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MILITARY HANDBOOK

DEPARTMENT OF DEFENSE

MEDICAL AND DENTAL TREATMENT FACILITIES

DESIGN AND CONSTRUCTION CRITERIA

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ABSTRACT

This handbook provides design and construction criteria for DoD Medical and Dental Treatment Facilities. These criteria and procedures are mandatory for all DoD Medical and Dental Treatment facilities. Service-specific criteria may augment this handbook, but requirements that exceed this guidance must be fully justified to ensure understanding by the reviewing officials.

The procedures outlined in this handbook apply from the time the Design Authorization (DA) is issued by the Defense Medical Facilities Office (DMFO) and throughout the design, construction, Beneficial Occupancy, and the Post-Occupancy Evaluation (POE) period.

While these criteria were not developed primarily for use in review of military construction program and budget submissions, it is recognized they may be used for that purpose. Projects should not, however, be approved, disapproved, or justified solely on the basis of these criteria.

This document is not intended to be the basis of design for Operations and Maintenance (O&M) or Repair and Maintenance (R&M) work though it may serve as a guide in the absence of other relevant criteria.

FOREWORD

This handbook is issued under the authority of DoD Directive 6015.17, "Procedures for the Planning, Programming, Budgeting and Execution for Construction of Military Health Facilities," April 1, 1991. It complies with the policy of DoD Directives 5136.10, "Defense Medical Support Activity," dated February 6, 1986 and 6015.16, "Department of Defense Policies for Planning Fixed Military Health Facilities," dated April 15, 1986, which give Defense Medical Facilities Office the authority to develop and maintain the facilities planning, design and construction criteria in support of the missions of the Military Health Services System.

This handbook applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Organization of the Joint Chiefs of Staff (OJCS), the Unified and Specified Commands, the Defense Agencies, and activities administratively supported by OSD (hereafter referred to collectively as "DoD Components"). This handbook covers criteria unique to health care facilities only and shall be used in conjunction with the MIL-HDBK-1190, "Facility Planning and Design Guide," for general building requirements.

Recommendations for improvement to this handbook are encouraged and should be reported on the DoD Form 1426 provided inside the back cover to the Defense Medical Facilities Office (DMFO), 5109 Leesburg Pike, Suite 817, Skyline 6, Falls Church, VA 22041-3201, (Office of Primary Responsibility (OPR) for maintenance of this handbook). The using Military Departments and the Design and Construction Agents may submit proposed changes to this handbook through the Medical Facilities Acquisition and Maintenance Board (MFAMB) for consideration.

This handbook shall not be used as a reference document for procurement of facilities construction. It is to be used in the purchase of facilities engineering studies and design (final plans, specifications, and cost estimates). Do not reference it in military or federal specifications or other procurement documents.

DEPARTMENT OF DEFENSE MEDICAL AND DENTAL TREATMENT FACILITIES DESIGN AND CONSTRUCTION GUIDE

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SECTION 1: GENERAL GUIDANCE

1.1 General. This section provides general guidance on Department of Defense (DoD) policies and procedures for design and construction of Military Medical and Dental Treatment Facilities (MTF's). It is the DoD objective to provide MTF's that are responsive to the functional requirements of the using Military Department.

1.2 Applicability. This document sets forth DoD policy, procedures, and technical criteria for construction of MTF's. The procedures and criteria in this document shall be used for all facilities in the Defense Medical Military Construction Program (MILCON) and other construction projects over $200,000. In overseas locations where Status of Forces Agreements (SOFA) or local host country codes and standards conflict with the criteria in this handbook, conflicts will be resolved on a case-by-case basis and, whenever feasible, settled at the Design Agent Medical Facility Design Office (MFDO) level.

1.3 Policy. As stated in the DoD Directive 6015.16 (reference 1g), it is DoD policy to design efficient, economical, and safe MTF's which sustain an effective combat force, that support the DoD medical wartime mission, and that meet the provisions of Title 10, United States Code (reference 1a). This document prescribes the DMFO technical criteria and policy guidance for the design and construction of safe, functional, and durable facilities which will have reasonable and appropriate maintenance and operations costs throughout their designed life. Detailed design criteria and procedures which may be developed and issued by the DoD Components (Military Departments) shall be consistent with the policy statements and criteria contained herein and shall not exceed these criteria without DMFO approval. Design of MTF's shall:

1.3.1 Meet the operating requirements of the using activity and provide reasonable flexibility to accommodate future changes,

1.3.2 Provide functional facilities at the lowest practicable life-cycle-cost, and

1.3.3 Be aesthetically compatible with the local environs and meet necessary environmental requirements including applicable Federal, State, and Local pollution control standards and criteria. Necessary coordination shall be maintained with the state and local community in accordance with the requirements of E.O. 12371 (reference 1b) as implemented by DoD Directive 4165.61 (reference 1c).

1.4 Responsibilities. The Defense Medical Facilities Office (DMFO) is responsible for planning, programming, managing financial resources, preparing and maintaining facility criteria, performing concept review, and 35% certification for MTF design and construction in accordance with DoD Directives 5136.10 and 6015.16 (references 1f and

1g). The Design and Construction Agents may maintain supplementary technical criteria and will execute design and construction following established regulations and procedures unless otherwise directed by the DMFO. Design Agents will produce designs for a complete and useable facility within the approved programmed scope and programmed amount. The Military Departments as the users are responsible for all medical functional review and input during design. This functional user's responsibility often overlaps but never supersedes the technical role of the Design Agent. Specific responsibilities are addressed in various sections of this handbook.

1.4.1 Responsible Office. The Office of the Assistant Secretary of Defense (Health Affairs), OASD(HA), is responsible for the general administrative management of this entire document, and for the development and inclusion of all criteria in it.

1.4.2 Medical Facilities Acquisition and Maintenance Board (MFAMB). The MFAMB acts as the technical consultant to DMFO for the contents of this document. This Board is composed of Military Department members actively involved in the planning, programming, design, and construction of MTF's. The MFAMB can provide up-to-date, knowledgeable, and timely input to DMFO in all areas of MTF acquisition. All MIL-HDBK-1191 criteria updates and changes may be formally submitted to this Board for evaluation and presentation to DMFO along with the MFAMB's recommendation for adoption or rejection. DD Form 1426 is provided for this purpose at the end of this MIL-HDBK-1191.

1.4.3 Waivers. DMFO has the sole authority to waive MIL-HDBK-1191 policy, procedures, or criteria. Requests for project specific waivers to any portion of this document must be submitted in writing by the Design Agent to DMFO with full particulars and justification. The coordination of the using Military Department shall be obtained before such requests are submitted to DMFO.

1.5 Referenced Documents. The DoD Directives, Instructions, and selected technical data, publications and standards (latest or most current editions) are referenced in the text by basic designation only and form a part of these criteria to the extent required by these references. Where references are made to MIL-HDBK-1190 (reference 1d), those referenced sections shall become an integral portion of this guidance.

1.6 Restrictions. This handbook is not to be used as a reference document for procurement of facilities construction. It is to be used in the purchase of Military Medical and Dental Treatment Facilities engineering studies and designs (final plans, specifications, and cost estimates). It is not to be used for reference in other Military or Federal specifications or other procurement documents.

1.7 Predesign Considerations. DMFO in coordination with the using service will prepare a Project Planning Package prior to start of design to will include the following:

1.7.1 DD Form 1391,

1.7.2 Project Narrative summarizing the sizing decision process, siting, significant planning information, and results,

1.7.3 Program for Design, (PFD, space program), including the required number of parking spaces,

1.7.4 Equipment List (Category A, B, C, E, F, G), and

1.7.5 The Project Book (PB) summarizing existing site conditions and utilities.

1.7.5.1 The using Military Department shall fund and provide the Project Book (PB) to DMFO as part of the preplanning effort. The following information, at minimum, is required:

a) Area maps, location maps, site location, site description (to include grades, approved plantings, gates, etc), style of architecture (with photographs), construction season limitations, seismic, solar access, wind and snow considerations, SOFA, host country agreements, soil and foundation conditions, utility conditions (water, sewer, power, steam, electrical capacities and location), site restrictions (airfield, AICUZ potential helipad approach/departure zone obstructions, floodland, rights-of-way, etc.), and National Capitol Planning Region (NCR) considerations, etc.

b) Utility peak demand factors and availability, energy conservation requirements, existing fuel sources, central heat or chilled water systems and capacities, physical security considerations, power service characteristics and locations, electrical distribution, water and wastewater considerations, and corrosion control, i.e., cathodic considerations.

c) Environmental impact requirements, archaeological and historical considerations, explosive ordinance locations, contaminated soil (fuel, asbestos, etc.), coastal zone considerations, wetlands and watershed considerations, threatened and endangered species considerations, water quality, air quality, asbestos contamination, protection of natural resources information, and any other Environmental Protection Agency (EPA) or Occupational Safety and Hazard Administration (OSHA) considerations necessary which might impact the MILCON project.

d) Security requirements, protection requirements (from sabotage or unfriendly local citizens), contingency or BLAST considerations, and availability of police interface.

e) Fire protection considerations, such as accessibility and water supply.

f) Communications, information or data systems, telephone and signal interface requirements for fire, police, etc., telephone

switch capacities and line availability for MILCON project, Energy Monitoring and Control System (EMCS) interface, master antenna, cable TV and closed circuit availability, computer interface, and all other similar or useful information.

g) Preliminary analysis of replacement versus addition/alteration where requested by DMFO.

h) Completed site survey in Figure 1-1 format.

1.8 Design Considerations.

1.8.1 Economic Considerations. Project designs must be functional, aesthetically pleasing, and cost effective to acquire, maintain, and operate. The selection of one particular design feature for a given application, when two or more options are known to be feasible, shall be based on the results of an economic study. The goal of every MTF design is to provide the most functional, life-cycle cost-effective, maintainable, design possible within the available funds.

1.8.1.1 Cost estimates during design for building systems and casework shall be based on Figure 1-2. Logistical responsibility is explained in Section 16 and in the glossary.

1.8.2 Use of Local Materials and Skills. Project designs should consider economies that can be affected by the use of suitable local materials, construction methods, and skills which are consistent with the intent of these criteria.

1.8.3 Use of New Materials and Techniques. Project designs should consider new materials and techniques of construction, which have produced satisfactory results in actual use. Concurrence of the using Military Department, the Design Agent, and DMFO are required before proceeding with design using radically different materials or techniques.

1.8.4 Use of Stock Products. Use commercially available stock or standard materials, fixtures, and equipment whenever practicable.

1.8.5 Functional Use of Materials. Select both structural and finish materials which are consistent with simple functional design and appropriate for the climatic conditions of the geographical area where the project is located.

1.8.6 Integrated Building Systems (IBS). Consider the use of Integrated Building Systems (IBS) when the facility is large enough to warrant this approach. Obtain DMFO approval to consider IBS prior to design start. Refer to Section 19 for specific guidance.

1.8.7 Future Expansion. Incorporate considerations for future expansion into all designs. Consider both external and internal

expansion of vital functions such as ancillary and utility services. Building siting, 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 vertical expansion is authorized when approved by DMFO.

1.8.8 Construction Qualities. MTF's shall be designed and constructed to provide a well-built and enduring product at the lowest practicable life cycle cost. Specific criteria for individual spaces are set forth in Appendix A. Materials used in design and construction of overseas projects shall be in character with materials, techniques, and methodologies used for similar structures in that country, unless in the opinion of DMFO, the Design Agent and the using Military Department, U.S. standards should prevail.

1.8.9 Environmental Quality. Congressional and administrative guidance for general policies regarding environmental quality is provided in MIL-HDBK-1190 (reference 1d).

1.8.10 Fallout Protection. Provide Fallout protection according to the policy guidance given in DoD Directive 3020.35 (reference 1e) and MIL-HDBK-1190, (reference 1d), and as directed by the DMFO, using Military Department and Design Agents.

1.9 Improvement to Existing Facilities. The criteria contained herein are not to be used as the sole justification for addition/ alterations or improvements to existing MTF. Categorize and estimate all costs associated with projects containing altered areas including the cost of temporary structures, if required, according to the following definitions:

1.9.1 Level 1 - Light alteration includes minor partition layout changes, new finish treatment, minor casework and equipment changes, minor modifications to Heating, Ventilation and Air Conditioning (HVAC) distribution systems, and minor electrical branch circuit changes. The estimated cost of this alteration should not exceed 30 percent of replacement cost for the same type of facility.

1.9.2 Level 2 - Medium alteration includes 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 this alteration should not exceed 50 percent of replacement cost for the same type of facility.

1.9.3 Level 3 - Heavy alteration includes 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 and auxiliary equipment, plumbing system, and energy plant. The estimated cost of

this alteration should not exceed 75 percent of replacement cost for the same type of facility.

1.9.4 The cost of interim facilities (temporary construction), if required, shall be included in the estimated cost for each of the above levels of alteration.

1.10 Types of Construction. Construction levels and building types are outlined in MIL-HDBK-1190, Chapter 1 (reference 1d). For MTF's, the following apply:

1.10.1 Permanent Construction. MTF's built in the United States, its territories, or possessions are to be of permanent construction with a life expectancy of 25 years or more.

1.10.2 Semi-Permanent Construction. MTF's built outside of the United States, its territories, or possessions are to be semi-permanent construction with a life expectancy of 5 to 25 years unless the normal building practices of the host country, Status of Forces Agreements (SOFA), or other agreements stipulate permanent-type construction.

1.10.3 Contingency Facilities. Typical free-standing medical contingency facilities are to be semi-permanent construction with a life expectancy of 15 years, durable, and consistent with locally available building technology.

1.10.4 Temporary Construction. This type of construction may be authorized as an emergency measure or as an interim solution as approved and coordinated through formal request from the using Military Departments to DMFO. Follow individual Military Department rules and regulations for construction of these facilities.

REFERENCES

1a. Title 10, United States Code (USC).

1b. Executive Order 12371, "Intergovernmental Review of Federal Programs", July 16, 1982.

1c. DoD Directive 4165.61, "Intergovernmental Coordination of DoD Federal Development Programs and Activities", August 9, 1983.

1d. MIL-HDBK-1190, "Facility Planning and Design Guide", September 1, 1987.

1e. DoD Directive 3020.35, "Fallout Shelter Analysis".

1f. DoD Directive 5136.10., "Defense Medical Support Activity," February 6, 1986.

1g. DoD Directive 6015.16, "Department of Defense Policies for Planning Fixed Military Health Facilities," April 15, 1986.

FIGURE 1-1

SITE SURVEY

PROJECT NAME:_____ DATE: _____

PROJECT LOCATION: _____

1. ARE ROADS TO SITE ADEQUATE? Y or N

2. IS SITE IN FLOODPLAIN? Y or N

3. WHAT IS PROJECT TYPE? NEW or ADDITION/ALTERATION

4. IS THERE ANY ASBESTOS? Y or N

5. ARE THERE ANY OTHER CONTAMINATION OR SAFETY HAZARDS? Y or N

6. ARE THERE ANY HISTORICAL STRUCTURES ON OR ADJACENT TO SITE? Y or N

7. SEISMIC ZONE OF SITE? 0 1 2 3 4

8. IS THERE ANY EXPANSIVE SOIL AT THIS SITE? Y or N

9. WHAT IS THE GENERAL BEARING STRATA DEPTH IN THIS AREA? _____

10. ARE SPECIAL FOUNDATIONS REQUIRED? NONE PIERS MAT PILES
OTHER:_____

11. WHAT IS WATER TABLE LEVEL AT THIS SITE? _____

12. IS NOISE A PROBLEM? Y or N IF Y, WHAT IS NC-LEVEL? _____

13. ARE THERE ANY EXISTING STRUCTURES TO BE DEMOLISHED? Y or N

14. DO ANY DISPLACED FUNCTIONS NEED TO BE REPLACED? N/A, Y or N
IF YES, WHAT ARE THEY? _____

15. DO ANY EASEMENTS CROSS THE PROPERTY? Y or N
IF YES, WHAT ARE THEY? _____

16. WHAT IS BASIC SIZE AND SHAPE OF SITE? _____

17. WHAT IS SLOPE OF SITE? LEVEL 3-8% 9-15% 16-25% >25%

18. IS THERE ANY SIGNIFICANT VEGETATION? Y or N

19. WHAT IS THE PREVAILING WIND DIRECTION? _____

FIGURE 1-1 (CONTINUED)

20. WHAT IS AVERAGE ANNUAL RAINFALL? _____ INCHES

21. WHAT IS AVERAGE ANNUAL SNOWFALL? _____ INCHES

22. WHAT ARE THE CLIMATIC CONDITIONS? WIN DB____ SUM DB____ WB____

23. DOES WATER SUPPLY NEED TO BE TREATED? Y or N

24. WHAT IS THE AVAILABILITY OF UTILITIES TO THE SITE?

SYSTEM	DISTANCE TO CONNECTION POINT	CAPACITY AVAILABLE TO SITE	
WATER	_____ FEET	_____GPM	_____PSI
FIRE WATER	_____ FEET	_____GPM	_____PSI
CLEAN STEAM	_____ FEET	_____#/HR	_____PSI
UNTREATED STEAM	_____ FEET	_____#/HR	_____PSI
HI-TEMP HOT WATER	_____ FEET	_____GPM	_____TEMP
CHILLED WATER	_____ FEET	_____GPM	_____TEMP
SANITARY SEWER	_____ FEET	_____GPM	
STORM SEWER	_____ FEET	_____GPM	
GAS	_____ FEET	_____GPM	_____CFM
ELECTRICAL	_____ FEET	_____KVA	_____KILOVOLT
CABLE TV	_____ FEET		
COMMUNICATIONS	_____ FEET	_____SWITCH CAPACITY	
PATH. WASTE	_____ FEET	_____#/DAY	

25. WHAT IS THE FREGUENCY OF LIGHTNING?

26. ADDITIONAL REMARKS: (Add additional pages if necessary):

CERTIFICATION OFFICIAL: NAME: _____

TITLE: _____

ORGANIZATION: _____

SIGNATURE: _____

FIGURE 1-2

LOGISTICAL RESPONSIBILITY FOR CASEWORK AND BUILDING SYSTEMS

Special Instructions. The items listed in this section shall be included in construction cost estimates as appropriate.

ITEM	DIVISIONS						
	Logistical Responsibility[1]						
ITEM	A	B	C	D	E	F	G
Building and Grounds							
To include:							
Hospital buildings (including administration)							X
Medical Clinic buildings							X
Dental Clinic buildings							X
Clinical and Medical Research Laboratory buildings							X
Animal holding buildings							X
Maintenance shop buildings							X
Garages and automotive shelters							X
Power plant buildings (steam and/or electrical)							X
Sewage disposal plant structures							X
Medical helicopter/air evac landing pads							X
Chapel							X
Recreational building (including Red Cross, gymnasiums and swimming pools)							X
Recreational fields (including tennis courts, baseball diamonds, etc.)							X
Guard and sentry boxes, gate houses							X
Incinerator buildings							X
Electrical Service							
To include:							
Wiring (including material)							X
Conduits							X
Switches, panels boxes, service outlets							X
Transformers (stepdown and distribution)							X
Lighting, fixtures (including initial lamping)							X
Generating equipment (including emergency)							X
Explosion-proof fixtures							X
Power conditioning/surge protectors							X

[1] See Para 16.2.1 for definition.

ITEM	Logistical Responsibility A	B	C	D	E	F	G
Heating, Air Conditioning, and Ventilation							
To include:							
Air conditioning (including packaged units)				X			
Boiler plants and water heaters				X			
Heat and steam distribution systems				X			
Central vacuum cleaning system				X			
Plumbing							
To include:							
Piping valves, fittings, and outlets				X			
Toilet, bath, and lavatory fixtures (including shower stalls, mirrors, towel racks, toilet paper dispensers, paper towel dispensers, soap dispensers, and bed pan washers				X			
Sewer systems and plants				X			
Gas, air pressure and suction, and medical gas systems				X			
Automatic sprinkler systems				X			
Fire protection system (water)				X			
Refrigeration							
To include:							
Refrigeration (walk-in)				X			
Deep freeze (walk-in)				X			
Built-in morgue refrigerators				X			
Communications							
To include:							
LAN - Local Area Network				X			
Telephone system, including--							
Conduits, pull wires, wiring, outlet boxes					X		
Telephone exchange, key equipment-- instruments, and all necessary equipments					X		
Intercom systems, complete--							
Conduits					X		
Instruments and equipment					X		
Public address system (fixed)--							
Conduits					X		
Instruments and equipment					X		
Television system (excluding security)					X		

ITEM	Logistical Responsibility A	B	C	D	E	F	G
Communications - Continued)							
Entertainment	X						
Conduits, coax and pull wires	X						
Antennas	X						
TV receivers			X				
TV brackets, wall and/or ceiling mounted		X					
TV low voltage power supply		X					
Training--							
Conduits, coax, and pull wires	X						
TV cameras, TV receivers			X				
Patient monitoring--							
TV cameras, receivers, cables, and conduit	X						
Program distribution system, complete--							
Conduits, coax, pull wires, and equipment	X						
Paging systems for staff complete			X	X			
Radio equipment other than paging and program distribution			X				
Conduits, pull wires and cables	X						
Instruments, equipment, and accessories			X				
Nurses' call systems--							
Conduits	X						
Instruments and equipment	X						
Central dictating system--							
Conduits and pull wire	X						
Instruments and equipment			X				
Pneumatic tube systems	X						
Automatic data processing systems--							
Conduits, wire pairs (LAN), and pull wires	X						
Cables and distribution			X				
Instruments and equipment			X				
Intrusion detection system--							
Conduits and pull wires	X						
Cable and fittings						X	
Sensors and equipment						X	
TV equipment						X	
Interior intrusion detection system (Local)	X						
Clock system--							
Central clock system, conduit, and pull wire	X						
Battery clocks			X				
Audio-visual equipment other than systems listed above, conduits, and pull wires			X				
Energy monitoring and controls systems	X						
Fire protection alarm system	X						
Communication nets--							
Conduits and pull wires	X						
Antennas and equipment			X				
Transportation System	X						
Signage (Internal/External)	X						

SECTION 2: DESIGN PROCEDURES, SUBMITTALS, AND DOCUMENTATION

2.1 General. This section defines the minimum OASD-HA (DMFO) requirements for design procedures, submittals, and documentation for a typical project. Additional project specific requirements may be established by the Design Agent(s) and the using Military Department(s) to meet their specific requirements. Some projects may warrant different or fewer submittal requirements. The Design Agent, with the concurrence of the using Military Department, may vary from these standard requirements when warranted by specific project requirements, and when approved by DMFO for submittals required by DMFO.

2.2 Design Goals.

2.2.1 Scope and Criteria. The goal during 0 to 35% design is to comply with scope and criteria and establish a Programmed Amount (PA) based on the 35% design cost estimate. Final scope and PA will be determined by the 35% approved submittal.

2.2.2 Design to Cost. The goal during 35 to 100% design phase is to design to the PA established at 35% design approval. If design refinements cause the design to exceed the established PA, then the Design Agent, with the participation of the using Military Department, will present cost reduction alternatives to DMFO before finalizing the design documents.

2.2.3 Design Schedules.

2.2.3.1 35 Percent Submittal. For specified location projects, the DMFO goal is to be at 35 percent design by 1 August of the year prior to planned submission to the U.S. Congress. The Design Agent must request written approval from DMFO for late submission.

2.2.3.2 Unspecified Minor Construction. For Unspecified Minor Construction (DODI 4270.24, reference 2a), designs must be complete and projects ready for advertisement within 8 months of the date of the DMFO Design Authorization Memorandum.

2.2.3.3 Final Design. The goal during final design is to complete design in time for a construction contract award prior to the fourth quarter of the year of execution.

2.3 Design Sequence and Responsibilities.

2.3.1 2807 Action. DMFO issues the Section 2807, Title 10 USC (ref- erence 2b) Congressional notification after the project scope has been determined and as required to meet design and programming milestones. (See Figure 2-1).

Figure 2-1

DoD MEDICAL MILCON TIMETABLE
FOR PLANNING, BUDGETING, DESIGN, AND PROJECT EXECUTION
OF A TYPICAL FY 1994 PROGRAM

THIS IS A MINIMUM TIMETABLE WHICH DOES NOT PRECLUDE EARLIER DESIGN START FOR OCONUS, LARGE, OR COMPLEX PROJECTS

February 1990	Begin FY 94 Planning Year
July 1990	Award FY 94 EA Contract(s) (DMFO)
January 1991	FY 94 EA completed Preliminary Scope Available 2807 Action (DMFO)
February 1991	Release Design Authorization (DMFO) A/E Acquisition begins with CBD (Design Agent)
May 1991	Audit Requested for FY 94 projects A/E Prenegotiation on FY 94 projects
August 1991	Final Scope on FY 94 projects completed (DMFO) Negotiated A/E contract audit completed (Design Agent)
October 1991	Issue 35% NTP FY 94 (DMFO) A/E Begin Design (Design Agent)
July 1992	Best concept design cost estimate to DMFO (Design Agent)
August 1992	FY 94 35 percent design submit to DMFO (Design Agent) FY 94 budget submitted to OASD(C)(DMFO)
September 1992	35 percent design certified (DMFO)
October 1992	Issue Final Design NTP (DMFO)
January 1993	FY 94 MILCON Program to Congress (DoD)
July 1993	100 percent Design complete (A/E) (Submission to DMFO)
October 1993	FY 94 funds available (DMFO) Begin Award FY 94 MILCON projects (Design Agent)

amplitudes equal or greater than the above levels be [illegible]

2.3.2 Design Funds. DMFO suballocates design funds to the Design Agent to achieve the authorized level of design in accordance with Figure 2-1.

2.3.3 Design Authorization. The DMFO issues the design authorizations to the Design Agent with an information copy to the using Military Department, as appropriate, to meet design and programming milestones in Figure 2-1. The Design agent manages design in accordance with established policies and procedures unless otherwise directed by the DMFO. Separate design authorization memoranda are normally issued for A-E Selection, Concept Design, and Final Design. The Design Agents shall not pursue level of design beyond that authorized by DMFO.

2.3.3.1 Some larger, more complex, or OCONUS projects may require a greater level of effort and more time to achieve the 35 percent milestone in Figure 2-1. When this occurs, the using Military Department, with the concurrence of the Design Agent, may request an early design start from DMFO.

2.3.4 Architect-Engineer (A-E) Selection Authorization. This is authorization to synopsize, slate, and select (SSS) an A-E but not to negotiate, award a contract, or proceed with design. Following authorization by DMFO, the Design Agent selects an A-E following their established procedures. The using Military Department may participate in A-E selection in accordance with established Memorandum of Understanding (MOU's). DMFO may also participate when so specified in the design authorization.

2.3.5 Concepts (0 to 35%) Design Authorization. This is authorization to negotiate and award an A-E contract and to proceed to 35 percent level of design. This authorization will normally be issued when a project has been developed and has an approved Program For Design (PFD), the project is in the appropriate Program FY to start design action, 2807 action has been completed, and design funds are available. Concepts consist of Block Plans (S-1), Schematics (S-2), Design Development (S-3), Final Concepts/35% (S-4), and all supporting documentation outlined in this section. The Concept Design phase is complete when DMFO approves the S-4 submittal.

2.3.6 35 Percent Review and Certification. Following review of the 35 percent submittal, DMFO certifies to OASD(C) (Comptroller) 35 percent design completion and project cost estimates by 15 September of the year prior to planned submission to the U.S. Congress. The DMFO will also notify the Design Agent and the using Military Department if the Concept Design is approved, with or without comments, or disapproved, with comments.

2.3.7 Final Design Authorization. This is authorization to proceed from 35% to final design. DMFO normally provides this authorization after the 35% design is certified complete by the Design agent and the DMFO, and necessary revisions are made to the Program for

use the applicable distance-amplitude curve established in

Design and the DD Form 1391, if design funds are available, and if the project is in the appropriate Program FY.

2.3.8 Design Coordination. Designs will be developed and managed with close coordination between the Design Agent, using Military Department representatives, and DMFO by including each of these agencies as an information addressee on all correspondence relating to scope, cost, criteria, policy and procedure, and/or schedule.

2.3.9 Design Changes. Design Agent and/or the using Military Department must submit proposed scope changes to DMFO for approval with justification prior to incorporation into the design. The Design Agent may make a determination of whether or not design will be suspended pending DMFO approval/disapproval of proposed scope changes. Within the funds provided, the Design Agent with the coordination of the using Military Department may initiate design change orders up to $15,000. Design change orders over $15,000 and cumulative changes over 5 percent of the original A-E contract require DMFO approval. Design Agents may not fund design changes by deferring or otherwise delaying other DMFO funded project designs without prior approval from DMFO. Design changes which jeopardize the Design Agent's ability to meet the required design schedule will be avoided. The using Military Department may request that DMFO review a design change delayed or denied by the Design Agent. All design change orders shall be processed in accordance with DODI 6015.16 (reference 2c).

2.3.10 Stopped or Deferred Designs. Decisions to stop or defer designs will be made by DMFO.

2.4 Reporting Requirements. The Design Agents will maintain accurate records on design fees, schedules, construction cost, and other project data and report this information as required below.

2.4.1 Notification of Concept Design Start. The Design Agent will notify DMFO of the A-E's name, total award amount with A-E fees and in-house costs listed separately, and the design schedule within seven days after the A-E has been issued a Notice-To-Proceed (NTP) to 35 percent design.

2.4.2 Notification of Final Design Start. The Design Agent will submit to DMFO a schedule for the Final Design within 30 calendar days after the A-E has been issued a NTP to design completion.

2.4.3 Quarterly Execution Reports. The Design Agent shall submit the following reports to DMFO and using Military Department Agencies no later than three days prior to each Quarterly Execution meeting. Existing automated reports concurrently in use by the Design and Construction Agents which contain the requested information are acceptable substitutes for the report formats listed below:

2.4.3.1 Design Funds Status Report. Provide in format of Figure 2-2 for all projects authorized for design by DMFO.

2.4.3.2 Project Design Schedule. Provide in format of Figure 2-3 for each project authorized for design by DMFO.

2.4.3.3 Construction Status Report. Provide a report in Figure 2-4 format for each awarded construction contract for projects funded by DMFO. (See para 20.9).

2.4.3.4 Program Execution Schedule. Provide a report in Figure 2-5 format for all projects funded by the DMFO. (See para 20.9).

2.4.3.5 MILCON Funds Status Report. Provide a report in Figure 2-6 format for all appropriated projects. (See para 20.9).

2.5 Design Submittals and Documentation.

2.5.1 Economic, Engineering, and Environmental Studies. The design of an MTF is to be supported by engineering, economic, and environmental evaluations of those features which contribute most to the construction cost, energy efficiency, and environmental impact to provide the optimum combination for an efficient and effective facility at the most economical cost and least adverse environment impact. Such studies shall consider life-cycle-cost of the facility not just the initial construction cost. The specific studies required are identified with the other submittal requirements.

2.5.2 Block Plan Submittal (S-1). Block Plans are 5 to 10 percent of the total design effort and include at least three substantially different alternative design solutions. Each block plan will show building massing, siting, and the layout of the gross function areas (blocks) within the building. Although not normally required, DMFO may be included in the review process where size or complexity warrants early participation or DMFO requests to participate. The following are the suggested requirements for the Block Plan effort:

2.5.2.1 Site plans of each scheme showing existing and proposed structures, topography, utilities, roads, and parking.

2.5.2.2 Floor plans for each scheme showing each level with circulation patterns and principal dimensions. On addition/alteration projects, existing versus new conditions must be clearly delineated.

2.5.2.3 Gross area tabulation of floor area, along with small scale, single-line, dimensioned drawings, to reflect the total space required in Figure 2-7 format.

2.5.2.4 Preliminary cost estimate for each scheme.

2.5.2.5 Narrative description of each scheme and scheme comparisons explaining strong and weak points of each solution and the rationale for the recommended solution. The following features must be addressed for each scheme: expandability, flexibility, proposed structural system, proposed mechanical system(s), electrical system, energy conservation

features, net-to-gross ratio, phasing, and initial constructability considerations.

2.5.2.6 Site investigation report will address the existing and proposed conditions on and near the site including: demolition requirements (if any), topography, adjacent facilities, site vegetation, access roads, easements, safety clearances, site acoustics, parking (existing and proposed), soil conditions, floodplains or wetlands criteria, asbestos and hazardous waste on-site, and energy considerations such as building orientation, solar access, and prevailing wind conditions. Provide a summary of any environmental impact studies, base master plans and base architectural plans where available. Provide photographs of the site and nearby structures.

2.5.2.7 Site utilities report will address: storm drainage, sewer, water (potable and fire protection), gas, central heating and cooling, electricity, telephone, fire alarm, and communications. Address the quality and capacity of the existing utilities to serve the proposed project.

2.5.2.8 Economic Analyses (EA) of new versus addition/alteration where requested by DMFO, or update (substantiation) previous EA.

2.5.2.9 Pencil sketch perspectives for each proposed solution.

2.5.2.10 A massing model of each solution on significant projects, particularly addition/alteration projects where "new" and "addition" versus existing must be clearly defined.

2.5.2.11 Updating or verification of as-built and/or as-utilized drawings in addition-alteration projects may be required as directed by the Design Agent.

2.5.2.12 The narrative portion of the submittal, calculations, cost estimate, and reports shall be on 8-1/2 x 11 inch sheets packaged in a standard U.S. 3-ring binder with labeled subject dividers, sequential page numbers, and table of contents. Plans shall be drawn at 1/32 inch or 1/16 inch scales (1:400 or 1:200 SI) and reduced to double-page foldout size. Full-size or half-size drawings will also be provided as stipulated in the distribution schedule.

2.5.3 Schematic Design Submittal (S-2). This submittal is an additional 5 to 10 percent of the total design effort and includes development of the detailed room-by-room floor plans, elevations, and initial analysis of the major architectural and engineering systems based on the selected block plan from S-1. The primary purpose of this submittal and review is to identify and resolve all major space program deficiencies at an early stage in design and "fix" the footprint of the building. The Design Agent, using Military department representatives, and A-E will present the reviewed S-2 to DMFO. Requests for scope revisions with justification should be submitted at this time so that all scope issues can be finalized. Scope changes will

not be entertained after approval of S-2 unless fully justified. DMFO will provide approval/disapproval, with review comments, within 14 days of the presentation. The following are the minimum DMFO requirements for S-2:

2.5.3.1 Executive Summary of the various Block Plan alternatives from S-1, and rationale for the selected scheme. The block plan drawings from S-1 shall be included as double-page, fold-out, reduced drawings.

2.5.3.2 Site plans showing building location, future expansion, and existing and proposed structures, topography, utilities, roads and parking.

2.5.3.3 Floor plans for each floor showing all programmed spaces, corridors, structural grid system (including columns), electrical and mechanical equip- ment rooms, and stairs to meet the functional requirements. All spaces must be labeled with the room name, the room code from the DMFO Program For Design (PFD), and the programmed and designed net areas. For addition/alteration projects, preliminary demolition drawings, with photographs to depict conditions are required.

2.5.3.4 Plans showing major circulation paths in and around the facility.

2.5.3.5 A separate plan of the blast hardened/CBR protected area, if programmed, showing how the spaces would be utilized during contingency operations.

2.5.3.6 All proposed exterior elevations and major building sections appropriate to the level of Concept Design development.

2.5.3.7 Refined gross massing model, from S-1, as required.

2.5.3.8 A comprehensive narrative describing various proposed architectural and engineering aspects of the projects as follows:

a) Civil Design Narrative. Include site investigation and utilities reports based on further refinement of the S-1 requirements;

b) Architectural Design Narrative. Address the overall architectural concept including: Exterior wall systems and finish materials being considered, (develop alternative exterior materials and wall assemblies, compare each exterior wall scheme by both qualitative and quantitative analysis and include energy-conscious design considerations), acoustics, base architectural plan, floor-to-floor heights, proposed roofing materials, slope(s), styles, contingency and mobilization features, energy conservation features, life safety, and fire protection features, and Uniform Federal Accessibility Standards (UFAS) (reference 2d) compliance;

c) Structural Design Narrative. Address the alternative structural foundation and framing systems being considered and provide economic basis for system selection. Address concrete versus steel structure and longspan versus other alternatives;

d) Seismic Design Narrative. Summarize the seismic design considerations including "I" and "K" values and the level of protection required. Discuss post-earthquake operation requirements;

e) Heating, Ventilation, and Air Conditioning (HVAC) Design Narrative. Discuss design considerations and space requirements for the primary and secondary HVAC systems being considered;

f) Plumbing Design Narrative. Discuss design considerations and space requirements for the various plumbing systems, including domestic hot and cold water, fuel gas, medical gases, sanitary waste, acid waste, and storm drains. Discuss water supply, quality, required storage, and distribution systems. Discuss hot water generation, storage, temperatures, and distribution systems. Address various types of medical gases, storage, and distribution systems;

g) Electrical Design Narrative. Discuss design considerations and space requirements for electrical systems. Address the following: voltage, routing, and reliability of primary services; connected and demand load; normal and essential electrical system; lighting systems; and energy conservation features;

h) Communication Design Narrative. Discuss design considerations and space requirements for the following: telephone, intercom, dictation, paging, public address, televisions, nurse call, Comprehensive Healthcare [Computer] Systems (CHCS), data communication, and security systems;

i) Fire Protection Design Narrative: Address the following: type of construction, fire rating of materials, occupancy classification, fire detection, alarm, and suppression systems. Provide a summary of the latest Fire Safety Evaluation System Study for addition/alteration projects;

j) If IBS is planned for other than medical centers/teaching hospitals, provide an expanded justification;

k) If an Engineered Smoke Control System (ESCS) or an Energy Monitoring and Control System (EMCS) is planned, provide an economic justification; and

l) Construction Phasing Narrative. For addition/ alteration projects, provide a narrative description of the proposed Construction Phasing to evaluate the continued/uninterrupted operation of the existing facility during construction and the associated impact on the construction cost. Identify requirements for temporary buildings

to serve as swing space during the construction and the cost associated with these buildings.

2.5.3.9 Gross area tabulation of floor area, along with a small scale, single-line, dimensioned key plan, to reflect the total space required in Figure 2-7 format.

2.5.3.10 Net area tabulations, including net to gross calculations, in Figure 2-8 format.

2.5.3.11 Updated cost estimate.

2.5.3.12 The narrative portion of the S-2 submittal, calculations, and cost estimate shall be packaged in standard U.S. 3-ring binders with labeled subject dividers, sequential page numbers, and table of contents. Plans shall be drawn at 1/16 inch or 1/8 inch scales (1:200 or 1:100 SI) and reduced to double-page foldout size and included in the binders. Full-sized or half- sized drawings will also be provided as stipulated in the distribution schedule.

2.5.4 Design Development Submittal (S-3). This submittal is about 30 percent of the total design effort in all disciplines and includes further development of DMFO-approved S-2 submittal. The purpose of this submittal is to finalize all major design/engineering decisions and to validate project scope and cost. DMFO does not normally review this submittal; however, if the design is developed well enough, it may be submitted to DMFO as the S-4. The following are minimum requirements for this submission:

2.5.4.1 An update of all requirements in the S-2 Submission.

2.5.4.2 A separate, bound, Executive Summary (in addition to the other submittal requirements) to include design intent, costs, scope, and a general description of the project. Include sufficient detail to provide an overview of the project.

2.5.4.3 Plans showing building sections, elevations, and details to show the site development, utility distribution, and the overall design of the building in sufficient detail to allow for an in-depth review and a reliable cost estimate. As a minimum, provide the following:

a) Site plans showing building location, future expansion, existing and proposed structures, topography, utilities, roads, parking, and landscaping;

b) Floor plans for each floor showing all programmed spaces, corridors, structural grid system (including columns), electrical and mechanical equipment rooms, and stairs to meet the functional requirements. All spaces must be labeled with the room name, the room code from the DMFO program for design, and the programmed and designed net areas;

c) All exterior elevations and major building sections;

d) Reflected ceiling plans showing ceiling grid and light fixture placement;

e) Equipment plans showing all category A, B, C, D, E, F, and G equipment as described in Section 16 of this MIL-HDBK;

f) HVAC plans showing layout of mechanical rooms and one line drawing of distribution systems. Provide schematic diagrams of the major supply, return, and exhaust systems;

g) Plumbing plans showing plumbing, medical air, vacuum, and medical gas equipment and major distribution lines including riser diagrams;

h) Electrical plans showing electrical room layouts, light fixture locations, receptacle locations, motor controls, and locations of panelboards and distribution equipment. Provide single line diagrams of the normal and essential electrical systems;

i) Communication plans showing location of communication equipment and devices. Show layout of communication closets and provide single line diagram for each system;

j) Fire protection plans showing sprinklered areas, fire rated walls and doors, smoke compartmentation, fire pumps, stand pipes, fire extinguisher cabinets, fire alarm, and fire exits.

k) For addition/alteration projects, preliminary demolition drawings indicating the removal of structural, architectural, mechanical, and electrical systems. Photographs are desirable to accurately communicate existing conditions.

