module designs. Arrangement of IBS elements must be in accordance with Figure E-2.

Figure E-2 Interstitial Design Elements



E-3.3.1 Exceptions.

As early as possible in the design process, but no later than the 20 percent design submittal, identify any spaces or uses within a facility's proposed design that would either prevent, or otherwise negatively impact, the use of walk-on platforms. Spaces to consider include (but are not limited to) sloped floor areas; high-ceiling spaces, for example, auditoriums, high-pile storage, and atria; and MRI suites where equipment weight or unusual structural requirements may be applicable.

E-3.3.2 Number of Stories.

The walk-on platform constitutes the floor of the distribution zone. A walk-on platform does not constitute an independent story. Each occupied zone and the corresponding distribution zone are counted together as an independent floor (for the purpose of determining the number of stories).

E-3.3.3 Facility Expansion.

In DoD Systems Module buildings, place utility pods so not to encumber vertical or horizontal facility expansion.

E-3.3.4 Existing Facilities.

When an IBS facility is to be connected to an existing conventional facility, design concerns may arise. Existing floor-to-floor heights are typically less than the heights required for IBS construction. Therefore, alignment of new floors with existing floors is required. Continuity with existing facilities cannot be hastily assumed to preclude application of the IBS design concepts.

E-3.3.5 System and Equipment Capacity Increases.

Oversize utility systems to accommodate future changes. Design AHUs and ducts to have their capacities increased for future demand growth by a minimum of 15 percent. Design the distribution systems to accommodate a degree of capacity increase. During initial design, the Design and Construction Agent and the DoD Project Sponsor are to jointly determine the extent of system and equipment capacity increases required.

E-3.3.6 Distribution Zone Accessibility.

Provide means of egress paths on the walk-on platform throughout the distribution zone. All means of egress paths accommodate ease of access for maintenance and provide a defined means of egress. Provide available vertical space clearances within the distribution zone to permit the organization of the utility distribution systems for ease of accessibility. (Refer to Figure E-3.) It may not be practical to arrange the distribution zone for complete accessibility to every component. However, it is important to examine the various accessibility requirements to best locate means of egress paths to reach all main systems, feeders, connections, and maintainable equipment. Provide paths unobstructed by utility lines or other equipment. Provide sufficient clearance within the means of egress paths for a worker to stand, exclusive of major structural members. Additionally, clearly mark walking surfaces for means of egress paths which are to be clear from dust and debris. Access to the distribution zone is to be from adjacent stairs and, in multi-story facilities, from key-operated service elevators designed to stop at the walk-on platform levels. No access to the distribution zone will be permitted through access panels from the connection zone.

E-3.4 General IBS Mechanical and Plumbing Requirements.

E-3.4.1 Riser Locations.

In DoD Systems Module designs, risers and vertical circulation elements not located in the utility pods must be located at the boundaries of the DoD Systems Modules adjacent to permanent structural elements, stairs, or elevators.

Figure E-3 Interstitial Access-Egress (Typical)

E-3.4.2 Valves.

Locate control valves, except those required to be in the occupied zone such as medical gas control valves, in utility pods or equipment rooms to permit centralized control. Tag and identify shut-off and balancing valves located in the distribution zone and identify on a valve list that shows their distribution zone locations and the areas or equipment served in the occupied zone. Do not locate valves in the connection zone for any utility system unless specifically permitted by the DoD Project Sponsor.

E-3.4.3 Systems Expandability.

Select prime moving equipment, for example, pumps and fans, for operation at the midpoint of their operating characteristic curves. Size ducts and piping to permit future flow increases. Provide stubs, valves, and caps in plumbing risers and in horizontal branch terminations for future service extensions.

E-3.4.4 Air Handling System Selection.

Base system selection on functional needs, LCCA, energy efficiency, and ease of maintenance and repair. To enhance maintainability, it is normally desirable to "standardize" the size of AHUs when practical from a performance standpoint. For example, several AHUs of the same unit size and motor horsepower allow economy in the stocking of spare parts. Select "Off-the-shelf" packaged AHUs in lieu of custom manufactured units to ensure parts availability and ease of future modification.

E-3.4.5 Ventilation of Distribution Zone.

Under normal conditions, fresh air is not required in the distribution zone. However, if determined by the designers, ventilation may be required for moisture or temperature control in distribution zones exposed to roofs.

E-3.4.6 Gravity Systems in IBS Facilities.

Design the location and elevation of sloped gravity piping to maximize the access around the piping. Do not block designated access pathways.

E-3.5 General IBS Electrical and Communications Equipment.

E-3.5.1 Distribution Systems.

Base the distribution system routing (horizontal and vertical) and the quantity and location of unit substations on the size of the facility, LCCA, overall flexibility, and long-term system reliability. Compare the benefits of underground (or crawlspace) utility service distribution to the utility pods with service distribution through the distribution zones considering flexibility, reliability, system maintainability, and safety.

E-3.5.2 Electrical Room Locations.

In all IBS designs, stack electrical rooms to the extent feasible. In DoD Systems Module design facilities, locate electrical rooms in the utility pods and stack vertically from floor to floor. Provide provisions for easily running vertical cabling from floor to floor, for example separate/independent conduit risers with pull boxes at each distribution zone. (Refer to Chapter 11.) Size cabling and wiring for allowable voltage drop at full design load.

Evaluate the need for additional electrical rooms, located at opposite ends of the DoD Systems Modules from the utility pods, for maintenance of acceptable voltage drops, reasonable lengths of secondary cable runs, and numbers of devices per circuit. Locate additional rooms in the occupied zones adjacent to permanent structural elements, stairs, or elevators, and stack vertically from floor to floor.

E-3.5.3 Capacities for Flexibility.

Base capacities of major electrical components, such as main distribution panels and transformers, on the areas served, rather than specific use, to allow for flexibility.

E-3.5.4 Electrical Secondary Distribution.

Route branch circuiting through the distribution zone to allow for modification with minimal disruption of the occupied zone. Distribute electrical systems wiring through totally enclosed cable trays. Provide ground continuity throughout the cable tray system. Design cable trays with space dedicated in the distribution zone for future cable trays.

E-3.5.5 Communications Systems Distribution.

Use cable trays to distribute communications systems wiring. Provide ground continuity throughout the cable tray system.

E-3.5.6 Identification.

Provide coded identification of electrical raceway and junction boxes by voltage and function at 40 ft (12 m) intervals and on junction boxes. Provide circuit identification for electrical wiring and system identification for communications wiring.

E-3.5.7 Lighting.

Provide 50 lux of lighting throughout the distribution zone. Provide one hundred 50 lux over access-egress pathways and at distribution zone elevator lobbies using damage-resistant lighting fixtures. Additionally, provide egress lighting and exit signs over access-egress paths and at distribution zone exits as indicated in “Means of Egress Paths” of this appendix. Provide switches at each distribution zone entry and exit.

E-3.5.8 Power.

Provide specification-grade, heavy-duty, ground fault-protected electrical outlets in the distribution zone for use with portable tools and located to accommodate maximum 50-foot extension cords.

E-3.6 General IBS Fire Protection Design.

Design the fire protection and life safety features for facilities using IBS with the same codes and standards applicable to any non-interstitial facility. The IBS criteria noted here are based upon two special studies conducted by the National Institute of Standards and Technology (NIST)—one in May 1985 (NBSIR 85-3158) and the other in February 1995 (NISTIR 5560). The criteria herein have been coordinated with the requirements of the referenced codes and standards to accommodate the non-traditional characteristics of the interstitial building approach. Proposed designs that vary from the special studies will require a new fire test in accordance with NFPA 251.

Note that the use of engineering evaluation in lieu of fire tests is not permitted. Where variations between this standard and other applicable codes and standards occur, the fire safety design requirements for interstitial facilities indicated herein must govern; however, do not apply this document in such a manner as to exempt NFPA 101 or other applicable code requirements.

E-3.6.1 Occupancy.

The distribution zone is a “normally unoccupied building service equipment support area” (NUBSESA) as defined by NFPA 101. All IBS distribution zones and interstitial spaces are NUBSESA and compliance with NFPA 101 is required as modified in this appendix.

E-3.6.2 Smoke Compartmentation.

In all IBS building designs, provide smoke barrier separation for smoke compartmentation for occupied and connection zones. Smoke compartmentation is not required for the distribution zone in an interstitial floor.

In DoD Systems Module designs, the integration of facility building modules with NFPA smoke compartmentation requirements is a basic fire protection/life safety principle of this non-traditional building concept. When applying NFPA 101, the modular configuration of the DoD Systems Module approach becomes a significant benefit because compartmentation is a natural byproduct.

E-3.6.3 Floor-to-Floor Fire Separation.

A two-hour fire separation is required between each functional floor level for IBS facilities. The functional floors are separated by a fire-resistive “floor/ceiling” assembly. The limits of each floor/ceiling assembly are defined by the bottom of the walk-on platform and the top of the structural floor above. In the DoD Systems Module concept, the fire resistance rating runs in a horizontal plane along the utility pod floor, then vertically along the wall separating the utility pod from the occupied zone and connection zone. The fire resistance rating then continues along the walk-on platform to the outside wall. The walk-on platform of the distribution zone must be designed in accordance with NBSIR 85-3158. Figure E-4 illustrates fire protection for the DoD Systems Module concept. The same figure is applicable to alternative non-modular designs, except the Utility Pods are not utilized.

E-3.6.3.1 Occupied Zone.

Provide smoke barriers requirement of NFPA 101 for the occupied zone.

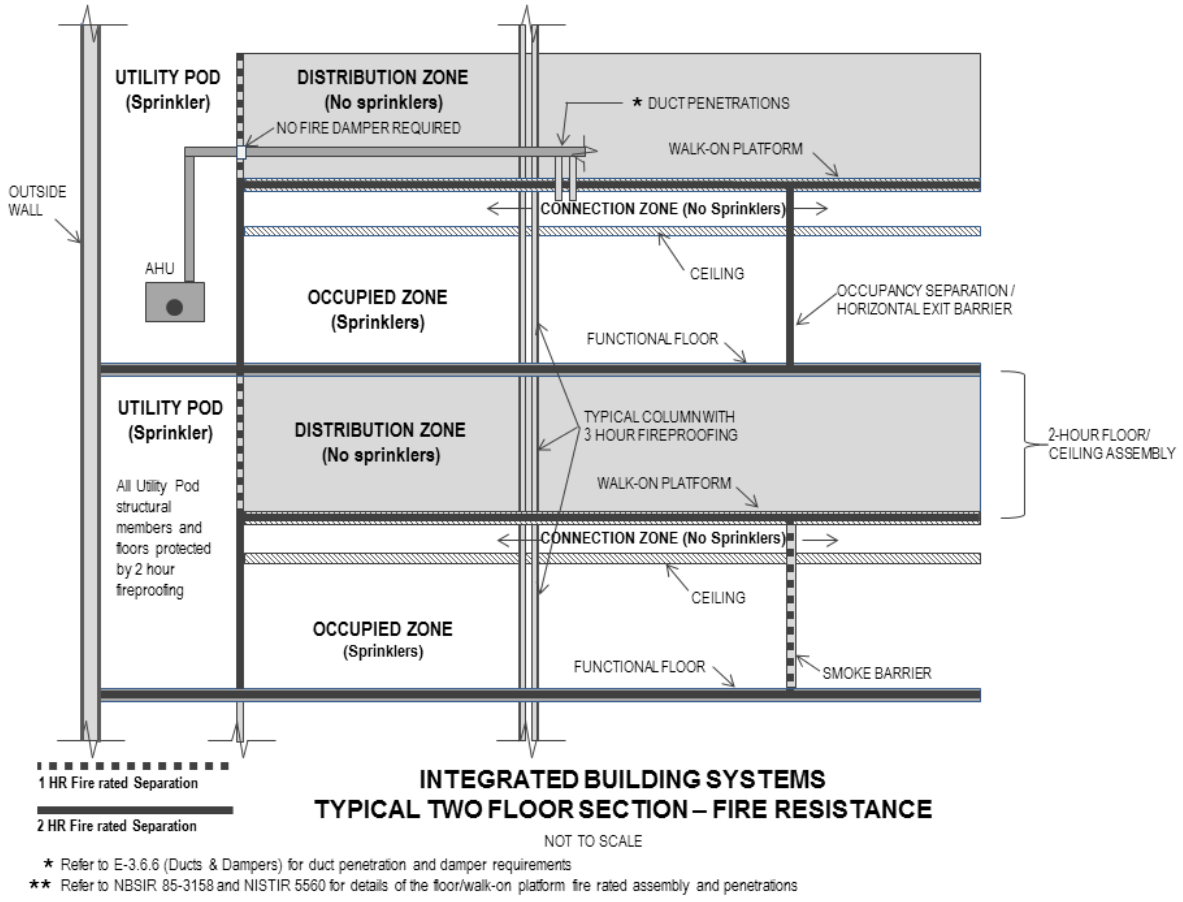
Extend all barriers and partitions with fire-resistive ratings of two hours or less to the bottom of the walk-on platform.

E-3.6.3.2 Distribution Zone.

Dividing the distribution zone into smoke compartments with smoke barriers is not required.

In DoD Systems Module design facilities, horizontal exit, occupancy separation, or smoke barrier walls located in the occupied/connection zone need not be extended up into the distribution zone.

Figure E-4 DoD Systems Module Typical Two Floor Section – Fire Protection



E-3.6.3.3 DoD Systems Module Utility Pods.

Separate utility pods from the distribution zones by one-hour fire-rated construction and from the occupied and connection zones by two-hour fire-resistive construction. **\1\ /1/** Provide a two-hour fire resistive rating for the structural members in the utility pod.

Clearly identify the limits of the connection zone, occupied zone, and the distribution zone from the utility pod, particularly with respect to delineation of one- and two-hour fire-rated assemblies.

E-3.6.4 Structural Members Fire Protection.

Results of NBSIR 85-3158 determined that all structural steel within the interstitial space (distribution zone), except the columns, is adequately protected from the effects of fire for a minimum duration of two hours by the walk-on platform/interstitial space arrangement without any fireproofing directly applied to the structural steel within the tested interstitial space. Structural steel within the distribution zone (interstitial space) includes structural members supporting the walk-on platform. **\1\ /1/** Provide all columns with three-hour fire-resistive rating within all zones.

Provide a two-hour fire-resistive rating or protect in accordance with the fire resistance requirements of IBC for all primary structural members (supporting more than one floor) located within the distribution zone, such as girders and trusses. Do not fireproof secondary structural members (supporting only one floor) within the distribution zone. Lateral and seismic bracing within the distribution zone need not be fireproofed provided these members do not carry vertical loads (live or dead).