2.5.4.4 A comprehensive narrative describing various architectural and engineering systems being considered:

a) Civil Design Narrative. Include the site investigation and utilities reports based on further refinement of the S-2 requirements. Summarize the civil design parameters, parking, and the major features of the design;

b) Architectural Design Narrative. Address the overall architectural concept including: interior (in accordance with Appendix A) and exterior finish materials (to include proposed Structural Interior Design (SID) color scheme/selections, see para 4.14), wall systems, roofing systems, acoustics, base architectural plan, floor-to-floor heights, contingency and mobilization features, energy conservation features, life safety, UFAS, and fire protection features;

c) Structural Design Narrative. Address the alternative structural foundation and framing systems considered and provide

economic basis for system selection. Address long-span versus other alternatives and concrete versus steel structure. Summarize the structural design parameters and the major features of the design;

d) Seismic Design Narrative. Summarize the seismic design considerations including "I" and "K" values and the level of protection required. Discuss post-earthquake operation requirements. Summarize the structural design parameters and the major features of the design;

e) Heating, Ventilation, and Air Conditioning (HVAC) Design Narrative. Provide a summary of the primary and secondary HVAC systems considered and the economic basis for system selection. Summarize the proposed control systems, fire protection features, and the energy conservation features being considered;

f) Plumbing Design Narrative. Describe the various plumbing systems, including domestic hot and cold water, fuel gas, medical gases, sanitary waste, acid waste, and storm drains. Discuss water supply, quality, required storage, and distribution systems. Discuss hot water generation, storage, temperatures, and distribution systems. Address various types of medical gases, storage, and distribution systems;

g) Electrical Design Narrative. Summarize the electrical design parameters and the major features of the design. Address the following: voltage, routing, and reliability of primary services; connected and demand load; normal and essential electrical system; lighting systems; and energy conservation features;

h) Communication Design Narrative. Summarize the communication systems design parameters and the major features of the design. Discuss the following: telephone, intercom, dictation, paging, public address, television, nurse call, CHCS, data communication, and security systems;

i) Fire Protection Design Narrative: Summarize the fire protection systems design parameters and the major features of the design. Address the following: type of construction, fire rating of materials, occupancy classification, fire detection, alarm, and suppression systems. Provide a summary of the latest Fire Safety Evaluation System Study (reference 2e) for addition/alteration projects;

j) Integrated Building System (IBS) Narrative. If IBS was approved at S-2, provide a summary of the IBS design parameters and the major features of the design;

k) Engineered Smoke Control System (ESCS) narrative. If an ESCS or an Energy Monitoring and Control System (EMCS) was approved at S-2, provide a summary of the ESCS/EMCS design parameters and the major features of the design;

l) Energy Conscious Design Narrative. Discuss all energy conscious design considerations implemented and considered for the design. Address all design disciplines that affect energy consumption. In addition, address the following: siting, orientation, solar access, and climatic influences; conservation (systems selection, etc.); renewable energy features (passive solar/daylighting, active solar, etc.); energy budget compliance; energy conscious design summary and other important energy design issues. The feasibility of total or selective energy systems shall be evaluated;

m) Food Service Narrative (when applicable). Summarize the food service systems design parameters and the major features of the design. Discuss the various systems considered and the economic basis for the system selections;

n) Materials Handling and Transportation Systems Narrative (when applicable). Summarize the materials handling and transportation systems design parameters and the major features of the design. Include escalators, elevators, cart lifts, automatic box conveyor systems, dumb-waiters, linen and trash chutes, pneumatic tubes, etc. The study is to include equipment requirements life-cycle-costs, maintenance, appearance, ease of operation, noise, security, maintainability, and availability in a competitive marketplace for each system;

o) Waste Handling Systems Narrative. Summarize the waste handling systems design parameters and the major features of the design. Address trash removal; hazardous, infectious, and biological waste; retort sterilizers; incinerators; and other waste handling features of the design; and

p) Security Systems Narrative. Summarize the security systems design parameters and the major features of the design.

2.5.4.5 Detailed Cost Estimate.

2.5.4.6 An updated DD Form 1391 reflecting the reviewed cost estimate, any changes to the project description, and justification.

2.5.4.7 Gross area tabulation of floor area, along with small scale, single-line, dimensioned drawings, to reflect the total space required in Figure 2-7 format.

2.5.4.8 Updated net area tabulations, including net to gross calculations, in the format of Figure 2-8.

2.5.4.9 Outline specifications showing basic intent only of complex items.

2.5.4.10 Room finishes schedule keyed to the plans by room number and name.

2.5.4.11 Equipment list showing all category A, B, C, D, E, F and G equipment for each room keyed to the plans by room number and name. Provide equipment data sheets for all equipment that requires utility connections and as described in Section 16 of this MIL-HDBK.

2.5.4.12 An updated pencil sketch perspective drawing depicting the proposed structure. This sketch will be critically reviewed as the basis for the subsequent rendering requirement. This requirement does not apply to projects which are primarily life safety code upgrade and minor additions.

2.5.4.13 Finalized model, showing the site, site circulation, parking, massing of structure, and a delineation between new and existing if the project contains additions and/or alteration.

2.5.4.14 The narrative portion of the submittal, calculations, and cost estimate shall be packaged in standard U.S. 3-ring binders with labeled subject dividers, sequential page numbers, and table of contents. Drawings shall be at a minimum 1/8 inch scale (1:100 SI); however, 1/4 inch scale (1:50 SI) may be necessary for clarity on equipment plans, mechanical and electrical equipment room layouts, complex rooms or departments, interior elevations. Drawings shall be reduced to double-page foldout size and included in the binders. Full-size or half-size drawings will also be provided as stipulated in the distribution schedule.

2.5.5 Value Engineering Study (VE). Conduct Value Engineering (VE) studies during design following the S-3 and S-5 (if required by the design agent) submission in accordance with DoD Directive 4245.8 (reference 2f). Value Engineering Studies consist of investigations of certain high-cost areas in a design to determine if an alternate way exists to achieve an improved design at a lower life-cycle-cost. The main objectives of VE studies are reduced life-cycle-cost and improved quality of design. The application of Value Engineering shall not result in lowering criteria or quality standards as established by the guidance in this document or reduction in the scope of the project.

2.5.6 35 Percent Design Submittal (S-4). This submittal is as a minimum 35 percent of the total design effort in all discilines and includes a corrected and refined S-3 package based on the S-3 review. This is the technical 35 percent Final Concept submittal. The reviewed S-4 will be submitted to DMFO by the Design Agent and the A-E with using Military Department coordination and participation. Final scope and PA (cost) shall be determined with this submission. The minimum requirements of this submission are the same as described for S-3 and a copy of the VE Study.

2.5.6.1 This is considered the "technical submission" and all issues regarding costs, Value Engineering Study (VE), constructability, phasing, and any other special studies must be resolved, though the results of all studies may not be incorporated prior to presenting this

submission to DMFO for approval. Action taken on Value Engineering proposals must be included with this submission.

2.5.7 Constructability Study. Perform a Constructability Study for all significant projects (over $20,000,000). This study is especially important for those projects involving additions and alterations. Constructability is defined as the ease with which a designated project can be administered, bid, built, enforced, and understood. Constructability must be strongly emphasized throughout the entire planning and design process. As a minimum, the preliminary study should be performed based upon the S-4 and updated at the S-6 Design Submission.

2.6 Rendering. A final rendering is prepared after 35 Percent Design Submission approval. A color photograph of the original rendering (either 20 x 16 inches or 22 x 14 inches photograph in a 28 x 20 inches frame brushed aluminum) shall be sent to DMFO. The photograph is to reflect the 35 percent review comments and be titled, matted, framed, and glazed with nonglare tempered glass or plexiglas. Other photographs are to be distributed as scheduled by the Design Agent in coordination with the using Military Department at the prenegotiation conference. Normally, the original rendering will be sent to the using facility at the installation for display.

2.7 Final Design (35 percent to 100 percent). The final design phase may be initiated only after approval of Concept Design by the DMFO. If, in the preparation of Contract Documents (CD's), it is necessary to deviate substantially from the approved Concept Design, such as the rearrangement of a major medical department or a change in the interrelationship of functional elements, design may be suspended and the pertinent facts and justifications concerning the deviations will be submitted for review and approval by DMFO.

2.7.1 Contract Documents (CD's). Final working drawings shall be prepared only to the scale necessary for clarity, good bidding, and ease of constructability. Where dictated by complexity, CD's shall be drawn to 1/4-inch to the foot. To reduce the sheer volume of production drawings, those areas and disciplines not requiring 1/4 scale drawings for bidding shall be prepared at 1/8 scale.

2.7.2 Comprehensive Interior Design (CID). The final design phase, at option of using Military Department, may include a Comprehensive Interior Design (CID) effort for furniture and accessory selection, layout and identification, and documentation for procurement. The Comprehensive Interior Design (CID) package is to be coordinated with the interior finishes and colors Structural Interior Design (SID) early in the final design phase so that the first submittal of the CID will be fully coordinated with the building design at S-5. Subsequent selections of furnishings and medical equipment are to be coordinated with the CID. See Glossary, para 4.14, and para 4.17 for expanded definitions of CID and SID.

2.7.3 65 Percent Submittal (S-5). On a case-by-case basis, DMFO may request submission of 65 Percent Preliminary Working Drawings.

2.7.4 100 Percent/Final Submittal (S-6). When the design is complete, the Design Agent will submit a copy of the final bid documents (i.e. drawings, specification, cost estimate, instructions to bidders, etc.) to DMFO. Along with this package, the Design Agent shall provide a memorandum to DMFO certifying that the design has been completed and that all technical requirements and cost criteria approved at the 35 Percent Design stage have been incorporated into the Final Design.

REFERENCES

2a. DoD Instruction 4270.24, "Unspecified Minor Construction, Emergency Construction, and Restoration or Replacement of Damaged or Destroyed Facilities."

2b. Section 2807, Title 10 USC, "Architectural and Engineering Services and Construction Design."

2c. DOD Directive 6015.16, "Department of Defense Policies for Planning Fixed Military Health Facilities."

2d. FED STD 795, "Uniform Federal Accessibility Standards (UFAS)," April 1, 1988.

2e. NFPA 101M, "Fire Safety Evaluation System (FSES)."

2f. DoD Directive 4245.8, "Value Engineering."

FIGURE 2-2
DESIGN FUNDS STATUS REPORT

			CONCEPT PHASE			X	FINAL PHASE				
	AUTH DES	ACT DES	EST 0-35%	DMFO FUNDS	OBLGTD	0-35% FUNDS	EST 35-100%	DMFO FUNDS	OBLGTD	35-100% FUNDS	FINAL
PROJECT	%	%	COST	AMT	AMT	LEFT	COST	AMT	AMT	LEFT	BALANCE

FIGURE 2-3
PROJECT DESIGN SCHEDULE

PROJECT TITLE/LOCATION:_____ FY:_____

AUTH % COMPL:_____ ACTUAL % COMPL:_____ USING SERVICE:_____

EVENT	ORIGINAL DESIGN SCHEDULE	CURRENT SCHEDULED DATE	ACTUAL DATE	REMARKS
DMFO 2807 NOTIFICATION ISSUED				
DMFO 35% DESIGN AUTHORIZATION MEMO				
DESIGN AUTHORITY TRANSMITTED TO FIELD				
A/E SELECTION PROCESS COMPLETED				
AWARD A/E CONTRACT				
A/E NTP				
A/E SUBMITS BLOCK PLANS TO AGENT				
SCHEMATICS SUBMITTED TO DMFO				
DMFO SCHEMATICS REVIEW COMPLETE				
PREFINAL CONCEPT SUBMITTED TO AGENT				
FINAL CONCEPT SUBMITTED TO DMFO				
DMFO REVIEW COMPLETE, CERTIFIES 35%				
CID STATUS				
DMFO AUTHORIZED DESIGN TO 100%				
A/E SUBMITS 65% DWGS TO AGENT				
A/E SUBMITS 95% DWGS TO AGENT				
AGENT CERTIFIES DESIGN COMPLETION				
READY TO ADVERTISE				

FIGURE 2-4
CONSTRUCTION STATUS REPORT

TITLE/LOCATION:______________________ USING SERVICE:______________________

FIELD OFFICE:__________ CONTRACTOR NAME:______________ CONTRACT NUMBER:__________

AWARD:____________ ORIG BOD:__________ CURR BOD:____________

		CY ___				CY ___				CY ___				CY ___			
	DEC	MAR	JUN	SEP	DEC	MAR	JUN	SEP	DEC	MAR	JUN	SEP	DEC	MAR	JUN	SEP	DEC
%SCH																	
%ACT																	

FUNDS STATUS:

ORIGINAL AWARD CWE:__________ CURRENT CWE:__________

CONTINGENCY FUNDS:

STARTING TOTAL:__________
VALUE OF CHANGES TO DATE:__________
REMAINING BALANCE:__________

INSTALLED EQUIPMENT:

STARTING TOTAL:__________
AMOUNT OBLIGATED TO DATE:__________
UNOBLIGATED BALANCE:__________

FIGURE 2-5
PROGRAM EXECUTION SCHEDULE

PROJECT TITLE/LOCATION	PA	ESTIMATED AWARD CWE	DESIGN COMPLETE	ADVERTISE	BID OPENING	AWARD

FIGURE 2-6
MILCON FUNDS STATUS REPORT

PROJECT TITLE/LOCATION	USING SVC	PA	SUBALLOCATED FUNDS	EST AWARD CWE	EST AWARD SAVINGS	ACTUAL AWARD CWE	ACTUAL AWARD SAVINGS

FIGURE 2-7
GROSS AREA CALCULATION

Instructions for Preparing Gross Area Tabulation.

Gross floor area tabulation is a summary of the total floor area in the building with small scale, single-line, dimensioned drawings, to illustrate the calculations. The gross area includes the total area of all floors, including basements, mezzanines, penthouses, central plant areas (separate line item on the updated 1391), mechanical and electrical spaces, loading docks, ambulance garages and shelters, and other spaces with a floor to ceiling height of seven feet or greater. Gross floor area is measured from the exterior surfaces of enclosing walls except where there is an overhang of one foot or more at the exterior of the windows. In this case the gross area is measured from a point one-half the distance between the exterior plane of the window glazing and the outmost plane of the overhang as determined to be the outside dimensions of the building.

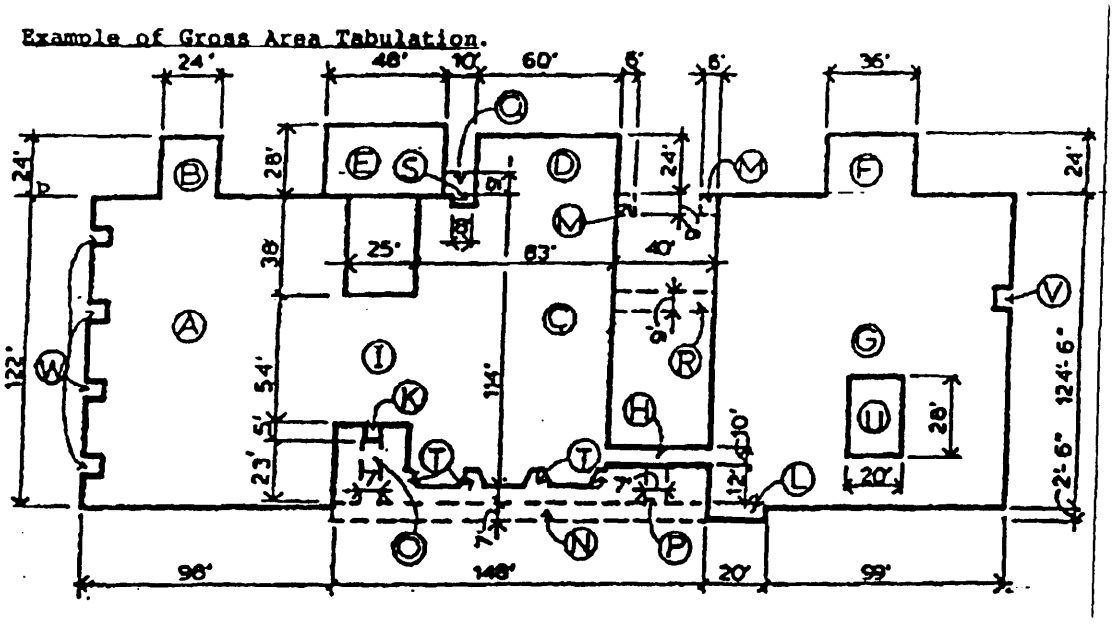
Include one-half the actual area in the gross area for exterior balconies, porches, covered but not enclosed passageways or walks, covered and uncovered but open stairs, covered ramps, and open ambulance shelters.

Include openings for the following elements in the gross area calculation for one floor only: atria, unenclosed floor openings, stairs, escalators, elevator and lift shafts, mechanical and electrical service shafts, and other shafts connecting two or more floors. Vertical circulation elements are accounted for in general circulation scope. Mechanical, electrical, and communication shafts are accounted for in mechanical scope.

Exclude the following spaces from the gross area: crawl space areas, pads, exterior insulation applied to existing building, open courtyards, open paved terraces, uncovered ramps, uncovered stoops, and utility tunnels. Other Support Facilities such as the Central Plant (boilers and chillers) for a large MTF in a physically separated building or roof-top penthouse areas under 7'-0" should not be counted against programmed scope but should be entered on the 1391 under "Primary Facilities" for proper cost accounting.

Spaces under 7 feet (clear) are not accountable as scope. Exception to 7 foot rule: If, during the course of construction, excavation for footings, or because of sloping terrain, the "crawl space" exceeds 7 feet, it is not necessary to "fill" to achieve the "less than 7 feet to avoid scope" issue. Full explanations and justifications are required in the narratives.

Example of Gross Area Tabulation.



GROSS AREA TAKE-OFF

Plan Area Reference/Type	Plan Dimensions		Scope	Gross Sq. Ft.
A bldg. space	98 x 122	x	1.0	11,956
B "	24 x24	x	1.0	576
C "	83 x 114	x	1.0	9,462
D "	24 x60	x	1.0	1,440
E "	28 x48	x	1.0	1,344
F "	24 x36	x	1.0	864
G "	119 x 124.5	x	1.0	14,815.5
H "	10 x40	x	1.0	400
I "	25 x54	x	1.0	1,350
K "	5 x 7	x	1.0	35
L "	2.5 x20	x	1.0	50
M entry canopy	6 x 9 x 2	x	.5	54
N covered walk	7 x 148	x	.5	518
O "	7 x23	x	.5	80.5
P "	7 x12	x	.5	42
Q covered porch	9 x10	x	.5	45
R covered walk	9 x40	x	.5	180
S covered porch deduct	4 x 8	x	-.5	-16
T alcove deduct	5.5 x 6 x 3	x	-1.0	-99
U courtyard deduct	20 x28	x	-1.0	-560
V alcove deduct	4 x 8	x	-1.0	-32
W "	4 x 6 x 4	x	-1.0	-96
First Floor Total Gross Area				42,408

FIGURE 2-8

NET AREA TABULATION

The net floor area of a space is measured from the interior surface of the walls that enclose the space. Exterior walls, interior partitions, columns, structural members, and internal circulation space for other than individual occupancy(ies) are excluded from the net floor area.

Provide a tabulation of net areas, by room, in thirteen columns as follows:

a) Room Code Number From Program For Design (PFD),
b) Functional title of room,
c) Number of rooms,
d) Net area of room from Program For Design,
e) Total net space programmed for rooms [Product of cols.(c) x (d)],
f) If Add/Alt - allocated to unaltered existing space,
g) If Add/Alt - allocated to altered existing space,
h) If Add/Alt - allocated to new space,
i) Net individual room areas as designed,
j) Difference between program and design [columns (i) minus (d)],
k) Percent variation between program and design [cols (j)/(d)x100%],
l) Notes. Provide justification if the deviation listed in k) is more than 10 percent. Rooms of 50 SF or less are exempt from the 10 percent justification process. The justification is to indicate why the deviation was made, not just who authorized it. As a minimum, the spaces considered irreducible are Operating Rooms, Examination Rooms, Treatment Rooms, Provider's Offices, Emergency Rooms, Dental Treatment Rooms, Labor Rooms, Delivery Rooms, Diagnostic and Therapeutic Radiology Rooms, and Patient Bedrooms/Toilets. Depending on function and mission, there may be other rooms identified by the using Military Department which will be identified as irreducible, and
m) Provide a total summary of each column.

After the above is accomplished, prepare a Net to Gross ratio in the same format as provided in the Program For Design (PFD).

Figure 2-8 (continued)

NET TO GROSS SQUARE FEET CALCULATIONS

FACILITY W/O HARDENING
NEW/REPLACEMENT PROJECT

ALLOWANCES/CATEGORIES

	MEDICAL/DENTAL CLINICS	STATION/COMMUNITY HOSPITALS	REGIONAL MEDICAL CENTERS
TOTAL NSF	NSF	NSF	NSF
MECHANICAL	11.0% of NSF	14.0% of NSF	16.0% of NSF
CIRCULATION	41.0% of NSF	42.0% of NSF	46.0% of NSF
WALLS & PARTITIONS	14.0% of NSF	15.5% of NSF	15.5% of NSF
HALF AREAS	1.5% of NSF	1.5% of NSF	1.5% of NSF
FLEXIBILITY	1.0% of NSF	1.0% of NSF	1.0% of NSF
TOTAL GSF	168.5% of NSF	174.0% of NSF	180.0% of NSF

NOTES:
1. For hardened facilities, increase walls & partitions allowance by 1.0%; and half areas allowance by 2.0%.
2. For addition/alteration projects, upto 15% of the total altered net space may be added to the flexibility allowance to offset physical constraints in the existing facility. This increased allowance must be validated during design.

SECTION 3: SITE DEVELOPMENT

3.1 General. This section provides guidance on siting of Medical and Dental Treatment Facilities (MTF's). Each new DoD MTF or MTF addition will be sited in conformance with an approved installation master plan developed by the using Military Department and coordinated with the using Military Department's Surgeon General advocate, i.e., the U.S. Army Health Facility Planning Agency, the U.S. Air Force Health Facilities Office, and/or the U.S. Navy Bureau of Medicine 43B. Master plans are to be updated regularly to reflect the latest defined medical requirements.

3.1.1 Community Planning. Siting of MTF's shall consider the planning goals and objectives of the surrounding community in order that a harmonious future relationship may exist between the facility and the community. Such planning is to be coordinated in compliance with E.O.12372 (reference 3a) as implemented by DoDD 4165.61 (reference 3b).

3.2 Site Design. The siting of MTF's should attempt to achieve energy efficiency, a pleasant appearance, and to the extent feasible, accommodate mission change and future growth. MTF's shall be located in functional relation to each other for economical maintenance, operational efficiency, and preservation of the character of the site. Setbacks and spacing of buildings are to provide for the admission of adequate light, circulation of air, fire safety clearances, parking, pedestrian access, and vehicle access where required. Where solar energy systems are contemplated or used, care must be exercised to ensure that the solar collectors are not shadowed by adjacent facilities. Emphasis is to be placed on aesthetics in the siting of MTF's.

3.2.1 Topography. Topography, more than any other site characteristic, should strongly influence the design of a project. The project should be planned to fit the topography and preserve the character of the site so as to produce an efficient, economical, and interesting composition. If existing topographic characteristics permit, they may be used to obtain a multilevel configuration with the entrances located at the appropriate functional floors.

3.2.2 Natural Resources Considerations. A conscious and active concern
for the value of natural resources should be considered in the siting of facilities in accordance with DoD Directive 5500.5 (reference 3c). Natural site features such as ground forms, water, rocks, ledges, trees, and others are to be preserved to the greatest extent feasible.

3.2.3 Orientation of Buildings. Views from buildings or from key location on the site should be used to take advantage of desirable vistas of the surroundings. Such views are especially important for the patient in the bedrooms of nursing towers. Views from roads, walkways,

and other site vantage points, coupled with effective signage and properly aligned walks, provide an important frame of reference for orientation and direction of visitors, patients, and other personnel. Views must also be considered for aesthetic impact in a health care environment where their therapeutic effect may be helpful for the patient and visitor alike.

3.2.4 Appearance. Meters, poles, transformers, vaults, pressure reducing station piping and valving, and other utility items are to be located so that they do not detract from the building's appearance. Design should also reduce the negative visual impact of utility items and communication lines in accordance with the Joint Service Manual TM 5-803-5, NAVFAC P-960, AFM 88-43 (reference 3d).

3.2.5 Restrictions. Land use restrictions dealing with runway clearances, helipad planning, aircraft noise, and use of airspace are to be applied to the site location with MIL-HDBK-1190 (reference 3e).

3.3 Construction in Floodplains or on Wetlands: The construction of MTF's in floodplains and wetlands is not recommended but is permitted provided the provisions of MIL-HDBK-1190 (reference 3e), Executive Order 12372 (reference 3a), DoD Directive 4165.61 (reference 3b), Executive Order 11988 (reference 3f), Executive Order 11990 (reference 3g), 43 FR 6030 (reference 3h), Title 44, CRF 59-79 (reference 3i), Executive Order 11514, Executive Order 11991 (reference 3j), Public Law 91-190 (reference 3k), and DoD Directive 6050.1 (reference 3l) are all met.

3.4 Planning Procedures for the United States National Capital Region (NCR). Planning for all MTF's in the NCR shall comply with MIL-HDBK-1190 (reference 3e) and OMB circular A-11 (reference 3m). Master plans for MTF's in the NCR shall be sent to the National Capitol Planning Commission (NCPC) or the Commission of Fine Arts (CFA), or both, as required by the policies issued by the Commissions. The United States National Capitol Region is defined as the District of Columbia; Prince Georges and Montgomery Counties in Maryland; Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia; and all cities and towns within the outer boundaries of the foregoing counties.

3.4.1 Projects normally are not advertised for bids prior to resolution of any serious objections by either Commission. Requests for exceptions are to be submitted to DMFO together with a statement on the special circumstances involved.

3.4.2 The Military Departments and Defense Agencies are to establish a day-to-day staff working relationship with the NCPC and the CFA to ensure expeditious handling of the reviews.

3.4.3 The provisions of OMB Circular A-11 (reference 3m) require the submission of five-year construction budget proposals to NCPC by the Military Department and Defense Agencies.

3.5 Energy Concerns. Orient buildings on the site to decrease energy consumption within the constraints of the functional requirements, the topography, and the site configuration while at the same time enhancing natural daylighting. Consider effect of local sun angles and wind conditions when orienting building on the site. Any useful temperature or humidity characteristics of the site due to land forms or major stands of vegetation should be used to the maximum extent practicable.

3.5.1 Winds. In harsh climates and areas of consistently high or changing winds, building entry points must be designed to compensate for these adverse conditions, including snow. Consider prevailing and seasonal wind conditions where locating energy plants, incinerators, trash and trash collection points, and exhaust vents in relation to air intakes to minimize contamination of the site and building.

3.5.2 Massing and the Sun. Advantages and disadvantages of building massing and orientation with respect to natural daylighting and renewable energy opportunities, energy concerns (peak loads, annual consumption, etc.), and environmental concerns (prevailing seasonal winds, etc.) should be compared to shading of glazed areas to eliminate sunlight glare and to conserve energy in climates where air conditioning is the primary energy consumer while maintaining a comfortable working environment.

3.6 Handicapped Accessibility. All MTF's are to be accessible to the handicapped. Parking spaces for the handicapped should be located adjacent to facility entrances. Provide accessible site circulation paths to all public and staff entrances. Pedestrian crosswalks are to be clearly painted and proper signage provided at all locations. Aspects of handicapped design shall be in accordance with the Uniform Federal Accessibility Standards (FED-STD-795) (reference 3n).

3.7 Security Fencing. Limit the use of fencing to enclose and separate areas within a medical complex to those conditions requiring security or the protection of life, separation of a construction site from operational facilities, isolation of a hazardous area such as Magnetic Resonance Imaging (MRI), or as stipulated by the individual using Military Departments. (See Section 14).

3.8 Landscaping. Provide landscaping (grass, trees, shrubs) as an integral part of the design as appropriate for each type of facility. Use low maintenance plants which are indigenous to the area. Existing mature trees and vegetation should be retained whenever practical. The costs of such planting(s) should be included in the funding of the facility. These subjects are addressed in detail in the Joint Service Manual TM5-803-5, NAVFAC P-960, and AFM 88-43 (reference 3d).

3.8.1 Sidewalks. Sidewalks are to be designed to provide convenient and safe pedestrian access and necessary circulation. The width of walks is to be based on pedestrian traffic volume, UFAS, and

code requirements. The grades of walks will normally follow the natural pitch of the ground except where handicapped access criteria must be followed.

3.9 Soil Conditions. Soil and foundation conditions shall be investigated to assure suitability for economical excavation, site preparation, building foundations, utility lines, grading, and planting. Bearing capacity tests are to be made to assure stable and economical foundations for buildings and other structures. The Design Agents are responsible for supplying or contracting for appropriate information early in the design process.

3.10 Siting of Utilities. Provision of utilities essential to efficient operation and of adequate size to serve future MTF requirements shall be considered in the early planning stages to avoid conflicts in the design and layout of the various utility lines and the early recognition of the need for additional production and/or supply capacity. All MTF projects should specifically address the adequacy of existing utilities support and include any additional needs. Planning of utility lines should minimize utility easements, capital investments, and maintenance and repair costs.

3.10.1 Underground Lines. Locate underground utilities to minimize the cost and effort of performing maintenance. Normally, utility lines of all types should not be located under buildings, parking lots, paved terraces, sidewalks, and other paved areas. All underground utility lines, mains, and conduits are to be located at the minimum depth required in accordance with local code, frost line and water table requirements, and, when possible, in common corridors to allow for ready access and maintenance.

3.10.2 Storm Drainage. The storm drainage system, including gutters, drain, inlets and culverts, is to be designed to carry the anticipated runoff, including runoff from melting snow. Inlets should be provided where necessary to intercept surface flow. The building up of undeveloped areas may have a noticeable effect on installation drainage facilities; major alterations or extensions to storm sewers and drainage channels may be required because of the location and design of new facilities.

3.11 Vehicular and Pedestrian Circulation.

3.11.1 Street System. Design of the street system within each project area is to be coordinated with the overall traffic circulation plans for the installation. Provide convenient and safe vehicular access and circulation for essential services, such as deliveries, trash and garbage collection, fire protection, and maintenance and repair, with through traffic being kept to a minimum.

3.11.2 Separate Access. Provide separate roads, if feasible, from the site entrance to emergency services, to patient parking, and to

support service areas. An additional road may be required from the helipad to emergency services.

3.11.3 Turning Conflicts. Minimize turning conflicts between opposing traffic flows.

3.11.4 Ambulance Traffic. Ambulances must be able to move nonstop, sometimes at high speed, from a site access point or helipad to the emergency entrance. Ambulances must also be able to move rapidly from the emergency entrance to any point on the installation, including the helipad. Where possible, ambulances are to be provided with a separate, dedicated route to the emergency entrance from the nearest primary arterial roadway.

3.12 Parking Facilities. Ninety degree offstreet parking normally is provided for both organizational and nonorganizational vehicles. Parking areas should be closely, but unobtrusively, related to the facilities served, and should be coordinated with the location of underground utility services. In the interest of the economy and efficiency of land, joint use parking may be considered where feasible. In designing parking lots, care should be taken to avoid the extremes represented on the one hand by a proliferation of small lots or, on the other hand, massive areas of unbroken pavement. Where relatively large lots are unavoidable, the natural terrestrial features and allocation of natural tree islands should be combined effectively to relieve the unfavorable view. When mature trees or vegetation exist on a site, every reasonable effort should be used to integrate them into parking areas. Criteria and allowances for parking spaces for nonorganizational vehicles are to be in accordance with Table 3-1 (reference 3o).

3.12.1 Parking Structures. Parking structures or garages will only be considered when the site for the projected MTF is so small no other alternative exists. DMFO will approve on a case-by-case basis any parking structures required.

3.12.2 Ambulance Shelters. Ambulance shelters in the form of a garage or carport are authorized as part of a MTF as follows:

3.12.2.1 Ambulance Garage. A garage may be provided at Installations where the heating design temperature on the 97.5 percent dry bulb basis is less than eleven degrees F (-12 degrees C).

3.12.2.2 Ambulance Carport. A carport may be provided at Installations where the air conditioning design temperature on the one percent dry bulb exceeds 87 degrees F (31 degrees C).

3.12.2.3 Design Temperatures. All design temperatures shall be obtained from the Tri-Service Manual, Engineering Weather Data, AFM 88-8, chapter 6; TM 5-785; or NAVFAC P-89 (Reference 3p).

on file in > > 4. Data records. Data records of all tests shall be kept

TABLE 3-1
AUTHORIZED PARKING SPACES FOR
MEDICAL AND DENTAL TREATMENT FACILITIES

TYPE OF FACILITY	NUMBER OF PARKING SPACES
HOSPITALS AND OUTPATIENT FACILITIES	(.59)(X1)+(.21)(X2)+(X3)*+(X4)+(X5)

X1 = All personnel working in the Medical Treatment Facility on a full time basis, minus the Dental staff (see X4), plus an allowance for visitors and part-time staff. Include FTE's, contract maintenance, Red Cross volunteers, base exchange, clergy, interns, technical school trainees, VA, other Military Department liaison staff, Reserve, Guard, PME and visitors (i.e., Commander, CHAMPUS, RMO Security, Fire Department Consultants, Salespersons, etc.) and shift change overlap. (Use 10 percent if statistics otherwise unavailable for additional visitors, shift overlap, and part-time staff).

X2 = Average daily outpatient workload for "peak month" using 21 workdays per month and 250 workdays per year as a basis for calculation. Workload to be used in calculation is all outpatient visits to clinics plus outpatient O.T, P.T., immunizations, physicals, inhalation therapy, EEG's, ECG's plus a 10 percent factor for pre-admission testing and paperwork, pharmacy visits (including refills), environmental health, records retrieval, partnership program visits, education programs (birthing, smoking, nutrition), "drop-in" check-ups, school physicals, appointments, DEERS checks, meeting with family members in conjunction with a MTF "visit", etc.

*X3 = One space for each patient bed. (Do not include in free standing, Outpatient Medical Treatment Facilities or Dental Facilities calculations which are not co-located with an inpatient facility (CMTF).

X4 = Dental Clinic (both free-standing and as a part of another facility (CMTF)). Three spaces per dental treatment room (DTR).

X5 = One space for each organizational vehicle.

Note 1: Carpooling, "Reserved" spaces for Command, General Officers, Rewards, and Handicapped are included in the above factors.

Note 2: Handicapped as required in FED-STD-795. These spaces are included in and broken out from the above total and designated per UFAS for both in- patient and outpatient MTF's. Handicapped spaces are to be allocated per UFAS standards proportionally for both inpatient and outpatient requirements as applicable.

Note 3: Calculations may be adjusted for public transportation (if reliable and available within reasonable walking distance and for Quarters/Housing (if within reasonable walking distance).

Note 4: Parking lot segregation for staff, patients, and visitors will be addressed by respective Military Departments during design.

REFERENCES

3a. Executive Order 12372, "Intergovernmental Review of Federal Programs," July 14, 1982, 47 Federal Register 30959.

3b. DoD Directive 4165.61, "Intergovernmental Coordination of DoD Federal Development Programs and Activities," August 9, 1983.

3c. DoD Directive 5500.5, "Natural Resources--Conservation and Management," May 24, 1965.

3d. Joint Service Manual, TM 5-803-5, NAVFAC P-960, AFM 88-43, "Installation Design," March 1, 1981.

3e. MIL-HDBK-1190, "Facility Planning and Design Guide," 1 September 1987.

3f. Executive Order 11988, "Floodplains," May 24, 1977.

3g. Executive Order 11990, "Protection of Wetlands," May 24, 1977.

3h. 43FR6030, "Floodplain Management Guidelines," February 10, 1978.

3i. Title 44, CFR 59-79, "National Flood Insurance Program."

3j. Executive Order 11514, "Protection and Enhancement of Environmental Quality," March 5, 1970 (as amended by Executive Order 11991, May 24, 1977).

3k. Public Law 91-190, "National Environmental Policy Act of 1969," January 1, 1970.

3l. DoD Directive 6050.1, "Environmental Effects in the United States of DoD Action," July 30, 1979.

3m. OMB Circular A-11, "Preparation and Submission of Budget Estimates," May 27, 1979.

3n. FED-STD-795, "Uniform Federal Accessibility Standards," April 1, 1988.

3o. MTMC Report 74-28, "Traffic Generations at Military Medical Facilities," Military Traffic Management Command Transportation Engineering Agency, September 1974.

3p. "Engineering Weather Data," Tri-Service Manual AFM 88-8, Chapter 6; TM 5-785; or NAVFAC P-89.

SECTION 4: ARCHITECTURAL

4.1 General. This section provides guidance on architectural design of DoD Medical and Dental Treatment Facilities (MTFs). All MTFs shall employ an economical, completely functional architectural design, closely tailored to the requirements of the project. Designs are to be closely governed by standard healthcare, DoD, and Military Department specific functional requirements and the criteria specified herein. (See references).

4.2 External Design. Provide designs which are compatible with the environs and the existing buildings in the case of an addition/alteration project. Colors, textures, and the forms of existing buildings or other site features must be considered.

4.2.1 Massing. Give consideration to the visual impact of any new structure, especially to a new addition on an existing building, and to the massing effect on surrounding views.

4.2.2 Building Exteriors. Exteriors (elevations) are to conform to or be compatible with the styles of previously constructed permanent facilities of the region, station, base, or post. To ensure compatibility, observe and document during the site visit the physical features of the site and the character and style of any surrounding building(s). Develop elevations based on interior departmental functional relationships and requirements, and where possible, by taking advantage of existing or developed site assets.

4.2.3 Building Materials. Cladding is to meet engineering standards with respect to the environment, energy use, materials, and methods of construc- tion. In selecting building materials, careful consideration shall be given to technical criteria. Vapor barriers, paints, and other finishes shall be selected with respect to vapor flow through the walls and roofs to preclude moisture accumulations and condensation within the building structure, reduction of thermal performance, and increased latent cooling load in the space. Materials utilized on the exterior of the buildings should have higher vapor resistance than the materials utilized on the inside of buildings.

4.2.4 Roof Considerations.

4.2.4.1 Roofing system(s) are to be compatible with construction materials used, readily repairable, and designed to provide a complete, waterproof roof. The system is to be durable, require minimal maintenance, and provide the fire ratings and classifications required. (MIL-HDBK 1008A, reference 4b).

4.2.4.2 On new construction, design the roofing system for resistance to wind uplift forces.

penetrometer shall be parallel with and at least 1/8 inch, but not more than

4.2.4.3 On re-roofing projects, if the design requires ratings for fire or wind uplift, ensure that the existing structure, in combination with the new design, can attain those ratings.

4.2.4.4 Design roof slope(s) no less than 1/4 inch per foot. This may be accomplished by sloping the roof structure or by using tapered insulation in accordance with manufacturer's instructions.

4.2.4.5 Minimize the use of roof penetrations to the greatest extent possible. Do not install penetrations in valleys or near drains or scuppers.

4.2.4.6 When roof-mounted equipment is used, select the equipment to provide the lowest profiles for the application used. Design the supports for the equipment size and weight, provide for the ease of a complete re-roofing process without disturbing the equipment, and design for construction in a manner so as not to violate the waterproofness of the roofing materials.

4.2.5 Solar Shading. In climates where summer air conditioning is not required, adjustable blinds may be used to eliminate direct sunlight glare. In climates where summer air conditioning is required, solar shading may be accomplished by using solar shading screens or baffles, recessing the exterior windows, light-reducing glass, heat-absorbing tinted glass, reflective glass, adjustable blinds, or combinations of these materials so as to provide the most desirable and economical solution. Provide a solution with a life-cycle cost effect solution approach for shading of exterior window areas that is compatible with the comfort required in the working areas, aesthetics, and the Energy Analysis Study.

4.3 Internal Design. Factors that affect the perceptual quality of a space such as changes of daylight, the movement of air, changes of temperature, sights and sounds of human activity, spatial variety, and graceful proportion must be considered in terms of their therapeutic effects.

4.3.1 Shapes and Function. Building or departmental floor plan shapes should be simple and functional. Avoid narrow or irregular floor shapes. Locate permanent plan elements, such as mechanical shafts, stairways, and reinforced concrete vaults, to minimize their impact on functional use areas or future expansion of critical areas.

4.3.2 Space Allocations. Use the DMFO-approved Program-For-Design (PFD) exclusively to allocate space assigned to a facility.

4.3.3 Functional Planning and Future Expansion. Departmental size fluctuation with changing utilization must be considered. Relocation of departments having least first-cost is a valuable mechanism for accommodating change. Expansion of expensive existing departments can often be coupled with relocation of lower cost functions. Placing departments on outside walls with adjacent site space available for

expansion also adds future flexibility. Corridor patterns can enhance circulation and flexibility. Adequate access to general circulation is needed for each department to facilitate visitor, patient, staff, and material traffic. Open plans, where feasible, allow easy departmental change. Avoid floor plans that encircle a department with permanent corridors, stairs, mechanical rooms, or other building elements difficult to relocate.

4.3.3.1 Pursue the grouping of functional elements in accordance with the following objectives. Where difficulties arise in the mutual accommodation of all of the following objectives, the objective stated in subparagraph a) below shall be given priority.

a) Combine elements on the basis of functional adjacency requirements to facilitate better functional flow and reduced operating and staff costs.

b) Combine departments and functions with similar fire code requirements where feasible. For example, the assembly of all outpatient clinical elements which do not serve nonambulatory patients can be constructed to a lower cost as a "business occupancy" rather than the higher cost of a "health care occupancy."

c) Combine elements with similar electrical, mechanical, and structural requirements to facilitate savings in construction costs.

4.3.3.2 Consistent with proper functional adjacency planning, soft-functional areas (areas having minimal plumbing, special finishes, special mechanical features, and special power demands) should be placed between hard-functional areas (areas having appreciable plumbing, special finishes, special mechanical features, and special power demands) to permit in-place future growth of the hard-functional areas by relocation of the less costly soft-functional areas.

4.3.3.3 Assure column-free functional areas where possible. Provide vertical column compatibility in multi-story facilities. Also see Section 6 for seismic considerations.

4.3.3.4 Design electrical, mechanical, plumbing, and other support systems in such a manner as to permit modifications in support of medical functional changes with the least life-cycle-cost and least disruption to the overall operations.

4.3.3.5 Longspan structural construction usually increases flexibility but must be studied in relation to cost effectiveness, the life of the structure, and the probability of functional change.

4.3.4 Atriums. In addition to improving aesthetic conditions, providing natural light to interior patient rooms and establishing an environment providing psychological benefits to patients, staff, and visitors, a rationale may exist for incorporation of an atrium into the design of a multi-story MTF. This rationale involves the potential for

reducing initial capital investment, construction costs, and associated energy costs by reducing the exterior of the facility exposed to weather and by providing an opportunity for the achievement of significant savings in both construction and operation of the energy system through integration of the mechanical/HVAC and atrium into a single system. An example of reducing construction costs could be by utilizing the atrium as part of a return air duct system. Energy costs for running the MTF round-the-clock could be reduced since perimeter heat gains and losses could be held to a minimum. Where there is heat build-up from equipment, lighting, and people in spaces within the facility normally requiring air conditioning even in the winter, the atriums could be used as a "heat sink" rather than exhausting the air as is customary.

4.4 Circulation.

4.4.1 Separation of Traffic. In a multi-story medical facility, elevators are a principal axis of personnel, patient, and materiel movement. To reduce the mixing of supplies, visitors, staff, and patients, access to and location of different types of elevators should be considered. The objectives of separation are to decrease cross contamination, disturbance of patients, and traffic congestion. (NFPA 101, reference 4d). See Section 17.

4.4.2 Circulation Patterns.

4.4.2.1 Control traffic flow by signage. Provide adequate circulation space at points of traffic congestion and architectural features that emphasize overall circulation patterns and major entrances to departments.

4.4.2.2 Make circulation more efficient by:

a) Avoidance of confusing hallway systems and extension of through corridors from department to department;

b) Avoidance of horseshoe shape in major corridor systems that require excessive walking distances;

c) Avoidance of dead end departmental corridors;

d) Minimize the use of single loaded corridors; and

e) Elimination of major corridors through elevator lobbies or through other areas which tend to concentrate circulating personnel; and

f) The location of vertical transportation element(s) should be immediately visible from the major entrances.

4.4.2.3 Pay special attention to code requirements for Lobbies and vestibules in front of elevators. Main circulation corridors in health care occupancies should be at least 8 feet wide exclusive of Lobbies and

elevator vestibules unless otherwise directed. Minimum corridor widths must comply with NFPA 101 (reference 4d) and UFAS (reference 4e) requirements. Generally, minimum corridor widths shall be 5 feet 6 inches and 8 feet depending on loading and code requirements.

4.5 Floor-to-Floor Heights. Determination of finished-floor to finished-floor heights in Medical Treatment Facilities is a multi-disciplinary task. Elements requiring special ceiling heights should be grouped on the least number of floors consistent with proper functional design. Refer to Appendix A for rooms requiring special ceiling heights.

4.5.1 Underfloor or Crawl Spaces. Limit crawl spaces or underfloor areas to less than 7 feet (2.1 m) in height. Spaces under 7 feet (clear) are not accountable as scope. Exception to 7 foot rule: If, during the course of construction, excavation for footings, or because of sloping terrain, the "crawl space" exceeds 7 feet, it is not necessary to "fill" to achieve the "less than 7 feet to avoid scope" issue. Full expanations and justifications are required in the narratives.

4.6 Exterior Wall Design.

4.6.1 Materials and Assemblies. Develop and select wall designs according to applicable criteria.

4.6.2 Thickness. Evaluate wall thickness for its effect on the net-to-gross floor area ratio of the entire building. Placement of the wall in relation to the structure impacts construction cost, fenestration shading, exterior materials, and method of assembly.

4.6.3 Design Characteristics. Evaluate the design characteristics of wall schemes for aesthetic, functional, and cost effectiveness as their characteristics relate to the following:

4.6.3.1 Exterior wall termination at the roof, or top of parapet walls (including penthouse), including consideration of the structural deck, roofing system, drainage pattern, roof slope, and cornice flashing;

4.6.3.2 Construction and control joint locations, considering impact on sterile areas, construction sequence, and building movement due to expansion and contraction;

4.6.3.3 Corner conditions, especially material relationships at the intersections of vertical planes, and the continuity of wall supports and flashings;

4.6.3.4 Load transfer of the wall to the structure, including consideration of structural frame exposure and lateral wall supports;

4.6.3.5 Weathertight design, including sealant profiles, material adjacencies, and flashing configuration; and

4.6.3.6 Window placement relative to the wall, secondary connection requirements, material adjacencies, window washing, glass type and thickness, and life safety hardware.

4.6.4 Climate Factors. Climate data establishes performance requirements for thermal design of exterior walls. Use overall composite heat transfer or "U" factors in conjunction with local climatology data. Composite "U" factors must conform to criteria in Sections 7 and 8.

4.6.5 Moisture Transport. Prepare dew point calculations following recommended design procedures in the ASHRAE Handbook of Fundamentals (reference 4c). Dew point consideration will determine where condensation will occur within the wall assembly and what problems will be generated by its presence at specific points during freeze-thaw cycles.

4.6.6 Thermal Resistance. Obtain the thermal characteristics of single materials or wall assemblies from the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Handbook of Fundamentals or from manufacturer's certified technical information. Identify thermal resistance (R) values for each element in the building shell. Prepare "U" factor calculations following recommended procedures as documented in the ASHRAE Handbook of Fundamentals. (ASHRAE, reference 4c.) Use thermal transmission values prescribed in Table 7-1 for gross wall and opaque wall.

4.7 Fenestration and Windows.

4.7.1 General. Design fenestration considering National Fire Protection Association (NFPA) (reference 4f) codes, HVAC requirements, aesthetic appearance, and the comfort of patients and personnel. MIL-HDBK-1190 (Reference 4a) contains provisions for natural light and ventilation and prescribes minimum glass areas to achieve those provisions in certain faci- lities but establishes maximums only for locations designed for less than 0 degrees F (-18 degrees C winter design temperature). Where glazing is used (fixed or operable sash), the need for window cleaning maintenance must be recognized, and where need be, provision must be made to accomplish it.

4.7.2 Location. Exterior windows must be provided in normal nursing care, Intensive Care, and Cardiac Care bedrooms, Prosthodontic Dental Treatment Rooms (nontinted), and Prosthodontics-Ceramics Laboratories (nontinted).

4.7.3 Patient Bedroom Windows. Every patient sleeping room must have an outside window in accordance with NFPA-101 or outside door arranged and located so that it can be opened from the inside to permit the venting of products of combustion and to permit any occupant to have

direct access to fresh air in case of emergency. Exceptions to this are facilities located in high-threat areas. NFPA 101 (reference 4d) outlines definitive requirements and acceptable exceptions.

4.7.4 Sash Selection. Some existing DoD Medical Treatment Facilities have seasonal type air-conditioning and must be provided with operable sashes, with screens as appropriate, to provide natural ventilation during the spring and fall seasons when the air-conditioning is not operating. Where sashes must be operable for ventilation requirement and economic considerations, limit the maximum opening of the operable sash to prevent the open sash from being used as a means of exit. Do not use a projected-type (hopper) sash that may introduce exterior or interior safety hazards.

4.7.5 Glazing for Impact Safety. Due to the size and shape of glazing in some locations, glass panels may be mistaken for a means of entrance or exit and may be subject to human impact. Comply with the requirements of ANSI Z97.1 (reference 4g) and NFPA 101 in these circumstances. Sill heights less than 30 inches above the finished floor must have an intermediate horizontal mullion included in the fenestration at that height. Examples of these conditions are framed or frameless glass doors, borrowed lights, sliding glass doors, fixed glass panels, and shower or tub enclosures.

4.7.6 Fallout Shelter and Contingency Design Considerations. Fenestration may be eliminated where there is a justifiable requirement for fallout shelter space or contingency design requirements supersede normal design procedures.

4.8 Interior Construction.

4.8.1 Component Evaluations. Select interior components and their related construction details based on initial cost, life expectancy, housekeeping and maintenance costs, and aseptic characteristics, as applicable. Normally used materials, including their correlation and standard abbreviations are indicated in Appendix A.

4.8.2 Functional Classifications. Divide MTF interiors into four functional classifications as follows to evaluate interior finishes:

4.8.2.1 Dry Use Areas. These functions have a low frequency use of liquids in operational activities and housekeeping procedures.

4.8.2.2 Wet Use Areas. These functions frequently use liquids in operational activities and housekeeping procedures, such as Toilets with showers, Showers, Operating Rooms, Delivery Rooms, Hydrotherapy, therapeutic pool areas, and others as required by NFPA 99. (NFPA 99, reference 4f.) (See glossary.)

4.8.2.3 Damp Use Areas. These areas infrequently use liquids in operational activities and housekeeping procedures but require special attention such as Toilets, Locker areas in conjunction with showers,

Sub-Sterile and Scrub areas adjacent to Surgery and Delivery, and so forth.

4.8.2.4 Protective areas. Occupants, equipment, or adjacent spaces may require protective areas (for either wet, damp, or dry use) against fire, smoke, radiation, electrical grounding, or radio frequency interference.

4.8.3 Aseptic Environments. Selection of interior construction and finishes must consider the need for aseptic environments. Use smooth, nonporous, seamless materials, recessed cabinets with rounded inside corners to minimize contamination and reduce housekeeping. Smooth, seamless wall and floor coverings facilitate cleaning. As a minimum, the following areas shall be designed for ease of housekeeping, elimination of physical features which could harbor contamination, and to decrease maintenance access to support systems within these rooms:

a) Oral Surgery Rooms, Dental Treatment Rooms,

b) Special Procedure (Cardiac Cath, etc.) Rooms,

c) Operating and Delivery rooms,

d) Emergency Room,

e) Decontamination and Clean-up in Surgery, Delivery, and Central Processing and Distribution (CP&D),

f) Sterile Storage (Surgery, Delivery, CP&D),

g) Substerile and Recovery (Surgery and Delivery).

h) All Patient Treatment Rooms.

4.8.4 Alterations. In areas where functional considerations require removal of the majority of the existing partitioning, employ the complete demolition of partitions and ceiling systems. Avoid the "patch-to-match" technique where possible.

4.9 Floors. Design floors to accommodate different types of wheeled conveyances and to be devoid of abrupt changes in elevation. Maintain constant floor elevation throughout for safety and ease of movement of wheeled equipment. Avoid raised thresholds, steps and ramps. Recess all expansion joint cover plates flush with the finished floor.

4.9.1 Floor Finishes.

4.9.1.1 Finish all exposed concrete floors in MTFs and Contingency facilities with sealers to protect against deterioration due to chemicals, oils, greases, salts, wear, and other factors. Floor finishes shall be as indicated in Appendix A.

4.9.1.2 Provide the following areas, as a minimum, with waterproofing when located over occupied areas to protect ceilings below from water damage due to leakage from spilled liquids and cleaning solutions. Ceramic and quarry tile and sheet vinyl will provide adequate waterproofing.

a) Operating and Delivery rooms,

b) Dishwash and Cartwash areas,

c) Decontamination and Clean-up,

d) Tub Rooms and Whirlpool areas,

e) Laboratory Glasswash Room,

f) Sterilizer Closets,

g) Toilets and Showers,

h) Food preparation areas,

i) Autopsy and Cast Rooms, and

j) Dental Treatment Rooms.

4.9.1.3 Carpeting. Limit the use of carpeting in Military Medical and Dental Treatment Facilities to those areas specified in Appendix A.

4.10 Partition Systems. Limit partition systems to masonry or steel stud with gypsum wall board systems. Construct partition systems with noncombustible materials and design them to conform to applicable portions of the National Fire Codes. Select systems which permit modification with the minimum cost and difficulty within acoustical and fire criteria except in areas subject to severe impact.

4.10.1 Barriers. Design protective barrier partitions to protect occupants or equipment in rooms, spaces and compartments from fire, smoke, radiation exposure, or for physical security purposes. Reinforced masonry or concrete partitions are desirable around areas where the physical security of valuables or drugs is required. (See Section 14.)

4.10.2 Gypsum Wall Board. Considerable cost advantage may be derived by the use of gypsum wallboard in lieu of plaster on walls in dry or damp spaces. Performance of gypsum wallboard must satisfy criteria for fire rating, sound transmission class (STC) rating, flame spread, and thermal insulation. Provide protective measures such as wall and corner guards in heavy traffic areas to protect gypsum wallboard. This criterion is not intended to exclude other types of authorized materials. In areas subject to severe impact from mobile equipment, consider the use of other wall materials, including masonry.

4.10.3 Protection. Use bumper guards on walls in areas subject to frequent abrasion and impact such as Corridors, Utility Rooms, Central Processing and Distribution (CP&D), Gurney Storage, and others. Mechanically mount bumper guards to appropriate wall blocking where steel stud partitions are used and extend outward from the wall to afford the needed protection. Provide corner guards at outside corners of walls, corridors, and in areas and rooms subject to damage by mobile equipment. Design corner guards to extend from the floor to the finished ceiling. Masonry partitions also require corner guards. Do not use bullnosed masonry corner units.

4.10.4 Reinforcement. Wall partitions require additional reinforcing for positive attachment of surface-mounted items such as casework, wall bumpers, toilet accessories, and other equipment.

4.10.5 Partition Finishes. Finishes can be generally categorized into the same dry, wet, damp use, and protective classifications as interior construction. Finishes may be directly applied to the partition systems or may be applied to a substrate which has been previously applied to the partition system. Finish materials, substrates, and the basic partition system must work compatibly to be effective.

4.11 Ceilings. Ceilings may be an element of a U.L. fire resistance-rated floor and ceiling or roof and ceiling assembly. Attention shall be given to lighting fixture arrangements, HVAC outlets, and other appurtenances, as well as construction methods, finishes, and maintenance access. Select a ceiling system based on initial cost, surface visual appeal, resistance to moisture, fire resistance rating, lighting, HVAC outlets, security, maintenance, and acoustic characteristics--see Appendix A.

4.11.1 Support. Use of suspended ceiling surfaces for the direct support of intravenous infusion tracks or cubicle curtain tracks is not recommended. Ceiling-mounted accessories secured through the ceiling to secondary support members is recommended. Secure suspended heavy equipment or equipment tracks to independent structural assemblies attached directly to the structural floor and roof framing members overhead. Use universal suspension systems in all radiographic rooms--see Section 16 and Appendix B (Universal X-Ray Room).

4.11.2 Utility Access. Provide maximum accessibility in corridor ceilings to the mechanical and electrical distribution systems above. Do not use concealed-spline ceiling systems requiring special tools to lower tile assemblies. Color-code the access panels into ceiling plenums with tabs to identify the type of utility present.

4.11.3 Moisture Protection. When acoustic treatment is required in the presence of high levels of moisture, use plastic-faced acoustic tiles.

4.11.4 Grid. Layout ceiling tiles symmetrically so that tiles and grid members retain modular dimensions. Modular coordination can decrease ceiling cost and provide dimensional continuity at corridor intersections.

4.11.5 Ceiling Heights. Design the minimal finished floor to ceiling height to be eight feet (2.44 m) throughout the facility, except for the areas and rooms in Appendix A where the indicated heights are required.

4.12 Interior Finishes. Selected interior finishes shall be appropriate for the design of the building and each functional area and space. All materials in Appendix A have been selected based on:

4.12.1 Being suitable for the environment in which they are used;

4.12.2 Having low maintenance and life-cycle costs for the anticipated usage, such as having the ability to withstand abuse, the continual application of cleaning and decontamination agents, and contain high-wear resistancy characteristics;

4.12.3 Meeting applicable fire and other safety requirements as set forth in the NFPA 701, 258, 255, 253, 101, 56A (reference 4f), also ASTM Standard E-84 (reference 4h), UL 992 (reference 4i), NBS Technical Note 78 (reference 4j), AATCC Test Method 134-1969 (reference 4k), and Pill and Radiant Panel Tests (see NBSIR 78-1436)(reference 4l);

4.12.4 Meeting appropriate acoustical qualities; and

4.12.5 Facilitating control of nosocomial infection.

4.13 Vestibules and Doors.

4.13.1 Exterior Vestibules. Vestibules or revolving doors (when justified) may be provided at exterior entrances and shall be of sufficient depth to allow the outside doors to close before the inside doors can be opened.

4.13.2 Revolving Doors. Revolving doors may be provided when justified and all code requirements are met. When revolving doors are provided, the requirements of NFPA and UFAS to have normal swinging doors for egress are still required.

4.13.3 Automatic Doors. Electrically-controlled, hydraulically-operated automatic doors should be provided for Emergency trauma entrances of Medical Treatment Facilities and selected Medical Treatment Facility entrances based on facility size. Automatic doors should also be considered at all Surgery and Delivery Suite entrances and along required corridor paths. Automatic doors to Radiology, Recovery, Intensive Care, Surgery, Delivery, and Cardiac Care areas may be considered for Medical Centers and Regional Hospitals. Connect all electrically-operated doors to emergency power. Do not use

treadle-operated doors at exterior entrances. Use electric eye or beam activated devices.

4.14 Structural Interior Design (SID).

4.14.1 All work relating to fixed structure colors and finishes selected for the integrated structural interior design shall be prepared by a qualified design staff or consultant in accordance with current, professional design principles. The object is to create an environment that will contribute to the welfare of patients and productivity of operating personnel. Do not sacrifice quality, safety, function, and comfort for aesthetics. Design all work in accordance with current fire and safety standards pertaining to Medical and Dental Treatment Facilities.

4.14.2 Color Selections.

4.14.2.1 Use neutral colors for permanent hard surface materials to avoid long term effects of color selection on future color schemes. Limit more dramatic colors to changeable surfaces and materials.

4.14.2.2 Coordinate color selection with the quality and quantity of light provided in each space. New color schemes proposed for existing interiors must not exceed the capability of the existing lighting system to illuminate the colors selected to required brightness levels.

4.14.2.3 Select all nonproprietary paint colors from a nationally recognized paint manufacturer. Coordinate the colors with the basic architectural finish schedule.

4.14.2.4 Select colors with regard to their effect on the function of the space. Special consideration must be given to worktops in laboratory areas and maintenance shops where staining from various solutions is a problem.

4.15 Signage. This section provides criteria for standard, flexible signage for MTFs. These criteria apply to all types of MTF's, including new construction, additions to existing construction, alterations and upgrades. Signage includes all visual messages extending from the site boundary to an individual room number. Signage serves three functions: direction, identification, and information.

4.15.1 Exterior Signs. All signs located on the MTF's site shall be included in the Military Construction project (MILCON).

4.15.1.1 Directional signs must direct the patient or visitor to the services they need. Keep the number of directional signs and the information presented on each sign to a minimum to prevent confusion. Begin directional signs for commonly used major services at campus boundaries and guide a person through decision points to the parking area nearest the entrance needed. Building entrance signs must be visible from that point. Group the information with left-pointing

arrows at the top, up-pointing arrows next, and right-pointing arrows at bottom. Always place the Emergency sign at the top of a directional signage group.

4.15.1.2 Provide entrance identification signs for each major entrance to a MMTF. The sign shall describe the purpose of the entrance, that is, Main Entrance, Clinic Entrance, Dental Clinic, or other specific activity intended to be reached by the public primarily through that entrance.

4.15.1.3 When a MTF includes an Emergency room, the entrance to this activity must be marked by an internally illuminated sign in accordance with local area requirements and Department of Transportation standards. (See reference 4m). Place this sign where it will be easily visible to oncoming vehicles. It (they) should clearly mark a specific door.

4.15.1.4 Information signs provide basic directions essential to the patient or visitor relevant to specific locations.

a) This category includes highway standards such as stop, yield, and others. These standards are described in the Federal Highway Administration Manual of Uniform Traffic Control (reference 4n). Projects outside the CONUS may be modified to conform to local standards.

b) Other information signs are usually regulatory. The most common types are for parking regulation signs. Verbiage may include Visitor Parking, Staff Parking, Outpatient Parking, Handicapped, or other as local conditions dictate.

4.15.2 Interior Signs. Design signs to help patients and visitors find their way from the building entrance to the services they need, directly and without confusion.

4.15.2.1 Directories. Once inside a facility, the first requirement for directional signs is to orient the person to the building in general. Locate a directory just inside the lobby to serve this purpose. Overall directories should be placed in each major lobby area. These list all major services with their room number or area designations. Smaller, less comprehensive directories should be used in less important lobbies such as elevator lobbies on each floor.

4.15.2.2 Directional Signs. Once a person has used the directory and decided the general direction to go, directional signs must guide individuals through decision points and to their destination. Directional signs may be applied to the wall or suspended from the ceiling. As with exterior signs, left-pointing arrows should be placed at the top, up-pointing arrows next, and right-pointing arrows at the bottom. All characters and directional arrows should be easily changeable to provide for future department relocations. When pictographs are used, the pictograph shall be shown left of the

verbiage. An important part of a directional signage network is the "No Entry" or "Staff Only" sign.

4.15.2.3 Identification Signs. Design signs to identify activities for individual rooms. This type may show a pictograph and room number on the header panel with the verbiage on the insert panel. Design patient room identification signs to have the room number on the header panel and insert panels used for information such as No Smoking, Oxygen in Use, Isolation, and No Visitors. Message copy on all interior room identification signs must be capable of being easily changed by the using staff.

4.15.2.4 Information Signage. These signs provide messages that aid in the daily transaction of business and provide regulation for health and safety. Use these signs to fulfill requirements of OSHA and Military Department safety standards. Keep the messages on information signs simple. Use of pictographs to aid in understanding of messages is encouraged where feasible.

4.15.3 Room Numbering. Provide a simple, distinct, and different number for groups of rooms within a department such as Examination Rooms, Dental Treatment Rooms, Operating and Delivery Rooms, X-ray Exposure Rooms, and Patient Bedrooms. The size and complexity of the facility determines the complexity of the numbering scheme. Alpha characters should be avoided in room number groupings. Make the room numbers used for building maintenance purposes different from those for patient and staff use. Use the room numbering system developed for each room's identification on the project drawings to label each room for the maintenance staff. A small, inconspicuous laminated plastic sign with the room number on it attached to the upper door frame will usually suffice. Do not place this room number on the room identification sign.

4.15.3.1 Integrated Design. Coordinate the signage system fully and blend it with the structural interior design color and material scheme.

4.16 Acoustics. Consider sound source and transmission an integral part of the design and construction of MTF's. This section prescribes basic acoustical criteria for consideration during early design phases of a project. Employ design details and techniques which will preclude acoustical deficiencies.

4.16.1 Some of the sound transmission problems which are to be considered for elimination or minimized through proper design techniques are as follows:

4.16.1.1 Sound transmission through suspended ceiling systems and down through the ceilings of adjacent spaces; through cracks between the tops of partitions and the bottom of continuous, suspended ceiling systems; and through fabric-covered accordion doors;

4.16.1.2 Sound leakage around heads, jambs, and sills of connecting doors;

4.16.1.3 Sounds produced by noisy items of equipment in special purpose rooms transmitted through walls and ceilings into adjoining spaces, such as a toilet room with wall-hung fixtures adjacent to a conference room; and

4.16.1.4 Sound transmission through short ventilation ducts with registers in different rooms, through poorly designed or installed recessed light fixtures in the ceiling, through electrical outlet boxes or other penetrations located opposite each other on a party wall, through the joint between walls and floors, and through door grilles.

4.16.2 Acoustical Requirements.

4.16.2.1 Each occupied space in a Military Medical and Dental Treatment Facility has requirements and characteristics which define its acoustical environment. Each of these acoustical elements is important, and failure to consider any one of them can affect the overall acoustical acceptability of a space. Appendix A contains parameters of the acoustical environment for each typical space. The acoustical parameters shown on Appendix A include ambient noise level, speech privacy requirements, and special sound transmission requirements.

4.16.2.2 The two most important acoustical characteristics for each space are the ambient noise level and the sound isolation requirements. The ambient noise level is the level of general background noise existing within a space. Sound isolation defines the degree to which the surrounding construction systems attenuate noise coming from outside the space. The ambient noise level in a space and the sound isolation of the enclosure together define the degree of speech privacy obtained in that space. If either one of these acoustical characteristics is downgraded, the other one must be increased to maintain the same level of privacy.

4.16.3 Acoustical Design Objectives. Basic acoustical objectives include controlling the level and character of background sound within a space (ambient noise level); reducing the sound transmitted between spaces, either by initial planning or with construction elements (sound isolation); and by controlling the level of noise and vibration produced by the operation of the building mechanical systems (noise control).

4.17 Comprehensive Interior Design (CID). The design shall include Comprehensive Interior Design (CID) effort to include furniture and accessory selection, layout and identification, and documentation for procurement. Coordinate the Comprehensive Interior Design (CID) package with the structural finish and colors (SID) (See 4-14) so that the CID will be fully coordinated with the building design. Coordinate subsequent selections of furnishings and medical equipment with the CID. The CID must be coordinated with using Military Department.

4.17.1 Color Coordination. During construction, indicate final approval colors in the Comprehensive Interior Design package.

4.17.2 Code Compliance. Design all items used for interior finishes and furnishings to conform to applicable codes and standards.

REFERENCES

4a. MIL-HDBK-1190, "Facility Planning and Design Guide."

4b. MIL-HDBK-1008A, "Fire Protection for Facilities Engineering Design and Construction."

4c. ASHRAE, "Handbook of Fundamentals," American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

4d. NFPA 101, "Life Safety Code," National Fire Protection Association.

4e. Fed STD 795, "Uniform Federal Accessibility Standards (UFAS)," April 1, 1988.

4f. NFPA 99, "Health Care Facilities," National Fire Protection Association (NFPA).

4g. ANSI Z97.1, "Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test," American National Standards Institute.

4h. ASTM E-84, "Standard Test Method for Surface Burning Characteristics of Building Materials."

4i. UL 992, "Flame Propagation Classification of Flooring and Floor Covering Materials, Chamber Test Method," Underwriters Laboratories, Inc.

4j. NBS Technical Note 78, "Oblique Incidence Receiving Antenna Array for a Relative Ionospheric Opacity Meter."

4k. AATCC Test Method 134, "Electrostatic Propensity of Carpet," American Association of Textile Chemists and Colorists.

4l. NBSIR 78-1436, "Flammability Testing for Carpet."

4m. Department of Transportation Signage Standards.

4n. "Manual of Uniform Traffic Control," Federal Highway Administration.

SECTION 5: STRUCTURAL

5.1 General. This section provides guidance for the selection of structural system(s) and materials, basic and special design requirements, climatic conditions, and cost considerations for Medical and Dental Treatment Facilities (MTF's) and functionally supporting structures. The system(s) and materials selected for a project shall be:

5.1.1 Suitable for permanent construction in the locale of the project;

5.1.2 Capable of carrying the required loads;

5.1.3 Compatible with fire protection requirements; and

5.1.4 Compatible with architectural and functional concepts.

5.2 Design Criteria. The structural design requirements, including the load assumptions not otherwise covered herein, shall conform to the using Military Department criteria (references 5a and 5b).

5.2.1 Floor Live Loads. Appendix A shall be used for floor live loads unless the occupancy is not shown. Actual design floor live loads may be simplified at the discretion of the designer to achieve a "user-friendly" floor system to accommodate future load occupancy changes.

5.2.2 Wind and Snow Loads. Wind and snow load design methods shall be in accordance with American National Standards Institute (ANSI) A58.1 (reference 5c).

5.2.2.1 Wind Loads. Design basic wind speeds and their resultant pressures based on "Exposure C" conditions (open terrain with scattered obstructions having heights generally less than 30 feet). Exceptions shall be where it can be clearly established that lesser loads associated with "Exposure B" conditions (towns, city outskirts, wooded areas and rolling terrain) are and will remain applicable, or where greater loads associated with a coastal waterfront site are applicable. Promontory, mountain, hill, and some valley exposures shall be examined for unusual channeling or lifting effects. Where these occur, the design load shall be adjusted accordingly. MTF's located in areas subject to typhoons and hurricanes shall be designed in accordance with reference 5d and other using Military Department criteria.

5.2.2.2 Snow Loads. Ground snow loads shall be based on the snow load zone maps unless a site specific study or local records indicate a higher value should be used. Frost penetration depth shall conform to reference 5a, 5b, and using Military Department criteria.

5.2.3 Seismic Design Criteria. Seismic design shall conform to the requirements set forth in Section 6 of this manual.

5.3 Protective Construction Criteria. Structural requirements for hardened facilities and protective construction are discussed in Section 15 of this manual. General information is available in the "Design Criteria for Hardening MTF's Against Chemical, Biological, and Collateral Damage Threats" prepared by Omaha District Corps of Engineers and the Defense Medical Facilities Office (DMFO) (reference 5e).

5.4 Soil Investigations. Soil investigations shall be conducted early in design as directed by the Design Agent to enhance recommendations for foundation design. The geotechnical report shall include information such as allowable soil bearing pressure, dynamic properties of in situ soils, expected differential settlement for proposed foundation types, and proposed soil treatment. Special considerations for foundations in arctic and subarctic construction areas are contained in reference 5f and other using Military Department criteria.

5.5. Special Structural Concepts. If exceptionally long spans or special long span structural techniques are considered appropriate, justification shall be developed in terms of additional cost over the life of the facility versus cost of planning constraints produced by conventional short spans. Integrated Building System concepts (see Section 19) normally require special structural systems and shall be considered only as directed.

5.6 Alternative Structural Systems. A minimum of three structural systems shall be thoroughly evaluated and submitted with a recommended selection of a structural system based on an economic study. The structural system selected shall be the one which best combines economy and suitability regarding functionality and seismic (Section 6) resistance configuration for the specific project. The comparative study shall address the cost of foundations and superstructure as well as appropriate cost factors for architectural, fire protection, mechanical, electrical, and seismic conditions where these vary between structural systems. Some structural systems are more compatible than others with the architectural, fire protection, mechanical, electrical, and seismic requirements for MTF's. Structural systems shall be evaluated within this context to determine penalties or advantages of alternate designs. Narrative justification, describing the basis for system selection, along with drawings of the selected structural system adequately developed so that no additional major engineering decisions are required, shall be provided. The economic study shall employ a method which considers all factors and requirements of the system's total cost. The method employed shall incorporate cost per unit of area, erection time, compatibility with other systems, nonstructural flexibility, lateral load resistance, noise attenuation and the natural vibration period of the structure, when applicable.

5.7 Development of Systems. Structural system(s) shall be designed with adequate strength to support all applicable loads. The structural system(s) shall be an assembly of structural elements forming a stable, self-contained structural unit. A repetitive pattern of assembled structural elements shall be used to the maximum extent possible.

5.7.1 Procedures. To select a structural system(s) for MTF's, the following shall be considered:

a) General condition: geographic location (seismic zone, see Section 6), building geometry, site conditions, codes and accepted industry practices;

b) Structural system: preliminary soil investigation; architectural, fire protection, mechanical and electrical requirements; column spacing; shear walls (if applicable); load conditions; floors, roof and special framing; and lateral stability;

c) Construction materials: strength requirements, unit cost, and construction method; and

d) Structural system assurance: the structure is constructible and economical; the structural design satisfies sound engineering design principles and practices, and is in accordance with applicable regulations; and the system satisfies all other requirements of the functional design, and of other design disciplines.

5.8 Additions and Alterations to Existing Facilities. When new functions are to be assigned to the existing structure, a structural investigation of the affected existing building segment(s) shall be executed to verify that the structure has the capacity to safely support the proposed new occupancy loads. The A-E shall notify the Design Agent in the event inadequate capacity is discovered. Provision shall be made for a structural stiffening of facilities when new floor loadings are required. The designer in conjunction with the using Military Department shall determine whether renovated and existing construction will have the same or different occupancy classifications. This determination shall also include magnitude of stiffening required for existing construction.

REFERENCES

5a. Joint Army-Air Force Manual, TM 5-809-1, AFM 88-3 Chapter 1, "Load Assumptions for Buildings," 28 March 1986.

5b. Navy Manual, NAVFAC DM 2.02, "Structural Engineering Loads," September 1986.

5c. ANSI A58.1, "Minimum Design Loads, Buildings and Other Structures," American National Standards Institute, 1982.

5d. Joint Army-Air Force Manual, TM 5-809-11, AFM 88-3 Chapter 14, "Design Criteria for Facilities in Areas Subject to Typhoons and Hurricanes," June 21, 1983.

5e. "Design Criteria for Hardening Medical Treatment Facilities Against Chemical, Biological and Collateral Damage Threats," Omaha District and DMFO.

5f. Army TM 5-852-4, "Arctic and Sub-Arctic Construction: Building Foundation."

SECTION 6: SEISMIC DESIGN

6.1 General. This section provides seismic design guidelines for permanent Military Medical and Dental Treatment Facilities (MTF's). The Department of Defense policy is to provide a framework to make the most effective use of medical Military Construction (MILCON) funds and to accommodate the concerns and legal requirements associated with the seismic risks faced by military hospitals. The Earthquake Hazards Reduction Act (P.L. 95-124) (reference 61) and the National Earthquake Hazards Reduction Program, while indicating the need to ensure that critical facilities such as hospitals are serviceable following an earthquake, also recognize that the measures necessary to implement seismic requirements are extremely expensive.

6.1.1. Corrective Actions. When existing MTF's having seismic deficiencies are being programmed, the seismic problem will be considered along with all other factors used in developing the requirement for a construction project. The corrective measures planned must address all factors including earthquake safety, be consistent with system- wide priorities, and be undertaken in a reasonable manner.

6.1.2 Guidance. In designing Military MTF's, the following guidance is provided:

6.1.2.1 All facilities will be designed to prevent building collapse under seismic forces anticipated for that location and to preclude collapse of equipment or utility systems that would also endanger life. Under this criterion, the facility would have to be evacuated, and post-earthquake operations provided from other sources.

6.1.2.2 Any Military MTF or portion thereof designated by the Department of Defense as "essential" will be designed to ensure serviceability so that post-earthquake operations can be provided from the facility. This includes ensuring that utilities, plant systems, and emergency vehicle access are designed to enable restoration of facility operations without undue delay.

6.2 Design Requirements. Seismic design requirements for a particular MTF depend upon the operation level required following an earthquake. This operational category will be determined by the DMFO after considering the recommendations of the using Military Department, the Design Agent, and the Federal Emergency Management Agency (FEMA).

6.2.1 Damage Risk Classification Categories. The damage risk classification (or occupancy) categories stated herein correspond exactly with the classifications in the Joint Services Seismic Design Manuals. These are:

a) Essential Facilities,

b) High Risk Facilities,

c) All Others Facilities (Basic Life Safety).

These provide the link between the required operational levels and an executable design procedure.

6.2.2 Damage Control. One of several possible means of achieving better seismic performance is to increase base shear by using an importance factor in the equivalent static loads design procedure. Another is to determine the loads by dynamic design procedures for elastic and inelastic behavior modes or variations thereof. Regardless of the design procedure or the force levels, the basic concepts and configurations of the lateral force resisting system are important considerations in achieving good performance and damage control. The lateral resisting systems must be well detailed to accommodate seismic demands. Non-structural elements must also be designed, specified, and detailed to provide good seismic performance and achieve the desired operational level. Such considerations tend to be difficult to codify.

6.2.3 Seismic Design Criteria. The seismic design of new facilities shall conform to the guidance herein and one of the Joint Services Seismic Design Manuals TM 5-809-10, NAVFAC P-355, AFM 88-3 Chapter 13, (reference 6b) or TM 5-809-10-1, NAVFAC P-355.1, AFM 88-3, Chapter 13, Section A (reference 6c).

6.2.4 Seismic Upgrades Criteria. The seismic design for upgrades of existing facilities shall conform to the guidance herein or the Joint Services Manual TM 5-809-10-2, NAVFAC P-355.2, AFM 88-3, Chapter 13, Section B (reference 6d).

6.2.5 Base Isolation. Approval to use "base isolation" design concepts and theory shall be approved by DMFO prior to any design effort being initiated.

6.3 Operational Level Criteria. The following levels of seismic resistance for various Military MTF's are specified with respect to operational mission, disaster preparedness, and medical post-earthquake needs:

6.3.1 Hospitals.

6.3.1.1 Basic Life Safety. This level generally applies to existing facilities. The most important requirement is to reduce the likelihood of injury or death to personnel by providing a structure which

resists collapse. This is the minimum requirement for seismic upgrade of alteration projects for existing hospitals. Structural systems for existing hospitals will be considered acceptable if they are in substantial conformance with the Basic Life Safety seismic design requirements in the Joint Service Manuals (reference 6b, 6c, or 6d). Substantial conformance is defined as the structure having lateral resistance equal to 80 percent of that seismically required with supports for mechanical, electrical, architectural, and other non-structural elements spaced at a distance no greater than 125 percent of the spacing required by the Joint Services Manuals. When an existing structural system does not meet these requirements, it will be strengthened as required. Alternately, the existing system may be analyzed for ultimate resistance to collapse, using the response spectrum approach, based on the forces from an earthquake with a 20 percent probability of being exceeded in 50 years. Anchorage and bracketing of mechanical, electrical, architectural, and other non-structural supports must also be strengthened if they fail to meet this requirement. With this class of structure, the MTF requires evacuation, and post-earthquake operations depend upon outside assistance. No specific time is specified for reoccupancy and utilization for this class of structure.

6.3.1.2 Partial. This level generally applies to existing facilities in seismic zone 1 and seismic zone 2. If an existing structural system is deficient, seismic strengthening will be required to meet the Essential category seismic zone requirements. To meet this operational level, a portion of existing building must be usable for continued medical care following an earthquake of expected zone severity. However, the facility may be rendered inoperative by structural damage due to an earthquake of greater than expected zone severity. The following areas must fully meet the Essential category design requirements of the seismic zone for structural and non-structural elements: Surgery, Labor, Delivery, Nursery, Intensive Care, Nursing Units, Emergency, Central Material Supply, Radiology, Clinical Laboratory, Supply Storage, Nuclear Medicine, the Emergency Operations Center, Hemodialysis, Respiratory Therapy, Patient Administration (inpatient activities only), Morgue, Building Maintenance and Engineering, and Food Service. Provisions for post-earthquake emergency utility services and emergency vehicle access will be made. In the area specified, fixed equipment, vertical transportation, and utilities will be anchored, braced, and/or tied down to fully resist design seismic forces, and if damaged or disrupted, will be restorable within several days. Outside the designated areas of existing buildings provide tie-downs, anchorage, and bracing for mechanical, electrical, architectural, and other non-structural supports in accordance with the High Risk category seismic design requirements. Outside assistance will supplement on-site care of inpatients and disaster victims while restored portions of the facility are used, and temporary expansion of emergency facilities implemented.

6.3.1.3 Selected/Full:

a) This level provides a higher operational capability than "Partial". It applies to new additions with key health care components (selected) and complete new essential facilities (full) in seismic zone 2 and above. Seismic design will be based on the maximum probable seismic ground motion with 10 percent probability of exceeding in a 50-year period that which is predicted to occur at the site.

b) MTF's in this operational category of seismic resistance will be so designed as to be prepared for post-earthquake operations and capable of restoration of minor damage within several hours following the maximum probable seismic ground motion. The facility may be rendered inoperative by damage due to an earthquake of greater than expected severity. All utilities and equipment must be prepared for isolation and/or restoration with minimum work if damage occurs. Provisions for post-earthquake emergency utility services and emergency vehicle access will be made.

6.3.1.4 Complete: This is the maximum level of seismic resistance for essential facilities. Seismic design will be based on a maximum probable earthquake occurring at the site, with a 10 percent probability of being exceeded in a 100-year period. This category generally applies to new construction located in seismic zones 3 and 4 that have been identified as requiring continuous operation both during and after an earthquake. Design the entire facility for complete continuity of operation, for care of inpatients, and for receiving earthquake casualties. Utilities, plant systems, and emergency vehicle access must provide for complete restoration of the facility to a near-normal interior environment within several hours. All site utilities must be restorable within a four-day period.

6.3.2 Outpatient Clinics and Dental Clinics.

6.3.2.1 For existing freestanding Outpatient Clinics and Dental Clinics, base the maximum requirements for seismic upgrade upon the Basic Life Safety category for hospitals.

6.3.2.2 For new freestanding Outpatient Clinics and Dental Clinics, base the seismic design on the Basic Life Safety requirements in the Joint Services Manuals. When it is determined that the facility is critically needed for receiving and treating earthquake casualties, a High Risk design category may be directed.

6.3.2.3 For combined type facilities, i.e., when Outpatient Clinics and Dental Clinics are within the hospital structure, use the hospital seismic design requirements.