E-3.6.5 Openings.

To prevent fire and smoke migration into the distribution zone, protect openings through the walk-on platform as noted here: **\1**

E-3.6.5.1 Firestop.

/1/ Firestop all penetrations, for example, ducts, pipe, cables, and conduit, at the walk-on platform with approved material in accordance with NBSIR 85-3158 or with an approved through-penetration protection system. Incorporate all proposed designs with utility penetrations of the walk-on platform by one of the following methods of firestopping:

a. Approved firestopping material using materials from the NBSIR 85-3158.

b. A listed through penetration assembly for the proposed walk-on platform design.

c. A tested system that complies with ASTM E814 or ANSI/UL 1479 for the proposed walk-on platform. **\1**

E-3.6.6 Shafts.

/1/ Enclose shafts in properly rated construction and tightly seal the full perimeter of the penetration at the walk-on platform in accordance with NBSIR 85-3158 or with an approved through-penetration protection system.

E-3.6.7 Ducts and Dampers.

E-3.6.7.1 One-hour Rated Partitions.

Fire dampers are not required where ducts penetrate the one-hour fire-rated partition between the utility pod and the distribution zone.

E-3.6.7.2 Two-hour Rated Partitions.

Fire dampers are required where ducts penetrate two-hour fire-rated partitions between the utility pod and the occupied and connection zones.

E-3.6.7.3 Walk-on Platform Limitations on Unprotected Penetrations.

Do not exceed .98 percent for the total cumulative open space created by unprotected duct penetrations in the walk-on platform above any single smoke compartment or room in the occupied zone. NOTE: this includes annular space between duct and the inside edge of the walk on platform opening. This limit is provided as a design control feature to prevent over penetrating a given area of walk-on platform with un-dampered duct penetrations. The 0.98 percent value is based upon the percentage used in NBSIR 85-3158 and has been coordinated with TJC. Comply with the following paragraph for Individual duct penetrations.

E-3.6.7.4 Walk-on Platform Duct Openings.

Provide fire dampers for duct penetrations greater than 225 in^2 (0.14 m^2) in the walk-on platform. Fire dampers are not required in ducts for openings in the walk-on platform less than or equal to 225 square in^2 (0.14 m^2). This includes supply ducts from the distribution zone to the occupied zone, exhaust ducts, and return ducts from the occupied zone to the distribution zone. Flexible, round duct work (UL 181, Class I) is permitted in interstitial space for connections less than 5 ft (1.52 m) long, but not larger than 12 in. (305 mm) in diameter.

E-3.6.8 Automatic Sprinkler Protection.

Provide an approved automatic supervised sprinkler protection as defined by NFPA 101, throughout the occupied zone and, in DoD Systems Module facilities, in the utility pod. Sprinkler protection is not required throughout the distribution zone or connection zone unless otherwise required by UFC 3-600-01. However, sprinkler protection is required in rooms being used for electrical, communications, and elevator machine equipment, as well as over automatic box conveyor rails and tracks for electric track vehicle systems when located within the distribution zone.

E-3.6.9 Standpipe Protection.

Provide standpipe protection in accordance with UFC 3-600-01. In addition, provide hose outlets at each entrance to the distribution zone exit/access door.

E-3.6.10 Management of Smoke.

Evaluate each facility on an individual basis for the requirements for a smoke management system. Provide a means for purging the distribution zone of smoke and other products of combustion for post-fire operations.

E-3.6.11 Fire Alarm, Fire Detection, and Mass Notification.

Provide fire alarm, fire detection, and mass notification in accordance with Chapter 14. In addition, align system supervision and alarm zoning with the fire and smoke compartments associated with the IBS design. Identify the fire alarm and fire detection devices located in the distribution zone as a subset of the fire alarm evacuation system.

E-3.6.11.1 Manual Alarm Initiation.

Provide a manual pull station provided in the distribution zone at each exit/access door. Coordinate zoning for annunciation with the exit enclosure serving the occupied zone exit/access.

E-3.6.11.2 Occupant Notification.

Provide alarm notification appliances (speakers) utilizing voice evacuation for occupant notification throughout the distribution zone. Activate the alarm notification appliances within the corresponding distribution zone, upon any alarm initiating signal. Provide supplemental visual notification (signaling) in accordance with NFPA 72 along the means of egress paths.

E-3.6.11.3 Smoke Detection.

Provide smoke detection at each elevator access landing in the distribution zone. Connect the smoke detector(s) to the elevator controls and provide elevator response per NFPA 101.

E-3.6.12 Distribution Zone.

Storage is not permitted in the distribution zone.

E-3.6.12.1 Exit/Access.

Exiting from the distribution zone is provided by a side-hinged swinging door assembly located in each exit stairway enclosure. The exit/access door is the primary means of egress for distribution zone occupants and compliance with the exit and ease of operability requirements of NFPA 80 and 101 is required. Provide a door assembly with a minimum width of 36 in. (915 mm) and height of 80 in. (2030 mm). Provide a door which is lockable, self-closing, positive latching, and accessible only by key. Provide a sign on each access door stating: “Storage in This Area is Prohibited by Order of the Fire Marshall.” Provide a similar sign inside the distribution zone.

E-3.6.12.2 Means of Egress Paths.

Provide a designated means of egress path throughout the distribution zone space in accordance with NFPA 101. Any means of egress path connecting the exit/access doors are required at the perimeter of the distribution zone. Provide egress travel along means of egress paths not to exceed 100 ft (30 m) before two separate and distinct means of egress paths of travel to two remote exits are available. Additionally, provide means of egress paths within 25 ft (7.6 m) of any portion of the distribution zone where the only available access requires crossing over or under obstructions or distribution equipment. The minimum clear width for all paths is 36 in. (915 mm), except paths of existing distribution zones which maintain a minimum clear width of 28 in. (710 mm). Provide paths which are nominally level with thresholds and elevation changes in accordance with NFPA 101.

Delineate paths for the full 36 in. (915 mm) width on the surface of the walk-on platform from the most remote point to the exit/access door. Paint paths yellow with direction arrows or cross-hatching indicating direction to each exit/access door. Treat paths with a surface sealant prior to painting. **\1\ /1/** Illuminate exit signs and locate at each exit/access door. Provide an exit sign adjacent to the doorway within 36 in. (915 mm) of the walk-on platform. Locate exit signs along the pathways to provide clear direction toward exits. Provide exit signs in accordance with NFPA 101 for size and illumination requirements.

E-3.6.12.3 IBS Headroom Clearance.

Provide a designated means of egress path with a minimum headroom clearance of 80 in. (2032 mm) and maintained along the entire designated pathway, exclusive of interferences from major structural members. Headroom clearance may be reduced to 72 in. (1828 mm) for no more than 36 in. (915 mm) along any given path. The minimum spacing between each location with limited headroom clearances must be 36 in. (915 mm).

E-3.6.12.4 Exit Signage and Egress Lighting.

Provide exit signage and egress lighting on the life safety circuits and provide with standby or emergency power. Since the distribution zone space is normally unoccupied, separate keyed-alike key-operated light switches (for normal lighting, egress lighting, and exit sign lighting) located at each access doorway activates normal lighting, egress illumination, and exit sign illumination within the module in accordance with NFPA 70 switch requirements for control of emergency lighting circuits to minimize electrical usage and replacement of lamps in the distribution zone.

E-3.6.13 Variations.

In the event a variation from applicable IBS criteria herein is considered, provide documentation to justify the need and identify alternate solutions. Solutions may include equivalent concepts. Support all documentation with sound engineering

principles that are economically feasible and practical to apply. Address and obtain approval of all variations with the Design and Construction Agent prior to incorporation into the design. Interstitial floor construction characteristics, including the features, properties, and attachment methods of structural support members, walk-on deck materials and properties, and limitations and characterization of allowable deck penetrations, to be in accordance with the referenced NIST-tested assemblies. Where the proposed interstitial design does not replicate NIST tested assemblies, demonstrate structural and thermodynamic equivalency by full-scale testing in accordance with NFPA 251.

E-3.7 Documentation and Construction Considerations.

E-3.7.1 Construction Documentation.

Provide drawings for IBS facilities to include plans and sections delineating zones reserved for utility distribution, branches, and laterals. Drawing information must indicate location of all utility system walk-on platform penetrations and include installation details for each type of utility system penetration. Coordinate drawings with all disciplines. Provide interdisciplinary cross-sections at critical locations, for example, above ORs, equipment rooms, and corridors. Include requirements for coordination of all disciplines prior to construction in all pertinent specification sections.

E-3.7.2 Pre-Bid Conferences.

To ensure that construction contractors take the IBS DoD Systems Module design concepts into account when preparing bids, recommend presentations of these concepts for pre-bid conferences conducted by the Design and Construction Agent.

E-3.7.3 Pre-Construction Consideration.

For a DoD Systems Module construction project, construct a mock-up distribution zone at least 1000 ft^2 (93 m^2) in area at the project site, at the discretion of the Design and Construction Agent. Include a complete walk-on platform assembly with suspension members for the mock-up. Within the sample, include elements of the utility systems within the distribution zone. Complete construction of the mock-up in advance of facility construction to allow time for necessary testing and approval. Address and finalize various construction details within the mock-up, such as temporary protection of the walk-on platform during construction, proper support and sealing of ducts and fire dampers at walk-on platform penetrations, and permanent fire sealing of the walk-on platform to abutting walls and other permanent structural elements.

E-3.7.4 Coordination Drawings.

Provide coordination drawings prior to construction that show all utilities and penetrations. Include this information in the record drawings indicating the as-built conditions.

APPENDIX F FOOD SERVICE

F-1 GENERAL.

This appendix provides criteria and guidance for the design and development of food service systems in new and existing applicable facilities. The appendix includes lessons learned from using MilDep consultants and Post-Occupancy Evaluations for the purpose of minimizing errors on all future projects.

F-2 CONSULTING SERVICES.

The A/E of record shall provide the services of a qualified hospital food service consultant at project initiation, who provides design function, flow and equipment input throughout the design process. The consultant also provides input on equipment specifications and cost estimates of the equipment. A qualified food service consultant is one who has been in business solely as a food facilities design professional for a period of not less than five years and is a member of the Food Service Consultants Society International (FCSI) or equal. The consultant shall not be involved in the sale, installation, distribution, manufacture, or representation of food service equipment. Furthermore, the consultant should have experience with similar projects scope, size, and location for the specific project.

F-3 FOOD SERVICE DESIGN OBJECTIVES.

F-3.1 Environment.

Provide a functional, efficient, and aesthetically pleasing food and nutrition environment for patients, service members, staff, and guests, within staffing, budgetary guidelines, and space requirements. This includes a functional, efficient patient tray assembly area designed to provide room service style patient feeding.

F-3.2 Design Elements.

Design nutrition services (or patient and staff feeding) facilities that optimize the performance of existing personnel, the facility, and the equipment, while producing high-quality nutrition care services and products. The design shall incorporate evidence based design (EBD) elements, such as access to outdoor dining, access to natural views, a variety of spaces for social, dining, and collaborative engagement among patients, family, and staff, and providing positive distractions in all public spaces. Design patient tray assembly area to efficiently support room service style patient feeding, please refer to F-4.5. Give highest priority to colocation of all food service spaces and functions on one level. Requirements for food preparation spaces include proper temperature control, ventilation, and to the extent possible, minimizing the distance required to transport food products and finished food items from the point of preparation and cooking to the point of service.

Collocate and make accessible the pot and pan room and dishroom to the patient tray service and dining facility preparation areas.

F-3.3 Design Flexibility.

Design a food service system with the ability to adapt readily to changing missions, requirements, food preparation processes, labor conditions, and equipment technology.

This objective requires forethought from the DoD Project Sponsor, end user, and food service consultant. Recommended methods to build flexibility into the design include planning multiple sources of power with additional electrical capacity incorporating dual use equipment and integrating information technology effectively. Design the dining area to maximize the projected seating capacity without sharing with non-food service departments, allow for flexibility to accommodate various sized groups as needed within the dining area, and provide a clear flow of traffic into and out of the dining area. Design the servery, dining area, cash registers and condiments bar as securable, discrete areas during non-operational hours.

F-3.4 Equipment.

Provide high-quality food service equipment that is manufactured in the United States (or as designated by regional requirements in OCONUS locations) and sized to accommodate the maximum capacity of the expected growth of the facility at the time of design. Provide dual functional equipment when possible, for example, a serving line capable of being self-serve or full service; a serving line with the capability to hold hot or cold food for service. Select and incorporate equipment into the design to create an efficient flow of materials and personnel. Custom-fabricated equipment is permitted in the servery, walk-in refrigeration and freezers, and space-restricted equipment; specified modular equipment must be easily disassembled and reassembled by the end user and must be off of the floor and or on wheels or coasters for ease of movement for cleaning and reconfiguration. Equipment must also be designed and built for ease of sanitation and food safety measures. Large equipment installed, custom fabricated or not, must be designed such that it can be removed and replaced at the end of its life cycle without having to execute major facility construction to widen doorways, open walls, or move other installed equipment during the removal/replacement process [or] all equipment included in the design must have the ability to be disassembled with minimal effort for removal through existing doorways, elevators, etc.

F-3.5 Energy Efficiency and Sustainability.

Consider energy efficiency and sustainability in the design. Incorporate sustainable design features and requirements including daylighting, energy and water conservation measures, the use of nontoxic materials and finishes, and sustainable O&M practices. Incorporate space and equipment to maximize waste reduction, reuse, recycling, and composting in accordance with UFC 1-200-01 and local installation requirements. Prior to design, the contractor must verify that the community can support the recommended sustainability practices. Incorporate a blend of reusable dishware and other food service-related disposables.

F-3.6 Food Service Systems.

The basis of physical planning constitutes three food service system: ready prepared, cook/serve, and Grab and Go or a mix thereof. Most facilities have a mix of food systems utilizing a conventional flow of food. See the Functional Diagrams depicting flows for the various food service systems in the DoD Space Planning Criteria Chapter 510 Food Service.

F-4 DESIGN CRITERIA.

F-4.1 Design.

In food service design: (1) provide movement of food products to ensure effective monitoring and control of food temperatures through conventional flow while minimizing personnel cross-traffic, backtracking, and queuing conditions; (2) incorporate the Food and Drug Administration (FDA) Hazard Analysis and Critical Control Points (HACCP) system, and the Tri-Service Food Code (TSFC) to ensure food safety. The DoR and food service design consultant, at the 35 percent submittal, provide schematic plans; circulation paths from servery to seating, loading dock to storage, and kitchen to inpatient units; general material movement; principal dimensions; and dining seating counts in accordance with current DoD Space Planning Criteria Chapter 510 Food Service.