6.4 Design Development of New Facilities.

6.4.1 Seismic structural design and siting considerations may conflict with functional considerations in building design. For instance, shear walls may limit horizontal flexibility, and diaphragms may limit vertical circulation. Faults or soil instability may preclude siting that would be otherwise desirable. Therefore, for all Medical and Dental Treatment Facilities, include seismic considerations in Concept studies at the start of design as well as functional, flexibility, and siting considerations in order that all requirements may be optimally integrated. It must be noted that building configuration plays an important role in the performance of the structure when subjected to seismic ground motion. To obtain optimal seismic resistance and performance, consider a symmetrical configuration of the structure system with properly placed lateral resisting structured elements. Further, the non-structural elements must be seismic resistant in order to maintain a post-earthquake operational capability.

6.4.2 Seismic considerations may require limits on the height of structures and design configurations. Structures shall not normally be sited over active geological faults, in areas of instability subject to landslides, where soil liquefication is likely to occur, or in areas subject to tsunami damage.

6.4.3 Consider the seismic design requirements with functional requirements in developing facility master plans. Functional relationships essential to life saving medical missions must not be comprised for nominal structural cost savings.

6.5 Provisions for Fire Protection System.

6.5.1 Brace sprinkler system piping in accordance with details provided in NFPA 13 (reference 6d).

6.5.2 Provide mounting brackets for wall-hung and freestanding portable fire extinguishers designed to preclude inadvertent release of the extinguisher due to vertical or horizontal earthquake motions.

6.5.3 Brace wet and dry standpipes.

6.5.4 Protect fire pumps (or domestic water pumps) to avoid damage by falling debris.

6.5.5 Design stairways to resist required lateral loads and ensure tolerance to maximum predicted structural deformations.

6.5.6 Design Exit door frames so that they will not deform and jam the doors.

6.5.7 Plan exit ways to avoid blockage with debris from ceilings, brittle wall finishes, and glass following a seismic disturbance.

6.6 Provisions for Hazardous Materials.

6.6.1 Provide special storage equipment or accessories convenient for normal daily use and function after earthquakes. Examples of such equipment are lower profile shelves with face bars which restrain material on shelves and secure shelves to the wall or floor; specially designed racks for restraining reserve oxygen and nitrous oxide tanks; and special bins for storing anesthesia gas containers.

6.6.2 Brace gas piping and provide shut-off valves. Secure lead storage safes and bricks used for radioactive materials storage. Anchor bulk liquid oxygen storage tanks. Brace fuel lines. Provide malleable fittings and valves with swing joints where necessary.

6.7 Provisions for Alternate Source Power System.

6.7.1 The essential electrical system shall follow the requirements outlined in Section 10.

6.7.2 Vibration isolation is necessary. Provide restraining clips at vibration isolators to prevent the failure of the isolation mountings under earthquake vibration conditions.

6.7.3 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.

6.7.4 Use underground fuel storage tanks. Install expansion flex loops in fuel lines which are on the soil side of a foundation. Anchor all fuel day tanks, using malleable fittings and valves, with flexible connections to the generator.

6.7.5 Anchor and brace battery racks.

6.7.6 Anchor or otherwise restrain switchgear, substations, automatic transfer switches, bus ducts, distribution panels, and motor control centers.

6.7.7 Design all crossings of seismic or expansion joints by power lines appropriately. Provide for the flexibility of cable and conduit at potential points of differential movement. Provide separate grounds for conduit runs crossing seismic joints.

6.8 Provisions for Communication Systems. Plan the internal and external communication systems for the facility to ensure that post-earthquake emergency communications shall be available.

6.9 Provisions for Transport Systems. Design elevators and shafts to meet the prescribed lateral force requirements. It shall be necessary to install additional rail support brackets, counterweight

retaining brackets, rail safety shoes, and emergency stop gear; and to brace spreader beams and elevator control cabinets.

6.10 Provisions for Mechanical Systems.

6.10.1 Provide special detailing for bracing and flexible connection of essential ventilation systems and mechanical piping that serves operating rooms, emergency, laboratory, and radiology.

6.10.2 Design the air conditioning system to enable cooling of selected operating rooms and intensive care units by using the main chilled water system on a selected-period basis without cooling other portions of the facility.

6.10.3 Provide limiting restraints for all vibration-isolated air handling equipment.

6.10.4 Provide for normal water service with two independent connections to the water system. In addition, provide a water storage facility as a source of supply. Size the water storage facility to adequately meet fire and water demands during a 7-day post-earthquake emergency period. Design on-site water lines to minimize disruption from earthquakes and to facilitate post-earthquake repair. Design the water distribution system to conserve the water supply and permit control of its use.

6.10.5 Give special attention to the routing and bracing of pipe, vent, and sewer lines serving essential fixtures. Provide damage control valves and flexible connections where piping crosses seismic joints. Specify malleable valves and fittings rather than cast iron. Piping shall not be damaged by movement of the structural system or other equipment.

6.10.6 Restrain all free-standing equipment, such as water tanks, chillers, boilers, pumps, and controls.

6.10.7 Provide an emergency 7-day sanitary sewage holding facility for temporary retention of all sanitary sewage discharge from the hospital during the post-earthquake emergency period.

6.10.8 Make provision to assure that the steam supply and the steam lines to the medical facility remain functional.

6.10.9 Standby reserve oxygen cylinders shall be mandatory for post-earthquake emergency use and shall be sufficient in number and capacity to supply the entire facility.

6.10.10 Equip the site gas supply line with a safety shut-off valve.

6.11 Provisions for Medical Systems.

6.11.1 Fixed Equipment.

6.11.1.1 Anchor the autoclaves.

6.11.1.2 Provide bracing as required for ceiling track design for X-ray units. Anchor all X-ray control consoles and automatic film developers.

6.11.2 Free Standing Equipment. Secure to a partition, equipment or shelving not required to be moved from location to location. Equipment with doors should have a positive latching device.

6.11.2.1 Secure the blood bank, drug storage, critical refrigerators, freestanding incubators, and centrifuges.

6.11.2.2 Secure sequential multiple blood analyzers, and other fragile laboratory equipment shall be secured. Anchor related shelving with lips and face bars provided as necessary.

6.11.3 Storage for Supplies. Supply cabinets shall have either plastic or tempered glass in sliding doors, and the doors should slide closed automatically. Open shelving shall have a shelf rim which precludes supplies being shaken from their storage position.

6.11.4 Medical Gas Bottles. Provide for metal boxes attached to the floor and equipped with double chains for medical gas bottles. Equip wheeled carts carrying oxygen or other medical gases with wheel locks and chains for fastening to walls.

6.12 Provisions for Architectural Systems.

6.12.1 Lighting Fixtures. Provide independent hangers at diagonal corners of lighting fixtures installed in suspended ceilings. Avoid the use of pendant fixtures; if used, they shall be of earthquake-resistant design. Use positive locking devices; install surface-mounted and recessed fixtures.

6.12.2 Ceilings. Avoid the use of large areas of lay-in type acoustic ceilings. Where such ceilings are used, use lateral bracing and runners tied with wires rather than hold-down clips. Do not attach the ceiling to the surrounding walls.

6.12.3 Computer Floor. Adequately brace computer floors to resist seismic motion.

6.12.4 Partitions. Provide appropriate backing plates, blocking, studs, and bracing for partitions which support cabinetry, storage racks, shelves, bins, and lockers. In a relatively flexible building, partition damage due to interaction with the frame shall be limited by

anchoring each partition to a single structural member and allowing movement at the other edges.

6.12.5 Facing Materials. Brittle facing materials such as ceramic tile or glazed masonry suffer extensive damage during earthquakes and shall be used only when necessary.

6.12.6 Windows. Consider story drift when detailing window frames and exterior wall panels.

6.12.7 Overhangs. Do not use unbraced overhangs, parapets, and balconies.

REFERENCES

6a. P.L. 95-124, "Earthquake Hazards Reduction Act."

6b. Joint Services Manual, TM 5-809-10, NAVFAC P-355, AFM 88-3 Chapter 13, "Seismic Design for Buildings," February 15, 1982.

6c. Joint Services Guidelines Manual, TM 5-809-10-1, NAVFAC P-355.1, AFM 88-3, Chapter 13, Section A, "Seismic Design Guidelines for Essential Buildings," 27 February 1986.

6d. Joint Services Guidelines Manual, TM 5-809-10-2, NAVFAC P-355, AFM 88-3 Chapter 13, Section B, "Seismic Design for Upgrading Buildings", 1987.

6e. NFPA 13, "Sprinkler Systems, Installing".

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SECTION 7: ENERGY CONSCIOUS DESIGN

7.1 General. This section provides guidance on energy conscious design of Medical and Dental Treatment Facilities (MTF's). This is interim guidance pending establishment of DoD energy conservation standards. The goal of this guidance is to achieve an architecturally integrated design that utilizes an optimum mix of conservation technique and conventional Heating, Ventilation, and Air Conditioning (HVAC) control measures combined with renewable energy sources. All designs must achieve the following:

7.1.1 Energy Conservation. Achieve compliance with the designated design energy targets, minimizing the annual energy costs and the consumption of fossil fuel based energy set forth in 10 CFR Subpart A, Part 435, Energy Conservation Performance Standards of New Office Buildings (Reference a),

7.1.2 Approaches. Consider energy conscious design approaches concurrently in the design process, so that presupposed solutions on the one hand do not negate untried or untested opportunities on the other hand,

7.1.3 Cost Effectiveness. Utilize proven, cost effective method designs on a life-cycle-cost basis (25 years or the life of building, whichever is less), and

7.1.4 Compatibility. Utilize systems that are compatible with using Military Department medical functional criteria.

7.2 Design Intent. Medical and Dental Treatment Facilities have a unique composition of varying environments required to support highly technical equipment along with patients, staff, and visitors with special needs. Many of these needs are set forth in this handbook in specific criteria addressing temperature ranges and tolerances, humidity levels, room pressure relationships, ventilation rates, lighting requirements (see Appendix A), and functional relationships as set forth in using Military Department medical criteria. An energy conscious design approach must involve a comprehensive and rational view of all viable energy resources and design measures that can be employed to minimize energy costs and fossil fuel consumption. Energy conservation must be achieved in conjunction with, not at the expense of, the medical/architectural/engineering requirements of Medical and Dental Treatment Facility design.

7.2.1 Energy Conscious Design Intent. It is the intent of this guidance to require that both energy conservation approaches (as evidenced by the climate rejecting buildings) and renewable energy approaches (as evidenced by climate adapting buildings) be considered in the design process. It will require that solutions from various

approaches be considered concurrently and life-cycle costed in the design process.

7.3 Study Considerations. For guidance concerning design energy target compliance, see paragraph 7-16. Special energy conservation and cost saving design features shall be evaluated concurrently with appropriate special renewable features according to the requirements for "Special" energy conservation and cost saving design features/systems defined as:

7.3.1 System Requirements. Those features or special system requirements that exceed the minimum energy criteria or exceed conventional energy features in standard equipment or systems normally utilized and specified by the majority of the design community; or,

7.3.2 System Design. Those features, special system approaches, or design strategies that exceed common design knowledge or practices followed by the majority of the design community, and

7.3.3 Passive Solar Energy. The use of passive solar energy conservation techniques shall be considered. Earth sheltering and berming, building orientation and shading shall be used to reduce heating and cooling loads if practical. Passive design techniques could reduce and possibly supersede the requirement for the conditioning (HVAC) system and equipment normally required to meet the energy budget.

7.3.4 Energy System Feasibility Study. If directed by the Design Agent, a separate engineering study shall be made to determine the feasibility of using an energy system such as a total or selective energy system. The energy feasibility study must also meet related requirements in Section 8 and references 7c-7f.

7.3.5 Energy Monitoring Control System (EMCS)/Engineered Smoke Control System (ESCS) Feasibility Study. If directed by the Design Agent, a separate evaluation will be performed to ascertain the feasibility of an EMCS or ESCS for the facility. Regardless, consideration should be given to designing all new medical facilities to be compatible with the future application of EMCS and/or ESCS.

7.3.6 Computer Analysis. Any new building which is heated and exceeds 20,000 square feet (1859 square meters) and any building which is heated and air conditioned or air conditioned only and exceeds 8,000 square feet (743 square meters) shall be analyzed using computer analysis methodology(ies). These analyses shall be performed using a professionally recognized and proven design computer program which allows the integration of architectural techniques and heating and air conditioning systems that would result in the lowest life-cycle-cost. An "hour-by-hour" analysis shall be used at the detailed design component selection stage for projects with complex HVAC system requirements such as multiple areas having different occupied times, internal loading densities, and HVAC system types.

7.4 Thermal Transmission Values (wall, roof and floor). The maximum thermal transmission values utilized in the design shall be in accordance with ASHRAE Handbook of Fundamentals (reference 7b) and the criteria in Table 7-1. For climates that exceed 10,000 Heating Degree Days (HDD), a study shall be performed to determine the most life-cycle-cost effective insulation levels, rather than utilizing Table 7-1.

7.5 Building Envelope Design.

7.5.1 Condensation Prevention (wall, roof, and floor). A sufficient vapor barrier and thickness of insulation shall be designed and appropriate specifications provided for all perimeter (as well as appropriate interior partitions) walls, roof, and floor sections to prevent condensation in these sections. Calculations based on applicable standard practice as set forth in the current edition of ASHRAE Handbook of Fundamentals will be provided by the designer in climates where this condition, as established by the respective military department, exists.

7.6 Heating, Ventilation, and Air Conditioning (HVAC) Systems. Heating and cooling system design loads for the purpose of sizing systems shall be determined in accordance with Section 8.

7.6.1 System Sizing. Heating, ventilation, and air-conditioning systems shall be sized to meet the calculated space loads, consistent with available equipment capacity, unless oversizing can be shown not to increase life cycle cost. However, where high thermal mass or night setback strategies result in pick-up or pulldown loads to be met in the building operation, additional capacity may be specified but must be life-cycle cost justified.

7.6.2 System Design Parameters. For outdoor and indoor design conditions, see Section 8. Infiltration for heating and cooling design loads will be calculated by the procedures set forth in the ASHRAE Handbook of Fundamentals.

7.6.3 System Selection. For permissible system types, see Section 8 System Selection for Functional Area Requirements.

7.6.3.1 HVAC System Selection. The least complex of the applicable HVAC systems should be selected based on functional requirements, ease of maintenance, and the design energy budget. Systems such as Variable Air Volume (VAV) may require extensive use of complex control devices and associated equipment. Constant volume multi-zone system, on the other hand, have fewer operating components and use simpler controls. System efficiency improvement should be weighed against other factors that could affect overall life-cost-cycle of the system to the user as well as service required by the system from the maintenance staff. Systems that are costly to install or are overly complicated may not be worth the extra efficiency. Conversely, a system that saves only a small amount of energy or cost but simplifies design and operation may

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be justified. The goal is not only to achieve the most energy efficient facility but also to provide systems that are easy to maintain and operate and which will ensure a reasonable and constant level of comfort.

7.6.3.2 Systems Controls. Temperature and humidity controls shall be designed as set forth in Appendix A and in Section 8 of this Handbook.

7.6.4 HVAC System Energy Considerations.

7.6.4.1 Simultaneous Heating and Cooling Systems. HVAC systems will be designed to eliminate or minimize simultaneous heating and cooling, unless medical functional requirements necessitate a variation.

7.6.4.2 Radiation Systems. Where perimeter radiation heating systems are utilized, zoning and temperature reset control by ambient temperature shall be studied. The radiation system control shall be separate from the cooling system control and sequenced to minimize simultaneous heating and cooling (See Section 8).

7.6.4.3 Cooling With Outdoor Air. An economizer cycle shall be considered as set forth in Section 8.

7.6.4.4 Energy Recovery. A study shall be made by the designer of the possible use of energy recovery systems that conserve energy (the amount expended must be less than the amount recovered). Typical applications to be analyzed include, but are not limited to, the use of exhaust air to intake air heat exchangers for preheating outdoor ventilation air (see exceptions in Section 8), the use of refrigeration system heat recovery for heating domestic hot water, the use of boiler economizers for preheating make-up air or water, the use of run around loops to transfer excess interior core energy to perimeter spaces, and the use of double-bundle chiller condensers for building comfort or domestic hot water heating applications. In the study, sources of recoverable energy such as coincident heating-cooling applications (with or without storage) and system operating hours shall be considered and added to system resistances which increase the energy expended. Because of the substantial quantities of hot air exhausted from nongrease contaminated sources in Kitchens, heat recovery systems shall be considered to reduce the cost of heating Kitchens and Dining facilities.

7.7 Service Water Heating (Conventional).

7.7.1 Combination Service Water Heating/Space Heating Boilers. Service water heating equipment shall not be dependent on the year round operation of space heating boilers, that is, boilers that have winter space heating as another function. Where operation of the space heating boiler is required solely for service hot water purposes in the summer, a separate smaller service water heater, properly sized, shall be installed as close to the point of use as practicable so that the larger boiler can be shut down during these periods of very light loads.

Exception: Where the size of a separate service hot water boiler would be more than 30 percent of the input to the boiler used for providing service water in the summer, a small service water heater shall not be provided.

7.8 Utilization of Waste Heat or Solar Energy. Condenser heat, waste energy, and/or renewable energy to supplement hot water requirements shall be considered.

7.8.1 Freeze Prevention. Consideration shall be given to the use of waste heat, heat recovery, or heat trace systems to conserve energy in providing freeze protection for cooling towers and the like.

7.8.2 High Temperature Condensate. Consider heat recovery of high temperature condensate through condensate cooling or flash steam, for domestic water preheat, auxiliary low pressure steam generation, or other LCC-effective application.

7.8.3 Heat Recovery. Use of the storage shall be considered to optimize heat recovery when the flow of heat to be recovered is out of phase with the demand for heated water.

7.9 Auxiliary Transportation Systems. In buildings that include horizontal or vertical transport systems, automatic elevator and conveyer systems, energy usage reduction control arrangements shall be considered.

7.10 Lighting and Electrical Considerations. For lighting and electrical considerations also refer to Section 10 and references 7c - 7f.

7.10.1 Natural Lighting. Natural lighting shall be utilized and optimized whenever possible for general illumination.

7.10.2 Task Lighting. Task lighting shall be utilized to improve the flexibility and management of illumination and energy requirements.

7.11 Electrical Power. For power considerations also refer to Section 10 and references 7c - 7f.

7.11.1 Power Factors. Consider power factor correction at the motor location for all 15 horsepower and larger motors. Consider power factor correction for groups of motors 10 horsepower or smaller.

7.11.2 Distribution Voltage. Utilize the highest distribution voltage consistent with economics and safety.

7.11.3 Three-Phase Power. Utilize three-phase power where possible.

7.11.4 Energy Metering. Provide metering of all primary energy sources entering the building. In addition, energy consuming

mechanical/electrical systems within the building may be designed for submetering.

7.12 Renewable Energy Requirements (General). The current requirements reflect the latest legislative and DoD changes concerning the design, procurement, and use of renewable forms of energy in new MTF's. In essence, these requirements necessitate the consideration of energy systems using renewable forms of energy (e.g., active, passive, hybrid, daylighting, photovoltaic, wind, geothermal, biomass, and so forth) in those climates where the use of such form of energy has the potential for savings of fossil-fuel-derived energy and where such use would be practical and economically feasible. The requirements for being economically feasible are set forth in this section and references 7c-7f. Whenever the energy-saving design feature is determined to be life-cycle-cost effective, it must be incorporated into the design of the facility. Indicate type of renewable form of energy, e.g., active solar or photovoltaic system, and report the "unit cost" and "cost" in terms of dollars per square feet of solar collector. For passive or hybrid solar systems, report the "unit cost" as a lump sum labeled "Passive/Hybrid Solar Energy." Evaluate requirements for active and passive/hybrid solar energy. Refer to references 7c-7f for specifics.

7.12.1 Special Criteria Consideration. Orientation, solar shading, glazing, and balance point considerations shall be considered as set forth in references 7c-7f.

7.12.2 Climate Summary. The designer will develop a climatic summary that identifies macro or micro-climatic assets and liabilities having the potential to significantly influence the building energy performance. Factors to consider include temperature, humidity, solar availability, air motion, air quality, bodies of water, topography profile, vegetation, precipitation, etc. A brief summary shall be provided in the concept narrative concerning findings and recommendations and other materials shall be referenced in the appendices or drawings. Also address information on solar access considerations with respect to existing and future surrounding buildings in the narrative.

7.13 Design Energy Budget. Each individual building in the medical MILCON project shall be required to meet a Design Energy Target (DET). The DET shall be calculated by the designer or, depending on the type of facility, shall be provided by the Design Agent. The designer shall provide a calculated Design Energy Budget (DEB) which considers all building and process/appliance loads for comparison with the DET. Refer to Table 7-1 for information on maximum thermal transmission value for DoD MTF's and Table 7-2 for information on Design Energy Targets (DETs) for medical facilities. As an option, the Design Agent may utilize the Annual Energy Usage (AEU) and Annual Energy Target (AET) method provided in reference 7c.

7.14 Life-Cycle-Cost (LCC) Analysis. For requirements on life-cycle analyses, refer to Section 8.2.1 and References 7c-7h.

7.15 Initiating Design Analysis. The energy design analysis should be initiated during Concept design (prior to S-1 Submittal). In essence, energy analyses need to be performed much earlier than in the traditional design process. Because of the sequential nature of the design process, major decisions made early in Concept design (S-1, S-2, S-3 and S-4 Submittals) cannot be easily changed during Final design (S-5, S-6, and S-7 Submittals). The initial summary of highlighted energy and economic considerations should be provided in the S-1 Submittal. The S-2 Submittal should reflect the important energy considerations for the favored energy alternative selected in the S-1 Submittal. Subsequent submittals should reflect alternative modifications made in the design of the MTF. For specific requirements established by the Design Agent, refer to references 7c - 7f.

7.16 Verification of Compliance. Calculate or determine the preliminary DET or utilize the optional methodology for AET. A preliminary calculation shall be provided in the First Submittal (S-1). It will be updated at later submissions, if required. Provide preliminary Design Energy Budget (DEB) and total DEB (TDEB) calculations in the S-2 Submittal, and update, if necessary, in the S-4 Submittal. Provide final DEB and TDEB calculations in the S-5 Submittal and up, if necessary, in the S-6 Submittal and S-7 Submittal (Final). Refer to references 7c-7f.

REFERENCES

7a. 10 CFR, Subpart A, Part 435, "Energy Conservation Performance Standards of New Office Buildings."

7b. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals, American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

7c. U.S. Army Corps of Engineers, Architectural & Engineering Instruction Medical Design Standards, 10 JULY 1989.

7d. TM 5-838-2, U.S. Army Health Facility Design, Draft (Revised).

7e. AFR 88-50, Criteria for Design and Construction of Air Force Health Facilities, 16 May 1986.

7f. NAVFAC DM-33.01, Medical Facilities Preliminary Design Considerations, Updated.

7g. NBS HDBK 135 (Rev), Life Cycle Cost Manuals for Federal Energy Management Programs.

7h. TM 5-802-1, Economic Studies for Military Construction Design Applications

TABLE 7-1

MAXIMUM THERMAL TRANSMISSION VALUES FOR
DoD MEDICAL AND DENTAL TREATMENT FACILITIES
(For Climates with Fewer Than 10,000 HDD)

HEATING DEGREE DAYS	GROSS WALL2	WALLS3	CEILING/ROOF4	FLOOR	
	Uo	Uw	Ur	UF5	UF6
Less than 1000	0.38	0.15	0.05	0.10	0.29
(less than 560)	(2.15)	(0.853)	(0.284)	(0.568)	(1.647)
1000-2000	0.38	0.15	0.05	0.08	0.24
(561-1110)	(2.15)	(0.853)	(0.284)	(0.454)	(1.363)
2001-3000	0.36	0.10	0.04	0.07	0.21
(1111-1670)	(2.048)	(0.568)	(0.227)	(0.397)	(1.192)
3001-4000	0.36	0.10	0.03	0.07	0.18
(1671-2220)	(2.048)	(0.568)	(0.170)	(0.397)	(1.022)
4001-6000	0.31	0.08	0.03	0.05	0.14
(2221-3330)	(1.760)	(0.454)	(0.170)	(0.284)	(0.794)
6001-8000	0.28	0.07	0.03	0.05	0.12
(3331-4440)	(1.590)	(0.397)	(0.170)	(0.284)	(0.683)
Over 8000	0.28	0.07	0.03	0.05	0.10
(over 4441)	(1.590)	(0.397)	(0.170)	(0.284)	(0.568)

1. Heat transmission values are expressed in English units (U-Btu/ft^2-h-^oF) or values shown in parenthesis are all expressed in SI units (U-W/$M^2{}^oC$).

2. Gross wall values include all doors and windows, window frames, metal ties through walls, structural steel members that protrude through all insulation to the exterior, or adjacent to the exterior, and continuous concrete or masonry walls or floors that extend from inside heated spaces through the building envelope to the exterior, e.g., fire walls that extend above the roof and concrete floor slabs that extend beyond the exterior walls to form a balcony or terrace. Maximum "Uo" value will put a limitation on the allowable percentage of glass to gross wall area in a building. It should be noted that in hospital, medical, and dental facilities which are positively pressurized the 10 percent limitation on glass to gross wall area for walls facing a prevailing winter wind may not be appropriate. Insulating glass on the building will allow a higher percentage of glass in comparison to single pane glass.

3. Wall "Uw" value is the thermal transmittance of all elements of the opaque walls area. "Uw" values shall be used for upgrade of existing

facilities where the alteration of the wall cavity and resizing of window glazing to meet gross wall values (Uo) are not cost effective. There may be situations where upgrading all the perimeter walls in low, medium, and high internal loaded spaces to the specified transmission value may not be life-cycle-cost effective. The designer will recommend appropriate alternatives when such situations occur, providing supporting life-cycle-cost data that are supported by appropriate "hour by hour" computer simulations. This requirement to assess the above-mentioned situation may necessitate a variation from the values set forth in this table.

4. Ceiling/roof "Ur" values are for ceiling/roof areas where adequate space exists for insulation to be applied above ceiling and/or below roof structure. Built-up roof assemblies and ceiling assemblies in which the finish interior surface is essentially the underside of the roofdeck will have a maximum "Ur" value of 0.05 (0.284) for any Heating Degree Day area.

5. Floor "UF5" values are for floors of heated space over unheated areas such as garages, crawl space, and basements without a positive heat supply to maintain a minimum of 50 degrees F (10 degrees C).

6. Floor "UF6" values are for slab-on-grade insulation around the perimeter of the foundation.

7. Degree-Day value from the joint service Manual TM5-785, NAVFAC P-89 and AFM 88-29 Engineering Weather Data shall be used.

TABLE 7-2

DESIGN ENERGY TARGETS (DET) FOR DoD MEDICAL AND DENTAL TREATMENT FACILITIES - (000)(BTU/SQ FT/YR)

BUILDING CATEGORY	CODE	NAT'L	REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6	REGION 7
CDD:			< 2000	< 2000	< 2000	< 2000	< 2000	> 2000	> 2000
HDD:			> 7000	5500-7000	4000-5500	2000-4000	0-2000	0-2000	2000-4000
Hospital Buildings (1)	510	110	150	150	115	110	110	115	120
Laboratories (2)	530	50	50	50	40	40	40	40	40
Dental Clinics (2)	540	60	75	75	60	55	45	50	65
Dispensaries (1)	550	55	70	70	55	50	40	45	60

(1) 24 hours/day, 7 days/week; design assumptions should include comfort conditioning and lighting set backs during night and weekend periods for zones other than patient care areas.

(2) 10 hours/day, 5 days/week; specified ventilation requirements to support operational needs (e.g., chemical exhaust hoods) shall be determined outside of this design budget.

(3) Cooling Degree Days - CDD; Heating Degree Days - HDD

(4) Energy consumed within 5 foot line, based on Dept. of Energy building categories and weather zones.

(5) Degree-Day value from the joint service Manual TM5-785, NAVFAC P-89 and AFM 88-29 Engineering Weather Data shall be used.

SECTION 8: HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

8.1 General. This section provides HVAC design guidance for Medical and Dental Treatment Facilities (MTF's). The goal of this section is to emphasize simplicity of design with appropriate considerations given to future expansion or modernization, operating costs, and maintenance. The intent of this criteria is to meet the Military Departments functional requirements while ensuring the operational and maintenance cost are minimized.

8.1.1 DoD Weather Data. Weather data, from the current edition of the Joint Services Manual TM 5-785, NAVFAC P-89, AFM 88-29, "Engineering Weather Data" (reference 8a), is used for design of the HVAC system for interior conditions given in Appendix A (see also 8.4.1, and 8.5.1 for specific criteria) when it is determined the facility is eligible for air conditioning in accordance with 8.2.2. If the project is not listed in reference 8a, then the source of weather data for the project will be determined by normal Military Department Procedures.

8.1.2 Overseas Medical Facilities. Utilize this material DoD-wide for conformity of design operations, except in those locations outside the United States, US territories, and possessions where Host Nation standards may be utilized as required by the SOFA agreement or treaty. MTF's located outside the United States and United States Territories and possessions may use multiple self-contained units or multiple packaged units for those functions approved for air-conditioning, in authorized weather zones. Where perimeter radiation is required to comply with Host Nation standards, the floor area will be counted as mechanical space not net functional area.

8.2 Mechanical Concept

8.2.1 Life-Cycle-Cost/Energy Analysis. An energy and life-cycle-cost analysis will be provided on systems having a comfort cooling demand greater than 50 tons or a heating demand greater than 1 mega BTU per hour. All HVAC systems that are considered will be compared to a basic system with respect to both life-cycle and energy use. This basic system will be that system having the lowest initial cost. Where higher initial cost for a system can reasonably be offset by a life-cycle-cost analysis, a full justification shall be provided in the Concept Design Analysis. If a competitive system has a life-cycle saving of at least 15 percent, as compared to the basic system, such a competitive system shall be chosen so long as the 25-year energy use is not greater than that of the basic system. Refer to Design Agent guidance for further requirements.

8.2.2 Eligibility for Air Conditioning shall be as follows:

8.2.2.1 Total Air Conditioning. Total air conditioning is permitted in all new MTF's where the cooling requirements exceed 100 cooling

degree day (CDD), as determined from reference 8a, except as noted in paragraph 8.2.2.2, 8.2.2.3, and 8.2.2.4. In areas with less than 100 CDD per year, the following spaces may be cooled:

a) Critical areas as defined in Section 10.

b) Sensitive areas as defined in Section 8.4.2.

c) Dental Treatment Areas.

8.2.2.2 Kitchen and Dining Area. Kitchen and dining area may be air conditioned as long as they meet the requirements of paragraphs 8.2.2.1, 8.5.1, 8.3.3.4, and Appendix A.

8.2.2.3 Not Authorized Air Conditioning. The following areas shall not be air conditioned regardless of weather conditions:

a) Motor Vehicle Storage Areas,

b) Boiler Plants,

c) Maintenance Rooms,

d) Greenhouses,

e) Interior Swimming Pools,

f) Toilets/Showers, and

g) Locker Rooms.

NOTE: This does not preclude heating and/or ventilation in these areas.

8.2.2.4 Medical Warehouses. Storage for MTF's may be divided into two categories. Category 400 buildings ("organizational storage"), which may be a site support structure. Category 500 buildings ("medical"), which are normally included as part of the MTF (reference 8b). Category 500 storage requirements may be air conditioned up to 50 percent of the storage space in accordance with paragraphs 8.2.2, 8.5.1, 8.3.3.4, and Appendix A.

8.2.3 Mechanical Space for MTF's

8.2.3.1 Mechanical rooms for major air handling equipment, medical gas supply, and vacuum pump/air compressor rooms will be located in the MTF, or if more cost effective, on the MTF in a penthouse. Their location will provide for:

a) Maintenance and replacement of equipment,

b) Minimization of distribution runs,

c) Optional expansion of mechanical systems, and

d) Potential for the MTF to expand in the future.

8.2.3.2 Chilled water and steam/hot water generators may be located in a separate energy plant with the utility lines connecting the energy plant to the MTF and located in an accessible area that is at the same time protected from damage. Energy plant space for boilers and/or chilled water generators is not included as part of programmmed mechanical space. (See Figure 2-7 explanation.)

8.3 Medical Facility Requirements

8.3.1 Critical Areas. (These areas, for air conditioning purposes, are itemized in Section 10.) Design the hospital areas considered critical for critical air conditioning based on the 1 percent dry bulb temperature with corresponding 1 percent MCWB temperature, reference 8a.

8.3.2 Sensitive Areas. Provide air conditioning in areas where specialized technical equipment is used such as Prosthetic Laboratory, Medical Clinic Laboratory, Automatic Data Processing, and Radiology Computer Rooms. These areas are sensitive to humidity and temperature for accurate use of the equipment or the laboratory work being performed. For laboratory ventilation, see also 8.9.

8.3.3 Dental Treatment Rooms. Although not considered a critical area, procedures done in Dental Treatment Rooms requires aseptic environment to justify air conditioning.

8.3.4 Specified Air Flow. All air supplied to Cardiac Catherization Rooms (hospital based), Cystoscopy (hospital based), Delivery Rooms, Nurseries, Operating Rooms, specialized patient bedrooms, and Surgical Clean Rooms should be as specified in Appendix A. Air movement should range from a preferred 25 ft. per minute (0.127 m/s) to a maximum of 100 ft. per minute (0.508 m/s) over the sterile field.

8.3.5 Operating & Delivery Room Exhaust Registers. There should be a minimum of two exhaust registers in each Room with bottoms not less than 6 inches (15 cm) nor more than 9 inches (23 cm) above the finished floor and diagonally opposite each other.

8.3.6 Operating & Delivery Suite Continuity of Service. Design supply and exhaust systems for Delivery and Operating Room Suites to be independent of other fan systems and to operate automatically from the hospital emergency power system in case of power failure. The Operating and Delivery Suites are to be supplied by at least two separate HVAC systems arranged in a manner such that, in cases of system failure, the facility retains some surgical and delivery capability (references 8f and 8g). The maximum number of Operating Rooms per air handling system should be four.

8.3.7 Source of Steam for Space Humidification. Boiler steam, or any other steam containing amines, shall not be used for space humidification.

8.4 Mechanical System Planning

8.4.1 HVAC System Requirements. Design heating and air conditioning systems capable of maintaining the indoor design temperature at design conditions. Combine heating and air conditioning systems in locations that are authorized to have air conditioning. Design ventilating systems capable of supplying sufficient outdoor air to meet and maintain indoor design ventilation requirements. To the extent practicable, design the HVAC system to fulfill the following requirements (references 8c, 8d, and 8e):

8.4.1.1 Minimize the bacterial contaminants, maintain an aseptic environment, and remove odor,

8.4.1.2 Restrict air movement between various areas and other departments,

8.4.1.3 Filter the air to remove airborne contamination from outdoor and recirculated air,

8.4.1.4 Provide proper instrumentation and devices to maintain adequate temperature, relative humidity, and air balance, and

8.4.1.5 Provide the most energy efficient and life-cycle-cost effective system.

8.4.2 Mechanical Equipment/Building Operations

8.4.2.1 A central energy plant may be provided in Medical Centers or large hospitals unless specific engineering cost studies indicate subcentral plants to be more economical on a life-cycle-cost basis. Use energy recovery systems, economizer cycles, alternate energy sources, and HVAC shut-down during non-24 hour operations to the maximum extent to achieve energy conservation.

8.4.2.2 Refrigeration equipment shall not use refrigerants identified to be harmful to the environment and expected to be phased out in the foreseeable future, such as Chlorofluorocarbon (CFC) and Hydrochlorofluorocarbon (HCFE).

8.4.2.3 Automatic changeover between cooling and heating controls is permitted in buildings with a central air conditioning or heating system provided the changeover control is based on sensing outside air temperature and there is a neutral zone or "dead band" of a minimum of 6 degrees F (3.3 degrees C).

8.4.2.4 HVAC equipment sizing and selection shall permit the shutdown of departments/areas not in operation on a 24-hour basis. Zone

the facility for HVAC purposes to coordinate with the functional requirements and departmental layouts to facilitate shutdown of portions of the building. These system shutdowns must be coordinated with the using Military Departments to avoid adversely impacting medical/dental operations. Base the shutdown times on the hours of operation of the occupied area.

8.4.2.5 Sensitive spaces, such as communication, computer areas, or similar unique loads that require year-round, highly reliable air conditioning, should be provided with an auxiliary system so that the sensitive partial load can be provided when the central system is shut down for repairs.

8.4.3 System Selection for Functional Areas. (See also Section 7.6.3) In terms of HVAC design the complete MTF can be considered as containing five general areas including critical or sensitive areas, administrative areas, outpatient clinics, MTF support areas, and patient bedrooms. The environmental conditions and functional requirements of the MTF are primary considerations. Multizone, dual duct, terminal reheat, variable volume, and combinations of such systems may be considered. All-water and unitary systems will not be considered for most spaces in MTF's due to their limitations.

8.4.3.1 Critical or sensitive areas normally will be served by terminal reheat or double duct systems. Simultaneous temperature and humidity control requirements for these spaces preclude the use of other types of systems.

8.4.3.2 Administrative areas may be served by variable air volume (VAV), multi-zone, or dual-duct systems with perimeter radiation when required. Where perimeter radiation is required to meet standards, the space occupied by fin tube units will be accountable to mechanical scope and not against the functional room net scope.

8.4.3.3 Outpatient clinics may be served by VAV, dual-duct, or multi-zone systems. VAV air volume systems will be one of the minimum air quantity type. Multi-zone systems may only be employed if the following conditions are considered: 1) ease of mechanical room duct egress, 2) no large disparity in zone size or load profile, 3) little likelihood of repartitioning, and 4) proximity of space served to the mechanical room.

8.4.3.4 Support service areas may be served by VAV or dual-duct VAV systems. Certain single spaces, single zone areas, such as portions of Food Service, may be provided with central air single zone systems with full consideration given to heat recovery.

8.4.3.5 Normal patient bedrooms (vis-a-vis special patient bedrooms in paragraph 8.4.4) may be served by dual duct, variable or constant volume, or multi-zone systems that provide minimum air quantities and may be accompanied with perimeter radiation (radiant panels). Note: Fin tube heating systems shall not be used in patient bedrooms.

8.5 Design for Interior Spaces. Provide interior design conditions for occupants in heated or air-conditioned facilities, or both, according to the current DoD guidance in Appendix A.

8.5.1 Air Conditioning Design Dry and Wet Bulb. Air conditioning for all facilities should be designed on the basis of a 2.5 percent dry bulb temperature and corresponding 2.5 percent mean coincident wet bulb tempera- ture as specified in reference 8a, except for those critical areas where specialized technical requirements demand exact humidity or temperature control, or both, at all times. Heating for all facilities should be designed on the basis of a 97.5 percent dry bulb temperature, except for critical areas. (See Sections 4, 10, the Glossary and Appendix A).

8.5.2 Temperature Control. Provide temperature control where authorized or required, based on Appendix A:

8.5.2.1 Where a single temperature is to be maintained in the space (may be different for summer and winter) in accordance with Appendix A criteria, the control shall maintain the (summer or winter) temperature ± 2 degrees F (± 1 degree C).

8.5.2.2 Where a temperature range is specified for a space in Appendix A, the controller shall be capable of controlling, year-round, the temperature for the space within this range.

8.5.3 Humidity Control. Provide humidity control where authorized or required, based on Appendix A, and locate controls as follows:

8.5.3.1 Non-Tropical. Locate required summer and winter humidity controls on a zone basis.

8.5.3.2 Tropical. Room (humidity) control is normally permitted in the winter in tropical locations where the winter design temperature exceeds 65 degrees F (18 degrees C).

8.6 HVAC System Design

8.6.1 Air Distribution System.

8.6.1.1 Outdoor Air Intakes. Outdoor air intakes shall be located as far as practical, but not less than 30 feet (9144 mm), from exhaust outlets of ventilation systems, combustion equipment stacks, medical/surgical vacuum systems exhaust, plumbing vent stacks, emergency generator exhaust, or from areas which 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 8 feet (2438 mm) above ground level, or if installed above the roof, 3 feet (914 mm) above roof level.

8.6.1.2 Duct Design. Duct systems shall be designed in accordance with the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. HANDBOOK of Fundamentals (reference 8d(1)).

8.6.1.3 Ductwork Material. (See also 8.9.2.) Ductwork installed downstream of high efficiency filters (90% or greater, see Appendix A) shall be of stainless steel, or aluminum, including all accessories such as dampers and turning vanes. Exhaust ducts for glass washers, dishwashers, and cart washers shall have soldered or welded joints and shall be pitched to drain.

8.6.1.4 Duct Velocity. Initial main duct velocities for high velocity systems shall not exceed 3000 fpm (15.24 m/s) and a constant friction loss not greater than 0.7 inches of water gauge per 100 feet (30 480 mm). The maximum design velocity for low velocity ducts should be 1500 fpm (7.62 m/s) and a friction loss not greater than 0.15 inches of water gauge per 100 feet (30 480 mm). Provide long-radius duct elbows where practicable. When conditions require 90 degree elbows, provide turning vanes. See also 8.6.3.

8.6.1.5 Return Air Plenums. Corridors shall not be used as return air plenums.

8.6.1.6 Exhaust. Specialized exhaust systems shall be provided for Central Sterile Supply (Ethylene Oxide), animal holding areas, autopsy/morgue spaces, laboratory fume hoods, each radioisotope hood, each bacteriological cabinet, kitchens, laundry, bathrooms, isolation rooms, and other special areas such as mechanical rooms. The exhaust vents will be sited above the building roof line and located to prevent short-circuiting to air intakes.

8.6.2 Access for Maintenance.

8.6.2.1 Mechanical Equipment. Provide maintenance access areaways to gain adequate access to all inaccessible areas of the facility where equipment is located. Generally, provide a minimum of four feet clearance at all service points to mechanical equipment. For IBS-designs, see Section 19.4.2.8.

8.6.2.2 Suspended/Mounted Mechanical Equipment. Where suspended and mounted equipment is installed, provide 6-feet 8-inches of clearance for headroom as required. Provide with a fixed ladder and/or catwalk any work station or point of accessibility that is not readily accessible from a 6-foot high portable ladder (reference 8e).

8.6.2.3 Boiler and Chiller Cleaning/Repairs. Provide adequate pull spaces for all coils, heat exchangers, chillers, boiler tubes, and filters.

8.6.2.4 Outdoor Air Intake Plenums. Design all outdoor air intake plenums to facilitate periodic cleaning.

8.6.2.5 Balancing. Provide access for balancing points for the HVAC system.

8.6.3 Noise and Vibration Shielding.

8.6.3.1 Major Mechanical Equipment. All prime moving equipment shall be isolated to prevent transmission of resonant sound and vibrations to the structure.

8.6.3.2 Piping/Ductwork. Provide noise and vibration elimination connections isolating piping and ductwork from prime moving equipment.

8.6.3.3 Terminal Devices. Select terminal fixtures (diffusers and grilles) to meet appropriate ambient noise levels and sound transmission classifications as found in Appendix A.

8.6.3.4 Duct Velocity. Excessive air velocity in ductwork can cause objectionable noise and shall be considered in the design. Do not design air velocities exceeding 1300 feet per minute (6.604 m/s) in main ducts and 900 feet per minute (4.573 m/s) in branch ducts (reference 8d(4)). High velocity ducts such as those used in variable air volume systems will be approved on a case-by-case basis.

8.7 Interdisciplinary Coordination

8.7.1 Smoke/Fire Dampers. Design HVAC zones to coincide with smoke zones whenever practicable. Minimize smoke/fire damper penetrations of rated walls. Coordinate with architectural design to assure provision for access in walls and ceilings.

8.7.2 Fire Protection. Air supply and exhaust systems shall be of the mechanical ventilation type and shall meet the requirements of NFPA 90A, reference 8h.

8.7.3 Electrical Service. Serve the electric supply to the ventilating system for critical areas from the equipment branch of the essential electrical system in accordance with the requirements of NFPA 99 (reference 8g).

8.7.4 Waste Anesthesia Gas Exhaust (WAGE). In hospitals, provide each space utilized routinely for the administration of inhalation anesthesia or analgesic agents with separate disposal systems for removal of waste anesthetizing gases--Waste Anesthesia Gas Exhaust (WAGE). Locate the intake designed in relation to the patient and the equipment so as to ensure the exhausting of these gases to the outside in a manner that will preclude reentry (reference 8i). For specifics, see Section 9.5.13 and related notes in Appendix A.

8.7.5 Seismic. See 6.10 for seismic provisions for HVAC SYSTEM.

8.7.6 Medical Equipment. See Section 16.6 for special ventilation requirements of medical equipment.

8.8 Kitchen Hoods. Exhaust hoods in the kitchen area are to be the type utilizing 80 percent unconditioned air and have an exhaust rate of not less than 50 cfm per square foot of face area as an option. Supply 80 percent tempered make-up air using the warm exhaust through heat recovery make-up units (reference 8j). Face area is defined for this purpose as the open area from the exposed perimeter of the hood to the average perimeter of the cooking service. Equip all hoods over the cooking service with fire extinguishment systems, automatic washdown and grease extractors, and heat-actuated fan controls. Cleanout openings shall be provided every 20 feet (6096 mm) in horizontal exhaust duct systems serving these hoods. For Specifics see NFPA 96 (reference 8k). Recovery hood ventilation units may be considered for personnel comfort.

8.9 Laboratory Ventilation Design. Laboratory equipment exhausting chemicals, bacteriological, isotope, gas, or vapor hazards shall be provided with an independent exhaust system in accordance with NFPA 99 (reference 8g). Laboratory exhaust(s) containing infectious materials and radioisotope particles shall be screened with high efficiency particulate air type (HEPA) filters (reference 8l). Do not use exit corridors to directly supply or exhaust air from the laboratory. Place exhaust fans above the roof line. Provide between 1,000 to 3,500 feet per minute (5.08 m/s - 17.78 m/s) outlet velocity, dependent upon the material being exhausted. Locate fume hoods in areas of minimal air turbulence away from doors, windows, and traffic. Arrange controls to ensure that shutting off ventilation of one hood will not reduce the exhaust capacity or create an imbalance between exhaust and supply for any other hood connected to the same system. Do not recirculate air exhaust from the laboratory area(s) to other sections of the facilities. When provided with mechanical ventilation through or employing fume hoods as an integral part of the exhaust system, balance the air supply and exhaust to provide a negative pressure relative to the surrounding occupancies (reference 8l). For additional design requirements, refer to the American Conference of Governmental Industrial Hygienists (ACGIH) Manual on Industrial Ventilation, ASHRAE Handbooks (reference 8d), and NFPA 99 (reference 8g).

8.9.1 System Design Requirements. General purpose laboratory fume hoods that control chemicals and physical contaminants shall have a minimum face velocity of 100 feet per minute (0.508 m/s). Hoods shall be designed and equipped to permit the safe removal, disposal, and replacement of contaminated filters. Design and locate filters as close as is practical to the end of the duct run. Fume hoods shall meet requirements contained in the ACGIH manual, "Industrial Ventilation, a Manual of Recommended Practice" (reference 8j) and NFPA 99 (reference 8g).

8.9.2 Ductwork Materials.

8.9.2.1 Hoods for Radioactive Material. Design duct systems serving hoods for radioactive material to be constructed of acid resistant type stainless steel for their entire length with a minimum number of joints.

civilian connector. The connector is top or side mounted. Common

Duct systems serving hoods in which strong oxidizing agents are used shall be constructed of acid resistant stainless steel for at least 10 feet (3048 mm) downstream from the hood and shall be equipped with washdown facilities. Give consideration to current practices when a laboratory is provided with supply and exhaust ventilation to design the fume hood exhaust as an integral part of the balanced ventilating system in order that the fume hood exhaust is in constant operation.

8.9.2.2 Canopy Hoods for Prosthetic Dental. In Prosthetic Dental Laboratories, fabricate all ductwork to the canopy hood of corrosion resistant material 10 feet (3048 mm) from the connection to the hood. (Note: The hoods themselves also are to be fabricated of corrosion resistant material in order to resist caustic fumes emanating from boil-out tanks and casting activities conducted in the laboratory.)

8.9.3 Biological Safety Cabinets. Provide biological safety cabinets for Microbiology and Mycology with a HEPA filter. The biological safety cabinet shall be designed for a 50 cfm per square foot, 75 fpm (0.381 m/s) of open door area for Class I and Class II, Type A cabinets. Class II, Types B1, B2 and B3 shall require 100 fpm (0.508 m/s) of open door area. Refer to ASHRAE HANDBOOK, Applications Volume (reference 8d(4), National Foundation Standard 49, Class II (Laminar Flow) Biohazard Cabinetry (reference 8m), and Biosafety in Microbiological and Biomedical Laboratories, CDC-NIH (reference 8e).

8.9.4 Radioisotope Hoods. There are three classifications of radioisotope laboratory hoods--TYPE A, high level laboratory; TYPE B, radioisotope laboratory; and TYPE C, good chemical laboratory. Since hospital laboratories are usually classified as TYPE B or C, radiochemical hoods with HEPA filters are not normally required. A conventional chemical laboratory hood without a HEPA filter is acceptable. Exhaust from radioisotope hoods shall be vented at least 10 feet above the building roof, and outlets must be located to prevent recirculation. All hoods shall comply with requirements of the Nuclear Regulatory Commission. Radioactive isotopes used in injections without probability of airborne particulates of gases may be processed in a "clean work bench" type hood which shall comply with NFPA 99 (reference 8g) and NFPA 801, Facilities for Handling Radioactive Materials (reference 8n).

8.9.5 Perchloric Acid Hoods. These hoods shall be used only to support special requirements in analytic laboratories. See NFPA 99 and ACGIH specific operations data sheet "Perchloric Acid Hood Data."

8.9.6 Exhaust Canopies. Provide exhaust canopies for excessive heat and steam producing equipment, such as glassware washers, boilout tanks, drying ovens, sterilizers, and stills. Ventilate heat and moisture generated by sterilization. Canopies shall comply with the ACGIH data for "Canopy Hood" (reference 8j).

8.9.7 Laminar Flow Clean Benches. These horizontal flow hoods shall be 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.

8.9.8 Bench-Back Slot Hoods. Slot hoods are built into the wall behind laboratory benches to exhaust vapors, gases, and odors that are released with little energy or velocity. Design application is similar to ACGIH data sheet titled "Specialized Laboratory Hood Design Evaporation Bench," with a slot velocity of 2,000 ft/min.

8.9.9 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 shall be attached to built-in exhaust outlets with flexible ducts. Each built-in exhaust system outlet shall provide a minimum of 160 cubic fpm or a face velocity of 75 fpm at the hood, whichever provides the maximum mass flow of air. The exhaust duct opening shall be provided with a blast gate and sealing plug to stop air flow when the unit is not in service.

8.9.10 Ethylene Oxide. Exhaust sterilizers, aerators, and manifold rooms directly to the outside. For specific requirements, see Appendix A and Section 9.

8.9.11 Containment Laboratories (Health Care). These laboratories deal primarily with indigenous or exotic agents which may cause serious or potentially lethal disease as a result of exposure by inhalation. A ducted exhaust air ventilation system must be provided. The air distribution system has directional air flow that draws air into the laboratory through the entry area. The exhaust air is not recirculated to any other area of the building and is discharged directly to the outside without being filtered or treated. Discharge from biosafety cabinet, Class I or Class II, shall be provided with HEPA filter (reference 8m). For additional design requirements see reference 8e.

REFERENCES

8a. Joint Services Manual TM 5-785-NAVFAC P-89-AFM 88-29, "Engineering Weather Data."

8b. DoDI 4165.3, "Department of Defense Facility Classes and Construction Categories."

8c. ASHRAE 62-89, "Ventilation For Acceptable Indoor Air Quality," American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

8d. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) HANDBOOK Series. Volumes (Subjects) in the ASHRAE HANDBOOK Series (scheduled revisions every 4 years) are:

8d (1) Fundamentals
8d (2) Systems
8d (3) Equipment
8d (4) Applications
8d (5) Refrigeration

8e. OSHA - Part 1910, "Occupational Safety and Health Standards."

8f. ANSI B 9.1, "Safety Code for Mechanical Refrigeration."

8g. NFPA 99, "Standard for Health Care Facilities."

8h. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilation System."

8i. ANSI Z-79, SC-4 "Anesthesia Gas Scavenging Devices and Disposal Systems."

8j. ACGIH, "Manual of Recommended Practices for Industrial Ventilation."

8k. NFPA 96, "Cooking Equipment, Vapor Removal."

8l. CDC-NIH, "Biosafety in Microbiological and Biomedical Laboratories."

8m. Standard 49, "Class II (Laminar Flow) Biohazard Cabinetry", National Sanitation Foundation.

8n. NFPA 801, "Facilities for Handling Radioactive Materials."

ically sealed housing water or other liquids requires a non corrosive, hermet

SECTION 9: PLUMBING AND MEDICAL GASES

9.1 General. This section provides design guidance for plumbing and Medical gas systems. Plumbing systems for Medical and Dental Treatment Facilities (MTF's) consist of rain water drains, sanitary waste, acid waste, various temperatures of domestic hot water, domestic cold water, and various types of purified water systems, medical gases and vacuum systems. A complete list of medical gases, their use and definitions, can be found in Appendix A and in the Glossary.

9.1.1 System Performance. Continuous, high level, low maintenance performance from plumbing and medical gas systems is required. Isolation of all piping branches will be provided and is critical to future system alteration as well as maintenance. Design plumbing and medical gas systems to minimize variations from normal pressure and temperature caused by demand and stagnation to acceptable values. Normally, medical gas supplies will be centralized with pipe distribution to point of use, but alternatively in low use systems, such supplies may be localized with pressure cylinders provided at the point of use.

9.2 Plumbing. Plumbing, water supply, backflow prevention, and drainage system design should comply with the National Standard Plumbing Code (reference 9a) and other national or local codes as approved by the DMFO.

9.2.1 Water Supply System. Design water systems to provide sufficient pressure to operate all fixtures and equipment during maximum demand period. Incoming water service will have a reduced pressure type backflow preventer. Provide a minimum of two water services for hospitals with each service designed for full capacity (serving potable, process, and fire protection system) and entering the building at different locations.

9.2.1.1 Service Water Heating. See para 7.7.1, boilers for service water and space heating during winter.

9.2.2 Plumbing Fixtures. Plumbing fixtures should conform generally to Federal Specification WW-P-541/9b (reference 9b) or American National Standards Institute (ANSI) standards. For uniformity, all fixtures shall be identified by the Joint Schedule Number (JSN) provided in MIL-STD-1691 (reference 9c). Quantities of fixtures shall be in accordance with the DMFO Program For Design.

9.2.2.1 Drinking Water Coolers. Locate public drinking water coolers convenient to each public waiting room and as directed by the using Military Department. The standard rating and performance shall conform with ARI Standard 1010.

9.2.2.2 Handicapped Fixtures. Provide handicapped fixtures in accordance with the Uniform Federal Accessibility Standards (UFAS) (reference 9e). See Section 12.

9.2.3 Hot Water Design Temperatures. The hot water supply system shall generate sufficient water to provide the following maximum temperatures:

9.2.3.1 Central Sterile Supply, Soiled Utility with bedpan washers, Cart Wash, and special Pathological wash areas shall be provided with 140 degrees F (60 degrees C) hot water.

9.2.3.2 Kitchen Areas:

a) Dietary Area. 105 degrees F (41 degrees C).

b) Dishwashing (automatic equipment) and Pot Washing. 180 degrees F (82 degrees C). Booster heaters shall be provided to obtain this temperature.

9.2.3.3 Public and Staff Toilets in Separate and Distinct Administration Buildings. 105 degrees F (41 degrees C).

9.2.3.4 Patient Toilets, Showers, and Bathing Facilities. 105 degrees F (41 degrees C).

9.2.3.5 All Others. 105 degrees F (41 degrees C).

9.2.4 Water Analysis. A water analysis will be prepared to determine the degree of treatment required. When the water supply to a Medical Treatment Facility has a hardness of 170 mg/l or more, provide softening to between 50 mg/l and 85 mg/l (3 to 5 grains per gallon). Maintain water hardness in Dental Clinics between 50 mg/l to 85 mg/l. If specialized equipment requires water having a hardness less than 50 mg/l, a special study shall be made to determine the most feasible means of obtaining water of the necessary hardness. The Langelier Index should be positive (see Glossary for definition).

9.2.4.1 Water Purification Systems. Water purification systems include reverse osmosis, deionization, and distillation. Type III grade water, as specified in ASTM D 1193 (reference 9f), will be provided for all heat exchangers used for steam humidifiers, electrically powered sterilizers, Pharmacies, Laboratories, distillation units, Renal Dialysis, Glassware Washing, and Central Supply. Laboratories in large Medical Centers may require ASTM D 1193 Type I water that will be supplied by a local subsystem. Additional systems and use areas for a specific project will be determined by the using Military Department. A combination system may be considered for large facilities with reverse osmosis being considered for primary treatment and either deionization or distillation for secondary treatment. Reagent water, with its corresponding electrical resistivity in mega-ohms, where required, shall be provided per ASTM D 1193 (reference 9f).

9.3 Sanitary Waste System. Special requirements for MTF's include, but are not limited to, interceptors, flush rim drains, garbage grinders, and separate acid waste system for Laboratories, Darkrooms, and Nuclear Medicine. Interceptors will be provided when precious materials may be sediment in the waste such as in Cast Rooms, Prosthodontics Laboratories, Barium Procedure areas, film X-ray processing, and in blood analyzers. The interceptors will be cast iron; barium interceptors will be aluminum. Flush rim floor drains will be provided in Autopsy and similar areas. Garbage grinding disposers will be provided in Kitchens on dishwashers, pot and pan sinks, and other sinks as required.

9.3.1 Special Waste Lines. Separate waste lines will be provided for acid waste and Nuclear Medicine waste. The acid waste will utilize acid resistant pipe and pass through a dilution tank before combining with building waste. If large quantities of acid or strong base solutions are to be dumped into the waste system, neutralization will be required.

9.4 Freestanding Clinic Guidelines. The following applies to freestanding medical clinics, dental clinics, and combined medical/dental clinics:

9.4.1 Medical Clinics. These facilities are not normally authorized centrally piped gas or vacuum systems. However, if a freestanding clinic is
in close proximity to the hospital, medical gas service may be extended from the hospital to the adjacent clinic, if proven cost effective.

9.4.2 Dental Clinics. Centrally piped systems shall be provided, as required, for dental compressed air at 85-100 psig (DCA 90); high volume oral evacuation (HVE); high vacuum oral evacuation (HIVAC); high volume evacuation for laboratory use (HVEL), and dental laboratory air at 30 psig (DLA 30). Gas (natural or propane) shall be provided to support prosthodontic and orthodontic laboratories and Dental Treatment Rooms (DTR's).

9.5 Medical and Dental Gas Systems. Appendix A contains guidance for allocation and location of gas systems and outlets. Gas systems include medical air, dental air, laboratory air, processed air, laboratory vacuum, medical vacuum, natural gas, nitrogen, nitrous oxide, oral evacuation, oxygen, and waste anesthesia gas exhaust (WAGE). The number of outlets shown in Appendix A are intended for the design of medical gases for Medical Centers. Station level MTF's will not require all of the items indicated. Therefore, the tables should be used judiciously when designing medical gas systems for MTF's other than Medical Centers. The number of outlets shown in Appendix A are the "maximum" allowed. Additional outlets may be requested through DMFO. Requests for additional outlets must have full justification. All systems shall comply with the latest edition of NFPA 50, 99, 70, (references 9n, 9o, and 9p) and in accordance with the requirements of Compressed Gas Association Pamphlet No. P-2.1 (reference 9d).

9.5.1 Medical-Surgical Vacuum System (MV). The medical vacuum (MV) system shall be a centrally piped, dry vacuum system containing two or more continuous duty pumps with a central receiver. The system shall meet the requirements of NFPA 99 and shall be sized so that if one pump fails, the remaining pump (or pumps) can supply 100% of the total system demand.

9.5.1.1 Vacuum system pumps and piping shall be sized in accordance with NFPA 99 "Recommended Vacuum Source Sizing" and "Recommended Minimum Pipe Sizing." See dental HIVAC system in paragraph 9.5.2 for system's dental demands.

9.5.1.2 A minimum vacuum of 19 inches of mercury (Hg) shall be maintained at the receiver. System pressure drop shall be a maximum of 1 inches of mercury (Hg) per 100 feet of pipe for a maximum total pressure drop of 4 inches of mercury (Hg) in the system. The farthest inlet shall have a vacuum of 15 inches of mercury (Hg) minimum with a demand in accordance with NFPA 99.

9.5.1.3 Vacuum bottle slide brackets shall be provided for all medical vacuum inlets. Vacuum bottles shall be used at all vacuum inlets to prevent liquids and solids from entering the piping network. Vacuum bottles shall be provided with an overflow shut-off device to prevent carry over of fluids or solids into the piping system. Brackets shall be positioned to provide proper clearance for flow meters and adapters and to eliminate conflict with electrical receptacles.

9.5.1.4 Vacuum shall be exhausted in accordance with NFPA 99.

9.5.2 Dental High Vacuum Oral Evacuation System (HIVAC). A central HIVAC system may be supplied for areas in dental clinics where medical vacuum is required in Appendix "A." This system is also a dry system with no liquids or solids transported in central systems. Individual separators shall be located in each applicable DTR. In dental clinics located in a hospital, medical vacuum system shall be used in lieu of HIVAC System. The system shall consist of two or more vacuum pumps and a central receiver. System shall be sized so that upon failure of one pump the remaining pump(s) maintain the minimum vacuum specified while providing 100% of the calculated demand.

9.5.2.1 A minimum vacuum of 19 inches of mercury (Hg) shall be maintained at the receiver. System pressure drop shall be such that the most remote inlet will have a minimum vacuum of 12 inches of mercury (Hg) under peak demand conditions.

9.5.2.2 System demand shall be calculated as two SCFM for each DTR HIVAC inlet with the following demand factors:

TABLE 9-1

HIVAC DEMAND FACTORS

No. of DTR HIVAC Inlets	Use Factor
1 - 6	1.0
7 - 10	0.8
Over 10	0.6

9.5.3 Oral Evacuation System (OE). A central high volume oral evacuation system (HVE) shall be installed in dental clinics to provide scavenging, collection, and disposal of liquids, solids, and aerosols from mouth of the dental patient.

9.5.3.1 The HVE system shall consist of, but not be limited to, two or more turbo-exhausters, one or two central separators/collector tanks with automatic washdown system, silencers, volume control valves, anti-surge valves, directional flow valves, isolation pads, remote control panel, plumbing isolators, electrical controls, air control solenoid valves, and mechanical and electrical tank overflow protectors. The separator(s) shall receive all liquid, air, and solids upstream of turbo-exhausters. Liquids and solids will be discharged from the separator(s) to a floor sink connected to the sanitary waste. Discharge shall occur upon a 24-hour interval at separator automatic washdown, or when high liquid level sensor activates on receiver. The HVE system shall be designed to provide a vacuum of 7-8 inches of mercury (Hg) with 12-15 SCFM at each DTR. When one turbo-exhauster fails, the remaining turbo-exhauster(s) shall provide the above vacuum pressure and fluid flow for 70% of the total facility DTR's simultaneously.

9.5.3.2 The separator/collector tanks shall be sized according to the following table:

TABLE 9-2

SEPARATOR TANK SIZING

	Separator Tanks	
Number of DTR's	Quantity	Size (Gal)
1-6	1	20
7-10	1	40
11-20	1	80
21-30	2	40
31 and above	2	80

9.5.3.3 Horsepower ratings for the turbo-exhauster drive motors shall not exceed the following quantities for capacities and pressure shown:

TABLE 9-3

TURBO-EXHAUSTER DRIVE MOTOR HORSEPOWER LIMITS

	VACUUM [inches of mercury (Hg)]					
	7	8	9	10	11	12
H.P.	SCFM					
5	90	64				
7-1/2		180	165	100		
10	240	220	185	150		
15	375	350	275	200	125	100
20	560	475	400	300	260	225
25	770	600	475	400	335	300
30	840	725	625	540	430	360
40	1225	1000	825	650	565	480
50	1530	1250	1100	900	725	600

9.5.4 Central Dental High-Volume Laboratory Evacuation (HVLE) Systems For Base Dental laboratories. The HVLE system shall 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. The HVLE system must exhaust to the atmosphere outside of the laboratory work-space. The central high-volume evacuation system for dental laboratories shall consist primarily of one belt-driven turbo-exhauster complete with high and low voltage switching controls; a preset, field- adjustable ingestion valve and exhaust silencer; a central cyclonic separator with a filter bag system; a low voltage source and remote control panel for remote control and performance indication of the turbo-exhauster; a properly sized piping system to provide one 1.5 inch inlet per technician and others as indicated for equipment specified in the laboratory design; a full-bore manual valve (settable) in each riser located immediately after the riser branches from the trunk line; and an automatically compensating air volume relief valve located in the trunk line upstream of all riser or branch connections, equipped with silencer and drawing air from outside the facility.

9.5.4.1 The HVLE system must develop and maintain a vacuum of 1 inch of mercury (Hg) in the trunk line upstream of the filter or collector. Total calculated air flow load SCFM must be the sum of 50 SCFM per technician, and 150 SCFM for each unit of equipment specified. The system capacity and the separator filter must be sized, based on the total calculated load modified by the usage factor given below:

TABLE 9-4

HVLE SYSTEM UTILIZATION FACTORS

Lab Size (# of techs)	Usage Factor Percent	Separator Filter (Sq. Ft.)
1 to 4	60	60
5 to 10	70	100
11 to 15	80	300
16 to 24	85	300

9.5.4.2 The modified air flow load value (SCFM) must be used to select the turbo-exhauster from the following standard chart:

TABLE 9-5

TURBO-EXHAUSTER SELECTOR CHART

Exhauster (hp)	Air Flow (SCFM)	R.P.M. (Motor/Exhauster)
3	400	1725/2600
5	700	1725/2600
7.5	1100	1725/2600
10	1600	1725/2600
15	2200	1725/2600

9.5.5 Medical Air (MA). The medical air (MA) system shall be an independent central piped system consisting of two or more oil-free compressors and a central receiver conforming to the requirements of NFPA 99. The system shall be sized such that upon failure of one compressor the remaining compressor(s) can supply 100% of the total system demand.

9.5.5.1 The medical air compressor(s) shall be oil-free specifically designed and manufactured for this purpose. Medical air quality shall be in accordance with "oil-free, dry air" as defined in NFPA 99 with a dewpoint of 33 degrees F. Intake air shall be direct from outdoors or of quality better than outside air (i.e., prefiltered air for use in operating room ventilation). Locate intake in accordance with NFPA 99.

9.5.5.2 System pressure at the pressure regulators shall be maintained at 55 psig. Pressure drop within the piping system shall be designed at a maximum of 1 psig per 100 feet of pipe for a total system pressure drop of 5 psig so that a minimum of 50 psig is available at the farthest outlet under peak system demand.

9.5.5.3 Medical air system demand shall meet the following peak flow requirements as a minimum.

TABLE 9-6

MEDICAL AIR SYSTEM DEMAND

Air Outlet/Equipment	Design Flow in SCFM (Free Air) Per Unit	Per Room	Per Bed	Per Outlet	Simultaneous Use Factor %
Anesthetizing Locations:					
Special Surgery & Cardio-Vascular			.5		100
Major Surgery & Orthopedic		.5			100
Minor Surgery		.5			75
Emergency Surgery		.5			25
Radiology		.5			10
Cardiac Catheterization		.5			10
Ventilators	3.5				100
Delivery Room		.5			100
Acute Care Locations:					
Recovery Room/Surgical			2		25
ICU/CCU			2		50
Emergency Room			2		10
Neonatal ICU			1.5		75
Dialysis Unit			.5		10
Recovery Room/O.B.			2		25
Subacute Care Locations:					
Nursery		.5			25
Patient Rooms		.5			10
Exam & Treatment	1				10
Pre-Op Holding				1.5	10
Respiratory Care	1				50
Pulmonary Function Lab				1	50
EEG & EKG				1	50
Birthing & Labor/Delivery	1				50
Other:					
Anesthesia Workroom		1.5			10
Respirator Care Workroom	1.5				10
Nursery Workroom		1.5			10
Equipment Repair		1.5		1.5	10
Med. Laboratory				1.5	25

NOTE: This is a generic listing and must be used to include specific room names in Appendix A.

9.5.6 Laboratory Air (LA). The laboratory air (LA) system shall be a central piped system consisting of two or more oil-free compressors and a central receiver conforming to the requirements of NFPA 99. The system shall be sized such that upon failure of one compressor the remaining compressor(s) can supply 100% of the total system demand. This system may be combined with the dental air systems (DA, DCA, and DLA).

9.5.6.1 Air compressors used for laboratory air shall be oil-free specifically designed and manufactured for this purpose. Laboratory air quality shall be in accordance with "oil-free, dry air" as defined in NFPA 99 with a dewpoint of 33 degrees F. Intake air shall be direct from outdoors or of quality better than outside air (i.e., prefiltered air for use in operating room ventilation). Locate intake in accordance with NFPA 99.

9.5.6.2 The LA system shall be oil-free air with the following air standards as maximums:

Contaminant	Maximum Limit
- Water	Dry to a pressure dewpoint of 33° F at not less than 90 psig
- Condensed hydrocarbons	0.1 parts per million (ppm) by weight
- Permanent particulates	1.0 ppm by weight

9.5.6.3 LA shall be provided at 30 psig by two or more equally sized compressors, duplexed, with provisions for automatic, alternate, and simultaneous operation. Each compressor shall be sized to operate at 65% duty cycle for maintenance of standard demand. The system shall consists of, but not be limited to, the following components in downstream order:

- Compressor intake filters
- Compressors
- Aftercooler (air cooled)
- Air receiver
- Prefilter
- Dryer (refrigerated)
- Afterfilter
- Pressure regulators
- Low pressure monitor and warning device

All system components downstream of compressors shall be sized for maximum combined compressor output.

9.5.6.4 Pressure drop within the piping system shall be designed at a maximum of 1 psig per 100 feet of pipe for a total system pressure drop of 5 psig so that a minimum of 30 psig is available at the farthest outlet under peak system demand.

9.5.7 Dental Air (DA). A central piped dental air (DA) system shall be provided for all facilities that require dental compressed air as listed in Appendix "A". Dental compressed air shall be used for utility control in dental units, power for lifts, locks, rotary and other pneumatic dental instruments and equipment. Dental air, unlike medical air, is not used for breathing or respiratory support of any kind. DA is equivalent to Dental Compressed Air (DCA) or (DCA 90). Dental lab air (DLA) which is normally used for laboratory restorative and fabrication techniques may be combined with DA system.

9.5.7.1 DA, DCA, and DLA shall be oil-free air with the following air standards as maximums:

Contaminant	Maximum Limit
- Water	Dry to a pressure dewpoint of 33° F at not less than 90 psig
- Condensed hydrocarbons	0.1 parts per million (ppm) by weight or 0.1 mg/L.
- Permanent particulates	1.0 ppm by weight or 1.0 mg/L.

9.5.7.2 DA, DCA, and DLA shall be provided by two or more equally sized compressors, with provisions for automatic, alternating, and simultaneous operation. Each compressor shall be sized to operate at 65% duty cycle for maintenance of standard demand. The system shall consist of, but not be limited to, the following in downstream order:

- Compressor intake filters
- Compressors
- Aftercooler (air cooled)
- Air receiver
- Prefilter
- Dryer (refrigerated)
- Afterfilter
- Pressure regulators
- Low pressure monitor and warning device

All system components downstream of compressors shall be sized for maximum combined compressor output.

9.5.7.3 DA and DCA shall be supplied to the outlets at a pressure of 90 psig. DLA shall be supplied to outlets at a pressure of 30 psig. In-line pressure regulators shall be provided when combined with DA system to reduce DA to DCA 90 or DLA 30.

9.5.7.4 The system shall be sized using the following criteria.

$$\text{Compressor Size (CFM)} = \text{Standard demand} = \text{Number of DTR's} \times 2.0 \text{ CFM}$$

$$\text{Receiver Size (Gallons)} = \frac{157 \times \text{Standard demand}}{10.88}$$

9.5.8 Process Air (PA). Compressed air (120 psig) generated from a non-oil-free compressor and used for building system controls, door operators, and similar applications.

9.5.9 Oxygen (OX). Oxygen shall be supplied by a central supply system in all hospitals. Oxygen may be supplied by a central supply system in clinics if determined to be economically feasible; otherwise, a portable source shall be provided.

9.5.9.1 The oxygen central supply system shall conform to NFPA 99 and NFPA 50 and consist of one of the following:

- Cylinder system without reserve supply
- Cylinder system with reserve supply
- Bulk supply system

9.5.9.2 A cylinder system without reserve supply consists of cylinder manifold system with two banks of cylinders, a primary and secondary bank. When the primary bank has been depleted, the secondary bank shall automatically operate to supply the system.

9.5.9.3 A cylinder system with reserve supply consists of a primary, secondary, and reserve supply. The primary supply operates to supply the system. Upon depletion of the primary supply, the secondary supply shall automatically operate to supply the system. Upon depletion of both the primary and secondary supply, the reserve supply shall automatically operate to supply the system.

9.5.9.4 A bulk supply system consists of a primary supply and a reserve supply. Commonly used systems include a liquid oxygen tank primary supply with a liquid oxygen tank reserve or a liquid oxygen tank primary supply with gas cylinder reserve.

9.5.9.5 Storage locations for supply systems shall be in accordance with NFPA 99 and NFPA 50. Provide an emergency oxygen supply connection on the building exterior when the oxygen supply system is located outside of the building.

9.5.9.6 Oxygen pressure shall be maintained at 55 psig at the pressure regulators for the supply system. Pressure drop within the distribution system shall be maintained at approximately 1 psig per 100 feet of pipe for determined peak load. Total system pressure drop shall be a maximum of 5 psig to provide a minimum of 50 psig at all system outlets. Systems shall be designed for a demand of 20 lpm per outlet with the following usage factors. A usage factor of 100% shall be used for all critical care areas. For other areas use the following factors:

TABLE 9-7

OXYGEN SYSTEM UTILIZATION FACTORS

Number of Outlets	Percent Usage
1-3	100%
4-12	75%
13-20	50%
21-40	31%
41 or more	25%

9.5.9.7 Manifold and bulk oxygen supply systems shall be sized based upon historical or projected consumption rates. When these requirements cannot be determined, the following criteria shall be used as an estimate for sizing systems.

TABLE 9-8

CYLINDER MANIFOLD SYSTEMS

Number of Beds	Minimum Number of Cylinders per Bank Using Size "H" Cylinders (244 cubic feet)
1-50	8
51-75	12
76-100	16
101-125	20
126-150	24
Over 150	Requires special study

The above does not take into account dental requirements. Cylinder number should be increased to accommodate dental demand and local availability of oxygen. Space shall be provided for additional cylinders to allow for expansion of the cylinder system at a later date. Manifold system cylinder quantities should be adjusted to reflect local availability of gases.

9.5.9.8 The central oxygen system design shall also be in accordance with DoD Directive 6055.10 (see reference 91) with provisions made for the installation of in-line oxygen monitors. The monitors shall be collocated and interconnected with the medical gas alarm panels.

9.5.9.9 When considered to be economically feasible based on historical or projected consumption, bulk liquid oxygen system may be used.

9.5.10 Nitrogen (NI). Nitrogen shall be supplied by piped central manifold system in all hospitals. The manifold system shall consist of

two banks of cylinders (a primary and secondary bank) that alternately supply the system. When the primary bank has been depleted, the secondary bank shall automatically operate to supply the system. The cylinder manifold system shall be designed and installed in accordance with NFPA 99. Where a Dental Clinic is integral to the MTF, nitrogen may be centrally piped to operate dental surgical handpieces.

9.5.10.1 System pressure at the manifold pressure regulators shall be maintained at a minimum of 180 psig. Pressure drop within the distribution system shall be a maximum of 20 psig total to provide a minimum of 160 psig at system outlets. Each individual nitrogen use location (i.e., individual operating room) shall be provided with a nitrogen control cabinet with pressure gauges and pressure regulating valves for the purpose of independently regulating pressures at each usage location.

9.5.10.2 Piping shall be designed to provide 15 cfm at 160 psi to each outlet.

9.5.10.3 Manifolds shall be sized so that each bank contains a minimum of 2 size "H" (226 cu.ft.) cylinders or that required by the following table (reference 9k):

TABLE 9-9

MANIFOLD SIZING FOR NITROGEN SYSTEM

Number of Operating Rooms and DTR's Piped with Nitrogen	Duplex Manifold Size	
	Total Cylinders	Cylinders per bank
1-4	4	2
5-8	6	3
9-12	8	4
13-16	10	5
17-20	12	6
21-24	14	7
25-28	16	8

The above table assumes Size "H" cylinders and one complete change of cylinders each week. Manifold system cylinder quantity shall be adjusted to reflect local availability of bulk gases.

9.5.11 Central Dental Surgical Handpiece Drive Air (SHDA) Systems. SHDA may be used as a substitute for nitrogen to support exodontic procedures in free-standing Dental Clinics. SHDA is not used for breathing or respiratory support. SHDA must be a separate system from DA, DLA, and DCA.

9.5.11.1 The quality of SHDA relative to specific contaminates shall be per the following limits:

Contaminant	Maximum Limit
- Water	Dry to a pressure dewpoint of -40°C (-40°F), at not less than 150 psig.
- Condensed hydrocarbons	Not more than 0.1 parts per million (ppm) by weight or 0.1 mg/L.
- Permanant particulates	Less than 1.0 ppm or 1.0 mg/L.

9.5.11.2 The network demand for Surgical Handpiece Drive Air (SHDA) shall be according to the number of Oral Surgery (OS) DTRs programmed per the following:

TABLE 9-10

SHDA UTILIZATION FACTORS

Number of OS DTRs	Network Demand (CFM)
1-2	6
3-4	12
5 and over	18

9.5.11.3 Minimum system pressure shall be not less than 150 psig.

9.5.11.4 Booster cut-in pressure shall not be less than 160 psig.

9.5.11.5 The maximum system pressure shall not be less than 170 psig.

9.5.11.6 The system pressure differential shall not exceed 10 psig.

9.5.11.7 The station pressure for SHDA at each fixture shall be not less than 100 psig.

9.5.11.8 The system shall include, but not be limited to, the following components listed in downstream order:

- Air Pressure booster device
- Air receiver
- Regenerative desiccant column dryer
- After filter
- Pressure regulator
- Low pressure monitor and warning device

9.5.11.9 The system shall be provided with one or more boosters with provisions for automatic operation. Multiple booster systems will not

be duplexed but shall have provision for automatic simultaneous operation.

9.5.12 Nitrous Oxide (NO). Nitrous oxide shall be provided by a central manifold system in all hospitals and hospital-based dental clinics. The manifold system may be located in the oxygen manifold room, a separate room near the point of use, or located on the building site in a bulk storage park. Nitrous oxide manifolds shall not be located outside in cold climates due to the low vapor pressure of nitrous oxide at low temperatures. Nitrous oxide storage locations shall be inaccessible to unauthorized personnel by means of completely locked and fenced in areas for exterior locations and a lockable area for interior locations.

9.5.12.1 The manifold system shall consist of two banks of cylinders (a primary and secondary bank) that alternately supply the system. Upon depletion of the primary bank, the secondary bank shall operate automatically. The manifold system shall be connected in accordance with NFPA 99.

9.5.12.2 System pressure shall be maintained at the manifold pressure regulators at a minimum of 55 psig. Pressure drop within the distribution system should be maintained at 1 psig per 100 feet of pipe. Total system pressure drop shall be a maximum of 5 psig to provide a minimum of 50 psig at the most remote outlet. Nitrous oxide piping systems shall be designed for a demand of 20 lpm per outlet with the following usage factors (reference 9k):

TABLE 9-11

NITROUS OXIDE SYSTEM UTILIZATION FACTORS

Number of Outlets	Percent
1-3	100%
4-12	75%
13-20	50%
21-40	31%
41 or more	25%

9.5.12.3 Manifolds shall be sized so that each bank contains a minimum of 2 Size "G" (489 cu.ft.) cylinders or that required by the table below.

TABLE 9-12

NITROUS OXIDE SYSTEM MANIFOLD SIZING

Beds	Number of cylinders/bank
50-100	2 expandable to 4
100-250	4 expandable to 6
250-500	6 expandable to 8
500 or More	Special Study

The above cylinder quantities shall be adjusted to reflect local availability of bulk gases.

9.5.13 Ethylene Oxide. Gas/vapor sterilization may be used for treating certain infectious waste. In this method, the sterilizing agent is a gaseous or vaporized chemical. The two most commonly used chemicals are ethylene oxide (ETO) and formaldehyde which may be human carcinogens. Where ethylene oxide (ETO) is planned in DoD Medical Treatment Facilities, a separate room shall be provided. All precautions in the use of ETO as outlined by OSHA (reference 9g) and NIOSH CIB 52 (reference 9n) shall be strictly followed.

9.5.14 Waste Anesthesia Gas Exhaust (WAGE). A separate, non-recirculating ventilation system or separate vacuum system, designed in accordance with NFPA 99, shall be provided for the removal of waste anesthesia gases (reference 9i.)

9.6 Medical Gas System Performance Criteria and Testing. Medical gas systems shall be cleaned and tested in accordance with NFPA 99. Each system shall have its piping blown clear of debris by means of oil-free, dry air or nitrogen and then purged with a test gas. Testing shall include, but not be limited to, cross-connection, purity, pressure, and alarm testing. All testing and certification of medical gas systems should be done by an independent testing agency, not the equipment supplier or Contractor.

9.7 System Control Valves. All medical gas centrally piped systems shall be provided with shut-off valves and zone valve box assemblies in accordance with NFPA 99. Zone value controls must be located in the zone of use and preferably adjacent to the most critical point of use for emergency control. Mounting height for zone valve boxes shall be 5'-0" above finish floor to center line of unit.

9.8 Warning Systems. Medical gas warning systems shall be provided for all central piped systems in accordance with NFPA 99. Warning systems shall consist of master alarms and area alarms with pressure gauges. Mounting height for alarms shall be 5'-0" above finish floor to center line of unit.