F-4.2 Configuration.

Use a rectangular general configuration of the food service operation to optimize use of space. Provide capacity to close off and secure the food storage areas, food service preparation, servery area, cash registers and cash control room from the public area after normal operational serving times. The food storage areas should have limited access to required personnel. Individual controlled access (card readers) is required on all walk-in refrigerators and freezers in addition to all storage rooms. Configuration provides an efficient flow of products from storage to preparation, to service in the servery and the patient tray assembly areas. The servery accommodates large numbers of customers in short periods of time and be configured to support prominent display of healthy/nutrient dense food and beverage options and less prominent display of less healthy/low nutrient density foods. Utilize a scatter, hollow square, or scramble servery design. Supply beverage stands with water sources and piggyback soda fountain conduit. Serving stations must require extensive planning based on input from the DoD Nutrition Committee, and the local end user, as well as coordination with the DOD Space Planning Criteria Chapter 510 Food Service, and Chapter 13.

F-4.3 Staging.

Collocate food service storage areas with the food service operation. Provide a dedicated food service dock that distinctly separates “dirty” and “clean” receiving. For the receiving area, provide adequate space and associated utility connections for a large, digital read out platform scale. The food service operations and receiving areas

must fully comply with HACCP principles and the TSFC. With respect to food safety, consider staging refrigerators and freezers near the loading dock to minimize elevation in food temperature. Provide a transportation and handling study during the planning stage that addresses the transportation of foods, food products, and food material throughout the medical facility to include recycling and holding, trash compaction, paths of travel, efficiencies in operations and locations, and waste management associated with food service. Refer to Chapter 17 for coordinated information related to transportation and waste management requirements. All supply areas where pallet jacks are used must have corridors that are a minimum width of 6 ft (1.83 m), and door design must accommodate pallet jacks. Food storage areas must be limited to authorized personnel for food security, safety, and accountability purposes. Designs must not have open access to all nutrition staff members.

F-4.4 Refrigerator and Freezer.

Connect all refrigerators and freezers to a single control panel with corresponding temperature readouts. Fit all refrigerators with a visual and audio alarm that annunciates in the Food Service Department and in the Facility Management Control Room and off duty personnel. Equip all refrigerator systems with temperature gauges located outside the entrance of the walk-in unit. Design must accommodate walk-in access to freezers directly via a walk-in refrigerator for optimal temperature control, and door design must accommodate pallet jacks. Locate compressors in close proximity to the refrigeration system, in a ventilated room with a floor drain and hose bibb. Refer to Chapter 10 for ventilation criteria. Label compressors with the refrigeration unit(s) they service. When using chilled water backup, include, a redundant pump to avoid refrigeration and freezer compressor damage and food product loss. All refrigeration and freezer units must be placed on an equipment EPS to provide department functionality during periods of crisis. Refer to Chapter 11 and Appendix B for emergency power requirements.

F-4.5 Patient Tray Assembly.

Patient Tray Assembly area must be designed to support Patient Room Service. Patient Room Service allows patients to call a dedicated call center that receives patient meal orders. Patients may order meals anytime between established hours (typically between 0600-1800). Meals are prepared and delivered on-demand within a specified time after the patient calls (typically 40 minutes). The Room Service call center must be adjacent to the Patient Tray Assembly area. The Patient Tray Assembly area must be separate from the dining room food preparation area and must be designed with a separate but collocated cold preparation area, hot cooking area to include hooded ventilation, tray assembly area and cart staging area. Appropriately scale the hot cooking area equipment to support the patient feeding workload, using relevant historical, current, and projected patient workload information to ensure sufficient capacity, such as a grill and stove top. Design all areas to include adequate adjoining workspace collocated with equipment; for example: space to land hot pans, and adequate power, grates, drains, hood systems and exhaust systems. Additionally,

provide appropriate space and connectivity (IT and power) for printers that print patient meal tickets throughout the meal period.

A directly accessible route from tray assembly to service corridors or elevators to patient care areas is required. Provide dedicated elevators to food service in large medical centers. For cart routes, prevent dirty carts from crossing food preparation areas. Include flexible energy distribution systems in patient tray assembly area. Design warmers and refrigeration to ease bulk movement. Plan beverage islands and include a water source, ample electricity for expansion, under-floor installation of a 4 in. (100 mm) (minimum size) PVC conduit for “piggy-back” soda fountain conduit and juice machines, steam, and adequate drainage. If beverage dispensers have an ice machine affixed to the top, plan and provide a minimum ceiling height of 9 ft 0 in. (2.74 m) (reference Appendix B). Design a flexible tray line to decrease or increase the number of trays without changes in infrastructure requirements. Electrical outlet drops from the ceiling must be available to ensure versatility of tray line reconfiguration. Adequate space is required for cart staging, loading, storage, and cleaning, which includes consideration for life-safety requirements for egress and two-way traffic, as well as increasing space requirements to avoid life-safety parameters around and near electrical boxes, control boxes, fire extinguishers, eyewashes, and other like items.

F-4.6 Dishwashing and Ware Washing.

Design dishwashing and ware washing (pot washing) to prevent crossing workflows between soiled and clean wares, and the food preparation and service areas. Locate dishwashing and pot washing adjacent to each other to share labor and equipment. Locate pot and Pan washing area in proximity to the main food preparation area. Sufficient dirty pot and pan landing space adjacent to a three-compartment sink must be considered. Design dishwashing space to provide ample space as dirty dishes arrive on a conveyor system, followed by a disposal system, then a spray mechanism prior to dishes being loaded in the dishwasher. This space must accommodate patient tray carts to include the offloading of the cart, scraping of trays and allocation of various tray items into the appropriate containers for further cleaning. Plan out space to accommodate separate clean dish air drying and storage, dish racks, pots, plate warmers/low-raiders, inpatient tray racks, and tray delivery carts. Locate the tray drop-off and dishwashing areas as close to the dining area exit as possible to permit patron self-bussing. Design workflow to prevent garbage and dirty dishes from crossing into clean areas. Design must include or plan for installation of automated washing, disinfecting, and sanitizing chemical dispensing systems that are easily accessible to staff and have sufficient space for storage and cleaning.

F-4.6.1 Additional Requirements.

For manual ware-washing operations, water temperatures for sanitization must comply with the TSFC requirements. Allocate sufficient space to land large items that require cleaning and a garbage disposal/rinsing component. In accordance with the TSFC, manual washing must have sufficient space to accommodate air-drying of dish racks, pots, utensils, mobile plate warmers/low-raiders, inpatient tray racks, and tray delivery

carts (see DoD Space Planning Criteria Chapter 510 Food Service). Additionally, after manual cleaning and sanitizing, equipment and utensils must be air-dried or used after adequate draining as specified in 40 CFR 180.940. Design must include or plan for installation of automated washing, disinfecting, and sanitizing chemical dispensing systems that are easily accessible to staff and have sufficient space for storage and cleaning.

Install all mechanical ware washers and pot and pan washers with a steam reclaimer designed to remove hot, moisture-laden air as described in TSFC. For mechanical ware-washing equipment and sanitizing units, the wash solution temperature must comply with the TSFC requirements. Provide booster heaters as needed to meet TSFC temperature requirement. If low temperature ware-washers are used, they must be designed to dispense approved chemical sanitation agents in accordance with Federal, state, and local requirements. Include in the design floor drains in the ware washer center where equipment cleaning actually occurs. Special consideration must be given to the coordination of appropriate drain types, and their locations, and elevation such that the floor slopes toward the drain(s). Minimize the runs of piping from equipment to drains.

F-4.7 Communications.

Coordinate communications requirements with the DoD Project Sponsor and Chapter 12. Coordinate wiring, conduit, routing devices, and equipment with the DHA-FE and Food Service Consultants. Telephone and data lines are required in all offices, the Room Service call center, the tray assembly area, serving lines, storage, receiving, and food preparation areas. Provide connectivity to a wireless network or the internet throughout the kitchen to accommodate capabilities for patient tray ticket transfer and printing, temperature monitoring systems, inventory systems, and communications among staff. Prewiring is required for computerized communication at the cashier stations for electronic payment options and at serving stations for electronic menu boards. Design cashier stations to have a separate internet line to process credit card transactions that does not interface with the main server/system at the facility due to cyber security concerns. The dining area requires a base or post telephone capability for medical staff responses. Security systems (Service component coordination) intercom system, and TV in dining room require prewiring. The video surveillance system, at a minimum, must include cameras in the cash control room, at cash registers and in storage and supply areas, and per the requirements of the project specific CONOPS.

F-4.8 Waste Handling.

Dietary trash and waste handling requirements must be considered in conjunction with the total health facility waste handling requirements to minimize duplication of facilities. (Refer to Chapter 17.) Design dining, food preparation, servery, and processing areas to avoid transporting trash through food-handling or preparation areas for disposal. Provide waste pulping disposing systems to minimize the volume of solid waste products. Current disposal methods for the pulping residue must be accommodated in

the design as required per local contract agreement. Provide recycling areas and equipment in the Food Service Department for separating and recycling of cardboard, plastics, and other recyclable materials as required per local contract agreement. Handling of waste must be in compliance with local installation requirements. Further, separate spaces for storing clean (empty) and dirty (full) waste and recycling bins must be incorporated into nutrition services space and at external delivery pick up locations according to evidenced based / regulatory waste handling procedures that include prevention pest mitigation considerations and life-safety concerns. Also design a dedicated space to use for regularly cleaning waste and recycling bins (this may be interior or exterior near the waste disposal area).

F-4.9 Emergency Power.

Evaluate food service equipment for inclusion on the EPS to ensure impact to dining facility and patient tray food service operations is minimized by loss of power, giving special consideration to inclusion of walk-in refrigerators and freezer. The cash register electrical power system, at a minimum, must be on UPS; however, evaluation of the cash register system must be part of the overall evaluation of kitchen equipment and may be deemed appropriate for inclusion on the EPS by the DoD Project Sponsor. Refer to Chapter 11 and Appendix B for emergency power source requirements. Consideration must also be given to distributing electrical requirements between separate major junctions to create redundancies that maintain power to certain equipment while others may be down unexpectedly or for preventive maintenance requirements.

F-4.10 Steam.

Steam in direct contact with food must be "clean", containing no amines, oxygen scavengers, or other potentially harmful treatment chemicals. Where treated steam is available, it may be used for the indirect generation of clean steam for cooking. All equipment used in the generation and distribution of clean steam must be constructed of stainless steel in accordance with Chapter 10. Consideration must also be given to have multiple steam access and shut off points such that redundancies exist that maintain at least moderate steam flow to equipment when valves or steams systems go down unexpectedly or are taken out of operation for preventive maintenance requirements.

F-4.11 Shelving

Equip all storage areas (dry, non-food, refrigeration and frozen) with shelving systems that maximize space utilization and are appropriate to their specific applications. Use high density or track shelving where feasible to expand storage capabilities and maximize available storage areas. Shelving must be finished with galvanized steel, zinc-coated carbon steel, chrome-plated carbon steel, or extruded aluminum. To comply with Joint Commission, the bottom shelf must be solid. Louvered and open-wire shelving is recommended to encourage air movement. The Chemical Storage Room is

best located near the dishwashing and pot-washing area in accordance with applicable safety and environmental requirements.

F-4.12 Plumbing.

F-4.12.1 Hand washing.

All hand-washing sinks must be stainless steel and have “hands free” operation (wrist-, elbow-, or knee-operated). Install in accordance with the manufacturer’s instructions. Ensure compliance with the requirements of the TSFC for water temperature, valves, and water flow.

F-4.12.2 Floor Drains and Sinks.

Provide floor drains or floor sinks at all "wet" equipment (including ice machines) and as required for wet cleaning of floors. Coordinate location of floor drains and floor sinks with equipment to avoid conditions that prohibit removal of drain/floor sink covers (for example ensure drain/sink covers can be removed for cleaning). Drains must be properly leveled on the floors to ease cleaning.

F-4.12.3 Trough Drains.

Provide a floor trough at steam-jacketed kettles and tilt frying pans to facilitate cleaning of food service equipment. Construct fiberglass or heavy gauge stainless steel trough grates. Where pallet jacks are utilized, do not provide troughs in front of walk-in refrigerators and freezers. Grade floors throughout the storage (to include refrigerators and freezers), food preparation, food service, and sanitation areas to eliminate water accumulation.

F-4.12.4 Eyewash Stations.

Provide eyewash stations in janitor closets and all other areas where chemicals are utilized.

F-4.13 Compliance Standards.

Design food services to comply with TJC standards of care of patients, the NSF standards, the TFSC, and the HACCP Food service equipment must be manufactured or fabricated in accordance with industry standards governing safety such as the NSF, UL, the American Gas Association (AGA), the ASME, and the EPA ENERGY STAR program.

F-4.14 Exhaust Hoods.

Design all kitchen exhaust hoods to meet ASTM standard for open joints and solid welding, maximum noise thresholds (85 dBA time-weighted average is the maximum allowable exposure), and to be self-cleaning. Fire suppression system must be provided over all deep fat fryers, grills and charbroilers. Increased ventilation capability

must be considered where deep fat fryers and charbroilers are planned. Refer to Chapter 10.

F-4.15 Interior Finishes.

Interior finishes throughout food service must comply with Appendix B. Corner guards, wall guards, and steel kick plates for doors that continue up the wall partitions, toe-kicks, or cabinetry at least 4 in. (100 mm), forming a 3/8 in. (10 mm) minimum radius cove as an integral unit must be installed in applicable location per manufactures requirements. Cart wash areas and dish machine areas must be finished for wet environments to include non-slip floors. Acceptable flooring material is durable, light-colored, waterproof, grease-resistant, easily cleanable, and can withstand the load of heavy cart traffic. In areas where two contiguous Food Service functions have different flooring finishes in accordance with the Appendix B, provide the finish that is most appropriate throughout the contiguous areas/functions. Use grouting that is nonabsorbent and impregnated with epoxy, silicon, or polyurethane. Flooring must meet NSF/ANSI 52 minimum standards. Acceptable wall material is durable, waterproof, grease-resistant, and easily cleanable, and can withstand high levels of moisture and the constant movement of carts that will bump and scrape against walls.

F-4.16 Data Processing Equipment and Security.

If the facility utilizes an information system or other interdepartmental system, the Food Service operation must be linked to this system (the Hospital Information Management Computer Room). Visual security monitoring systems with data recording and retrieval must be provided in the cash control room where cash counting occurs, the cashier stations, the loading dock, and the corridor utilized to move Food Service supplies into their designated storage areas. The cash control room, cash register stations, and the main foodservice supervisor office must be wired for a duress alarm. Reference paragraph 5-4.6 for further duress alarm requirements.

F-4.17 Grease Traps.

Locate grease traps outside the building. Grease traps must be accessible for cleaning in accordance with Federal, state, and local fire, safety, and environmental requirements.

F-4.18 Sealants.

Thoroughly seal all openings or penetrations of any horizontal or vertical finish surface so as not to provide access and/or hiding places for vermin or encourage the growth of bacteria. Sealant must be water- and detergent-resistant silicone.

F-4.19 Franchised/Leased Food Services.

Identification of the type of franchised or leased space for Food Services provided by entities other than DoD Food Service components must be identified during project planning and programming. To minimize unnecessary construction change orders,

careful coordination is necessary to identify room net square footages, equipment, engineering requirements, and wireless coverage for government networks to support these distinct functions. These requirements must be submitted to the Design and Construction Agent prior to the 20 percent design submittal.

F-5 SEISMIC CRITERIA.

The planning, selection, and installation of food service equipment must be carefully considered with regard to potential damage by earthquakes. Give special attention to the mounting of fixed equipment, to utility connections, and to the design features of selected equipment. The required seismic protection must depend on the seismic design level prescribed for individual projects. Indicate all bracing details for food service equipment on contract documents. Reference Chapter 7 for additional requirements.

F-6 FOOD SERVICE EQUIPMENT SPECIFICATIONS.

All contractor-provided food service equipment items identified on the contract drawing must be specific in detail. The latest technology must be specified. Commercial kitchen appliances must be either ENERGY STAR-qualified or Federal Energy Management Program (FEMP) recommended. All equipment must meet EPA standards where required, as well as NSF, UL, and AGA.

APPENDIX G PARKING REQUIREMENTS

G-1 GENERAL.

This appendix provides mandatory criteria for parking associated with applicable facilities.

G-2 PARKING AUTHORITY.

DHA-FE is the sole Approving Authority over DoD medical facility parking requirements. Inadequate parking can impede the MHS' ability to provide prompt and unhindered care to patients. It may also require ill patients to walk extended distances, and potentially increase infectious incidence on public transportation. Parking requirements within this document and shown in Table G-1 consider these issues and have been calculated and formulized by professional traffic engineers directly considering patient, staff, and visitor populations. Parking requirements at DoD Installations as stated in this document supersede all non-medical state, regional, and or local jurisdiction criteria or requirements. **\4**

A comprehensive site-specific parking study for peak parking demand may be performed to refine the overall parking requirement. **/4/**

G-2.1 Facilities and Location.

The parking area designer must size the required parking area based on calculation as described in this appendix. The designer must consider the minimum use of land, the economical and efficient use of existing and future utilities, ecological conditions, the impact on the environment, sustainability and conservation considerations, maintenance and operations requirements, and the potential need for future growth. Shared parking may be considered where feasible. Landscaping appropriate to the locality should be considered and utilized where applicable, affordable, and practical. Every reasonable and practical effort should be used to integrate existing trees or vegetation into the parking areas.

Parking structures or garages must be considered by the DoD Project Sponsor when the site is too small to accommodate the required parking, when the value of the land is excessive, the site is located in a harsh climate, the required amount of spaces creates extreme walking distances, or sustainability or ecological issues prevail. Parking structures must be included as a separate line item in the project Capital Investment Decision Model and later project DD Forms 1391. The DoD Project Sponsor must approve parking structures on a case-by-case basis.

G-3 PARKING CONSIDERATIONS.

G-3.1 General.

Integrate all design elements, including functional, architectural, civil engineering, electrical, emergency services access, security, and delivery services, and other features.

G-3.2 Off-Street Parking Design.

The DoR must follow the concepts from the most current Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) Pamphlet 55-17, Section 17.2, Better Military Traffic Engineering, Off-Street Parking Facilities. Table G-1 (below) supersedes parking demand in MSDDCTEA Pamphlet 55-17, Section 17.2.1. Design parking areas for continuous traffic flow to the maximum extent possible.

G-3.3 Parking Garages.

The DoR must design each parking garage for continuous traffic flow and minimize dead-end parking spaces. The lack of continuous flow slows traffic flow and contributes to increasing vehicle accidents. Do not permit handicapped access path to traverse behind vehicles. Crossing vehicle travel aisles requires approval by Design and Construction Agent. Parking garage elevators must be included in the elevator traffic study (ETSA) and analysis in paragraph 16-2.2.

G-3.4 Parking Wayfinding.

Parking wayfinding must be included in the wayfinding plan in paragraph 6-13.

Table G-1 Required Parking Spaces for Medical Facilities

Calculating the Required Parking Spaces	
Number of Parking Spaces Required = $(0.75)(X_1) + (.40)(X_2) + (X_3) + (X_4)$	
Where:	X_1 = All personnel working in the facility on a full-time basis, plus an allowance for visitors and part-time staff. Include FTE's, contract maintenance, Red Cross volunteers, base exchange, clergy, interns, technical school trainees, Veterans Affairs and other DoD Project Sponsor liaison staff, Reserve, Guard, Professional Military Exchange (PME), and visitors. Visitors include: Installation Commander, TRICARE, RMO Security, Fire Department consultants, salespersons, and shift change overlap. (Use 10 percent if statistics are unavailable for additional visitors, shift overlap, and part-time staff.)
	X_2 = Use projected M2 (Military Medical business objects database) outpatient visits for the peak month (typically either August or September) and peak day of the week (typically a Monday). Include projected M2 pharmacy encounters: new scripts ("FCC" and "FCD") and refills except those scripts that are picked up at satellite pharmacies.
	X_3 = One space for each inpatient bed.
	X_4 = One space for each organizational Government vehicle, and facility contractor support vehicle that regularly uses the parking facilities. For those vehicles that are too large to use a standard parking space, provide an oversized space.
Notes:	
1. Additional parking spaces must be justified.	
2. "Reserved" spaces for Command, General Officers, Rewards, and Disabled are included in the above factors.	
3. Spaces for Disabled are included in the above total and must be allocated in accordance with Chapter 13 for both inpatient and outpatient requirements as applicable.	
4. Calculation adjustments may be made to the X_1 parking requirement for carpooling, public transportation (if reliable and available within reasonable walking distance) and for Quarters/Housing (if within reasonable walking distance). The adjustment must only be based on those staff that routinely avoids using the parking facilities.	
5. Parking lot segregation for staff, patients, and visitors must be addressed by the Project Sponsor during design. **\4**	
6. Reduce the X2 coefficient from 0.40 to 0.20 for drive-through pharmacy workload.	
7. Organizational Government vehicle parking requirement will comply with UFC 1-200-01, 1-4.4 for Electric Vehicles (EV). EV parking count is included in X_4.	
8. Privately owned EV are included in X_1, X_2, and X_3. **/4/**	

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APPENDIX H TEMPORARY SPACES SUPPORTING CONSTRUCTION PHASING

H-1 GENERAL.

This appendix contains exceptions from the criteria in this UFC for the sole purpose of supporting phased construction of medical treatment facilities. The temporary spaces constructed utilizing the exceptions contained herein are required to be either removed from the site and/or returned to a condition which is compliant with the criteria of this UFC when the permanent construction is completed.

Temporary spaces must conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation, and sanitary requirements of the IBC, as modified in Chapter 2 of UFC 1-200-01. In addition, the medical functionality must be provided and maintained for all clinical spaces.

H-2 APPLICATION.

The UFC 4-510-01 exceptions are one of four actions, according to the following legend:

[Addition] – Add new section, including new section number, not shown in UFC 4-510-01.

[Deletion] – Delete referenced UFC 4-510-01 section or noted portion of a section.

[Replacement] – Delete referenced UFC 4-510-01 section or noted portion and replace it with the narrative shown.

[Supplement] – Add narrative shown as a supplement to the narrative shown in the referenced section of UFC 4-510-01.

H-3 EXCEPTIONS.

H-3.1 Chapter 5.

[Supplement] 5-4.6.2 Remote Alarm Reporting

For temporary trailers, a cellular module (wireless auto-dialer) meeting the requirements of CFR 1301 may be used to communicate alarms to the Installation Security Office.

H-3.2 Chapter 6.

[Supplement] 6-2 External Design.

A patient drop off area may not be required if ABA patient access is provided.

[Supplement] 6-4 Fenestration and Windows.

Natural day lighting maybe provided throughout the facility. All other requirements in this section need to comply for built on site temporary construction or temporary prefabricated construction.

[Supplement] 6-5.1 Aseptic Environments.

Allow the use of Plastic Laminate window sills.

[Supplement] 6-8 Wall and Partition Systems.

For non–bearing wall / partition allow framing to be 24 gauge with spacing to 24” (600 mm) on center when designing stick built construction. Wall framing for pre-fabricated or trailer construction is to be determined by that manufacturer. The minimum the STC rating for stick built or pre-fabricated or trailer construction to be STC 45.

[Supplement] 6-8.1 Use of Full Height Partitions.

Allow walls / partitions to stop 6 in. (150 mm) above the ceiling except for rooms that are required to meet fire or smoke separation, critical pressurization, and sound performance requirements stated in Appendix J and in the rooms, spaces, and compartments for physical security purposes listed in Chapter 6, Section 6-8.

[Supplement] 6-8.3 Protection and Safety Features.

Wall protection, such as corner guards, crash rails, chair rail and wall protection panels, are not required. Handrails are required as per Chapter 6, Section 6-8.

[Supplement] 6-10 Vestibules.

Exterior vestibule at main facility entrance may be reduced in sized in proportion to the 6-11.1 requirement below.

[Supplement] 6-11.1 Automatic Doors.

Allow use automatic operated swing doors at Emergency Trauma entrances for walk-ins and primary entrances of MTFs.

H-3.3 Chapter 9.

Requirements may be relaxed as indicated below for this chapter where vetted and approved on a project specific basis by the Design and Construction Agent and the DoD Project Sponsor. Not every exception below will be permissible for every temporary facility. Impacts to patient care, infection control and the space criticality (such as Space Category Code) must be considered. Allowable exceptions will be determined by the criteria effective date as specified in UFC 1-200-01.

[Supplement] 9-1.7 Piping Coordination.

Exposed piping and piping above sensitive areas, except for communication, electrical and server rooms is permissible where it does not have a direct impact on patient care or infection control.

[Replacement] 9-2.2 Continuity of Service.

Single water service connection is permissible.

[Replacement] 9-2.3 Backflow Prevention.

Single backflow prevention device is permissible.

[Supplement] 9-2.4 Water Treatment.

Life cycle cost analysis not required when evaluating water treatment options. No system redundancy is required.

[Supplement] 9-2.4.1 Scale Control.

Full automation of water softener, monitoring and reporting to BAS is not required.

[Supplement] 9-2.5.2.3 Supplemental Disinfection.

Supplemental disinfection may be avoided if approved by the Facility Water System Management Team.

[Replacement] 9-2.5.2.7 Piping Materials.

Piping materials and joining methods to comply with the International Plumbing Code.

[Replacement] 9-2.5.2.8 Piping Design/Distribution.

Comply with the International Plumbing Code.

[Replacement] 9-2.5.2.9 Location of Temperature Limiting Devices.

Comply with the International Plumbing Code.

[Replacement] 9-2.5.2.10 Hot Water Generation.

Instantaneous water heater are permissible. Comply with the International Plumbing Code.

[Replacement] 9-2.5.2.11 Water Storage Tank Design.

Comply with the International Plumbing Code.

[Replacement] 9-2.6.3 Domestic Water Heater Redundancy.

No redundancy required.

[Replacement] 9-2.6.4.1 Thermal Eradication.

Thermal eradication capability not required.

[Replacement] 9-2.6.4.2 Patient and Visitor Toilet Facilities.

Comply with the International Plumbing Code.

[Replacement] 9-2.6.4.3 Showers and Baths.

Comply with the International Plumbing Code.

[Replacement] 9-2.7.4 Water Usage Conservation.

Comply with the International Plumbing Code.

[Replacement] 9-3.1.7 Trap Priming.

Comply with the International Plumbing Code.

[Replacement] 9-3.2.1 Cleanouts.

Comply with International Plumbing Code.

[Supplement] 9-5 Medical Gas Systems.

The source selection of each medical gas system must be based on an analysis and may include all NFPA 99 compliant alternatives as well as portable cylinders as coordinated with and approved by the Design and Construction Agent and DoD Project Sponsor. The analysis must address all required systems (per Appendix B), anticipated usage, logistics for delivery, etc. Central supply system equipment and cylinder locations must meet NFPA 99.

[Replacement] 9-5.8 Medical Gas Equipment Rooms.

Comply with NFPA 99.

[Replacement] 9-5.11 Alarm Systems.

Comply with NFPA 99.

[Replacement] 9-5.23.5 Equipment Location.

Comply with NFPA 99.

H-3.4 Chapter 10.

Requirements may be relaxed as indicated below for this chapter where vetted and approved on a project specific basis by the Design and Construction Agent and the DoD Project Sponsor. Not every exception below will be permissible for every temporary facility. Impacts to patient care, infection control and the space criticality (such as Space Category Code) must be considered. Allowable exceptions will be determined by the criteria effective date as specified in UFC 1-200-01.

[Replacement] 10-6.1 Mechanical Room.

Major mechanical equipment must be designed to facilitate the maintenance service, and replacement expected during the timeframe the facility is in operation.

[Replacement] 10-6.2 Energy Plant.

Chilled water, steam and hot water generators may be located in a separate energy plant.

[Supplement] 10-7 HVAC System Design for Functional Areas.

For outpatient facilities not housing critical care, all-water, unitary, and fan-powered VAV systems may be utilized.

[Replacement] 10-8.8.1 Pipe Routing.

Pipes must not be routed through Telecommunications Rooms and Electrical Rooms unless dedicated to serving that room.

[Supplement] 10-9.6.2 VAV AHU Controls.

Fan speeds must be modulated by means of variable-frequency drivers (VFDs). Modulate supply fan speed to control duct static pressure. Controls must be provided to maintain required OA during all modes of operation. Unless the duct construction pressure classification is higher than the highest point on the supply fan curve for full speed operation, high supply duct static sensor and shutdown capability must be provided.

[Supplement] 10-11.1 AHU Requirements.

Exception: Paragraph 10-11.1 does not apply to administrative, non-patient care, or Outpatient facilities not housing critical care.