9.9 Color Coding and Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m), at least once in each room, and each story traversed by the piping system (reference 9i). Color identification of piping shall be in accordance with the gases and colors indicated in Compressed Gas Association (CGA) Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use in the United States (reference 9m).

REFERENCES

9a. National Standard Plumbing Code, National Association of Plumbing - Heating - Cooling Contractors.

9b. Federal Specification WW-P-541/9b, "Plumbing Fixtures (Land Use)."

9c. MIL-STD-1691, "Construction and Material Schedule for Military Medical and Dental Facilities."

9d. Compressed Gas Association Pamphlet No. P-2.1.

9e. FED-STD-795, "Uniform Federal Accessibility Standards (UFAS)," April 1, 1988.

9f. American Society for Testing and Materials, ASTM D 1193, Reagent Water (1983).

9g. Occupational Safety and Health Administration of the U.S. Department of Labor, 29 CFR 1910.1047(a), "Ethylene Oxide."

9h. National Fire Protection Association, 50, "Bulk Oxygen Systems."

9i. National Fire Protection Association, 99, "Health Care Facilities."

9j. National Fire Protection Association, 70, "National Electrical Code."

9k. American Society of Plumbing Engineers, Data Book, Volume 2, Special Plumbing Systems Design, Chapter 10, 1986.

9l. DOD Directive 6055.10, "Storage and Administration of Oxygen for Medical Use," May 29, 1985.

9m. Compressed Gas Association (CGA) Pamphlet C-9, "Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use in the United States."

9n. National Institute for Occupational Safety and Health, Current Intelligence Bulletin 52, "Ethelene Oxide Sterilizers in Health Care Facilities," July 13, 1989.

SECTION 10: ELECTRICAL

10.1 General. This section provides guidance on electrical and lighting systems design for MTF's. Refer to MIL-HDBK-1190 (reference 10a) for general electrical requirements.

10.1.1 Criteria. The electrical design criteria contained in this section is to ensure compliance with the referenced minimum standards and to assure a reliable electric supply under both normal and emergency conditions. Consideration shall be given to the location of space for components of the essential electrical system in order to limit interruptions caused by localized national conditions, i.e. floods, earthquakes, etc. The following references provide additional design guidelines:

a) NFPA 70 (reference 10b): "National Electric Code," and

b) NFPA 99 (reference 10c): "Standard for Health Care Facilities."

10.1.2 Definitions.

10.1.2.1 The above references discuss various requirements for "General Care" Areas and "Critical Care" Areas. The following areas are to be treated as "Critical Care" Areas:

a) Operating Rooms,

b) Delivery Rooms,

c) Cystoscopy Rooms,

d) Oral Surgery and Maxillofacial Surgery (Hospital),

e) Recovery (Surgery, Labor Recovery beds and Dental),

f) Coronary Care Units (patient bedroom),

g) Intensive Care Units (patient bedroom),

h) Emergency Care Units (treatment/trauma rooms and cubicles),

i) Labor Rooms (including Stress Test and Preparation),

j) Neonatal Intensive Care Nursery,

k) Cardiac Catheterization,

l) Angiographic exposure room,

m) Hemodialysis (patient station),

n) Surgical suite Preparation and Holding,

o) Hyperbaric Chambers,

p) Hypobaric Chambers,

q) Special Procedures room(s),

r) Pharmacy Dispensing,

s) Radiation Therapy (including Simulator room), and

t) Nuclear Medicine (camera room).

All other patient care areas shall be treated as "General Care."

10.1.2.2 Wet Locations. Refer to NFPA 99 and Glossary definition of Wet Locations.

10.2 Exterior Electrical.

10.2.1 Exterior electrical systems shall conform to ANSI C2 (reference 10d: National Electrical Safety Code).

10.2.2 Normal Source. As recommended by NFPA 99 (reference 10c), hospitals should be served by two primary central-station-fed service feeders, each able to carry the full hospital connected load, installed underground within the hospital site. Clinics, ambulatory care, or other Medical or Dental Treatment Facilities should be provided with one primary service. Service feeders will be connected 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 loop system. Manually operated primary selector switch and fused load break disconnect switch will be provided for each transformer as indicated in Figure 10-1. Transformers will normally be located outside the Medical or Dental Treatment Facility but may be located within the building where practicable and economical. Double-ended substation distribution systems should be designed for hospitals (refer to Figure 10-1). Each transformer in the double-ended substation will be sized to serve approximately 60-70 percent of the substation demand load. All other health care facilities will be served by a single-ended substation. System protection will be selective.

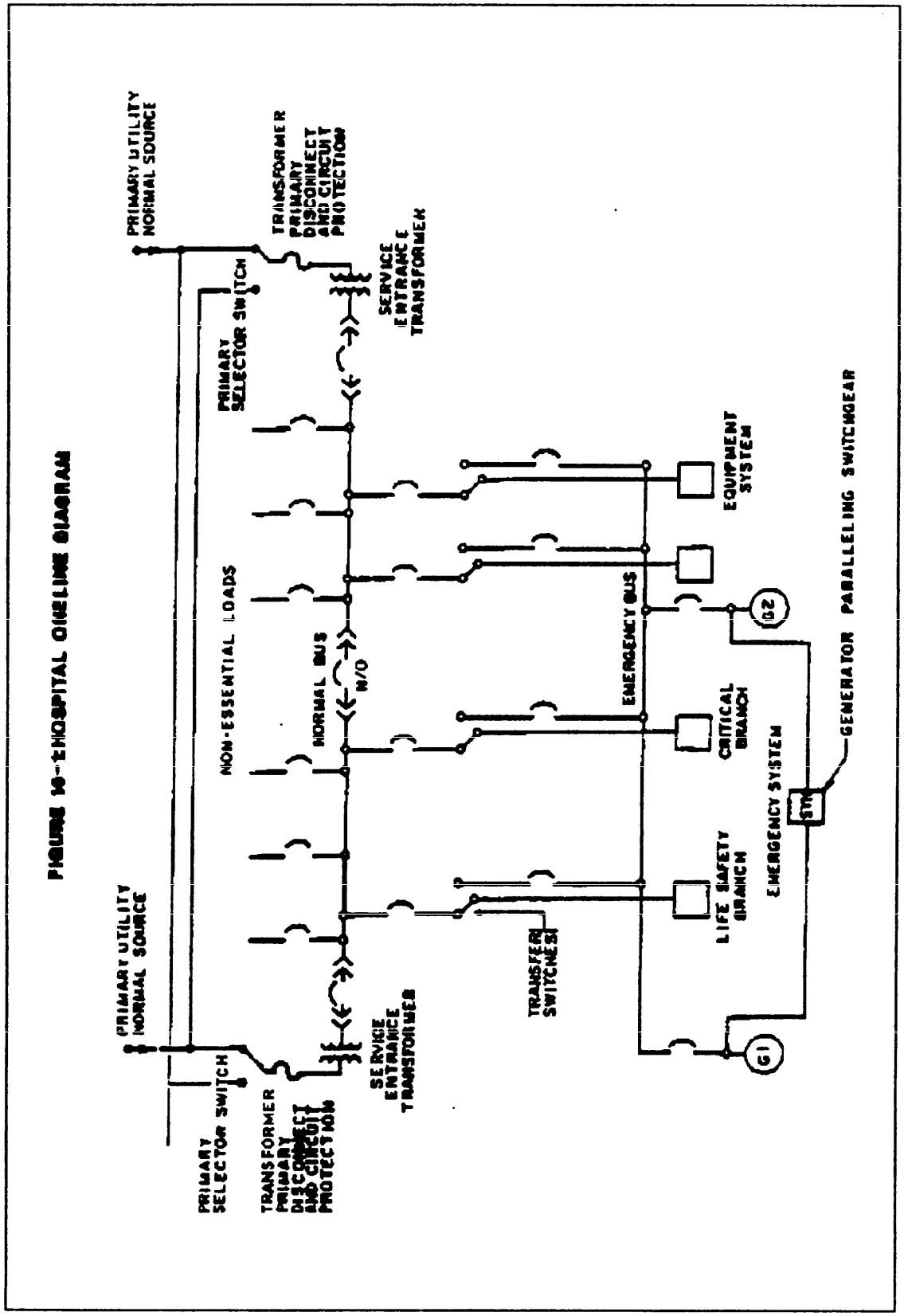


FIGURE 10-1 HOSPITAL ONELINE DIAGRAM

10.2.3 Transient Protection. Systems that incorporate solid state devices are susceptible to electrical system transients that can cause system malfunction or equipment component damage. The reliability of primary power source regarding transients, power anomalies, and aberrations will be analyzed and considered. The frequency and effect of lightning strikes on the primary distribution system will incorporate necessary features to minimize damaging transients. Unless specifically required for specific items of equipment by the using Military Department and/or by an A/E evaluation of solid state requirements for intensive care areas and approved for installation by DMFO, power conditioning equipment will normally not be installed as part of the building electrical system at the utilization point. Contractor-furnished, contractor-installed systems that utilize solid state devices will be provided with transient protection. Static Uninterruptible Power System (UPS) will normally be provided with the equipment and system being served. However, requirement or provisions for a UPS will be determined on a project-by-project basis. Provisions for future installed power conditioning equipment will be determined on a project-by-project basis.

10.3 Emergency Power.

10.3.1 References. NFPA 70 (reference 10b), NFPA 99 (reference 10c), and ANSI/IEEE Std. 602, 1986 (reference 10h).

10.3.2 Medical and/or Dental Clinics: Where any concentration of inhalation anesthetic is used or any electrical life support or resuscitative equipment is used in Clinics or Dental Clinics, an alternate source of power is required in accordance with NFPA 70, paragraph 517-50 (reference 10b). The alternate source of power shall be either a generator, battery system, or self-contained battery integral with the equipment and shall have the capacity to sustain its connected load for a minimum of 1 and 1/2 hours. The system shall be so arranged that the alternate source of power shall be automatically connected to the load within 10 seconds. The essential electrical system shall supply power for task illumination related to life safety which is necessary for safe cessation of procedures and all related anesthesia and resuscitative equipment. Clinics will not be provided with an engine-generator set unless authorized by DMFO.

10.3.3 Hospitals. The emergency power source will consist of two or more engine generator sets of sufficient capacity and proper rating to meet the maximum demand of the electrical system at any one time (fig 10-1) during an interruption of the normal power supply. Motor starting and X-ray unit momentary KiloVolt Amperes (KVA) loads will be included as applicable in demand load. Parallel operation of the generator sets will be as indicated by Figure 10-1. Load shedding or shifting may become necessary should one of the generators fail.

10.3.3.1. Engine Generator Sets. Engine-generator sets will be diesel powered. The preferred generating voltage is the highest utilization voltage proposed for the facility. The sets will conform to NFPA 37

(reference 10e), NFPA 70 (reference 10b), and NFPA 99 (reference 10c) and will include automatic start-and-stop equipment, solid state battery charger, fuel storage tank, warning device to warn of less than 3-hours fuel supply, and day tanks and radiators as required. Engines will have a residential type exhaust silencer and will be able to start and assume their electrical load within 10-seconds. "Utility" or "general purpose" generators shall not be utilized unless they meet the requirements set forth in NFPA 99 (reference 10c). If computers are to be operated directly (not through a UPS or uninterrupted power supply), an isochronous governor is required. Refer to ANSI/IEEE Std. 602-1986 (reference 10h).

10.3.3.2 Location of Engine Generator Sets. Generator sets normally will be located in or adjacent to the Central Energy Plant serving the hospital when the plant is located sufficiently close to the structure to reduce line losses and prevent excessive cable runs. When the Central Energy Plant is remote from the hospital structure, generators will be installed adjacent to the structure or within the structure at ground level, whichever is more economical. The Emergency Switch Gear Rooms will be located at or near the building exterior to facilitate initial installation and removal and replacement of defective equipment. The generator sets and auxiliaries will be arranged and located so minimum facility modifications will be required for future installation of an additional generator set and auxiliaries or replacement of existing units. Per NFPA 99 (reference 10c), service entrance transformers shall not be installed in this area.

10.3.3.3 Manual Test Switches. Manual test switches will be provided for each automatic transfer switch of the essential electrical system.

10.3.3.4 Automatic Transfer Switches. Automatic transfer switches shall be of double-throw construction. Circuit breaker type transfer switches are not acceptable. All automatic transfer switches will be equipped with by-pass isolation for maintenance purposes. Equipment system automatic transfer switches which feed large motors will be provided with an in-phase monitor or time delay feature to prevent excessive motor in-rush currents.

10.3.3.5 Ground Fault Protection Equipment. The essential electrical system will not be provided with ground fault protection of equipment. The generator circuit breaker and essential electrical system main distribution board circuit breakers will be provided with ground fault detection feature, when required, to indicate a ground fault and sound an audible alarm, but not trip the breaker.

10.3.3.6 Remote Alarm Annunciator. A remote alarm annunciator will be provided as required by NFPA 99 (reference 10c).

10.3.3.7 Fuel Storage Tanks. The fuel storage tanks and installations in Hospitals will comply with NFPA 30 (reference 10f), "Flammable and Combustible Liquids Code," and Local, State, and Federal Environmental Protection Agency requirements. The capacity of the fuel

oil tank will be sized to the nearest standard size for 7-day supply. A larger or smaller tank may be supplied as the local fuel supply conditions permit. Underground fuel tanks shall be double wall with leak detection in accordance with Environmental Protection Agency (EPA) standards. Separate day tanks will be provided for each engine generator set and will be sized as follows:

- 50 kW to 100 kW generator: 25 gallon min. - 50 gallon max.
- 101 kW to 200 kW generator: 50 gallon min. - 75 gallon max.
- 201 kW to 300 kW generator: 75 gallon min. - 100 gallon max.
- Over 300 kW generator: 100 gallon min. - 250 gallon max.

A set of duplex transfer pumps connected to the equipment branch of essential electrical system will be provided for each fuel storage tank. Each fuel transfer pump will be sized to accommodate all generators including future set. Natural gas or comparable gas fuel will not be used as an operating fuel for hospital emergency power generation.

10.3.3.8 Loads on the Alternate Source. The alternate power source will have sufficient capacity to supply the essential electrical system of the hospital as outlined in NFPA 70 (reference 10b), as modified herein, and as required by items listed in Appendix A. The essential electrical system consist of two parts: the emergency system and the equipment system. The emergency system will consist of two branches: the life safety branch and critical branch. The life safety branch shall have no loads connected to it other than those loads listed in NFPA 70 (reference 10a) and NFPA 99 (reference 10c). Care should be taken in not supplying only critical branch circuits to any critical area. The failure of a critical branch component between the area and the transfer switch could render the entire section without power. Supplying a mixture of normal, critical, and even equipment branch power to critical areas may be more prudent (reference NFPA 99). The essential equipment system will serve all essential equipment listed in NFPA 70 (reference 10b) and NFPA 99 (reference 10c). Additional loads may be added to the critical branch or equipment system by the using Military Department as needed for effective hospital operation.

10.4 Interior Electrical Systems.

10.4.1 Interior Distribution. Interior lighting and power loads will be served at the highest voltage practicable. Fluorescent and High Intensity Discharge (HID) lighting systems and building power loads may be supplied by a 480Y/277 volt system. Dry-type transformers will be utilized to furnish 208Y/120 volt power for incandescent lighting, receptacle, and small equipment loads. A 208Y/120 volt system will be provided where the use of higher voltage is not cost effective. Main distribution switchgear and switchboards will employ solid state, adjustable trip circuit breakers. Panelboards for branch circuits will be of the circuit breaker type. Ground fault protection will be provided in accordance with NFPA 70 (reference 10b). All protective devices will be coordinated for selective overload, short-circuit, and

ground fault protection. Ground fault protection of the essential electrical system will be as described above.

10.4.1.1 Location and Space Requirements. Main Electrical Equipment Rooms will be located at or near the building exterior to facilitate initial installation of large equipment and removal and replacement of defective equipment. Adequate space will be provided for maintenance of electrical equipment and equipment removal. Pipes and other equipment foreign to the electrical equipment will not be located in, enter, or pass through such spaces or rooms. Where practicable in finished areas of hospitals, panelboards, signal, and communication cabinets will be grouped, surface-mounted, in separate, ventilated, electrical and communication wiring closets. Joint-use closets will not be provided. Closets in which dry-type transformers are installed should be located away from noise sensitive areas and provided with adequate ventilation to maintain an ambient temperature not to exceed 86 degrees F. For MTF's with more than three floors, electrical and communication closets should be stacked vertically whenever practicable.

10.4.2 Conduit and Wiring. All conductors will be copper. An insulated copper ground conductor will be run with all branch circuits. Refer to MIL-HDBK-1190 (reference 10a) for additional requirements.

10.4.3 Branch Circuiting. Circuits serving patient care areas shall comply with NFPA 99 (reference 10c) and NFPA 70 (reference 10b).

10.4.4 Wet Treatment Areas. Circuits serving "wet" treatment locations, see subparagraph 10.1.2.2, will be furnished with ground fault interrupters. Ground fault interrupters on circuits serving life support equipment shall not be installed. Refer to NFPA 99 (reference 10c).

10.4.5 Radiology Provisions. Refer to Universal X-Ray Room Criteria in Section 16 and Appendix B.

10.4.6 Receptacles. Receptacles shall be provided as follows:

10.4.6.1 Critical Care Areas. Provide receptacles in areas defined herein as critical care as required by NFPA 70 (reference 10b) and NFPA 99 (reference 10c).

10.4.6.2 Hospital Grade Receptacle. Hospital grade receptacles will only be provided for areas as required by NFPA 70 (reference 10b).

10.4.6.3 Safety Receptacles. Tamperproof safety receptacles will be provided as required by NFPA 70 (reference 10b). In addition, all Waiting Areas and Lobbies will be provided with tamperproof safety receptacles.

10.4.6.4 Ground Fault Circuit Interrupters (GFCI). GFCI receptacles will be provided only at locations required by NFPA 70 (reference 10b). Also provide in "wet" locations as described in Section 4 and at outdoor

locations. Do not provide GFCI receptacles or circuit breakers on circuits serving critical life support equipment.

10.4.6.5 Maintenance Receptacles. Maintenance receptacles will be provided in corridors, at equipment locations on roof, at exterior equipment locations in underfloor crawl spaces, and around the exterior perimeter of building.

10.4.6.6 Receptacle Identification. Receptacles connected to the emergency system will be identified as required by NFPA 70 (reference 10b) and NFPA 99 (reference 10c).

10.4.6.7 Patient Care Area Grounding. General care areas and critical care areas, including all anesthetizing locations, will be provided with a grounding system as required by NFPA 99 (reference 10c) and NFPA 70 (reference 10b).

10.4.7 Inhalation Anesthetizing Locations. All inhalation anesthetizing locations will be classified and designed as nonflammable. Operating Rooms, Delivery Rooms, Oral Surgery, Cardiac Catheterization, and other Special Procedure Rooms as may be defined by using Military Department are considered anesthetizing locations. Emergency power and isolated power will be provided as required by NFPA 70 (reference 10b) and NFPA 99 (reference 10c).

10.4.7.1 Flammable Anesthetizing Locations. Flammable anesthetizing locations may only be used for training in major teaching medical centers and only after approval has been obtained from the DMFO by the using Military Department.

10.5. Lighting.

10.5.1 Design Criteria. Lighting design will conform to the requirements of this handbook and Appendix A. The lighting footcandle design levels shall be within $\pm$ 10 percent for 50 fc and over, and $\pm$ 5 fc for lower levels. Emergency egress and exit lighting will conform to the requirements of NFPA 101 (reference 10g). Lighting design and switching will incorporate energy efficient features whenever practicable and be consistent with lighting criteria and the functional or operational intent of the Medical or Dental Treatment Facility. Fluorescent lighting will be provided to the maximum amount practicable, except that infrequently used small Storage spaces, Janitor's Closets, and "special" task locations such as in a Chapel, over Library carrels, Reception pass-throughs, and so forth, may be provided with incandescent fixtures. Exterior lighting will normally be high pressure sodium, metal halide, or flourescent (with cold weather ballast) types. Recessed fluorescent fixtures will be provided in rooms with lay-in acoustical tile ceilings. Fluorescent fixtures may be recessed or surface mounted in rooms with gypsum board ceilings. Industrial-type or open-strip-type fluorescent fixtures will generally be used in rooms with unfinished ceilings. Fixtures in large Storage and Supply rooms will be mounted to readily permit relocation within several feet.

Fluorescent lamps will be normally 34/40 watt energy saving. Refer to Section 7 for energy conscious design considerations.

10.5.2 Battery Operated Lights. Fifteen to 25 percent of the lighting in Operating Rooms, Obstetrical Delivery Rooms, Emergency Treatment Rooms, Cystoscopy, Cardiac Catheterization Rooms, and any rooms with invasive procedures will be provided with battery backup for general illumination which will operate without interruption during periods of normal and emergency power lapse. Additional battery-operated light backup may be installed for surgical lights in the above-mentioned rooms. Fifteen percent of lighting in Nurseries and 25% in the NICU Nursery should be provided with battery backup. Batteries will have the capacity for 1/2 hour illumination. A minimum of one battery powered light will be provided in the generator set, the emergency switchboard location, and central communications room(s).

10.5.3 Patient Bedrooms. Provide general illumination and reading lighting controlled by the patient. Provide examination lighting, as stipulated by the using Military Department, controlled at the bed location. Provide night lighting controlled at the corridor door.

10.5.4 Other Rooms. Refer to Appendix A. Corridor lights adjacent to Intensive Care Bedrooms will be one-third increment switch controlled. In Recovery Rooms, Coronary, and Intensive Care Units, acute care step-down bedrooms, X-ray Therapy Rooms, and where patients will be confined to a bed for extended periods, low-brightness lighting will be provided. Provide examination lighting controlled at bed location in Intensive Care Units, Isolation Rooms, Labor Rooms, Acute Care Step-down Rooms, and Recovery Rooms. Fixtures in Seclusion Rooms will be recessed type, of tamperproof construction with impact-resisting tempered lenses. Seclusion Rooms will be provided with night lights. Darkrooms will be provided with an incandescent photographic safelight in addition to the normal white light for general room illumination. This safelight will normally be considered an item of medical equipment. Provide a "Darkroom In Use" light (sign), located outside and above the Darkroom door and control with the safelight switch in the darkroom. This "Darkroom In Use" light is not required in light-tight type doors. For Darkrooms with film loading bins, bin drawers will be interlocked with Darkroom white light and safelight so that when a bin drawer is opened, white light is extinguished and safelight remains lit. Refer to Section 16 and Appendices A and B for Radiographic Room requirements.

10.5.5 Exterior Signage. Exterior signage for Emergency should be lit so that the letters themselves are illuminated. The facility name will be front illuminated from the sign exterior. Signage location will be coordinated with illumination of access roads, parking areas, and building entrances to minimize requirements for additional illumination of signage.

10.5.6 Parking Areas and Walkways. Site areas intended for night use will be illuminated by an average of 0.5 footcandles of incident light on the area served. (See para 14.5).

10.5.7 Helipad Lighting. Lighting for the helipad shall consist of a rotating beacon, perimeter, and landing direction lights, pad inset lights and flood lights. Lighting shall be connected to the essential power system.

10.5.8 Dimming. Dimming will be provided as noted in Appendix A.

10.5.9 Maintenance Area Lighting. Interior utility tunnels and walk-in pipe chases will be lighted by one footcandle of incident light for the safety of maintenance personnel. Switches will be equipped with pilot lights. Receptacles for temporary work lights will be located at reasonable intervals.

REFERENCES

10a. MIL-HDBK-1190, "Facility Planning and Design Guide."

10b. NFPA 70, "National Electrical Code."

10c. NFPA 99, "Standard for Health Care Facilities".

10d. ANSI C2, "National Electrical Safety Code."

10e. NFPA 37, "Standard for the Installation of Combustion Engines and Gas Turbines."

10f. NFPA 30, "Flammable and Combustible Liquids Codes."

10g. NFPA 101, "Life Safety Code."

10h. ANSI/IEEE Standard 602-1986, "IEEE Recommended Practice for Electrical Systems in Health Care Facilities."

SECTION 11: COMMUNICATIONS, INFORMATION SYSTEMS, AND SIGNAL SYSTEMS

11.1 General. This section provides general guidance on providing communications, information systems, and signal systems design for Medical and Dental Treatment Facilities (MTF's):

11.1.1 For purposes of this section, the term "telephone system" applies to that internal and external communication system which is not necessarily peculiar to MTF's and will include all telephone switches, instruments, cabling, conduits, etc.

11.1.2 The system(s) description, features, and needs discussed in this section are developed for various types of MTF's throughout DoD. The A-E should use this information as a starting place--expanding every system and need to the fullest extent--thus providing a complete Information Systems package which meets current demands and has expansion potential to meet future needs.

11.2 Communication Distribution Facilities. Communication systems, equipment, and associated facilities will be designed in conformance with provisions of applicable using Military Department regulations: Uniform Federal Accessibility Standards (reference 11a), ANSI Y32.2 (reference 11b), ANSI C2 (reference 11c), NFPA 70 (reference 11d), NFPA 72 (reference 11e), NFPA 72E (reference 11f), NFPA 99 (reference 11g), NFPA 101 (reference 11h), MIL-STD-188/124 (reference 11i), MIL-HDBK-419 (reference 11j), and ANSI/IEEE Standard 602 (reference 11k).

11.2.1 Exterior.

11.2.1.1 Design of the exterior cable system will be based on the existing installation cable network and the requirement(s) of the project. All exterior cable will be installed underground to extent feasible. The primary route from the new MTF's to the Installation network will be a concrete encased ductbank to the nearest manhole. This ductbank will support cables for Telephone, Medical Information System, Cable Television (CATV), Energy Monitoring and Control System (EMCS), and any other communications systems required for the project.

11.2.1.2 In those cases where there is an aerial service connection point, underground conduits shall be installed from the new Medical or Dental Treatment Facility to the nearest service pole.

11.2.1.3 Conduits in ductbank will provide for current needs and for future expansion. Design will be coordinated with the forecasts for Electronic Private Automatic Branch Exchange (EPABX) line and trunk load and all other cable systems using the ductbank. The Design Analysis shall include the basis for conduit quantities used. Design of ductbank and manholes shall be based on using Military Department requirements.

11.2.1.4 Where long runs of cable are required to connect to the nearest point of service or where a large cable pair count is required from the new Medical or Dental Treatment Facility to the Installation Dial Central Office (DCO), fiber optic cable or screened cable to provide digital T-1 circuits may be used as required by using Military Department.

11.2.2 Interior.

11.2.2.1 Provide cable trays above suspended ceilings in corridors for all communications systems cables. Cable trays shall be located just above the ceiling and shall be designed and installed to ensure ease of accessibility for future wiring changes. Cable trays in MTF's with Integrated Building Systems (IBS) will be located in the distribution zone. (See Section 19). A conduit will be provided from each communication system outlet to the cable tray. Fire alarm and intrusion detection systems wiring will be installed in separate, totally enclosed conduit systems.

11.2.2.2 Communications Rooms and Closets. Communications rooms and electrical closets will be sized to accommodate telephone distribution terminal boards and the equipment panels of other communications systems. Provide utility and maintenance outlets on a dedicated circuit of the equipment branch of the emergency power system. Temperature and humidity conditioning will be provided to maintain the rooms at 78 degrees F (maximum) and 30 to 60 percent relative humidity. Ensure that alternating current (AC) power from the appropriate emergency power branch is provided for each communication system. Space for those functional areas will be taken from the mechanical equipment space in the Program for Design (PFD).

11.2.2.3 Communications Head-End Equipment Room. Provide a separate Communications Equipment Room with sufficient space for personnel circulation and equipment maintenance in MTF's for head-end equipment such as television, public address and program distribution, radio, and data communications equipment. This room may be located adjacent to the EPABX room, the Computer Room, or in the Mechanical areas. The head-end room should not be incorporated with the EPABX for security reasons. All installed equipment will be shown on the drawings. Circuit breaker panels fed from the appropriate emergency system branches as described in Section 10 shall be installed in the room to serve the head-end equipment. Design of the room will include temperature and humidity control to ensure that a temperature of 78 degrees F (maximum) can be maintained at a relative humidity of 30 to 60 percent.

11.2.2.4 Central Communication Room. A Central Communication Room will be located as directed by the using Military Department and sized in accordance with the Program for Design (PFD). The Central Communication Room size will 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 the following systems as required:

a) Energy Monitoring and Control System (EMCS),

b) Engineered Smoke Control System (ESCS),

c) Fire detection and alarm system,

d) Generator monitor and alarm system,

e) Medical gas monitors and alarms,

f) Closed Circuit TV (CCTV) for security (space designated for monitor and programmable system and control equipment and video cassette recorder),

g) Refrigeration temperature monitor and alarm system (Blood Bank, Food Service, Pharmaceuticals (Pharmacy and Material) and Morgue),

h) Public address master microphone and paging zone selector panel,

i) Radio paging console,

j) Telephone attendant console,

k) Security system console,

l) EPABX alarms, Operator Console, and

m) Dual cassette tape recorder/player to record Emergency Room calls.

11.3 Central Telephone System Requirements. The central telephone equipment shall be an EPABX or an electronic key system as prescribed by the Defense Medical Facilities Office (DMFO) and the using Military Department. DMFO policy prescribes that an EPABX is required at most DoD MTF's for voice and data transmission. An EPABX is required in all hospitals and all MTF's with a readiness or mass casualty mission. For other MTF's, an electronic key system or a hybrid system which combines features of an electronic key system and an EPABX will be provided. The Medical or Dental Treatment Facility telephone system shall be independent of the Installation DCO except for trunk access to other Installation telephones, autovon, and the commercial system. Any exception shall require special approval from DMFO. The method of providing the telephone system, i.e., Electronic Key System (EKS) or small commercial Electronic Private Automatic Branch Exchange (EPABX) for clinics, and large (500 lines and larger) EPABXs, shall be in accordance with the S-3 Submittal. A recommendation based on cost factors, user requirements, and the Installation telephone system shall be made by the using Military Department communications service. For installations outside CONUS, the recommendations shall also be based upon host nation and Communications - Computers System (C-CS) agreements

and systems interface approval requirements. (Examples include the European Telephone System (ETS) in West Germany, the Korean Telephone Upgrade (KTU) program in South Korea, and British Post Office regulations for systems in the United Kingdom.)

11.3.1 Integrated Intercommunication (InterCom) Systems. Except for the dedicated intercom systems listed in other parts of this section, all intercom functions will be engineered into the hospital telephone EPABX. These inter- com systems will be completely provided in the EPABX hardware and software with no external equipment required. All intercom systems calls will be private line (two subscribers) except when callers use three party conference or executive bridging. Each intradepartmental intercom system will be accessed via a separate function button on the subscriber electronic feature telephone. A two or three digit number shall be dialed to access stations.

11.3.1.1 Intradepartmental. Subscribers within a dedicated group will be provided an efficient means of two-way voice communication. Intradepartmental intercom will be provided among department heads, secretaries, NCOICs, and other staff members who converse on a frequent basis. The intradepartment intercom groups will be identified on the Telephone Station Requirement Schedule (TSRS) by assigning an appropriate alpha numeric code to each station in the group.

11.3.1.2 Interdepartmental. There will be no special interdepartmental intercom networks on the telephone system. However, in order to assure that critical medical care areas can reach any office in the MTF during an emergency, the executive bridging feature shall be assigned to all telephones in those areas. A list of critical care areas is contained in Section 10. That table will be used during TSRS development to assure all critical medical care areas are assigned this service.

11.3.2 Telephone Instruments. Instruments are to be provided in accordance with Figure 1-2 and in each functional area as required by using Military Department requirements. All instruments shall have push button Dual Tone Multi-Frequency (DTMF) dial pads. All single line instruments shall have a "tap" button to flash the hook switch.

11.3.3 Public Pay Telephone. Pay telephones will be positioned to accommodate handicapped individuals and patients in wheelchairs in accordance with Uniform Federal Accessibility Standards (UFAS, reference 11a). Pay station outlets will be placed in quiet locations that are conveniently located near high traffic areas. Pay stations will normally be provided in the Emergency Waiting areas, the Main Entrance Lobby, public corridors outside Nursing Units, Auditorium foyers, Expectant Fathers' Waiting Rooms, the Family Waiting Room of the ICU/CCU complex, and in Admissions and Dispositions (A&D) Waiting.

11.4 Central Dictation System. Design will include conduit, cable, and outlets for Government furnished, Government installed (GFGI) central dictation systems. One or more will be provided, depending on

the size of the Medical or Dental Treatment Facility. Access to the central dictation system will be provided on telephones as shown in the TSRS. Dictation access from outside the Medical or Dental Treatment Facility will be through the telephone operator or through DID lines into Central Dictation. Refer to using Military Department for any additional requirements.

11.5 Facsimile System (FAX).

11.5.1 Design will include outlets, wire, and ports on the telephone switch to accommodate GFGI facsimile equipment. The number of outlets and their specific locations will be identified by the using Military Department during the design process.

11.5.2 The system will use telephone lines and will access other stations through the EPABX. Ensure these facsimile outlets are included in the EPABX line count and are shown on the TSRS. Facsimile outlet locations will be provided by the user.

11.5.3 Refer to using Military Department for any additional requirements.

11.6 Public Address, Paging, and Program Distribution Systems. Public address system(s) shall be accessible from the telephone system. Refer to using Military Department for additional requirements.

11.7 Fire detection and Alarm System. Refer to Section 13 for requirements.

11.8 Energy Monitoring and Control System (EMCS). Refer to Section 7 for requirements.

11.9 Intrusion Detection System. Refer to Section 14 for requirements.

11.10 Nurse Call System. A nurse call system, visual and/or audio-visual, shall be provided in all MTF's. For general information refer to ANSI/IEEE Standard 602 - 1986 (reference 11k). Exact configuration and operational requirements of the system shall be identified by the using Military Department.

11.10.1 Hospitals. A nurse call system shall be provided in the following areas (connected to the emergency power system):

a) Nursing Units, i.e., Medical/Surgical, OB/Gyn, Pediatrics, Neuropsychiatric, and Intensive and Coronary Care.

b) Surgical Suite,

c) Delivery Suite,

s may be served by VAV, dual duct, or 8.4.3.3 Outpatient Clinic

d) Nursery,

e) Emergency Clinic, and

f) Radiology.

11.10.2 Clinics. A nurse call system with limited capabilities may be provided for patient care rooms in free-standing medical and dental clinics.

11.11 Miscellaneous Communications Systems. Radio Paging Systems, Emergency Medical Service (EMS) Communications, Clocks, Physiological Monitoring, Special Monitoring Equipment, Medical Information Systems, and Entertainment Television Distribution Systems shall be provided according to using Military Department requirements.

REFERENCES

11a. FED-STD-795, "Uniform Federal Accessibility Standards" (UFAS), 1 April 1988.

11b. ANSI Y32.2, "Graphic Symbols for Electrical and Electronic Diagrams."

11c. ANSI C2, "National Electrical Safety Code."

11d. NFPA 70, "National Electric Code."

11e. NFPA 72A, "Protective Signaling Systems, "Standards for the Installation, Maintenance, and Use of Protective Signaling System.

11f. NFPA 72E, "Fire Detectors, Automatic."

11g. NFPA 99, "Health Care Facilities."

11h. NFPA 101, "Life Safety Code."

11i. MIL-STD-188/124, "Grounding, Bonding and Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments."

11j. MIL-HDBK-419, "Grounding, Bonding and Shielding for Electronic Equipments and Facilities," Volume 1 and 2.

11k. ANSI/IEEE Standard 602, "IEEE Recommended Practice for Electrical Systems in Health Care Facilities."

SECTION 12: PROVISIONS FOR THE PHYSICALLY HANDICAPPED

12.1 General. Medical and Dental Treatment Facilities (MTF's) of the Department of Defense are required to be accessible to physically handicapped persons and shall be designed and constructed or retrofitted in accordance with the Uniform Federal Accessibility Standards (UFAS) (reference 12a). In general, all MTF's worldwide which are open to the public, or to limited segments of the public, or which may be visited by the public in the conduct of normal business, shall be designed and constructed to be accessible to physically handicapped persons. All MTF's should be designed to assure access to physically handicapped persons unless their intended use is specifically restricted to able-bodied military personnel. Able-bodied military personnel is defined as all active duty military personnel.

12.2 Patient Bedroom Toilets. All toilet/shower rooms serving patient bedrooms shall be designed to be accessible to the physically handicapped.

12.3 Overseas Facilities. U.S. funded MTF's constructed by the Department of Defense overseas will be accessible. Facilities for which the United States contributes a portion of the construction cost but does not control design criteria (such as NATO-funded facilities) need not but should be accessible. Facilities being constructed by or for use by the United States under the laws, codes, rules, and regulations of another country need not but should be accessible. Facilities being leased by the United States in other countries need not but should be accessible.

12.4 Military Exclusions. Spaces in MTF's intended for functions that require only able-bodied personnel as an employment requirement or where it is intended at the time of design that no handicapped persons will be employed need not comply with UFAS but should be accessible. Examples of this type of facility are contingency facilities and troop aide stations. As a minimum "should be accessible" is defined as providing egress and accessible door access to all spaces. In newly constructed institutional occupancies and other types of facilities providing outpatient medical, dental, or other treatment or care, all common use areas are required to be accessible. Pursuant to UFAS, although accessibility is recommended in all facilities, generally excluded are facilities which are intended for the use of, or occupancy by, or staffed only by able-bodied military personnel only; however, accessibility will be required in areas such as nursing units, dressing rooms, doctor's offices and examination rooms, and dental treatment rooms if the area in question is open to the public or is used by employees whose duties could be performed by a person with a disability. If a disabled person, in particular one in a wheelchair, could perform the duties set forth in the job description or the actual duties performed, accessibility will be required.

from a 8-foot non-portable ladder (reference 8e).

12.5. Medical Device Controls. Controls for medical gases, Operating Room lights, sterilizers and similar equipment may be located as established by customary Medical and Dental Treatment Facility design practice.

12.6. Waiver Authority. The Architectural Transportation Barriers Act permits the modification or waiver of the UFAS, on a case-by-case basis, if it can be shown that the modification or waiver is clearly necessary. Requests for modification or waiver should be sent to DMFO who will consult with the Deputy Assistant Secretary of Defense (Civilian Personnel Policy) to determine whether a modification or waiver should be pursued and subsequently granted. Waivers will be granted only in extraordinary circumstances.

REFERENCE

12a. FED-STD-795, "Uniform Federal Accessibility Standards" (UFAS), April 1, 1988.

SECTION 13: FIRE PROTECTION

13.1 General. This section provides fire protection design guidance for DoD Medical and Dental Treatment Facilities (MTF's). Any deviation from the criteria listed in this section shall require a waiver from the Design Agent with full justification from the fire protection designer. Waivers shall be submitted to DMFO for approval via the Design Agent. This section does not apply to contingency facilities, which will be governed by "minimum, austere, but adequate," given the least stringent requirements which can safely protect the contents of the contingency facility.

13.1.1 Codes and Standards. Fire protection for DoD MTF's shall comply with MIL-HDBK-1008A, the latest edition of the National Fire Codes (reference 13b), Joint Commission on Accreditation of Health Care Organizations (JCAHO) Manual (reference 13a), and Special Studies conducted by the Institute of Standards and Technology (NIST). The National Fire Codes and Standards will govern in all areas of protection addressed by the NFPA Codes and Standards.

13.1.2 Fire Protection Concept. The concept for DoD MTF's fire protection design involves the following five major considerations:

13.1.2.1 Prevention. This includes the basic choices of construction configuration, type, and method so that the structure can forestall the inception of a fire.

13.1.2.2 Detection. Provision is made for early warning of fire or smoke and the means of communicating the location or other information needed to take action.

13.1.2.3 Containment. This requires isolation and confinement of fire or smoke and the clearing of resultant smoke from the affected compartment.

13.1.2.4 Extinguishment. This includes provision of means to immediately or automatically fight any fire, including access for firefighters.

13.1.2.5 Evacuation. This requires provision of a clear, safe, understandable, and effective means of egress and escape to safe refuges or the outside for all occupants in case of fire or smoke.

13.1.3 Scope. This section specifies fire protection criteria for all facilities which provide medical, psychiatric, obstetrical, or surgical care on a 24-hour basis for four or more inpatients who are mostly incapable of self- preservation because of mental or physical disability and are bedridden, nonambulatory, or have impaired judgement. It also specifies fire protection criteria for free-standing Clinics and

erial to be constructed of acid resistant type rooms for radioactive mate

Dental Clinics. Outpatient areas of Hospitals may be classified as other occupancies (such as assembly or business) provided the following conditions are met:

13.1.3.1 Separation. Such facilities are separated from the health care occupancy by 2-hour fire-rated construction.

13.1.3.2 Access. Access for examination, consultation, or treatment of bedridden or litter borne patients shall be limited in such occupancies. Routine access by this category of patient shall be prohibited.

13.1.3.3 Anesthesia. Procedures requiring general anesthesia shall be prohibited in business occupancy areas as defined by NFPA 101 (reference 13b) and NFPA 99 (reference 13e).

13.1.3.4 Egress. All means of egress from the health care occupancy that traverse nonhealth care areas shall conform to the requirements for health care facilities as prescribed in the National Fire Codes.