[Replacement] 10-12.1 General Personnel Access.

Safe and practical means of personnel access must be provided to, and within, all areas of the facility where equipment is located, to adequately provide for O&M and replacement of the equipment. Access to equipment rooms from outside the facility

should be provided where feasible. Within equipment rooms, provide clearance to all service points to mechanical equipment to allow adequate personnel access and working space in accordance with equipment manufacturer's recommendations. Proper clearance must be provided such that personnel do not have to climb over equipment or crawl on hands and knees.

[Replacement] 10-12.2 Equipment Clearances.

Provide minimum clearances between electrical and mechanical equipment as required by NFPA 70.

[Replacement] 10-12.3 Suspended and Mounted Mechanical Equipment.

In refrigeration equipment rooms, provide overhead clearances required by ASHRAE 15.

[Replacement] 10-12.4 Air Distribution System Components.

Design outdoor air intake plenums, AHU casings, and distribution ductwork to permit access for periodic cleaning or disinfection.

[Deletion] 10-12.5 HVAC System Balancing Provisions.

[Supplement] 10-15 Fuel Storage Requirements.

For temporary facilities, a fuel maintenance system is not required.

H-3.5 Chapter 11.

Requirements may be relaxed as indicated below for this chapter where vetted and approved on a project specific basis by the Design and Construction Agent and the DoD Project Sponsor. Not every exception below will be permissible for every temporary facility. Impacts to patient care, infection control and the space criticality (such as Space Category Code) must be considered. Allowable exceptions will be determined by the criteria effective date as specified in UFC 1-200-01.

[Supplement] 11-1.2.9 Growth.

Growth (load, bus, wall, spare) for temporary spaces may be reduced to the anticipated need over the period of occupancy.

[Supplement] 11-3.3.1 Primary Feeders.

A single primary feeder may be used for temporary spaces.

[Supplement] 11-3.3.3 Transformer Substation.

A single ended transformer substation may be used to supply temporary spaces.

[Supplement] 11-4.3 Alternate Power Source.

If a generator is required for temporary spaces, a single generator may be considered.

[Supplement] 11-4.5 Location of Generator Sets.

If a generator is required for temporary spaces, it may be located outdoors in a weatherproof and sound attenuated enclosure.

[Supplement] 11-4.9 Automatic Transfer Switch (ATS).

The use of bypass isolation switches in temporary spaces may be limited to code compliance, unless 24/7 operation or refrigerated medical supplies.

[Supplement] 11-4.12.1 Fuel Tanks.

If a generator is required, fuel storage for temporary spaces may be reduced to 24 hours with a confirmed delivery source per UFC 3-540-01.

[Supplement] 11-5.2.3.2 Draw-out Circuit Breakers.

The use of draw-out circuit breakers and transfer switches in temporary spaces may be limited to code compliance, unless 24/7 operation or refrigerated medical supplies.

[Supplement] 11-5.4.1 Main Electrical Rooms.

The interior door for the main electrical room in temporary spaces is not required, provided the exterior door is readily accessible.

[Supplement] 11-5.4.3 Location and Layout Considerations.

A separate room is not required for branch circuit panelboards in temporary spaces if the installation is code compliant.

[Replacement] 11-5.6 Conduit, Cable Tray, and Wire.

Medical grade armored cable may be used in temporary spaces if code compliant.

[Replacement] 11-5.9 Receptacles.

The number of receptacles and circuits at patient beds, including operating rooms, may be reduced to code minimums.

[Supplement] 11-6.14 Continuity of Service.

Spare LED arrays and preprogrammed drivers are not required for temporary spaces.

H-3.6 Chapter 12.

Requirements may be relaxed as indicated below for this chapter where vetted and approved on a project specific basis by the Design and Construction Agent and the DoD Project Sponsor. Not every exception below will be permissible for every temporary facility. Impacts to patient care, infection control and the space criticality (such as Space Category Code) must be considered. Allowable exceptions will be determined by the criteria effective date as specified in UFC 1-200-01.

[Replacement] 12-2.1 Telecommunication Rooms (TRs) (COMC1).

(a) TR sizes serving Category 3 and 4 spaces of less than 130 square feet (12 sq m) may be approved. TRs less than 130 square feet (12 sq m) must be sized to accommodate all required equipment plus 20% spare wall space and 20% spare rack space. The DoR must provide a TR layout and rack elevations showing all required equipment plus 20% spare wall and rack space.

[Addition] 12-7 Telecommunications Infrastructure Systems (TIS)

The use of J-hooks may be approved to serve Category 3 and 4 spaces when unable to achieve clearances required for cable tray.

H-3.7 Chapter 16.

[Supplement] 16-1.2 Transportation Systems Evaluation.

A DoR may assume the responsibility of the qualified Medical Transportation and Logistics Consultant (MTLC).

[Supplement] 16.2 Transportation and Logistic Analysis Requirements.

The DoR can prepare a condensed elevator analysis or study from requirements established in Section 16-2, that are applicable to the size, functions, staffing, location, type of temporary space and temporary needs; as some elements may no longer be relevant. This may include the reducing the Elevator Performance.

[Supplement] Table 16-2 Elevator Performance Guide

PASSENGER ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Temporary Spaces	40 to 45 Seconds	10 - 12% of the calculated building population
Notes:		
3	Maintain existing elevators if temporary space is located within an existing facility.	

PATIENT SERVICE ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Temporary Spaces	40 to 45 Seconds	100% of the calculated traffic
Notes:		
3	Maintain existing elevators if temporary space is located within an existing facility.	

MATERIALS HANDLING SERVICE ELEVATORS		
Building Type	**Average Interval Required**	**Handling Capacity**
Temporary Spaces	40 to 45 Seconds	5 - 10% of the calculated elevator population for the area served (plus migration)
Notes:		
3	Maintain existing elevators if temporary space is located within an existing facility.	

Combined equipment/materials with other traffic and elevators may be allowed, by schedule, policy or temporary needs or otherwise approved by the DoD Project Sponsor. Maintain existing separation when temporary space is located within an existing medical facility.

[Supplement] 16.4 Elevator Design.

Temporary spaces are normally single-story freestanding prefab or modular units (portable, demountable, or transportable building) to being located within existing facilities. Freestanding units may also be multi-story and therefore shall be allowed to deviate from elevator design requirements in Section 16-4.

a. Number of elevators limited to at least one. However, additional elevators may be necessary depending on size (greater than 40,000 SF), layout, operational or ETSA of temporary facility.

b. Passenger elevators may be reduced in capacity and size. Temporary Passenger elevator are required to be wide car configuration, have side opening doors, be a minimum of 3500 lb (1587 kg) capacity and have a minimum 3 ft 6 in. wide door opening. With clear car/cab interior dimensions of 6 ft 8 in. wide x 5 ft 3 in depth. Any other deviations must be approved by the DoD Project Sponsor.

c. Minimum elevator lobby depth for passenger elevator to be 6'-0" when the opening opposes a wall.

d. Maintain and utilize existing elevators as intended.

H-3.8 Chapter 19.

[Supplement] 19-3.1 Level of Commissioning.

Provide small facility commissioning for temporary spaces as described in paragraph 19-5.

H-3.9 Appendix B.

[Supplement] B-6.2 Essential Power.

"RA – all receptacles", is not required in temporary spaces, if by implementing this requirement a second critical branch automatic transfer switch is required, so long as the installation is code compliant.
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APPENDIX I GLOSSARY

I-1 ACRONYMS.

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^{0}C	degree Celsius
^{0}F	degree Fahrenheit **/1/**
A	ampere(s)
AAMA	American Architectural Manufacturers Association
A/E	Architect/Engineer Firm
ABA	Architectural Barriers Act
AC	Alternating current
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
ADT	Admissions-Discharge-Transfer
AFCEC	Air Force Civil Engineer Center
AGA	American Gas Association
AGV	Automatic guided vehicle
AHA	American Hospital Association
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AHU	Air handling unit
AIA	American Institute of Architects
AICUZ	Air Installations Compatible Use Zones
AISI	American Iron and Steel Institute
AMR	Autonomous Mobile Robot
ANSI	American National Standards Institute
APFSS	Automatic Primary Feeder Selector Switch

APL	Approved Product List
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AT/FP	Antiterrorism/Force Protection
ATS	Automatic transfer switch
AV	Audio visual
BDF	Building distribution frame
BFE	Base Flood Elevation
BGSF	Building Gross Square Feet **\1**
BGSM	Building Gross Square Meter **/1/**
BHDG	Behavioral Health Design Guide
BH	Behavioral Health
BHMA	Builders Hardware Manufacturers Association
BHSA	Behavioral Health Staff Assist
BIM	Building Information Modeling
BP/IS	Bypass/isolation switch
BSC	Biological Safety Cabinets
Btuh	British thermal unit per hour
BUG	backlight, uplight, and glare
BUMED	U.S. Navy Bureau of Medicine and Surgery
C	Celsius
CATCODE	Category Code
CATV	Cable television

CAV	Constant Air Volume
CCT	Correlated color temperature
CCTV	Closed-circuit television
CCU	Cardiac Care Unit
CDC	Centers for Disease Control and Prevention
CEHNC-EDX	U.S. Army Corps of Engineers Medical Facilities Mandatory Center of Expertise and Standardization, Huntsville Engineering and Support Center
CFCI	Contractor furnished and contractor installed
CFM	Cubic foot per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHAPI	Chase Helicopter Approach Path Indicator
CID	Comprehensive Interior Design
CIE	Commission Internationale de l'Eclairage (International Commission on Illumination)
CIP	Capital Investment Proposal
CMS	Central Material Service
CO2	Carbon dioxide
CONOPS	Concept of Operations
CONUS	Contiguous United States
CPD	Central Processing and Distribution
CRI	Color Rendering Index **\1**
CT	Computed Tomography **/1/**
CWE	Current Working Estimate
CxC	Commissioning Specialist for the Construction Phase
CxD	Commissioning Specialist for the Design Phase

CxG	Commissioning Specialist for the Government
DA	Design Authorization, or dental compressed air
DALT	Duct Air Leak Testing
dB	Decibel **\1**
dBA	A-weighted Decibel **/1/**
DB	Design-Build, or dry bulb
DBB	Design-Bid-Build
dBmV	Decibel (referenced to millivolt)
DC	Direct current
DDA	Design Directive Amount
DDC	Direct digital control
DFE	Design Flood Elevation
DGSF	Departmental Gross Square Feet
DHA	Defense Health Agency
DHA-FE	Defense Health Agency Facilities Enterprise
DHP	Defense Health Program
DIN	Deutsche Industrie Normen
DISA	Defense Information Systems Agency
DISS	Diameter Index Safety System
DMLSS	Defense Medical Logistics Standard Support **\1**
DN	Diametre Nominal **/1/**
DoD	U.S. Department of Defense
DoDM	U.S. Department of Defense Medical
DoR	Designer of Record
DSV	Dental Surgical Vacuum

DTR	Dental Treatment Room
DUF	DTR Usage Factor
DX	Direct Expansion
EA	Economic Analysis
EBD	Evidence-Based Design
ECEv	The Environment of Care-Europe, Version V
ECG	Electrocardiogram (also EKG)
ED	Emergency Department
EEG	Electroencephalography, electroencephalogram
EENT	Eye, ear, nose, and throat
EES	Essential Electrical System
EIA	Electronic Industries Alliance
EMG	Electromyography
EMI	Electromagnetic interference
EMS	Emergency Medical Service **\1**
EMT	Electrical Metallic Tubing **/1/**
EN	European Norm
ENT	Ear, Nose, and Throat
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPS	Emergency Power System
ER	Emergency Room
ESS	Electronic Security System
ETL	Engineering Technical Letter
ETSA	Elevator Traffic Study and Analysis

EWD	Engineering Weather Data
F	Fahrenheit
FACP	Fire Alarm Control Panel
FAR	Federal Acquisition Regulation
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FF&E	Fixture, Furnishings, & Equipment
FLCM	Facilities Life Cycle Management
FM	Factory Mutual
FMDF	Fiber Main Distribution Frame
FO	Fiber optic
FPT	Functional Performance Test **\1**
fpm	feet per minute
fps	feet per second **/1/**
FSES	Fire Safety Evaluation System **\1**
ft	feet
ft^2	square feet
ft-lb	foot-pounds **/1/**
FTE	Full-Time Equivalent.
FY	Fiscal year **\1**
Gal	Gallon **/1/**
GFCI	Ground-Fault Circuit Interrupter, or Government furnished, contractor installed
GFGI	Government furnished, Government installed **\1**
GPF	Gallons per Flush **/1/**
gpg	grain(s) per gallon **\1**

GPH	Gallons per hour **/1/**
GPM	Gallons per minute
GPS	Global positioning system
GSF	Gross square footage/feet **\1**
GSM	Gross square meter **/1/**
HACCP	Hazard Analysis and Critical Control Points
HAG	Historical Analysis Generator
HCRA	Healthcare Service Requirements Analysis
HDMI	High-definition multimedia interface
HDTV	High-definition television
HEPA	High-efficiency particulate air
HID	High intensity discharge
HIPAA	Health Insurance Portability and Accountability Act
HIS	Hospital Information System
hp	horsepower
HPVA	Hardwood Plywood and Veneer Association
HQ	Headquarters
HVAC	Heating, ventilation, and air conditioning
HW	Hazardous Waste
Hz	Hertz
I/O	Input and output
IA	Instrument air
IBC	International Building Code
IBS	Interstitial Building System
ICRA	Infection Control Risk Assessment

ICU	Intensive Care Unit
ID	Identification
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
IMD-IA	Information Management Department Information Assurance **\1**
IMO	Installation Management Organization
in.	inch
in^2	square inch **/1/**
in-Hg	inches of mercury **\1**
in-HgV	inches of mercury vacuum
in. w.g.	inches of water gauge **/1/**
IO&T	Initial Outfitting and Transition
IPC	International Plumbing Code
IRES	Internal Cellular Antenna Systems
ITV	Interactive Television
JITC	Joint Interoperability Testing Committee
JSN	Joint Schedule Number
K	Kelvin **\1**
kg	kilogram **/1/**
kHz	kilohertz
kPa	kilopascal **\1**
kPaV	kilopascal vacuum **/1/**
kV	kilovolt
kVA	kilo-volt-ampere **\1**

kW	kilowatt
L	Liter **/1/**
L&D	Labor and Delivery **\1**
L/h	liter per hour **/1/**
L/s	Liter per second
LA	Laboratory Air
LAN	Local area network **\1**
lb	pound **/1/**
LCC	Life-cycle cost
LCCA	Life-cycle cost analysis
LCD	Liquid crystal display
LDE	Laboratory dust evacuation
LDR	Labor, delivery, and recovery
LDRP	Labor, delivery, recovery, and postpartum
LED	Light-emitting diode
LOD	Level of detail/development
LPD	Lighting power density **\1**
LPF	liter per flush **/1/**
LPM	liter per minute
LS	Life Safety
LSA	Life Safety Assessment
LUF	Laboratory Usage Factor **\1**
Lux	Illuminance
m	meter
m^2	square meter

m/s	meter/second **/1/**
MA	Medical compressed air
MCWB	Mean coincident wet bulb
MDI	Medical Design Instructions
MEP	Mechanical, electrical, and plumbing
MFPO	Medical Facilities Project Office **\1**
mg/l	milligram per liter **/1/**
MHS	Military Health System
MILCON	Military Construction
MINC	Multimedia Interactive Network Center
Mips	micro inch per second **\1**
mm	millimeter **/1/**
MMA	Material Management Analysis
MRI	Magnetic resonance imaging
MRT	Modified Rhyme Test
MSA	Medical Service Account
MSF	Medical Support Facility
MTLC	Medical Transport and Logistics Consultant
MTF	Medical Treatment Facility
MV	Medical surgical vacuum or Medium Voltage
N	Nitrogen
NAVFAC	Naval Facilities Engineering Systems Command
NC	Nurse Call, or noise coefficient
NCAV	Nurse Call Audio Visual
NCPC	National Capital Planning Commission

NCR	National Capital Region
NCRP	National Council of Radiation Protection and Measurements
NCTV	Nurse Call Tone Visual
NEC	Network Enterprise Center
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NICU	Neonatal Intensive Care Unit
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology **\1**
N·m	newton meter **/1/**
NO	Nitrous Oxide **\1**
NPS	Nominal Pipe Size **/1/**
NRC	Nuclear Regulatory Commission
NSF	Net Square Feet
NTP	Normal temperature and pressure
NTS	Network Time Synchronization
O	Oxygen
O&M	Operations and Maintenance
OASD(HA)	Office of the Assistant Secretary of Defense (Health Affairs)
OCONUS	Outside the Contiguous United States
OE	Oral evacuation **\4**
OMA	Building Owners and Managers Association International **/4/**
OMB	Office of Management and Budget, Executive Office of the President
OPR	Owner’s Project Requirements or Office of Primary Responsibility

OR	Operating room
OSHA	Occupational Safety and Health Administration **\1**
Pa	Pascal **/1/**
PA	Process Air or Program Amount
PACU	Post-Anesthesia Care Unit
PAPD	Public address and program distribution
PBB	Primary Bonding Busbar
PC	Personal computer
P.E.	Professional Engineer
PF	Power factor
PFC	Pre-Functional Checklists
PFD	Program for Design
PoE	Power over Ethernet **\1**
ppm	parts per million **/1/**
PRC	Project Room Contents
psf	pounds per square foot
psi	pounds per square inch
psig	pound-force per square inch gauge
PT	Physical therapy
PTS	Pneumatic tube system
PTZ	Pan/tilt/zoom
PVC	Polyvinyl chloride
QA	Quality Assurance
QC	Quality Control
RA	Requirements Analysis

Rcs,h1	Chroma Shift, Hue-Bin 1
RF	Radio frequency
Rf	Fidelity Index
Rf,h1	Fidelity Index, Hue-Bin 1
RFI	Radio frequency interference
RFP	Request for Proposal
Rg	Relative Gamut Index
RH	Relative humidity
RMF	Risk Management Framework
RMS	Root mean square
RMW	Regulated Medical Waste
RP	Radio Paging
RTA	Ready to Advertise
SATV	Satellite television
SBB	Secondary Bonding Busbar
SCFM	Standard cubic feet per minute
SEPS	Space and Equipment Planning System **\1**
sf	square feet **/1/**
SID	Structural Interior Design **\1**
SLPM	Standard liter per minute
sm	square meter **/1/**
SOC	Statement of Condition
SOFA	Status of Forces Agreement
SOW	Statement of Work or Scope of Work
SPD	Spectral Power Distribution

SPL	Sound pressure level
SRA	Safety Risk Assessment
SRM	Sustainment, Restoration, and Modernization
STC	Sound Transmission Class
SUF	System Usage Factor
TAB	Test and Balance
TBCx	Total Building Commissioning
TIA	Telecommunications Industry Association
TIS	Telecommunications Infrastructure System
TJC	The Joint Commission
TLA	Transportation Logistics Analysis
TLED	Tubular Light-Emitting Diode
TR	Telecommunication Room
TSS	Telephone Switching System
TV	Television
UCS	Uniform Chromaticity Scale
UFC	Unified Facilities Criteria
UHF	Ultra-high frequency
UMCS	Utility Monitoring and Control System
UPS	Uninterruptible power supply
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USGBC	United States Green Building Council
UTP	Unshielded twisted pair
UL	Underwriter’s Laboratory

UV	Ultraviolet
V	Volt
VA	U.S. Department of Veterans Affairs
VAV	Variable air volume
VE	Value Engineering
VMC	Visual meteorological condition
VoIP	Voice over Internet Protocol
W	watt(s)
WAGD	Waste anesthesia gas disposal
VSS	Video Surveillance System
WAN	Wide Area Network
WAP	Wireless access point
WB	White Board
WMA	Waste Management Analysis

I-2 DEFINITION OF TERMS.

For additional terminology, please reference the following:

DoD 6015.1-M, *Glossary of Healthcare Terminology*, January 1999, Assistant Secretary of Defense for Health Affairs, TRICARE Management Activity.

NFPA Glossary of Terms, 2021 National Fire Protection Association, www.nfpa.org

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Air Handling Unit (AHU): An air conditioning unit consisting of fan(s), coil(s), filter(s), and other components designed and sized for supplying conditioned air to a given area or space(s).

Ambulatory: Able to walk; not confined to bed. **\1**

Ambulatory Care Center: An outpatient facility which provides a wide range of medical treatment. This facility category includes Ambulatory Care Clinics **\4** and Medical Clinics. ***/4//1/***

Ambulatory Health Care Occupancies: Refer to NFPA 101 for occupancy definitions.

Ambulatory Surgery Center: An Ambulatory Care Clinic with two or more Operating Rooms.

Anesthesia: Partial or complete loss of sensation, with or without consciousness, as a result of drug, disease, or injury.

Anesthetic: Applies to any inhalation agent used to produce relative analgesia or general anesthesia.

Anesthetizing Location: Any area of the facility that has been designated to be used for the administration of any flammable or nonflammable inhalation anesthetic agents in the course of examination or treatment including the use of such agents for relative analgesia.

Antiseptic: The prevention of decay, putrefaction, or sepsis through use of an agent that must prevent or arrest the development of microorganisms.

Apparatus: Furniture, laboratory hoods, centrifuges, refrigerators, and commercial or man-made onsite equipment used in a laboratory.

Architect and Engineer (A/E) Firm: A business composed of professional architects and engineers.

Asbestos: A natural mined mineral that is a good thermal insulator, a good acoustical insulator, fire resistant, resistant to friction and wear, and a poor conductor of electricity. Known to cause lung cancer, mesothelioma, and other forms of cancer in the stomach and colon.

Aseptic Environment: An environment or area that is intended to be free from pathogenic microorganisms to prevent infection.

Automatic Box Conveyor (ABC): Also known as Electric Track Vehicle (ETV) or Powered Track Tote Box Conveyor System (PMTCS). A rail system utilizing self-contained buss bars to provide power to special carriers that contain and move small supply, demand, and other items between stations on the track network.

Automated Data Processing (ADP): Any equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data information.

Automatic Data Processing Equipment (ADPE): General purpose, commercially available automatic data processing equipment, and the systems created by them.

Autoclave: An apparatus for sterilizing utilizing steam under pressure.

Automated Guided Vehicle System (AGVS): Also known as Driverless Vehicle System (DVS). This system utilizes a battery-powered, electronically-controlled vehicle that follows a predetermined route (guide path or track that is buried in the floor or adhered to its surface) to move carts and material throughout the facility. The system utilizes the guide path network and special elevators to make the horizontal and vertical routings. Different degrees of automation and capabilities are available. The basic system components commonly found in a hospital application include: driverless vehicles, elevators, carts (modules), guide path and controls, cart wash(s), and battery charge equipment.

Average Interval, Elevator: The elapsed time in seconds between elevator departures from a terminal floor averaged over a specific time period. Average interval is a measure of the “quality” of elevator service. Average interval can be measured in existing buildings but must be calculated for new buildings. For practical purposes, it can also be viewed as the average roundtrip time of an elevator, divided by the number of elevators within the group in question. Average interval is not a direct measure of how long prospective passengers wait for service.

Average Maximum Ride Time (AMRT), Elevator: The amount of time a passenger is in an elevator from the point of origin to the destination is referred to as the “ride time.”

Average System Response Time, Elevator: The average time it takes for hall calls to be answered by an arriving elevator car. This is an estimated or simulated factor for new facilities but can be measured for existing facilities.

Average Waiting Time, Elevator: The average period that users wait for elevator service. This is an estimated or simulated factor. For example, if one person arrives at a lobby and initiates a hall call, and waits for 20 seconds for the car to arrive, while a second person arrives at the same time as the car, the average for these two persons being served is 10 seconds (20 seconds plus 0 seconds divided by 2). Tests indicate that average passenger waiting time (AWT) for service at a typical intermediate floor approximates 65–80 percent of the average interval during heavy two-way traffic periods.

Backflow Prevention: The use of a recognized device to prevent the backflow of water or other liquids, mixtures, or substances into the distributing pipes of the potable supply of water from any source such as a plumbing fixture or mechanical equipment.

Base Isolation: This is a seismic construction element to prevent ground motion from being transmitted from the building foundation into the superstructure.

Basic Life Safety (Seismic): A seismic damage risk classification category and an operational level category. Facilities in this category meet the minimum requirements and objectives of seismic building codes—to provide a collapse-resistant structure and thereby save lives. The life safety of the immediate building occupants is the sole objective of this category. Efforts to control damage due to earthquake in this category are minimum and limited primarily to the saving of human life. Reference Chapter 7.

Built-in Equipment: That equipment that is affixed to the facility and usually included in the construction contract.

Bulk Nitrous Oxide System: An assembly of equipment as described in the definition of bulk oxygen system that has a storage capacity of more than 3,200 pounds, approximately 28,000 cubic feet (normal temperature and pressure [NTP]) of nitrous oxide.

Bulk Oxygen System: An assembly of equipment such as oxygen storage containers, pressure regulators, pressure relief devices, vaporizers, manifolds, and interconnecting piping that has a storage capacity of more than 20,000 cubic feet of oxygen (normal temperature and pressure [NTP]) including unconnected reserves on-hand at the site. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. The oxygen containers may be stationary or movable, and the oxygen may be stored as gas or liquid.

C-Arm: Term referring to a specific type of radiographic machine used for fluoroscopic examinations.

Cardio: Related to the heart.

Cart (also called a "Module"): A wheeled vehicle upon which material is placed to transport it throughout the facility. Many cart variations are available. The movement of carts can be accomplished by employees, or semi-automated or automated transportation systems as determined by careful analysis for each individual hospital.

Cart Lift: A small vertical lift that is dedicated to the movement of carts. Cart lifts are usually automated and provide automatic dispatch and loading and unloading of carts. "Cart lifts" that are manually dispatched and require manual loading and unloading of carts are generally called "cart dumbwaiters."

Cart Wash: The semi- or fully-automated machine that washes and rinses carts as required by the individual hospital's program. Units may provide automated or manual loading and unloading. Units may or may not provide a full drying capability. Selection of the correct unit(s) for an application should be made after a complete analysis of all requirements, to include financial (life-cycle cost [LCC]) and traffic. When the cart wash function is to be done manually, it is done by hose or steam gun in an equipment washroom or area.

Category Code (real property): A series of numerical codes used to classify and categorize real property. These code numbers are based on ten basic functional classes coded by the DoD. They are generally a five-digit code to plan, program, budget, design and construct, inventory and maintain its facilities. Some commands add digits to refine the functional description. A category code may consist of a collection of attributes that come together to form the specific category code.

Category Code (NFPA): The terms "Risk Category", "System Category" and "Space Category" are used throughout NFPA 99 and can be confusing as the definitions appear similar and all have a range of 1 to 4 with category 1 being the highest risk (or most stringent requirement) and category 4 being the lowest risk (or least stringent requirement). Space categories relate to the typical function in a given space and are defined by NFPA 99, and for the Military Health System, are provided with the room code in Appendix B. Risk categories are defined by NFPA 99 and are determined by a risk assessment IAW NFPA 99. System Categories are the resultant design criteria to be applied to a given system after considering the Risk Category and Space Category, but note that there is not always a direct correlation between these categories.

Central Material Service (CMS): The physical area and functional operation that is responsible for cleaning, sterilizing, preparing, packaging, storing, and distributing

sterile items within the facility. CMS is the primary support element for the Operating suites and Labor and Delivery Rooms.

Central Processing and Distribution (CPD): An all-inclusive term for that function in a hospital that encompasses those terms variously known as Central Supply, Central Nursing Supply, Central Sterile Supply, and Central Material Services. Generally refers to a materials handling methodology. Provides for the central management of all medical material required to support patient care activities. The heart of this concept is an automatic distribution system. CPD requires the standardization and centralization of the elements of storage and distribution.

Civilian Health and Medical Program for the Uniformed Services (CHAMPUS): An indemnity-like program called TRICARE standard that is available as on option under DoD's TRICARE program. There are deductibles and cost shares for care delivered by civilian healthcare providers to active duty family members, retirees and their family members, certain survivors of deceased members, and certain former spouses of members of the seven Uniformed Services of the United States.

Code of Federal Regulations (CFR): The CFR annual edition is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation. The 50 subject matter titles contain one or more individual volumes, which are updated once each calendar year, on a staggered basis. The annual update cycle is as follows: titles 1–16 are revised as of January 1, titles 17–27 are revised as of April 1, titles 28–41 are revised as of July 1, and titles 42–50 are revised as of October 1. Each title is divided into chapters, which usually bear the name of the issuing agency. Each chapter is further subdivided into parts that cover specific regulatory areas. Large parts may be subdivided into subparts. All parts are organized in sections, and most citations to the CFR refer to material at the section level.

Combined Elevators: Elevators intended for dual or multiple function such as combined passenger (visitors/public) and service (moving of materials or patients).