13.1.4 Fire Safety Evaluation System (FSES). The NFPA 101M (reference 13f), or FSES, may be applied to new stand-alone health care occupancies, alterations to existing MTF's, and additions and/or alterations to MTF's. However, the JCAHO will not accredit a new or replacement stand-alone health care occupancy MTF based on NFPA 101M. New or replacement healthcare occupancies must be designed in accordance with NFPA 101 for accreditation. New or replacement MTF's which will never seek JCAHO accreditation may be designed IAW NFPA 101M only after approval is sought from and granted by DMFO. For existing MTF's, equivalent fire safety protection in accordance with NFPA 101M may be proposed by a qualified fire protection consultant if they are approved by the appropriate Design Agent and subsequently submitted to DMFO for approval. (See Appendix C for JCAHO procedures.)

13.2 Construction. NFPA 101 (reference 13b) shall be used to specify the type of construction. NFPA 220 (reference 13g) shall be used to determine the requirements for construction classification.

13.2.1 Number of Stories. For fire protection and life safety design purposes, the number of stories in a building will be determined by NFPA 101 rules.

13.2.2 Additions and Alterations to Existing Buildings. In alteration projects, any affected areas in the MTF will at least be brought up to current code requirements. FSES approach shall be considered to meet this requirement.

13.3 Comprehensive Design. Each new hospital and hospital based clinic shall have a comprehensive fire protection design which includes protection throughout the building by an approved automatic sprinkler system. (See exceptions in 13.10.1). All fire protection provisions shall be summarized and submitted as a separate plan supported by a fire

protection design analysis, including fire protection drawings developed during the Concept phase of the design. The fire protection study shall include related design considerations and criteria that have been coordinated among all the affected disciplines and shall serve as the basis for the design, construction, and future operation of the building. If required by the Design Agent, a completed Statement of Construction will be provided at the completion of construction by the contractor.

13.4 Construction Operations. Life safety provisions during construction specified in the National Fire Protection Codes shall be provided. When a Medical or Dental Treatment Facility is to be occupied during a renovation and upgrade, consideration shall be given to the potential impact of life safety in occupied areas. Construction and demolition phasing shall be planned so that the integrity of firewalls, smoke walls, stairways, and vertical shafts, which are contiguous with inpatient areas, is maintained to the highest level possible. Appropriate safety measures in accordance with NFPA 101 will be incorporated into temporary structures.

13.5 Occupancy Classification.

13.5.1 Health Care Occupancy. Hospitals and areas of Medical Treatment Facilities that routinely treating inpatients shall be classified as "health care occupancy" as defined in NFPA 101 (reference 13b). Outpatient areas of the above may be classified as another occupancy as specified in paragraph 13.1.3.

13.5.2 Business Occupancy. Outpatient only medical and dental clinics should normally be classified as "business occupancy." Business occupancy will be used where allowed by NFPA in Dental facilities and free-standing clinics. (Reference NFPA 101 and NFPA 99.)

13.5.3 Life Safety Provisions. All life safety provisions shall be in accordance with the NFPA 101.

13.5.4 Mixed Occupancies. It is expected that an occasional hospital patient who may be litter-borne will enter ambulatory care, medical clinics, and similar facilities that are primarily intended to provide outpatient services and are classified as a Business or Ambulatory Care Occupancy.

13.6 Means of Egress. Egress requirements shall conform to the National Fire Codes.

13.7 Areas of Refuge. Total evacuation of the occupants to the outside of the building is often considered to be impractical. Therefore, areas of refuge may be implemented through the use of compartmentation and smoke removal or control when a rapid and complete evacuation is not feasible. Topic requires continued monitoring by the using Military Department during design.

13.8 Detection and Alarm Systems.

13.8.1 Fire Alarm Systems. Fire alarm systems shall be provided in all facilities, shall meet the requirements of NFPA 101, and shall be installed to meet the requirements of the NFPA 72 Series (reference 13i).

13.8.2 Fire Alarm System Features in Hospitals. The system shall be placed on the life safety branch of the emergency power system. Each hospital shall have an independent, supervised, coded fire alarm system.

13.8.3 Fire Alarm System Features in Free-Standing Clinics. Outpatient only clinics shall be provided with a supervised, manually operated, noncoded, general alarm system. However, large Outpatient Clinics in excess of 50,000 sq.ft. (4,645 sq. meters) may be provided with a coded system.

13.8.4 Automatic Smoke Detection. Smoke detection shall be provided where required in accordance with NFPA 101, NFPA 101M, NFPA 90A, NFPA 72E, and MIL-HDBK-1008A (reference 13h).

13.8.5 Transmission of Alarms.

13.8.5.1 Fire Station. Automatic sprinkler systems, automatic detection systems, and manual fire alarm systems shall be equipped to transmit alarms to the fire station, or when latter is not available, to suitable locations where responsible personnel are continuously on duty.

13.8.5.2 Fire Extinguishing Systems Signal Transmissions. Systems, when activated, shall automatically transmit a signal to the fire station.

13.9 Smoke Control Systems. Smoke control systems shall conform to NFPA 92A (reference 13j), NFPA 92B (reference 13y), and the appropriate sections of NFPA 101. When a smoke detection system is used to initiate smoke control, it shall conform to the recommendations of NFPA 72E.

13.10 Protection.

13.10.1 Automatic Sprinkler. All Medical and Dental Treatment Facilities shall be protected throughout by an approved automatic sprinkler system installed in accordance with NFPA 13 (reference 13k). Exception: Outpatient Clinics and Dental Clinics one or two stories in height which are of 1-hour fire resistant construction and are within 4-6 minute response time of an adequately equipped and manned fire department. (See paragraph 13.3)

13.11 Electronic Equipment Installations.

13.11.1 Facilities to House Electronic Communications and Automatic Data Processing (ADP). EPABX equipment or other electronic

communications or ADP equipment shall be separated from other occupancies by a minimum of 1-hour fire-rated walls.

13.11.2 Fire Protection. Protection shall be provided as required in MIL-HDBK-1008A, Fire Protection (reference 13c).

13.11.3 Automatic and Manual Controls. Controls to disconnect power to all electronic equipment and shut down the air conditioning system shall be provided.

13.11.4 Halon Extinguishing Systems. Use of halon extinguishment systems is prohibited.

13.12 Atriums. Atriums shall conform to the requirements of NFPA 101 (reference 13b) and NFPA 92B (reference 13y).

13.13 Food Preparation Areas.

13.13.1 Commercial Cooking Range Hoods. Hoods and duct systems for cooking equipment which produces grease-laden vapors or smoke shall comply with NFPA 96 (reference 131).

13.13.2 Fire Extinguishing Systems Requirements. Extinguishing systems shall be provided in food preparation areas. Self-cleaning water-wash ventilators with waterspray fire protection systems shall be used to protect cooking surfaces, ducts, grease removal devices, and range hoods.

13.14 Integrated Building Systems. Fire protection codes and standards for health care facilities for an IBS design are identical to those for any MTF. The IBS configuration does impact the requirements of the referenced codes and standards to accommodate the nontraditional characteristics in the IBS approach. Supply services to any system module shall serve an area that corresponds to the smoke compartment, including electrical power, fire alarm zoning, automatic sprinkler zoning, and HVAC zoning. Supply services are defined as utilities, i.e., water supply, electrical power and medical gases that originate outside of the module, feeding utilities in the distribution zone of the system module.(See Section 19).

13.14.1 Construction.

13.14.1.1 Exiting. For fire protection exiting calculations, the building stories shall be counted starting at the primary level of exit discharge and ending at the highest occupied level. Building levels below the primary level of exit discharge shall not be counted as stories in determining the height in stories. The walk-on platforms constituting the levels of distribution zones do not constitute stories and shall not be counted.

13.14.1.2 The walk-on platform of the distribution zone shall be designed to act as a 2-hour fire-rated separation between the occupied zone and the distribution zone.

13.14.1.3 Columns. All columns shall be provided with the required degrees of fire resistance within all zones.

13.14.1.4 Other Structural Members. Other structural members will be provided with the degrees of fire resistivity as demonstrated in test NBSIR 85-3158 (reference 13n) or other approved tested assemblies. Lateral and seismic bracing not included in the test assembly need not be fireproofed provided they do not carry vertical loads (live or dead).

13.14.1.5 Utility Pods. Utility Pods shall be separated from the occupied, connection, and distribution zones by 1-hour fire resistive construction. Ducts penetrating this separation shall be fire dampered.

13.14.1.6 Openings. Openings through a 2-hour rated walk-on platform shall be protected as follows:

a) Pipe and conduit shall be tightly sealed at walk-on platform with approved material, and

b) Shafts shall be enclosed in properly rated construction and sealed at walk-on platform with an approved material.

13.14.1.7 Walls Other Than Shafts. Walls, smoke barrier partitions, occupancy separations (up to 2-hour fire resistive), and horizontal exit walls may terminate at the bottom of the walk-on platform.

13.14.2 Sprinkler Systems.

13.14.2.1 Sprinkler systems shall be arranged so that activation of any sprinkler in the smoke zone will activate a single flow alarm that will annunciate within the zone and at the fire emergency control center.

13.14.2.2 Sprinklers shall be provided throughout the occupied zone and in the utility pod.

13.14.2.3 Sprinklers are not required in the distribution zone.

13.14.3 Standpipe Systems.

13.14.3.1 Each enclosed exit stair shall include a Class III standpipe.

13.14.3.2 The sprinkler riser for a module shall be combined with a standpipe riser within the module.

13.14.3.3 Hose outlets will be provided on the landings at the occupied zone and at the entrances to the distribution zone located in the utility pod.

13.14.4 Smoke Removal. Each project shall be evaluated on an individual basis for the requirements for a smoke removal system. Typically a manual smoke purge system shall be provided for each individual system module with manual control available from the fire emergency control center. An engineered smoke control sysstem is required by NFPA if windows in patient rooms are not operable. "Smoke removal" is not considered an "engineered smoke control system."

13.14.4.1 Ventilation shall be required in the distribution zone.

13.14.4.2 Smoke removal shall be required in the distribution zone--see paragraph 19.10.8.

13.14.4.3 Every effort shall be made to design all HVAC systems to be contained within an individual module. Smoke removal/smoke purge should be zoned and annunciated by IBS module.

13.14.5 Fire Detection and Smoke Detection Systems. Each project shall be evaluated to determine the need for detection systems in special areas using NFPA 101 as a guide. All fire protection devices shall annunciate at the fire emergency control center. Annunciator panels shall annunciate by module, floor, and category of device (smoke, manual, water flow, trouble).

13.14.6 Horizontal Exits. Horizontal exits shall be utilized to the fullest extent possible to minimize exit stairs. See NFPA 101.

13.14.7 Distribution Zone.

13.14.7.1 An access door from each required exit stairway shall be provided to the distribution zone.

13.14.7.2 Access doors shall be locked and accessible only by key.

13.14.7.3 Each access door shall bear the sign "Storage in This Area is Prohibited by Order of the Fire Marshall." A similar sign shall be placed inside the space also.

13.14.7.4 The distribution zone is a normally unoccupied space and is not to be utilized for any storage.

13.14.7.5 A manual pull station shall be provided at each egress door from the zone. This device shall be zoned with the module that the exit enclosure serves. It shall be on an independent manual pull fire alarm zone.

13.14.7.6 Exit signs shall be illuminated and located at each egress door from the zone. Two signs shall be provided; one above the doorway

and one adjacent to the doorway within 36 inches of the walk-on platform.

13.14.7.7 Egress illumination shall be provided. The degree of illumination and location of lights shall be determined for each module.

13.14.7.8 Exit signage and egress illumination shall be on life safety circuits and provided with standby or emergency power. Since the space is normally unoccupied, the light switches at each egress doorway shall activate normal lighting, egress illumination, and exit sign illumination within the module. This shall minimize electrical usage and replacement of lamps in the distribution zone.

13.14.7.9 Upon any fire signal in a module, bells within the distribution zone of that module shall be activated. These are part of the module fire alarm and warning system.

13.14.8 Special NFPA Ruling on Fire Protection Provisions. Where the use of interstitial space is being considered, the following criteria for corridor walls shall be used. Exception: Corridor walls may terminate at ceilings which are not an integral part of the floor construction if there exists 5 ft. (1.5 m) or more of space above the top of the beams or joists protected by or supporting the ceiling, provided:

13.14.8.1 The ceiling meets the conditions of acceptance for ceiling construction specified in NFPA 251 (reference 19m) for a test period of one hour or more, and

13.14.8.2 Corridor walls form smoke-tight joints with the ceilings (joint filler, if used, must be noncombustible), and

13.14.8.3 Each compartment of interstitial space which constitutes a separate smoke area shall be vented, in case of smoke emergency, to the outside by mechanical means having sufficient capacity to provide at least two air changes per hour, but in no case having a capacity less than 500 cfm (850 cubic meters/ hour), and

13.14.8.4 The interstitial space shall not be used for storage, and

13.14.8.5 The interstitial space shall not be used as a plenum for exhaust, return, or supply air except as noted in 13.15.10.3 above.

REFERENCES

13a. Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

13b. NFPA 101, "Life Safety Code."

13c. MIL-HDBK-1008A, "Fire Protection."

13d. "Uniform Building Code," International Conference of Building Officials.

13e. NFPA 99, "Health Care Facilities Handbook."

13f. NFPA 101M, "Fire Safety Evaluation System (FSES)."

13g. NFPA 220, "Standard Types of Building Construction."

13h. NFPA 72E, "Protective Signaling Systems."

13i. NFPA 72 Series, "Signaling Systems."

13j. NFPA 92A, "Smoke Control Systems."

13k. NFPA 13, "Sprinkler Systems Installation."

13l. NFPA 96, "Cooking Equipment, Vapor Removal."

13m. NFPA 251, "Building Construction and Materials, Fire Tests of."

13n. NFPA 30, "Flammable Liquids."

13o. NFPA 45, "Laboratories Using Chemicals."

13p. NFPA 50, "Bulk Oxygen Storage."

13q. NFPA 70, "National Electric Code."

13r. NFPA 75, "Protection of Electronic, Computer/Data Processing Equipment."

13s. NFPA 82, "Incinerators, Waste and Linen Handling Systems."

13t. NFPA 96, "Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment."

13u. NFPA 232, "Protection of Records."

13v. NFPA 90A, "Air Conditioning and Ventilation Systems."

13w. NFPA 251, "Building Construction and Materials, Fire Tests of."

13x. NBSIR 85-3158, "Fire Performance of Interstitial Space Construction Systems."

13y NFPA 92B, "Smoke Management System in Malls, Atria, and Large areas.

SECTION 14: SECURITY

14.1 General. This section is intended to provide general guidelines for security/loss prevention efforts in the planning, design, and construction of DoD Medical and Dental Treatment Facilities (MTF's) worldwide. MTF's must be designed to maximize the protection of occupants and contents against harm or loss without undue interference in the provision of health care services. From a practical standpoint, it must be recognized that absolute security can never be obtained.

14.1.1 Potential Threats. Potential threats to DoD MTF's are generally influenced by the military installation's mission, the installation's location (CONUS vs overseas), and site specific conditions. Vulnerability of a treatment facility is contingent upon not only the existence of a threat but also upon the MTF Installation's ability to counteract the threat. Design and construction related security considerations are important to all MTF's but may be of greater concern for overseas facilities since the exposure to threat from a variety of adversaries is more likely.

14.1.2 Passive Security. DoD MTF's should be designed to maximize passive security, which largely depends on staff awareness of the presence of unauthorized persons. This concept depends on the utilization of security type zoning within the facility. All areas in the facility should be placed in designated classifications: unrestricted, controlled, or restricted. The purpose of physical security is to make unauthorized access to assets so difficult that an intruder will hesitate to attempt a facility penetration or will, in the course of such efforts, be forced to take actions which will assist in detection or apprehension. Consideration should be given to the following:

14.1.2.1 Access Control. Proper design permits staff to control specific areas of responsibility, reducing or eliminating the opportunity for undesirable behavior within a designated area, by restricting entry to only those authorized personnel having legitimate reasons for access. Consideration should be given to location and design of department reception areas and other operational functions to assist in controlling entry.

14.1.2.2 Proximity Placement. Planning and design should take into consideration collocating departments of similar sensitivity and access requirements, if feasible, and design of parking, entrances, and personnel traffic patterns to maximize the effectiveness of an access control system.

14.1.2.3 Good Visibility and Communication. Location of reception desks should afford unrestricted visibility of entry ways thereby establishing an entry control point. Traffic patterns must also bring traffic to these control points to ensure effective staff control.

14.1.3 Physical Construction. Physical construction should be built to resist break-in or destruction from overt or covert attack, where necessary, due to contents or function, i.e., Cashiers, Pharmacies, and Store Rooms.

14.1.4 Electronic Security/Monitoring Equipment. Electronic security (anti-intrusion devices) shall be provided for DoD MTF's when required and authorized.

14.1.5 Keys and Locks. The master key and lock plan for the MTF shall provide multiple levels of physical security as well as entry control.

14.1.6 A Systematic Approach. A systematic approach for the provision of securing a MTF during the planning and design of such facilities is absolutely necessary. During the planning phase, determinations should be made by the using Military Department regarding the assets to be protected and security design requirements necessary to protect these assets. During the design phase, measures should be incorporated for the protection of these assets. The security design process shall follow the following general guidelines:

14.1.6.1 Design Criteria Phase. The design criteria phase shall

criticality determination as a design basis for aggressor(s) identification and vulnerability determination.

14.1.6.2 Protective Design Phase. The protective design phase shall include protective system determination and document preparation for Concept Design purposes.

14.2 Levels of Security Resistance. The following levels of security resistance are defined according to the operational mission:

14.2.1 Medical Clinics, Dental Clinics, and Other Medical Facilities Excluding Hospitals. In addition to the above:

14.2.1.1 Protection shall consist primarily of anti-intrusion alarms on exterior doors with alarms monitored by the facility staff. Internal alarms shall be provided at the Emergency Reception desk when staffed 24-hours a day or preferably at the Central Security Operation Point for the facility, if one exists.

14.2.1.2 Other basic security devices shall be included for narcotics lockers, precious metal safes, and medical bulk storage warehouses with local and remote alarms.

14.2.2 Base/Station Hospital. The essential requirement is to provide an appropriate level of security protection for personnel and government property. The objective is to decrease the opportunity for security problems to develop. Security shall be enhanced in addition to the above by:

14.2.2.1 Traffic patterns that can be controlled with a minimum of entrance points during off-duty hours in a facility staffed 24-hours a day. In small base/station hospitals where the Emergency Reception is the only point of entry that is manned, visitors to the MTF should enter within direct control of the Emergency Reception desk. Other entrances such as Dental Clinic or hospital and clinic entrances shall be locked after duty hours and controlled with anti-intrusion alarms.

14.2.2.2 Remote, electrically operated locks which can be controlled from a central point such as Emergency Reception or Command and Control Center. This system establishes the Emergency Reception and/or the Command and Control Center as the central security operations point of the hospital after duty hours. These locks can be released automatically when fire and smoke alarms are activated for those doors which are for fire egress.

14.2.2.3 Vaults and Secure Storage areas require special design considerations. See paragraph 14.4, Sensitive Areas.

14.2.2.4 Anti-intrusion alarms, duress alarms, and/or motion or sonic detectors shall be planned to meet the security requirements of the location and as established by the using Military Department.

14.2.2.5 Closed circuit television may be considered, when available, in those areas specified by the using Military Department.

14.2.2.6 Card access systems to sensitive areas such as computer rooms, pharmacies, and other areas as specified by the using Military Department.

14.2.3 Regional Hospital and Medical Centers. These larger MTF's require greater attention to security design and systems. Security design and systems that shall be considered in addition to the above are:

14.2.3.1 Closed circuit television and monitoring.

14.2.3.2 Remote electrically operated locks on primary exterior doors.

14.2.3.3 Magnetic, timed locks which may be released only through integral fire and smoke alarms or the installation police.

14.2.3.4 Alarm systems, including anti-intrusion, duress, motion, and sonic detection.

14.2.3.5 Proper MTF design to afford maximum security for patients, staff, and visitors.

14.2.3.6 Proper site layout, lighting, and landscaping to meet security requirements established by the using Military Department.

14.3 Security Systems. A security system is a composite of people, equipment, and procedures. Functionally, these resources break down into six categories of security components that involve: intelligence, personnel, security clearance, entry control, physical structures and barriers, security forces, and anti-intrusion systems.

14.3.1 Component Role. Each of these components plays its own supporting role in the achievement of physical security. Intelligence activities provide a variety of data that are essential to the planning and design of a security system. These data include intelligence estimates of the relative skills of potential adversaries, the capabilities and availability of new penetration measures, and the anticipated attack patterns and tactics that may be used. Personnel security clearances provide a means of establishing and maintaining control over the movement of personnel to achieve security compartmentalization. Physical structures form barriers that the intruder must penetrate to perform his or her mission. Security forces perform many of the functions that keep the overall physical security plan in operation. Anti-intrusion detection systems permit efficient use of security forces by allowing available manpower to be shared in the protection of a number of areas.

14.3.2 Component Interrelationship. It is evident that there are symbiotic interrelationships among the elements of physical security systems. The interrelationship between an intrusion detection system and security forces requires mandatory response by the security force to all alarms and requires the presence of a security force in the immediate area to provide a higher level of active protection if the intrusion detection system becomes inoperative. Interrelationships also exist among intrusion detection systems, security forces, and structures. Where physical security protection is to be provided by anti-intrusion device and security personnel, it is essential that an attempted intrusion be impeded by physical structures to allow time for security forces to respond to alarms. It should be noted that anti-intrusion devices generally provide no protection against a rapid, violent attack aimed at the destruction of the facilities or material. Entry controls also support the role of intrusion detection systems. Often, anti-intrusion devices must be deactivated and placed in a non-detecting mode during normal working hours. During these periods, entry controls provide a means to prevent unauthorized persons from entering a protected facility. An intrusion detection system using interior detectors will also generally detect unauthorized persons who stay behind after working hours. Entry controls also restrict free access by persons whose intent may be to tamper with intrusion detection system components or circuits. The effectiveness of an intrusion detection system depends on the interaction of personnel security clearances and intelligence activities. Security clearances provide a measure of assurance that those who work on a security system are reliable persons who will not compromise the system. It must be recognized that security clearances provide no absolute guarantee of a person's reliability and that physical security measures are largely ineffective as a defense against collusion of personnel.

14.3.3 Electronic Security and Equipment Systems. The anti-intrusion device system's performance parameter includes the following factors:

14.3.3.1 Any alarm system under consideration shall:

a) Be capable of promptly detecting any attack on the outer doors, windows, walls, floors, or ceiling of each protected area. Any movement in the protected area should also cause an alarm to activate,

b) Be reasonably flexible; that is, used to protect large or small areas with small cost differentials,

c) Have a high degree of salvageable value,

d) Have an alarm annunciator panel board located in the installation's Security Police Operations Office to facilitate prompt response when a key activates or deactivates the system at a specific location. The system should have a built-in safe-guard to annunciate an alarm at the panel board when the mode of operation is changed at the control box,

e) Have a reasonable degree of immunity to nuisance alarms or other influences not related to illegal attempts against the protection area. The false alarm rate should not exceed one per 72-hour period,

f) Provide protection against intruders concealed on the premises and be capable of detecting a penetration of intervening walls, floors, or ceilings,

g) Annunciate alarms at locations specified by the using Military Department, i.e. the Communication Center, Emergency reception, EMCS, and installation's Security Police Office,

h) Be served by the hospital's essential equipment back-up power sources, and

i) Have alarm systems that sound audible alarms in addition to sending visual signals to remote monitoring stations, except duress alarms.

14.3.3.2 Types of systems or equipment that may be considered include:

a) Anti-intrusion alarms on entrances to individual clinics, departments, high value or controlled substance storage areas, etc.

b) Duress alarms for Pharmacies, Vaults, Nurse Stations, Cashier cages, Food Service cashiers, Emergency Control desks, Clinic

Control desks, and other points throughout the MTF that may require duress alarm protection as determined by the using Military Department.

c) Closed circuit television monitoring by way of a central security system within the MTF for all main exterior entrances, Emergency Reception and Clinic Lobbies, Dental Clinic entrances, Food Service docks, Medical Material docks, and major internal Lobbies along with escalators, stairwells, and elevators.

d) Other systems that may be considered include: remote electrically operated locks, electromechanical card access systems, magnetic hold-closed devices, and electronic security system interface with the EMCS or ESCS, where applicable.

14.4 Sensitive Areas. Sensitive areas/rooms shall be designed to store valuable resources, i.e. funds, narcotics, dangerous drugs, and controlled substances/material. The most cost-effective method of providing adequate storage for these sensitive resources shall always be selected. If, after a thorough analysis, the need for a Vault is validated, attention shall be focused on the items to be stored. Special consideration for sensitive areas requiring security include:

14.4.1 Fund Storerooms. Attention shall be taken to special needs of this type of room including possible requirements for roll-up shutters, special door and lock requirements, prevention of access from ceilings, anti-intrusion detectors, service windows constructed of laminated safety glass, and a special key control.

14.4.2 Safes. Drugs classified as Schedule I or II controlled substances under the Controlled Substance Act of 1970 must be stored in safes conforming to standards established by "Manual for Drug Security" of the Bureau of Narcotics and Dangerous Substance (reference 14a). Drugs classified as Schedule III through V may also be stored in safes/vaults as deemed appropriate by the using Military Department.

14.4.3 Vaults. The minimum physical security standards for the storage of narcotics, dangerous drugs, and controlled substances are established by the "Manual for Drug Security." Features to be considered for Vault storage areas are outlined in MIL-HDBK-1031/1, Section 7: Vaults and Strongrooms (reference 14b).

14.4.4 Pharmacy. Doors to Pharmacy shall be kept at a minimum and locked with security locks. Lock and key systems for this area will be capable of being closely controlled. Alarms shall be installed on all doors and windows in the Pharmacy. Windows and ceilings should be protected in a manner which prevents unauthorized entry into the room. Walls surrounding the Pharmacy shall be constructed in accordance with the "Manual for Drug Security" (reference 14a) and MIL-HDBK-1013/1 (reference 14b). Consideration should be given to the installation of anti-intrusion devices.

14.4.5 Medical Material Storage. In addition to the criteria contained under Pharmacy above, high value, critical, and pilferable resources stored in this type of storage area/building shall be enclosed within two or more time-delayed barriers, (i.e., fences, security cages, building walls, vaults, or locked doors). For specifics, see MIL-HDBK-1013/1 (reference 14b).

14.5 External Security. External security protection should be provided for MTF's with large parking lots primarily by proper illumination and by proper design of parking lots, such as walking distances where primary entrances to the facility by staff are not too great. Where possible in the design of the MTF's, parking lots should be built in such a fashion so that the entire lot can be viewed from internal points of the building, such as the Emergency Reception and the Main Clinic, Dental Clinic, and Hospital Entrances. For those MTF's built off the installation or in remote sections of the installation, especially OCONUS, chain-link fences shall be considered for use around the perimeter of the site for intrusion protection. The entire perimeter shall be well lighted. Minimal use of shrubs and trees in these areas is recommended for prevention of natural cover for intruders. This general policy shall be followed in the areas immediately around the building and in parking lots for the same reason. District telephone connection between large parking lots and the security section shall be provided. Since utilities are essential to the operation of the MTF, their design, location, visibility and access should be considered for security-type construction in order to reduce their vulnerability to enemy actions or sabotage. Particular attention should be given to commercial power access points and communication lines.

14.6 Protective Construction (BLAST/CW). Protective construction is one alternative, among many, which is available to reduce the vulnerability to attack of forces; therefore, in preparing projections of future force requirements and postures, the need for protective construction measures and the benefits to be derived therefrom must be considered. Protective construction costs vary from near zero for such items as proper site selection and proper choice of colors for exterior paint (tone-down) to reduce the ease with which the attacker can identify targets to extremely expensive for such items as the collateral protection of MTF's to withstand direct impacts of conventional weapons. Therefore, during the process of planning MTF's, a complete range of actions must be studied, with increasingly detailed attention applied to the more costly alternatives. In making such studies, the importance of the MTF to be protected must first be determined using the criteria shown in paragraph 060506, JCS Pub. 3, volume 1 (reference 14c). A realistic enemy attack must be assumed which is consistent with intelligence information and extrapolations to the time period during which the facility is to function effectively. Such studies must consider that a "realistic" enemy attack changes with protective measures employed along with other targets which could be attacked. Under no condition will MTF's be protected if other local military

SECTION 15: CONTINGENCY FACILITIES

15.1 General. This section provides design guidance for contingency Military Medical and Dental Treatment Facilities (MTFs) overseas. These MTF's provide collective protection for critical health care mission staffs and functions during conflict. Protection of this critical health care mission requires due consideration being given to the physical survivability of defined areas of the MTF against some specified level of wartime exposure to enemy action. The thrust of guidance contained in this section is to parametrically develop survivability design criteria as a function of the threat as identified by the Theatre Commander (EUCOM, PACOM, etc.) and approved by the OASD-HA for in-theatre medical facilities as specified and coordinated with the using Military Departments, the Theater Commanders, and the Joint Staff (JS).

15.2 Medical Care Continuum. All three Military Medical Departments use a framework of patient care that extends from the Theater of Operations to the Zone of Interior (CONUS). The framework, depicted in Table 15-1 as the DoD Continuum of Medical Care, identifies the medical resources by military departments, by zone within the theater of operations, and by echelon or level of medical care. (General space planning and design criteria is provided in Table 15-2: DoD Contingency Medical Facility Criteria Matrix. For specific proposed design details see "Design Guidance for Hardening Medical Treatment Facilities Against Chemical, Biological and Collateral Damage Threats," reference 15a).

At the Forward Edge of the Battle Area (FEBA), the first zone in the theater of operations, first echelon (1E) care (i.e., first aid treatment of the sick and wounded) is rendered primarily through a "self, buddy or first aid" approach. After 1E treatment, patients are subsequently transported to second echelon (2E) care facilities for triage, emergency medical treatment, and initial resusitative treatment.

The primary mission of 2E care is to return the minimally wounded to duty and when needed to stabilize the more seriously injured for transport to the third echelon where more definitive medical treatment can be administered. The Air Force and Navy, because of their operations from fixed air and shore bases, have the latitude to use fixed (non-deployable) medical facilities for 2E care. The Navy use of infirmary clinics corresponds to the Air Force's Air Transportable Clinics and the Survivable Collection Protection System - Medical (SCPS-M) (all of which lack surgical capability). At present, only the SCPS-M is expected to be collaterally protected.

Mobile resources employed at the 2E level include the Air Force's Mobile Aeromedical Staging Facility which consists of holding beds (i.e., 25 to 250 cots) to facilitate air medical evacuation and the Navy's Battle Dressing Station which can be on a vessel or ashore in

tentage. The Army's 2E mobile medical resources consist of the Battalion Aid Station (BAS), the Regimental Aid Station (RAS) and the Clearing Station (CS) all of which are employed in the forward portion of the Combat Zone. These resources render medical care from the back of ambulance or other vehicles, buildings of opportunity or even the ground along the route of movement.

At the 3E level of care the primary mission is to provide resuscitative and definitive medical care within the Combat Zone thereby enhancing further return to duty opportunities or stabilization for subsequent medical evacuation. The only in-theatre Navy fixed medical facilities are the In-Theatre Naval Hospitals (ITNAVHOSP) which provide both 3E and 4E care. The Air Force and the Army have two types of 3E fixed hospitals which can operate in the combat zone. The first is the fixed conventional hospital facilities which expands upon mobilization. The second is the fixed contingency hospital which is activated upon mobilization and may have between 250 to 500 hospital beds. The Air Force also operates Aeromedical Staging Facilities (250 beds) which facilitate evacuation from 3E to 4E care facilities.

Mobile medical resources operating at the 3E level are extensive. The Army has five different hospitals: the Mobile Army Surgical Hospital (MASH) with 60 beds; the Combat Support Hospital (CSH) with 200 beds; the Evacuation Hospital (EVAC) with 400 beds; the Field Hospital with 300 beds and the Station Hospital with 300 beds. The Air Force employs the 50 bed Air Transportable Hospital (ATH) and the 500 bed Soft Shelter Contingency Hospital (SSCH). The Navy shore medical resources include: the Fleet Hospital with 250-500 beds. Afloat resources include limited medical assets on some surface ships (SSMA), hospital ships (T-AH) with 500-1,000 beds and amphious ships which have a primary mission of transporting people and material ashore and then assume a secondary medical mission as Casualty Receiving and Treatment Ships (CRTS).

The primary mission of 4E care is to provide resuscitative, definitive, and restorative medical services to patients requiring serious or specialized medical care. These services are generally supportive in nature and contribute to stabilization prior to evacuation from the theater of operations. Again, fixed conventional hospital facilities, which expand upon mobilization, may be employed by all three military medical departments. Fixed contingency hospitals (500-1,000 beds) are also employed by both the Air Force and the Army. Mobile medical resources include the 500 bed SSCH, Fleet Hospital and Station Hospital as well as the Army's 1,000 bed General Hospital.

Hospitals in the Zone of Interior furnish the 5E of medical care which is definitive, restorative and rehabilitative in nature. Fixed facilities in this category include all military hospitals and hospital beds from the Veternans Affairs and designated civilian hospitals beds via agreement under the National Disaster Medical System. Only military hospitals, however, expand to meet contingency requirements.

15.3 Contingency Hospital Design Criteria. The general goal for non-deployable medical systems is to convert existing buildings (i.e. schools) of opportunity or construct new buildings as functional contingency hospitals at minimum cost. To achieve this goal, three design characteristics are of utmost importance - austerity, flexibility, and openness.

15.3.1 Austerity: The scope of any repair or construction work must be limited to the requirements for function or safety. No funds should be expended for standard aesthetic practice unless the host nation laws (SOFA or otherwise) have unwaiverable requirements. Typical finish and material standards for hospitals do not apply.

15.3.2 Flexibility: To enhance adaptability to variable contingency situations, designs should be as functionally flexible as possible, as for example, omitting walls unless absolutely, functionally necessary.

15.3.3. Openness: The limited numbers of nursing staff and items of medical equipment require sharing of both resources. Placement of more than one "standard" ward in large open spaces facilitates the sharing process. The associated medical hazards of large, open, patient care areas such as noise and spread of infection, must be considered and used to temper the scope of the open concept. For instance the standard ward size in a "normal" hospital is 25-30 beds. In a contingency hospital wards of 50 or more beds must be considered, taking into consideration minimal, intermediate, maximal and burn-type patient requirements.

15.3.4 Specific Design Criteria: Project designs must be functional and cost-effective to acquire, maintain, and operate. The least expensive, construction methods and locally available materials shall be utilized which supports the design intent and functional requirements.

15.3.5 Relationships Between Activities: The relationships between activities of various functional areas is an important consideration.

15.3.6 Logistics Areas: Types of logistics storage modes must be developed on a site specific basis. Cost effectiveness, including maintaining proper storage criteria, must be the primary determinant.

15.3.7 Finishes: Patient care areas require smooth finishes, painted with gloss or semi-gloss coating, including areas such as administrative spaces or storage areas. These minimal care areas shall only be painted as necessary to preserve the wall structures. Floors may be bare (sealed for dust protection) concrete, etc. Ceilings may be open to structure above unless required for functional reasons to have a ceiling.

15.3.8 Climate Control: Requirements must be determined to fit the geographic area. Normal hospital air exchange criteria should not apply to contingency facilities except where Military Departments' clinical

requirements, in conjunction with the DMFO, and the DMSB, provide additional guidance. Acceptable temperature ranges are 59-86 degrees Fahrenheit (15-30 degrees Celsius) in the storage mode and 68-77 degrees Fahrenheit (20-25 degrees Celsius) during contingency or operational mode in patient care or otherwise occupied areas.

15.4 Hardening Against Chemical, Biological & Collateral Damage. Chemical/biological (BLAST/CB) protection refers to the sealing and pressurization of the facility, air filtration, decontamination of incoming personnel and material to preclude CB agents from entering the facility, while permitting egress of personnel and material without compromising the CB protection "shirt-sleeve" operational mode of the facility. Collateral protection refers to a designated level of protective construction to withstand certain weapon fragments, ground shock, and blast overpressures associated with detonation of conventional weapons. Where a specific threat has been defined and other buildings on the installation are similarly protected, the protected area(s) of the structure should be designed and protected against that threat. Where no specific threat has been defined, the following guidance shall be applied and will result in a protected facility that provides limited resistance to a variety of threats. Unless otherwise stated in other specific design documents, the planners and designers for a Medical or Dental Treatment Facility (MTF) shall follow the latest appropriate government guidance. (See para 5.3 and para 14.6).

15.4.1 Functional Separation. The functions that need to be protected are generally identified in the DMFO generated space program by the using Military Department and have a dual purpose in both peacetime and wartime use. The protected areas shall be one floor on or below grade. The layout of the MTF shall be separated between those areas having only peacetime mission functions and those areas designated for wartime mission functions, e.g., business occupancy (Hospital Administration and Outpatient area) separated from institutional occupancy (Hospital, Surgery, and Inpatient Areas). The Military Departments shall identify and coordinate the functional spaces to be protected with DMFO.

15.4.2 Siting Considerations. Careful consideration to siting may add a degree of protection, depending upon the threat. Where possible, the MTF should not be in proximity to prime military targets nor on the probable bomb attack approach (azimuth) for such targets. Existing topography may provide a barrier between the MTF and probable military targets. When the MTF is sited close to an obvious military operational target, the air intakes and points of ingress/egress shall be on the opposite side of the MTF facing away from the target in order to reduce shrapnel and CB effects.

15.4.3 Concept of Operation. The MTF shall be capable of transforming from a peacetime (standby) mode to full alert mode (operationally ready) and from alert mode to a tactical (operations)

mode quickly and with a minimum of effort. This transformation requires some automatic changes and some manual changes.

15.4.3.1 Operational Ready Mode. After full alert mode preparations have been made, all systems must be functionally checked before they are designated as "operationally ready." The designer shall provide an Operations Manual which defines the tasks required to convert from a standby mode to "operationally ready," and from "operationally ready" to "operational." The Medical or Dental Treatment Facility shall be designed so that only a limited number of simple tasks need be performed during changeover. A checklist of these tasks shall be included in the manual.

15.4.3.2 Tactical (Operational) Mode. In the tactical (operational) mode, the MTF shall be capable of independent, sustained, continuous operation without resupply (including medical supplies, water, and chemical filters), refueling, or preventive maintenance.

15.4.4 Structural Design Requirements. Design requirements for the protected areas are:

15.4.4.1 Structural design shall consider normal "static" loading conditions (dead and live load) and the dynamic loads associated with specific weapons threat. Designers shall insure that structural members are proportioned to accommodate the more severe static or combined static and dynamic loads. Static designs shall comply with using Military Department criteria or host nation standards, whichever is greater.

15.4.4.2 Dynamic design shall be based upon the effects of the conventional weapons outlined in Annex-L of the Air Force War and Mobilization Plan (WMP-1) for "Exposure Protection." Protection from all of the effects of each-threat weapon shall be provided. Both surface and subsurface burst effects shall be considered. For surface bursts, weapons loads of primary concern are airblast and fragmentation. For buried bursts, the primary threat is ground shock.

15.4.4.3 Dynamic designs shall consider both localized weapons effects on individual structural members and overall weapons effects on entire structural systems. Designers are responsible to assess structural design requirements and perform analysis consistent with the weapons effects and specific structural configurations. Designers shall submit all structural calculations, including static and dynamic analysis for our reviews. All weapons effects can be calculated using TM 585-1, "Fundamental for Protective Design for Conventional Weapons."

15.4.4.4 The design shall provide a means to either contain or prevent spalling from resulting blast effects.

15.4.4.5 All openings into the protected area such as doors, air intakes and exhausts, and other penetrations shall be designed to the same level of protection as the structure.

15.4.4.6 Assure plumbing or conduit penetrations into the protected area are structurally shock isolated and air tight.

15.4.4.7 Water, fuel and sewage tanks are double wall construction and designed to the same structural requirements as the protected facility.

15.4.5 Supply Requirements. For both types of MTF, the internal supplies shall be for 10-30 days, with an additional storage for up to 30 days operation available when identified in the approved Program For Design and as required by the using Military Department. The additional storage may be nearby in another building. Beyond 60 days operation storage of supplies may be outside of the immediate threat area.

REFERENCE

15a. "Design Guidance for Hardening Medical Treatment Facilities Against Chemical, Biological and Collateral Damage Threats," 6 November 1989.