Commission of Fine Arts (CFA): A regulatory body in the U.S. National Capital Region (NCR) that helps determine applicability of all Federal Military Construction (MILCON)-funded facilities within the NCR. Reference National Capital Planning Commission [NCPC].

Compaction. A waste-handling methodology whereby the volume of waste materials is reduced for ease of disposal.

Concepts: The first phase of design that includes Block Plans (S1), Schematics (S2), Design Development (S3), and the final 35 percent submission (S4). The basis on

which a Programmed Amount (PA) can be set for the Budget Submission. Approximately 35 percent of the design effort, as opposed to the second phase of design that is called the “working drawings” phase of design.

Constructability: An analytical study that reviews the methodology, ease (or difficulty) with which a project can be administered, bid, built, enforced, understood, and phased that determines degrees of difficulty and construction time required to build a Medical Treatment Facility. Reference Chapter 3.

Construction Contract Solicitation: The point in the design-construction process when all review comments from the 100 percent design submittal have been incorporated, the CWE is within the PA, the DoD Project Sponsor has notified the Design and Construction Agent that funds are available, and the DoD Project Sponsor has notified the Design and Construction Agent to advertise the project for bids. It is generally the point in the process when the project ceases to be a design effort and becomes a “Construction Project.”

Construction Management Plan (CMP): Establishes processes and procedures for the execution of the construction contract.

Contract Documents (CDs): Design drawings and specifications that, as a unit, constitute the basis for receiving bids and awarding a contract for construction. Contract documents are the basis on which a building is constructed.

Cost-Benefit Analysis (CBA): The process of assessing all pertinent costs and benefits, usually performed in terms of an expected life-cycle of the system.

Court, Enclosed: A court bounded on all sides by the exterior walls of a building, or exterior walls and lot lines on which walls are permitted.

Criteria: Military Unified Facilities Criteria (UFCs), criteria manuals, guide specifications, definitive designs, DoD Project Sponsor guidance, standard designs, and other related guidance published to promote quality facilities’ engineering, design, construction, and maintenance.

Critical Facility: Critical Facility provides selective protection for critical healthcare mission staff and functions following catastrophic Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive (CBRNE) attacks.

Critical Path: The linear path through a work schedule network determining the shortest time within which all work can be completed.

Current Working Estimate (CWE): The current cost of the project including construction cost, contingency, and supervision inspection and overhead (SIOH).

Required at certain levels of effort of design to compare against PA to determine whether the project is executable given projected funds availability.

Damage Risk Classification Categories (Seismic): Three seismic categories that attempt to relate the seriousness of the consequences of damage due to earthquake. The selection of a category may consider the density of human occupancy, the importance of the activity, or the value of the contents or structure itself. These categories are as follows: Basic Life Safety, High Risk Facility, and Essential Facility. Reference Chapter 7.

Dedicated Elevators or Lifts: A vertical transportation element that must be restricted in use to a singular predefined function. Elevators intended for patient transport from one patient care area to another patient care area, (for example ER trauma rooms, to the ORs, clean surgical material only or soiled materials only). Other functions may include the transport of surgical case carts or patient meal service. These are NOT normally shared or combined with other traffic.

Defense Health Agency - Facilities Enterprise (DHA-FE): The office of primary responsibility for all DoD MILCON funded facilities, https://home.facilities.health.mil/.

Dental Compressed Air (DCA): Compressed air system used for drying applications during dental procedures and as a power or drive source for lifts, locks, and pneumatic dental instruments and equipment. Not used for breathing or respiratory support of any kind. Reference Chapter 9.

Dental Surgical Vacuum (DSV): Dry vacuum system used to support patient care in dental treatment rooms and oral surgeries. Refer to Chapter 9.

Dental Low Vacuum for Oral Evacuation (OE): Low vacuum, high volume, wet pipe system to provide scavenging, collection, and disposal of liquids, solids, and aerosols from dental procedures. Refer to Chapter 9.

Departmental Gross Area: The functional space within a department plus intra-departmental circulation. Does not include “general” circulation.

Design and Construction Agent: The agency designated by the Secretary of Defense (SECDEF) responsible geographically (or by agreement) for the design or construction execution associated with the military construction program. Responsible for the project during design, construction, warranty period and financial closeout. Current Design and Construction Agents are:

a. The U.S. Army Corps of Engineers (USACE)

b. The Naval Facilities Engineering Systems Command (NAVFAC)

c. The Air Force Civil Engineer Center (AFCEC) in the United Kingdom

Design Authorization (DA): Notices from the DoD Project Sponsor to the Design and Construction Agents to proceed with A/E selection and award, design a project to varying levels of effort, advertise, and ultimately award a construction contract. Usually designates project, project fiscal year, project location, programmed amount (PA), scope of the project (size in square feet), which meetings the DoD Project Sponsor will attend, any deviations from the submittal requirements in this document, and whether or not the DoD Project Sponsor wishes to participate in the A/E selection process. Reference Chapter 3.

Designated Seismic Systems: The seismic force-resisting system in all structures and those architectural, electrical, and mechanical systems or their components in RC III and IV structures that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, Ip, is greater than 1.0. This designation applies to system that are required to be operational following the Design Earthquake for RC III and IV structures and follow the MCER for RC V structures. All system in RC V facilities designated as MC-1 must be considered part of the Designated Seismic Systems. Designated Seismic Systems will be identified in Chapter 7 of this UFC and will have an Importance Factor Ip = 1.5.

Disabled Person: An individual who has a physical or behavioral condition that, to a material degree, limits, contributes to limiting, or if not corrected will probably result in limiting the individual's performance or activities to the extent of constituting a substantial physical, behavioral, or vocational handicap.

DoD Project Sponsor: The primary DoD Project Sponsor for a particular project. For DoD MILCON, DHA-FE is most commonly the DoD Project Sponsor. Other agencies may be the DoD Project Sponsor for specific medical projects.

Drug Dispensing: The issuance of one or more doses of prescribed medication in containers that are correctly labeled to indicate the name of the patient, the contents of the container, and all other vital information needed to facilitate correct patient usage and drug administration.

Dumbwaiter: A small vertical lift that is dedicated to the movement of carts, tote boxes, and other similarly-sized items. Generally, this term implies manual loading and **unloading of the cargo.**

Economic Analysis (EA): A cost-benefit analysis done to identify the relative cost-effectiveness of delivering healthcare to a projected beneficiary population under different MTF sizing scenarios. P.L. 97-337 (15 October 1982), amended by Section

1087 of Title 10, U.S.C., requires an EA be done to determine the space to be programmed in MTFs for military retirees and their dependents.

Electrical Life Support Equipment: Electrically powered equipment whose continuous operation is necessary to maintain a patient's life.

Elevator Population: The building elevator population is the total number of riders/ vehicles that will require the use of automated vertical transport (elevators) during their stay in the building. Hence people that come, arrive, and depart from the main entrance level and that use the stairs would not be included in the elevator population. Traffic studies shall detail the calculations that arrive at the population used.

Etiologic Waste: Any viable microorganism or its toxins that causes or may cause human disease.

Evaluation: Implies an analysis to be performed by the designer (A/E) in the basic contract (as opposed to "studies" or "investigations," that are extra services to be performed to complete the contract intent and requirements).

Evidence-Based Design (EBD): The conscientious, explicit, and judicious use of current best evidence in making planning and design decisions that advance the needs of patients, staff, families, and organizations. Reference Chapter 6.

Facilities: Building(s), equipment, and supplies necessary for the implementation of services by personnel.

Facilities Sustainment: Facilities sustainment provides resources for maintenance and repair activities necessary to keep a typical inventory of facilities in good working order over the specific facility's expected service life.

Facility: A separate individual building, structure, utility system, or other item of real property improvement each item of which is subject to separate reporting and recording in accordance with DoD Instruction 4165.14, Real Property Inventory and Forecasting.

Federal Energy Management Program (FEMP): The U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) provides services, tools, and expertise to Federal agencies to help them achieve their legislated and executive-ordered energy, greenhouse gas, and water goals. These are delivered through project, technical, and program services.

Federal Information Processing (FIP): Any automatic data processing (ADP) equipment procured with Federal Government funds.

Fenestration: The arrangement of windows in a building, **\4** including their size, placement and style. **/4/**

Fire Safety Evaluation System (FSES): In accordance with NFPA 101M.

Fixed: Fastened to walls, floors, or ceiling or to steam, gas, plumbing, electrical power, or sensor lines in a permanent manner.

Flammable Liquids Storage Cabinet: A cabinet for the storage of flammable and combustible liquids constructed in accordance with NFPA 30.

Floor Area, Gross: Gross floor area must be the total floor area within the building to include all rooms, mechanical rooms, hallways, stairs, closets, thickness of interior or exterior walls, columns, or other features. Where the term “area” is used, it must be understood to be gross area unless otherwise specified. Reference Chapter 3 and Figure 3-1 for expanded explanation.

Floor Area, Net: Net floor area must be the actual occupied area in a functional space, not including thickness of walls, chases, columns, or general circulation. Reference Chapter 3 and Figure 3-2 for expanded explanation.

Functional Program: A written narrative of the facility functional requirements. The requirements are expressed in both strategic objectives and facility area-specific operational perspectives.

Functional Requirements: Those requirements necessary to ensure a particular facility continually meets the objective of the function for which it was constructed.

Grade: The degree or inclination of slope at ground level.

Gravity Chutes: Usually used for the vertical return of trash and linen (separate chutes) to a holding and collection room at the base of each chute.

Green Board: Moisture resistant gypsum board.

Gurney: A gurney is a medical transport device designed with a variable height, adjustable headrest, leg-rest, contain accessories such as IV hook, oxygen tank holder, x-ray holder with wheeled metal frame to transport patients who require medical care, and are used by emergency medical services (EMS), hospitals and medical facilities. The minimum size is **\4** 36 in. (914 mm) wide x 92 in. (2,337 mm) **/4/** in length.

Handling Capacity, Elevator: The “quantity” measure of elevator service is called handling capacity. Handling capacity is the number of persons and vehicles that can be transported by the elevator system in a given length of time. Average interval and

handling capacity must be measured or calculated for the same designated time period to be meaningful.

Hazardous Area in Laboratories: The area inside fume hoods or enclosures where tests or procedures are being conducted.

Health: A condition in which all functions of the body and mind are “normal” and active.

Health Care Occupancies: Refer to NFPA 101 for occupancy definitions.

Hematology: The science of the blood.

High Efficiency Particulate Air (HEPA) Filter: Replaceable filters having a minimum collective efficiency of 99.97 percent for 0.3 micron particle. Reference Appendix B.

High Hazard Areas: Areas of structure, buildings, or parts thereof used for purposes that involve highly combustible, highly flammable, or explosive products or materials that are likely to burn with extreme rapidity, or that may produce poisonous fumes or gases, including highly toxic or noxious alkalis, acids, or other liquids or chemicals that involve flame, fume, explosive, poisonous, or irritant hazards; also uses that cause division of material into fine particles or dust subject to explosion or spontaneous combustion, and uses that constitute a high fire hazard because of the form, character, or volume of the material used.

High Risk Facilities (Seismic): A seismic damage risk classification category. Facilities in this category are recognized as warranting a higher level of damage risk than the average building but less than for an essential facility. Efforts to control damage due to earthquake in this category are intermediate. Reference Chapter 7.

Histology: Study of the microscopic structure of tissue. **\1**

Hospital: An inpatient facility which provides both inpatient and outpatient medical care. As a facility category this includes both Hospitals and Medical Centers.

/1/Hospital Bed: A bed for an adult or child patient. Bassinets for newborns in maternity units, beds in labor and delivery rooms, recovery rooms, and other beds used exclusively for emergency purposes are not included in this definition.

Illuminated, Externally: An illumination source contained outside the device that is to be illuminated.

Illuminated, Internally: An illumination source contained inside the device that is to be illuminated.

Incineration: In waste handling, the act of burning pathological and other designated waste/infectious waste in an incinerator in order to render the water material(s) harmless.

Inspection Certificate: An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics of the product, and the name and identification of an approved agency indicating that the product or material has been inspected and evaluated by an approved agency.

Interdepartmental Circulation: General circulation. Circulation that provides access to and from various departments; included elevators, stairs, and major corridors.

Interstitial Building System (IBS): System involving coordinated design of all elements to achieve a building of optimum functionality, appearance, maintainability, and adaptability. Reference Appendix E.

Interstitial Space: Unfinished and unoccupied space between floors used for horizontal utility distribution systems, of sufficient size to accommodate workmen, and that permit maintenance and alteration without interruption of activities on the normally occupied floors. Reference E for Interstitial Building Systems.

Intradepartmental Circulation: The area reserved for corridors and passages that are found immediately within the departmental area.

Japanese Facilities Improvement Program (JFIP): A government of Japan initiative, which started in 1979 to ease the financial burden of stationing U.S. Forces in Japan. The program reduces U.S. Government cost to improve the quality of life and military posture. Approximately 21 percent of the government of Japan host nation support provided to the U.S. Forces in Japan is allocated to JFIP.

Joint Schedule Number (JSN): The number used to identify equipment on architectural drawings and plans supporting Military Construction (MILCON) projects.

kvp: Unit used to describe the radiation quality of X-rays. X-rays generated by electrons accelerated in a potential difference of, for example, 100 kilovolts (kV), are termed 100 kvp (kV peak voltage) X-rays.

Laboratory Air (LA): Compressed air system for use in medical or dental laboratories. May be combined with a dental compressed air (DA) system. Reference Chapter 9.

Life-Cycle Cost (LCC): Reference UFC 1-200-02.

Life-Cycle Cost Analysis (LCCA): Reference UFC 1-200-02.

Local Area Network (LAN): A modular communication methodology whereby the facility is prewired during construction for current and future communications needs, such as telephone, Composite Healthcare (computer) Systems (CHCS), without having to surface-mount additional wires or coax in the future and thereby reduce future communication installation costs.

Logistics Elevator: An elevator whose primary purpose is to transportation various supplies, such as dietary or medical/surgical supplies, devices, and equipment, as well as occasional construction materials.

Material Handling (MH): The function of moving, packaging, and storing of substances in any form. Material handling does not alter, change, enhance, or add value to a product in any way. It is a "cost" function only that should be minimized to the greatest extent possible (within given aseptic, physical, operational, and functional parameters).

Materials Handling Service Elevators: Elevators intended for use by staff for materials, supplies and equipment movement.

Materials Management (MM): Material management is a scientific technique, concerned with planning, organizing, and control of flow of materials, from their initial purchase to destination.

May: "May" is used to indicate provisions that are used at the option of the designer.

Mechanical Space: The area that houses the primary and intermediate components of the air conditioning, plumbing, communication, electrical, and ventilation systems. This area includes chases and shafts as well as mechanical and electrical equipment rooms.

Medical Compressed Air (MCA): Compressed air system used only for medical functions requiring breathable air to support respiration or for air-driven instruments that discharge into the pharynx. Reference Chapter 9.

Medical Military Construction (MILCON) Program: That portion of the President's budget devoted exclusively to the renovation, upgrade, and replacement of applicable facilities that cost more than $750,000. MILCON is not supposed to include Operations and Maintenance (O&M) or Repair and Maintenance (R&M) unless the area that could be done with O&M or R&M is affected by the larger MILCON project and must be accomplished to provide a complete and usable facility in accordance with NFPA and TJC requirements.

Medical Surgical Vacuum (MV) System: Dry vacuum system used only for medical functions involving patient care, therapy, and diagnostic functions. May be used for Dental Surgical Vacuum (DSV) requirements in dental treatment rooms and oral surgeries. Reference Chapter 9.

Medical Treatment Facility (MTF): A facility established for the purpose of furnishing medical and/or dental care to eligible individuals.

Migration, Elevator: When more than one elevator group is available in a building, a passenger's origin does not necessarily dictate which elevator group will be used. A certain percentage of the population will migrate to other areas of a building to use an elevator for reasons such as meeting a friend or dropping off something on the way to their destination. This percentage is usually estimated to be 5-10 percent of the population (or as otherwise appropriate for the facility being studied).

Military Construction (MILCON) Programming: The annual processing, review, and approval of MILCON project proposals by the Military Department Secretaries, the OSD, and the OMB for submission to Congress.

Military Department (MilDep): One of the departments within the Department of Defense created by the National Security Act of 1947, as amended. Specifically includes the Department of the Air Force, the Department of the Army, and the Department of the Navy.

Milliampere (mA): The unit of electrical current flow equal to 0.001 ampere.

Mixed Occupancies: Reference NFPA 101 for occupancy definitions.

Modernization: Alteration, repair, remodeling, replacement, and renovation of existing buildings (including initial equipment thereof) and replacement of obsolete, built-in equipment of existing buildings. Does not include replacement of a facility or a portion to a capacity greater than the capacity of the existing facility.

Modular: a. Having commensurable dimensions.
b. Capable of arrangement with exact fit in more than one sequence or direction.
c. Composed of or containing predetermined dimensional or functional units such as repetitive structural bays or service modules.

Must: Indicates a mandatory requirement, synonymous with "will."

National Capital Planning Commission (NCPC): A regulatory body in the U.S. National Capital Region (NCR) that helps determine applicability of all Federal MILCON-funded facilities within the U.S National Capital Region. (See definitions of Commission of Fine Arts and NCR.)

National Fire Codes: Codes, standards and recommended practices published by the National Fire Protection Association (NFPA).

National Stock Number (NSN): Medical equipment identification consisting of an applicable four-digit class code number plus the nine-digit national item identification number.

Noise Criteria-Level (NC-Level): Refers to a set of contours roughly corresponding to the ear's response to sound pressure level at various frequencies that define the background sound level existing within a space.

Nonflammable Anesthetizing Location: Any anesthetizing location designated for the exclusive use of nonflammable anesthetizing agents.

Nonflammable Medical Gas System: A system of piped oxygen, nitrous oxide, compressed air, or other nonflammable medical gases.

Non-Regulated Medical Waste (NRMW): Waste not classified as regulated medical waste (RMW), recyclable materials, or hazardous materials. Poses no special danger of infection or injury to personnel or the public.

Nurses' Stations: Areas intended to provide a center of nursing activity for a group of nurses serving bed patients where the patient calls are received, nurses are dispatched, nurses' notes written, inpatient charts prepared, and medications prepared for distribution to patients. Where such activities are carried on in more than one location within a nursing unit, all such separate areas are considered a part of the nurses' station.

Operational Level Category (Seismic): These categories define the post-earthquake performance requirements for various facilities with respect to operational mission, disaster preparedness, and medical post-earthquake needs.

Operationally Ready Mode: A critical facility that completed its functional checks and determined to be capable of transforming to a higher level of preparedness. Ready for the next higher Operational Mode.

Operations and Maintenance (O&M) Funds: Those funds other than MILCON used for the express purpose of upgrading and maintaining existing facilities and equipment, or for the purchase of government furnished equipment and furnishing (not built-in) to provide a complete and usable facility.

Passenger Elevator: An elevator configured to move visitors, staff, and other ambulatory passenger traffic between floors. This elevator is generally wide car configuration to facilitate the movement of passengers.

Patient Service Elevator: An elevator configured to move patients on beds, gurneys, and stretchers, as well as patient care-related equipment such as portable X-rays,

inhalation equipment, empty gurneys, wheelchairs, etc. The elevation is generally narrow and deep to facilitate the loading and unloading of this traffic.

Permanent: For the purposes of Medical Military Construction (MILCON), any structure designed for a useful lifespan of 25 years or longer.

Planning and Design (P&D) Funds: Funds for costs associated with preparation of design plans and specifications (A/E and in-house design costs) and costs to develop Operation and Maintenance Support Information (OMSI) products for a specific project.

Plumbing Fixture: An installed receptacle, device, or appliance that is supplied with water or that receives liquid or liquid-borne wastes and discharges such wastes into drainage systems to which it may be directly or indirectly connected.

Pneumatic Tube System (PTS): A pneumatically-powered, small diameter (usually 4 or 6 inches) tube that moves special carriers that contain messages, small supplies, or other items that physically "fit" and can tolerate this method of transport. These systems can be point-to-point or multi-station in design.

Post-Occupancy Evaluation (POE): An evaluation of the design and construction of a facility performed after facility activation and usage to obtain lessons learned that can be applied to present and future designs and criteria.

Precious Metals Recovery Program: Promotes the economic recovery of precious metals from excess and surplus material, and the use of recovered precious metals as Government Furnished Material.

Pre-Engineered Building (PEB): For the purpose of these criteria, pre-engineered buildings are considered as those buildings in various configurations and sizes that are available from manufacturers as a standard item. This type of construction may be used for DoD medical and dental facilities where such use is indicated by life-cycle cost to be economical, where they will meet the performance and functional requirements of the project, and are architecturally compatible with the environment in which they will be erected. Because of the great variance in the quality and cost of such structures on the market, extreme care must be used in selection to ensure that the quality of the facility to be provided is commensurate with the project requirement and expected longevity of the mission to be served.

Process Air (PA): Compressed air system to support functions such as medical service columns or shop operations. Reference Chapter 9.

Program Amount (PA): The initial PA is the estimated cost of a facility based on the DoD Cost Guidance and DD Form 1391 preparation prior to any design effort that establishes a project's viability in the budget cycle. Once Concept Design is completed,

the PA may be adjusted (up or down) based on the developed and validated Current Working Estimate (CWE) from the Design and Construction Agents. This PA (new) may be the amount sent to Congress and the basis of Final Contract Document Design phases through Construction Contract Solicitation.

Program Objective Memorandum (POM): Formal document to identify major initiatives, their resource consumption estimates, and their operational justification used to prioritize and allocate manpower and fiscal resources.

Rad/Fluoro: Radiographic/Fluoroscopic.

Radio Frequency Interference (RFI): Electromagnetic radiation that is emitted by electrical circuits carrying rapidly changing signals, as a by-product of their normal operation, and which causes unwanted signals (interference or noise) to be induced in other circuits.

Readiness, Military: The ability of forces, units, weapons systems, or equipment to perform as they were intended and to deploy and employ without unacceptable delays.

Regulated Medical Waste (RMW): Waste that poses danger of disease transmission and/or objectionable appearances to personnel and the public.

Request for Proposal (RFP): A procurement document released to commercial industries outlining a requirement for development or implementation of a system or design. Industry provides its formal response in the form of proposed solutions to the problem defined, its cost and development schedules, and other pertinent data upon which the Government selects a vendor(s) with whom to contract.

Research and Laboratory: A facility or building used directly in theoretical or applied research, development, testing, and evaluation activities for medical research. It can also be a function detached from a hospital that provides laboratory support to the hospital or other medical activities equipped to conduct scientific experiments, tests, investigations, and research. These facilities are used directly in basic or applied research in the sciences including medicine and engineering.

Respiratory Care Department/Service: An organizational unit of the hospital that is designed for the provision of ventilator support and associated services to patients.

Root Mean Squared (RMS): Also knows as Effective Value. The value of alternating current or voltage equal to 0.707 times its peak value.

Schematic Design: Room-by-room scaled drawings defining the size and arrangement of areas in a building or building configuration as a basis for design development.

Section 2807, Title 10, U.S.C: The appropriate committees of Congress must be notified of the intent to award a contract for A/E services and construction design for the proposed Military Construction (MILCON) project if the estimated cost of such services exceeds $1,000,000. This notification must include the scope of the proposed project and the estimated cost of such services and must be made not less than 14 days before the initial obligation of funds for such services.

Semi-Permanent: For the purposes of Medical Military Construction (MILCON), any structure designed to last between 5 and 25 years of useful life. An example is an overseas free-standing contingency facility off-base.

Separated Elevator: Elevators that are intentionally separated within a facility such as passenger, service (staff or patients and logistics (materials), etc. based solely on the function, operation or service provided.

Service Elevator: An elevator that is “narrow and deep” in configuration to move patients and vehicular-type traffic between floors.

Should: Indicates a recommendation or alternative that is highly advised but not absolutely required.

Simulation: The use of a computer program as a model of a real situation.

Single-Loaded Corridor: A corridor with a single entry and exit point.

Sound Transmission Class (STC): A single-number rating system that compares the sound transmission loss of a test specimen with a standard contour.

Special Use Elevator: Elevators intended for loading docks, mortuary, AGV or the transport of animals.

Standby Mode: A critical facility capable of quickly, and with minimum effort, transforming from its peacetime mode of operation to a higher level of preparedness. Ready for the next higher Operationally Ready Mode.

Statement of Work or Scope of Work (SOW): A formalized document describing the details of an effort to be accomplished through contracted resources.

State-of-the-Art: The level of development (as of a device, procedure, process, technique, or science) reached at any particular time usually as a result of modern methods.

Status of Forces Agreements (SOFA): Agreements between the U.S. Government and the government of a foreign nation (host nation) that allows U.S. Forces to engage in some activity (such as occupy, build, or otherwise have temporary rights) that

otherwise would not be possible. SOFA agreements usually stipulate governing rules, codes, and standards that must be followed in the course of construction on that nation's soil.

Stretcher: A stretcher is an apparatus used for moving patients who require emergency medical care. These are collapsible on a variable-height wheeled frame, have special wheels that makes transportation over pavement easier, integral lug to lock into the ambulance and straps to secure the patient during transport. The minimum size is 24 inches wide x 84 inches in length.

Structural Interior Design (SID): The portion of basic design services concerned with establishment of "motif," color, and finish selection usually very early in the Concept Design phase of all fixed, "structurally related" finishes (for example walls, floors, ceilings, columns, fixtures, casework, equipment, and exteriors) as opposed to Comprehensive Interior Design (CID) that is an option to design services and relates to such things as moveable, mobile, or portable equipment, fixtures, and furnishings. For unity of color selection and design, both the SID and the CID must be compatible, conform to the finish schedule, and coordinate early and throughout the design, procurement, construction, and installation processes. Reference Chapter 3 and Chapter 6.

Sustainable Design: Design, construction, operation, and reuse/removal of the built environment in an environmentally and energy-efficient manner.

Tactical (Operational) Mode: A critical facility, having completed its Operationally Ready functional checks, and activated its limited number of simple tasks during changeover, that is operating in an independent, sustained, continuous operation without resupply for a predetermined period of time. This is the highest level of preparedness or operation.

The Joint Commission (TJC): Private, not-for-profit organization composed of representatives of the American College of Surgeons, American College of Physicians, American Hospital Association, American Medical Association, and American Dental Association whose purpose is to establish standards for the operation of health facilities and services, conduct surveys, and determine accreditation status of medical treatment facilities.

Total Building Commissioning (TBCx): Commissioning is defined by the building industry as the process of verifying that all building systems perform interactively according to the design intent, and the systems meet the Owner's operational needs. Reference Chapter 19.

Total Gross Area: The total area including intra-departmental circulation, inter-departmental circulation, walls and structure, mechanical space, and total net area.

Universal X-Ray Room: The universal X-ray room must be capable of accepting all routine radiographic, fluoroscopic, and tomographic equipment up to 1200 milliamperes (mA), 150 kvp, regardless of manufacturer, during initial installation and subsequent replacement actions with little, if any, facility modification. The procedures must be performed unencumbered and without any restriction of system components, patient size, or any known procedure that any installed X-ray equipment can perform now or in the future. This definition does not apply to digital radiography, special procedure rooms, C-arms, or angiography rooms. Reference Appendix D.

Value Engineering (VE): Value engineering studies consist of analyses of certain high-cost areas of a design to determine if an alternate way exists to achieve the same or improved function at a lower life-cycle cost (LCC). The main objectives of VE studies are reduced LCC and improved quality of design. The application of value engineering must not result in a lowering of criteria, quality standards, or reduction of scope as established by the guidance in this document. Reference Chapter 3.

Vehicular Traffic, Elevator: Generally defined as that traffic that is pushed or rolled into elevators on wheels. Examples of vehicular traffic are beds and gurneys. Wheelchairs are considered vehicular traffic where they are pushed by an escort or attendant, and where the occupant is a patient. Where wheelchairs carry staff or visitors, they are generally counted in with the pedestrian population since they would utilize passenger elevators.

War Reserve Material (WRM): Material required to augment peacetime assets to completely support forces, missions, and activities reflected in DoD/Joint Chiefs of Staff war plans.

Whole Building Design Guide (WBDG): WBDG was created to assist the design community with integrating Government criteria, non-Government standards, vendor data, and expert knowledge into a 'whole building' perspective. This 'whole building' concept is an integrated design approach that employs a collaborative team process to achieve high-performance buildings.

Working Drawings: The second phase of the Design process that includes the final development of all contract documents to prepare for the bidding phase.

X-Ray Installations (Momentary Rating): A rating based on an operating interval that does not exceed 5 seconds.

Zone, Elevator: A group of floors in a building that is considered as a unit with respect to elevator service. It may consist of a physical entity – a group of upper floors above and below which are blind shafts – or it may be a product of the elevator group control system, changing with system needs.

APPENDIX J REFERENCES

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