TABLE 15-1
DoD Continuum of Medical Care

MILITARY DEPARTMENT	FORWARD EDGE OF BATTLE AREA 1ST ECHELON OF CARE	COMBAT ZONE 2ND ECHELON OF CARE	COMBAT ZONE 3RD ECHELON OF CARE	COMMUNICATIONS ZONE 4TH ECHELON OF CARE	ZONE OF INTERIOR 5TH ECHELON OF CARE
Air Force:	Self Aid Buddy Care 1st Aid CCP	ATC (6 beds) SCPS-M MASF	ATH (50 beds) SSCH (250 beds)* FCH (250 beds) ASF (250 beds) FMTF	SSCH (500 beds)* FCH (250 beds) FMTF	FMTF
Army:	Self Aid Buddy Care 1st Aid	BAS RAS CS	MASH (60 beds)* CSH (200 beds)* EVAC (400 beds)* Field (400 beds)* Station (300 beds)* FMTF	Station (500 beds)* FCH (1,000 beds) Gen Hosp (1,000 beds)* FMTF	FMTF
Navy:					
Ashore	Self Aid Buddy Care 1st Aid	Inf/Clinic BDS SSC MC	INTNAVHOSP FLT HOSP (250-500 beds)*	INTNAVHOSP FLT HOSP (500 beds)*	FMTF
Afloat	Self Aid Buddy Care 1st Aid	BDS	T-AH CRTS	T-AH SSMC	

TABLE 15-1 KEY

ASF	Aeromedical Staging Facility	INTNAVHOSP	In-Theater Naval Hospital
ATC	Air Transportable Clinic	MASH	Mobile Army Surgical Hospital
ATH	Air Transportable Hospital	MASF	Mobile Aeromedical Staging Facility
BAS	Battalion Aid Station	MC	Medical Company
BDS	Battle Dressing Station	RAS	Regimental Aid Station
CCP	Casualty Collection Point	SCPS-M	Survivable Collective Protection System-Medical
CC	Clearing Company	SSC	Surgical Support Company
CRTS	Casualty Receiving and Treatment Ship	SSCH	Soft Shelter Contingency Hospital
CS	Clearing Station	SSMA	Surface Ships Medical Assets
CSH	Combat Support Hospital	T-AH	Hospital Ship
FCH	Fixed Contingency Hospital	TBTC	Transportable Blood Transhipment Center
FMTF	Fixed Medical Treatment Facility	*	Deployable Medical Systems

TABLE 15-2

DoD CONTINGENCY MEDICAL FACILITY CRITERIA MATRIX:

DoD CONTINGENCY MEDICAL FACILITIES BY ZONE AND LEVEL OF CARE IN THEATER OF OPERATION

	COMBAT ZONE								COMMUNICATIONS ZONE					
	2ND ECHELON						3RD ECHELON						4TH ECHELON	
MEDICAL FACILITY REQUIREMENT	ATC	ATH	MASF	SSCH	FCH	ASF	MASH	CSH	EVAC	FIELD	STA	FLIRT	SSCH	GEN	FCH
NO BEDS	6	50	25	250	250	250	60	200	400	400	300	250/500	500	1000	500/1000
SITE (ha)	0.014	0.49	0.014	11.3	8.9	0.85	2.4	3.2	4.0	4.0	4.9	6.9/8.9	11.3/20.2	10.1	6.1/10.1
WAREHSE SPACE (x 10,000 M^2)	0.003	0.093	.019	0.49	0.49	0.093	0.065	0.074	0.093	0.12	0.074/0.10	0.62/0.89	0.49	0.29	0.17/0.59
FUNCTIONAL SPACE (x 10,000 M^2)	0.005	0.10	0.014	0.70	1.02	0.20	0.18	0.33	0.53	0.57	0.39	0.64/1.54	0.97/1.47	1.07	1.47/1.77
POWER (kW)	100	200	100	1300	1300	200	600	700	1300	1600	1200	2250	1900	1800	1800
WATER (liters x 10^3/day)	11	208	11	83	83	45	30	49	83	87	76	189/284	341	189	719
WASTE LQD (liters x 10^3/day)	8	166	8	68	68	38	23	38	68	68	61	151/227	273	151	575
FLOOR LOAD (kg x 10^3)	3	14	3	14	14	14	16	16	16	16	16	18	14	18	14
MHE (kg x 10^3)	2	7	2	7	7	7	2	2	2	2	2	9	7	2	2
DAYS OF SUPPLY	60	60	60	60	60	60	10	10	10	10	10	60	60	10	10/60
CARETAKER LIFE SUPT	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES/NO
STAFF	4	128	21	588	588	135	239	299	400	436	268-395	614/1124	826	707	826/705
ACTIVATION TIME (days)	1	5/10	1	10	1	1/3	NS	NS	NS	NS	NS	4/10	8/10	10	1/10

TABLE 15-2 DoD CONTINGENCY MEDICAL FACILITY CRITERIA MATRIX KEY

MEDICAL FACILITIES

ATC	AIR TRANSPORTABLE CLINIC
ASF	AEROMEDICAL STAGING FACILITY
ATH	AIR TRANSPORTABLE HOSPITAL
CSH	COMBAT SUPPORT HOSPITAL
EVAC	EVACUATION HOSPITAL
FCH	FIXED CONTINGENCY HOSPITAL
FIELD	FIELD HOSPITAL
FLEET	FLEET HOSPITAL
GEN	GENERAL HOSPITAL
MASF	MOBILE AEROMEDICAL STAGING FACILITY
MASH	MOBILE ARMY SURGICAL HOSPITAL
SSCH	SOFT SHELTERED CONTINGENCY HOSPITAL
STA	STATION HOSPITAL

MISCELLANEOUS

ha	HECTARES
K	THOUSAND
kg	KILOGRAM
kW	KILOWATTS
LQD	LIQUID
MHE	MATERIAL HANDLING EQUIPMENT
M^2	METER SQUARE
NO	NUMBER
NS	NOT STATED
SUPT	SUPPORT
WAREHSE	WAREHOUSE

SECTION 16: MEDICAL AND DENTAL EQUIPMENT

16.1 General. The procurement of medical and dental equipment for Military Medical and Dental Treatment Facility (MTF) projects shall be in accordance with MIL-STD-1691, "Construction and Material Schedule for Military Medical and Dental Facilities" (reference 16a). This standard provides a uniform basis upon which the using Military Department can identify items of construction and material and fix logistical and financial responsibility. The information contained in this standard shall be applied in military construction budgets and may be used to identify equipment for construction and renovation planning not included in a military construction budget. This standard shall be applied to the architectural, financial and logistic planning, construction, and equipping of all Medical and Dental Treatment Facilities included in the budget for military construction appropriation funds (MILCON). This standard may also be used to budget for organizational maintenance funds (O&M), investment equipment funds, or other procurement (OP), Defense Health Council (DHC) approved line items, Comprehensive Interior Design (CID) packages, and other using Military Department operational funds.

16.1.1 The Joint Schedule Numbers (JSN) or the National Stock Numbers (NSN), within the MIL-STD 1691, shall not be used as substitutes for contract specifications and detail drawings. Citing JSN numbers and nomenclatures will not relieve the architect or design agent of the responsibility to verify and provide all necessary detail drawings and specifications showing actual dimensions, utility connections, accessories, quantity, quality, and performance required.

16.1.2 Where reference to a specification is included in a JSN item description, items identified as Category "A" in "CAT" column shall be procured against the latest authorized specification or purchase description. Design Agents and Architects-Engineers (A-E) shall assure that current specifications and their latest amendments or purchase description shall be used in the procurement of equipment supplied by the Construction Contractor.

16.1.3 The using Military Department shall furnish information and participate in review of shop drawings and inspections prior to acceptance of technical equipment. Inquiries shall be addressed to the appropriate authority.

16.1.4 Quality and type of equipment and furniture, e.g., stainless steel, steel, wood, gas fired or electric, shall be determined by the using Military Department in each instance, based on the intended life and mission of the facility and the location and circumstance under which construction is to be accomplished.

16.1.5 When design and space limitations necessitate substitution of equipment in the preparation of drawings, these substitutions shall be coordinated with and approved by the using Military Department.

16.2 Procurement. Provide logistical categories of equipment in accordance with MIL-STD-1691. Where it is feasible and economical to transfer items of existing equipment to the new or altered facility, the logistical category may change, but the Joint Schedule Number (JSN) will remain the same. The using Military Department shall base the decision to reuse existing equipment upon the life expectancy of the equipment at the time of beneficial occupancy (BOD), the repair costs experienced with the existing unit, and the operational considerations involved in moving the equipment prior to operation of the new or altered facility.

16.2.1 Logistical Responsibility. Furnish and fund medical and dental equipment in accordance with the following legend. Each item of equipment is identified in MIL-STD-1691 by these designations.

16.2.1.1 A- Contractor furnished and installed (CFCI) from military construction appropriation funds (Military Construction Appropriations, MILCON).

16.2.1.2 B- Government furnished from the using Military Department's operating funds other than construction and installed by Contractor (GFCI) construction funds (Military Construction Appropriations, MILCON). Operating funds shall be as determined by the using Military Department.

16.2.1.3 C- Government furnished and installed (GFGI) from existing assets or from funds other than MILCON as determined by the using Military Department.

16.2.1.4 D- Other (leased or rented equipment, or that obtained under special conditions as indicated). Funds shall be determined by the using Military Department and other than MILCON.

16.2.1.5 E- Government furnished and Contractor installed from Military Construction Appropriation funds (MILCON). Delay procurement until the latest date feasible that shall not interfere with project completion to acquire the latest technology.

16.2.1.6 F- Government furnished and government installed from Military Construction Appropriation funds (MILCON). Delay procurement until the latest date feasible that shall not interfere with project completion to acquire the latest technology.

16.2.1.7 G- Government furnished and government installed from other than MILCON funds through special justification, authorization and funding. Examples of category G equipment or equipment systems are Composite Healthcare (computer) Systems (CHCS) implementation, automated materials handling systems, and so forth.

16.3 Planning. DMFO is responsible for planning for installed (built-in) medical and dental equipment and the associated budgeting to support this requirement (MILCON). DMFO shall provide the using Military Department with an initial equipment listing based on the Program For Design for their review and input prior to furnishing the document to the Design Agent. Each equipment list may be tailored or modified by the using Military Department as appropriate. Equipment in Logistical category Codes E and F may be altered by the using Military Department if funding source requirements are not exceeded. Any increase in the funding for category Codes E and F equipment requires DMFO approval.

16.4 Design. Develop equipment plans as a building system and integrate with the planning of architectural, structural, mechanical, and electrical systems. Equipment shall be arranged and organized so as to provide adequate circulation, work flow, and maintenance clearances.

16.4.1 Catalogue Cut Sheets. Provide an appropriate catalog cut sheet(s) for all items of equipment having a logistical category code of A, B, E, or F and any C and G items having unique utility requirements, structural support, or space requirements.

16.4.2 Layout and Clearances. Arrange equipment to provide service clearances and maintenance access with minimum disruption to work spaces. When expansion is anticipated in a project, allow for the addition of equipment without disruption or reconfiguration of work flow in the layout of sterilizing and sanitizing equipment spaces.

16.4.3 Floor Preparation. Provide floor depressions to accommodate cart washers, floor-loading sterilizers, radiographic electrical raceways, and environmentally-controlled room equipment, walk-in refrigerators, audiometric suites, computer rooms, high-density shelving, and any other appropriate space.

16.4.4 Structural Support. Adequately reinforce wall partitioning systems for toilet accessories, physical therapy equipment, radiographic, hanging supply carts, and other items of wall-hung equipment. Ceiling support systems in radiographic rooms are to be of the grid system type to support various types of rail-mounted overhead x-ray tube heads and to minimize equipment vibration due to overhead support. See Paragraph 16.6. Structurally brace ceiling support systems for surgical lighting, service columns, hoist equipment, and other ceiling mounted items. Mount all fixed equipment to resist seismic forces in accordance with seismic levels defined for each applicable project (see Section 6, Section 8, and paragraph 4.11.1 in Section 4).

16.4.5 Recessed Equipment. Surgical storage consoles, wall-mounted panels, and accessories in operating rooms shall be flush mounted and of the wall-recessed or through-wall types, for aseptic control.

16.4.6 Casework. All built-in casework shall be fabricated and designated in accordance with Military Specification MIL-C-20709 (reference 16b). All other casework shall be designated, specified, and installed in accordance with MIL-C-29240 (reference 16c), MIL-M-29241 (reference 16d), and other specifications as directed by the Design Agency.

16.4.6.1 Provide corrosion resistant steel (CRS) or other nonporous, seamless joint casework in the following areas: Operating and Delivery rooms; their substerile and cleanup areas; Central Sterile Supply Decontamination and clean-up areas; and Autopsy and its associated clean-up areas.

16.4.6.2 Flexible or suspended construction casework systems may be used in projects deemed appropriate by the using Military Department.

16.4.6.3 Concrete cabinet bases may be provided on ceramic tile, quarry tile, resinous and epoxy terrazzo floors with an applied base that matches the remainder of the wall base when recommended during design by the A-E and approved by the using Military Department.

16.4.7 Specifications. The A-E shall develop specifications for all equipment that does not have current guide specifications. Update all equipment specifications to permit procurement of the latest model of equipment. Develop all equipment specifications to accommodate at least three reputable vendors of the same type equipment when practical. Coordinate problem items with the using Military Department. In equipment specifications, discuss the scope of services to be provided by mechanical and electrical contractors for installing government furnished equipment.

16.4.8 Drawings. Show Category A, B, and E equipment on the multidisciplinary drawings and floor plans with solid lines and Logistics Category C and F equipment with dashed lines. Provide joint schedule numbers (JSN) as indicated in the Medical Facility Room Contents List (MFRCL) for all applicable logistical categories.

16.4.9 Equipment Lists. The A-E for each project must develop the initial DMFO MFRCL into a viable room-by-room listing during Concept Design (S3). Coordinate substitutions or changes with the using Military Department.

16.5 Special Requirements.

16.5.1 Food Service Equipment.

16.5.1.1 Design, construct, and install all serving line and food preparation equipment according to the highest industry standards. Provide for mobility, flexibility, interchangeability, and ease of cleaning and maintenance for all specified equipment.

16.5.1.2 Automatic conveyors, belt lifts, and similar devices are unacceptable for delivering patients' meals to the nursing units. Unless special design instructions, approved by DMFO, are issued to the contrary, use a manual, mobile patient tray cart system.

16.5.1.3 When the kitchen is served by a central steam distribution system, the vegetable steamer-cooker and all other equipment that allows food to be brought into direct contact with live steam is to be served by a small independent steam generator. Boiler water treatment renders steam from a central steam plant unsuitable for direct contact with food.

16.5.1.4 Provide cart wash areas with a combination steam-water mixing unit and a 10-foot hose for washing carts. Provide the area with a floor drain and a separate exhaust fan for evacuating steam heat and vapors.

16.5.1.5 Specify a conveyor-type dishwasher with sizing dependent on anticipated workload. Provide a booster water heater capable of providing 140 degree F (60 degree C) wash and 180 degree F (82 degree C) rinse cycle.

16.5.1.6 Provide the pots and pans wash sink assembly with a spray hose assembly located near the garbage disposer. When specified in the design guidance, automatic pot washers may be used at large facilities and include booster water heater capable of providing 140 degree F (60 degrees C) wash and 180 degrees F (82 degrees C) rinse cycle.

16.5.2 Dental. Various models of dental radiographic units require different structural wall supports. When two or more units are installed in the same room, use a single control unit when feasible.

16.5.3 High Technology Equipment. The planning for and inclusion of new or unique medical technology such as linear accelerators, Positron Emission Technology (PET), lithotripsy, Magnetic Resonance Imaging (MRI), hyperbaric chambers, etc., in a MILCON project is the responsibility of the DoD Defense Health Council (DHC). Project specific guidance on equipment of this category will be issued to the Design Agents by DMFO. Design shall be in accordance with the recommendations and guidance of the respective manufacturers.

16.5.4 Magnetic Resonance Imaging Facilities (MRI). The planning, design, and installation of a Magnetic Resonance Imaging (MRI) system in a Medical Treatment Facility requires extreme care to assure that the magnet is sufficiently isolated from ferromagnetic and radio frequency influences of the impacted environment and the surrounding environment is isolated from the effects of the magnetic field. Therefore, the selection of the proper siting of the magnet is extremely important and shall be addressed in the earliest stages of the planning and design of the MRI system. Follow the specific guidance of the manufacturer of the selected equipment.

16.5.5 Hyperbaric Chambers. Hyperbaric oxygen therapy is used as an adjunct to the clinical and surgical treatment of certain diseases. It consists of administering oxygen to the patient at pressures greater than one atmosphere in a compressed air chamber. The DoD agency responsible for design requirements and certification is the Naval Facilities Engineering Command. This agency is available to assist Design Agents, using Military Departments, and A-E firms as needed.

16.6 Special Ventilation Requirements.

16.6.1 General. Control of ventilation for the employee working environment must be provided in accordance with the Occupational Safety and Health Act (OSHA) of 1970. The type, quantity, and location of biological, radioisotope, fume, canopy, and laminar air hoods shall be indicated in the Project Equipment List. See Section 8 for specific ventilation design guidance for each type of hood.

16.6.2 Dust Collectors. Dust collection shall be provided for locations where dust is generated by buffing or grinding wheels, dental lathes, disk or belt sanders, saws in dental laboratories, dental repair shops, calibration shops, and occupational therapy activities. Exterior air supply, exhaust with filtration, and dust containers must be provided.

16.6.3 Welding and Soldering. Welding and soldering functions shall be designed to meet the ventilation requirements of OSHA. The American Conference of Governmental Industrial Hygienists (ACGIH) specific operations plate on "Soldering and Arc Welding" shall be used for additional guidance.

16.7 DoD/VA Universal X-Ray Room. The universal X-ray room must be capable of accepting all radiographic, fluoroscopic, and tomographic equipment, regardless of manufacturer, during initial installation and subsequent replacement actions with little, if any, facility modifications. The procedures shall 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. Information is provided for guidance and the clarification of requirements. (See Appendix B).

REFERENCES

16a. MIL-STD-1691, "Construction and Material Schedule for Military Medical and Dental Facilities."

16b. MIL-C-20709, "Casework, Metal and Wood (Medical and Dental)."

16c. MIL-C-29240, "Casework Moveable and Modular for Hospital Laboratories and Pharmacies."

16d. MIL-M-29241, "Material Handling Units for Medical Facilities."

SECTION 17: TRANSPORTATION SYSTEMS

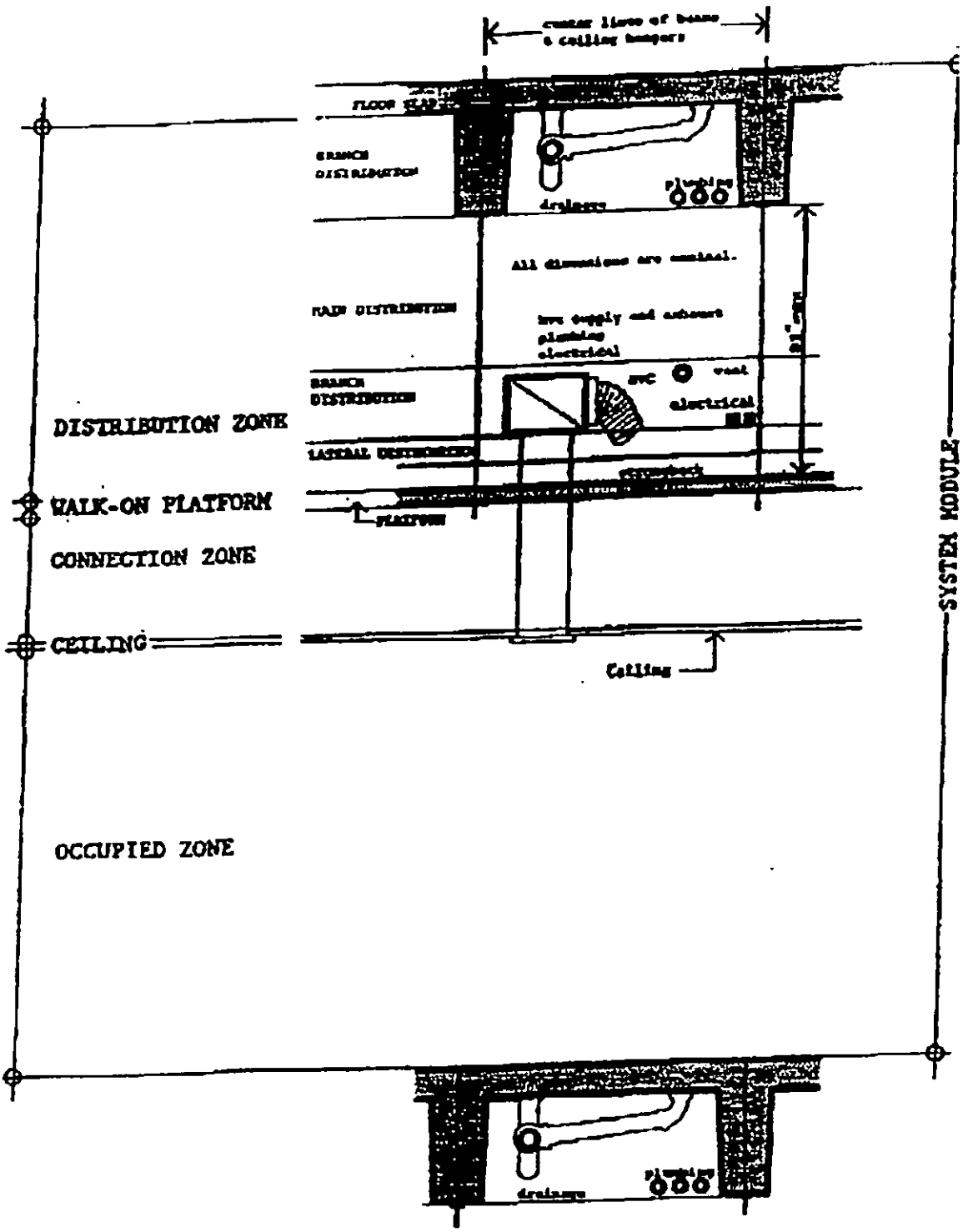
This section to be provided in a future release.

SECTION 18: WASTE MANAGEMENT

This section to be provided in a future release.

FIGURE 19-1

INTEGRATED BUILDING SYSTEM ELEMENTS



19.2.1 Utility Pod. The utility pod contains the air handling unit(s) with associated fans, pumps, etc., electrical and communication equipment, and associated risers and other main pipe risers. Fresh air relief and exhaust openings are generally a part of the utility pod enclosure. Personnel entry to the utility pod shall be from adjacent or nearby stairways outside of the occupied zone. Building systems enter and leave the utility pod at the level of the distribution zone to serve the occupied zone. The utility pod is a space defined by the floor to the underside of the floor structure above.

19.2.2 Occupied Zone. The occupied zone is the zone of functional activity of the hospital. It is defined by the floor and the architectural finish ceiling above.

19.2.3 Distribution Zone. The distribution zone accommodates all of the major horizontal distribution systems for the systems module. With few exceptions, all systems in the distribution zone downfeed to the connection zone. Sanitary and waste systems enter the distribution zone from the occupied zone above. In the walk-on deck concept, access aisles shall be maintained for maintenance personnel to perform periodic maintenance. The walk-on distribution zone platform permits maintenance personnel easy access to dampers, valves, and air terminal units. Care shall be exercised during the early design when systems are being organized to ensure that an access aisle for maintenance personnel is provided at the boundary of all distribution zones. Access to the aisle shall be from the utility pod egress stairs or the key operated service elevator that shall be designed to stop at the interstitial levels. No access into the distribution zone through ceiling access panels in the occupied zone shall be permitted. The access aisles shall be high enough for a workman to stand, exclusive of major structural beams.

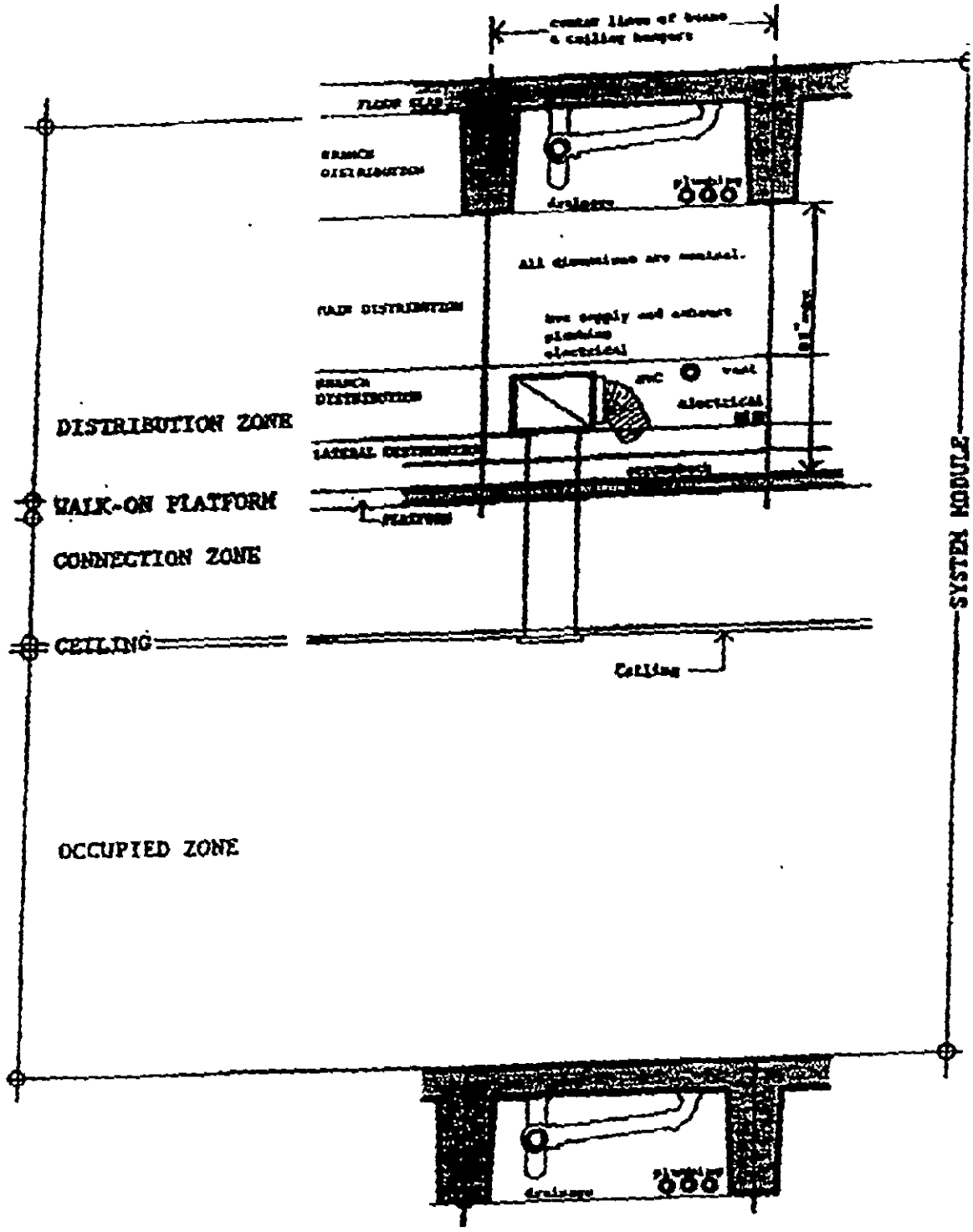
19.2.4 Connection Zone. In the walk-on deck concept, the connection zone is the layer of space between the architectural finish ceiling of the occupied zone and the underside of the walk-on floor or platform of the distribution zone. The connection zone accommodates the horizontal distribution of building systems for individual rooms. It shall be deep enough to accommodate recessed lighting and HVAC diffusers. Access to the connection zone shall be from the occupied zone below.

19.3 IBS Justification. The following are some of the significant benefits from IBS design concepts. These considerations should be factored into the IBS justification documentation.

19.3.1 System Modules. The repetitive system module is the basic building block of the IBS MTF by which economies may be achieved. Although there is a strict dimensional discipline associated with the system module, the overall organization and massing of the building can be varied according to the specific project requirements. This repetitive system module will allow both expanded building forms, as well as compact forms, to accommodate the need for daylighting/solar

FIGURE 19-1

INTEGRATED BUILDING SYSTEM ELEMENTS



20.4 Construction Management.

20.4.1 This guidance applies to all projects in the Defense Medical MILCON Program unless a waiver is obtained from the DMFO.

20.4.2 Establish a Construction Management Team for all major MILCON projects. The team should consist of representation from the following organizations:

20.4.2.1 The Construction Agent--to provide the construction management services. The management of the contract and interface with the construction contractor are the responsibility of the Construction Agent.

20.4.2.2 The using Military Department representatives (HFPO, MCLO, PHFO)--are responsible for the timely coordination of any contract change order affecting the scope and functional use of the Medical and Dental Treatment Facilities, processing user-initiated change order requests, project surveillance, service specific technical criteria, and assisting the Construction Agent in expediting the acceptance and transfer of the completed construction.

20.4.2.3 The Installation Engineer--to participate in matters which affect the military installation such as maintainability, outages of site utilities, and traffic flow.

20.4.3 Establish procedures to ensure that coordination is accomplished in a appropriate manner to include project coordination meetings as required and Construction Management Team meetings.

20.4.4 A construction management plan shall be developed to incorporate the requirements for this section and a copy provided to DMFO for information.

20.4.5 If Design-Bid-Build is the method of construction, address in the construction management plan the timely execution of project management approvals which should be at the lowest field level possible.

20.5 Construction Change Orders. Incorporate changes to the construction contract through a deliberate procedure that is time sensitive and results in the most advantageous procurement method for the government. To minimize disruption to the ongoing construction contract and to reap the benefits of competition, changes which can be deferred to the end of the project may be held for accomplishment by a separate follow-on contract on case-by-case basis. Approval authority is dependent on the size, type of change, and project funds status, as enumerated below:

20.5.1 Mandatory Changes. Mandatory changes are changes that must be made to allow the construction to proceed in a normal manner or provide a fully functional facility. The changes normally fall into one of the following categories:

20.5.1.1 Differing site conditions require a change,

20.5.1.2 The plans or specifications conflict with site conditions,

20.5.1.3 Errors or omissions in the plans or specifications require correction, and

20.5.1.4 Changes in building technology since the Medical or Dental Treatment Facility was designed.

20.5.2 Non-Mandatory Changes. Contract modifications for changes in medical operating procedures, equipment, or capabilities; or to improve the maintainability or functionality of the facility; or to implement Contractor VE proposals. These changes are optional in nature but may provide a benefit to the Government. These are changes which, whether implemented or not, will result in a fully functional Medical or Dental Treatment Facility when the Medical or Dental Treatment Facility is completed.

20.5.2.1 Contractor V-E Proposals. These changes must be carefully scrutinized by the highest level within the Construction Agency and by the using Military Department to assure that medical standards and requirements are not compromised.

20.5.2.2 Criteria and System Changes. Changes which alter system designs, life-safety features, or change functional requirements must be submitted to the highest level of the Construction Agency and the using Military Department representative prior to approval and incorporation.

20.5.2.3 Submit to the DMFO for approval changes which add significant, new features to the project which were not originally contemplated in the design.

20.5.3 Procedures. Include in the change order procedures coordination with representatives of the Construction Management Team and approvals that will be at the field level unless otherwise negotiated between the Construction Agent, the using Military Department, and the contractor.

20.5.3.1 Change Order Processing Length. Change orders must be submitted in a timely manner. Once submitted by the Construction Agent or using Military Department, change orders must be processed as expeditiously as possible. Any change orders pending in excess of 90 days from submitted date require the Construction Agent to provide actions taken to complete the request.

20.5.4 DMFO Approval. Submit all change orders with a cumulative government cost estimate in excess of $100,000 for DMFO concurrence prior to final obligation of contingency funds.

20.5.5 Mediation. Submit non-mandatory requested changes which cannot be resolved between the Construction Agent and the using Military

Department through the appropriate Military Department channels to DMFO for review and final decision.

20.6 Contingencies.

20.6.1 DMFO may suballocate all of the apportioned contingency funds for each project (typically five percent) to the Construction Agent who will then be required to retain two of the five percent contingency funds for potential non-mandatory requested changes and two of the five percent for mandatory changes. One percent may be retained as a management reserve account. The Construction Agent will provide quarterly status of funds reports to DMFO and using Military Department of all contingency funding.

20.6.2 If funds required for either mandatory or non-mandatory changes exceed the amount available and the management reserve account is inadequate, notify DMFO in writing along with justification for additional contingency funds as appropriate.

20.7 Installed Equipment (Category E and F).

20.7.1 The Construction Agent will suballocate funds required to procure this equipment as determined by the using Military Department up to the amount shown on the DD Form 1391 and as reflected in the equipment list as Category E and F.

20.7.2 The Construction Agent shall notify DMFO if actual requirements exceed the apportioned amount.

20.7.3 The Construction Agent shall provide DMFO with a quarterly update on the status of MILCON equipment funds. Final MILCON Funds Status Report (see para. 20.9.3) shall include a list of the equipment purchased by the Construction Agent or using Military Department. Funds not used at the end of construction shall be returned to DMFO.

20.8 Contractor Claims.

20.8.1 Construction Agents will notify DMFO of submitted contractor claims having merit within 30 working days of date of merit validation for claims in excess of $100,000. An information copy will be furnished to the using Military Department.

20.8.2 Such claims will be accompanied with a narrative explanation and assessment of the claim's merit, estimated final cost, and whether or not sufficient contingency funds are available.

20.8.3 The DMFO is responsible for monitoring fiscal compliance with the Public Law that provided Military Construction authorization. The Construction Agent is responsible for keeping the DMFO apprised of any field decision or change order request with merit which may exceed the Public Law and require a Congressional cost variation hearing.

20.9 Reporting Requirements. The Design and Construction Agents submit the following reports to DMFO and the using Military Department no later than one week prior to each Quarterly Execution meeting. Existing automated reports concurrently in use by the Design and Construction Agents which contain the requested information are acceptable substitutes for the report formats listed below:

20.9.1 Construction Status Report (Figure 2-4) must contain contract information for each awarded construction contract. Include in the report general contract data such as project title/location, using Military Department, responsible field office, contractor name, contract number, award date, original Beneficial Occupancy Date (BOD), current BOD, scheduled and actual percent completed on a quarterly basis. Also include contract funds data such as the original award CWE, current CWE, original contingency funds available, total value of change orders finalized to date, remaining contingency funds balance, and all installed equipment funds to include both contractor-furnished and E and F equipment (starting and remaining amount).

20.9.2 Program Execution Schedule (Figure 2-5) must list all execution year projects and annotate: project title/location, PA, estimated award CWE, design completion date, scheduled date of advertisement, scheduled bid opening date, and scheduled award date.

20.9.3 MILCON Funds Status Report (Figure 2-6). List for each appropriated project the project title/location, using Military Department, PA, amount of MILCON funds suballocated for the project, estimated award CWE for projects which have not yet reached bid opening date, actual award CWE for awarded projects, and the estimated and actual savings.

20.10 Acceptance Plan. An acceptance plan will be developed by the construction and management team. The plan will include pre-final and final inspection schedules, training requirements and schedules, testing requirements and schedules, acceptance and turnover documents, and as required, phased and interim occupancy requirements.

20.11 Post-Occupancy Evaluation (POE). The MFAMB will, in cooperation with the MFDO and the Medical Department representatives, conduct Post-Occupancy Evaluations of new major Medical and Dental Treatment Facilities and periodic on-site visits to all other major Medical and Dental Treatment Facilities. Provide copies of all Post Occupancy Evaluation reports to DMFO for information. Information concerning the functioning of the basic Medical or Dental Treatment Facility and the Medical or Dental Treatment Facility's mechanical and other engineering systems will be used by the MFAMB to update design criteria (see Section 1). The Military Departments are also authorized to perform their own Post-Occupancy Evaluations. Forward recommendations for criteria changes resulting from a POE to the MFAMB.

20.12 Liaison and Design Feedback. Using Military Departments will institute procedures for securing information on the functional

efficiency of all new major Medical and Dental Treatment Facilities. Use the information thus derived to enhance and modify Medical and Dental Treatment Facility design criteria leading to improved future Medical and Dental Facility designs. In addition, furnish any significant findings to the DOD Medical Facility Acquisition and Maintenance Board (MFAMB) for the consideration of the other Military Departments. Information shall be secured through Post Occupancy Evaluations.

20.13 Statement of Construction. If desired, and as required by the using Military Department and the Construction Agent, a Statement of Construction for fire protection may be prepared for the Joint Commission on Accreditation of Healthcare Occupancies (JCAHO) for certification purposes as an option to the A-E contract.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
ADMR1	ADDRESSOGRAPH MACHINE	VCT/ CPT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	40-45	55	60 2.9	50	***
ADPO1	AUTOMATED DATA PROC	VCT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	50	#3	50G 70	U
AMBO1	AMBULANCE SHELTER	CONC	SP	SP	SP	SP	SP	***	***	#1	5	LS
AMBO2	AMBULANCE GARAGE	CONC	SP	BLK-P	SP	12'-0" 3650mm	12X12 SP	35-40	50	#1	5	LS
ANCW1	ANESTHESIA CLEAN WORK	SV	IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	75	L;R
ANSW1	ANESTHESIA SOILED WORK	SV	IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	30	L;R
APFR1	APPLIANCE FITTING	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50	***
APAM2	APPLIANCE ADJUSTMENT	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50	***
APFB1	BRACE SHOP	VCT	R	AWF	ACT1	8'-6" 2750mm	4'-0" 1200mm	70-80	40	100 4.8	50	***
AUDO1	AUDITORIUM	CPT	R	SP	SP	VAR	3'-0" 900mm	25-30	50	100 4.8	30M	LE
AVBO1	AUDIO VISUAL BOOTH	PFB	SP	PFB	PFB	SP	SP	25-30	50	60 2.9	30	***
ABPD1	AUDIO VISUAL PROG DIST	VCT	R	GWP/ AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	30	***
AVRO1	AUDIO VISUAL ROOM	VCT	R	GWP/ AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	50	60 2.9	30	***
BMWS1	BIOMEDICAL WORK STATION	VCT	R	GWL	ACT1	8'-6" 2750mm	4'-0" 1200mm	35-40	40	60 2.9	50	***

all be to install modularized central HVAC goals of the HS design g

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	4 TEMP WIN	5 REL HUM	6 FILTRATION PRE	6 FILTRATION FIN	7 EXH	NOTES
		0	4	1	78F 26C	68F 20C	***	25%	***	NO	
		0	6	1.5	78F 26C	68F 20C	***	25%	***	***	
		***	-	***	***	***	***	***	***	***	
		0	6	4	***	68F 20C	***	***	***	YES	13
1OX 1MV 1MA 1NO	5	-	4	1.5	75F 24C	--	***	25%	90%	YES	
1OX 1MV 1MA 1NO	5	-	6	2	75F 24C	--	***	25%	90%	YES	
1LA 1PA 1LV		0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
1LA 1PA 1LV		0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
1LA 1PA 1LV	11	0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
		0	12	4	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX 1MV 1MA 1ND 1NI 1GA 1DA 1LA 1PA	3,10, 15,5	0	4	1	78F 26C	68F 20C	***	25%	***	***	

conservation considerations. The energy usage for any

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
BRAR1	BEDROOM ANTEROOM, ISOL	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-0" 2400mm	4'-0" 1200mm	30-35	40	60 2.9	30	L
BRIC1	BEDROOM, ICU/CCU, 1 BED	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-6" 2600mm	4'-0" 1200mm	25-30	40	60 2.9	30G 100	L;RC
BRII1	BEDROOM, ISOLATION, ICU	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-6" 2600mm	4'-0" 1200mm	25-30	40	60 2.9	30G 100	L;RC
BRIM1	BEDROOM, ISOLATION, M/S	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;RC
BRIP1	BEDROOM, ISOLATION, PEDS	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-0" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	30G 100	L;RC
BRIS1	BEDROOM STEP DOWN ISOL	VCT/ SV	R/ IV	GWP/ GWL/GWV	ACT1/ ACT2	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;RC
BRLC1	BEDROOM, LT CARE, 1 BED	VCT	R	GWP/GWV	ACT1	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	U
BRLC2	BEDROOM, LT CARE, 2 BEDS	VCT	R	GWP/GWV	ACT1	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R
BRLC4	BEDROOM, LT CARE, 4 BEDS	VCT	R	GWP/GWV	ACT1	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R
BRMS1	BEDROOM, M/S, 1 BED	VCT	R	GWP/GWV	ACT1	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	R1
BRMS2	BEDROOM, M/S, 2 BEDS	VCT	R	GWP/GWV	ACT1	8'-0" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BRMS4	BEDROOM, M/S, 4 BEDS	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BRNP1	BEDROOM, PSYCH, 1 BED	VCT	R	GWP	GWP	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS
BRNP2	BEDROOM, PSYCH, 2 BEDS	VCT	R	GWP	GWP	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
				-	4	2	78F 26C	70F 21C	***	25%	80%	YES	10
2OX	4MV	2MA		+	6	2	70-78F 21-26C		50-60	25%	80%	***	21
2OX	4MV	2MA		++--	6	2	70-78F 21-26C		50-60	25%	80%	YES	21
1OX	2MV	1MA	2	++--	6	2	78F 26C	70F 21C	***	25%	80%	YES	9,10
1OX	2MV	1MA	2	++--	6	2	78F 26C	70F 21C	***	25%	80%	YES	9,10
2OX	3MV	1MA	2	++--	6	2	78F 26C	70F 21C	***	25%	80%	YES	9,10
1OX	1MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	2MV	1MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
4OX	4MV	2MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	2MV	1MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
4OX	4MV	2MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	6	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	

additional information. See para 13.15 for

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
BRNP4	BEDROOM, PSYCH, 4 BEDS	VCT	R	GWP	GWP	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS
BRNP5	BEDROOM, PSYCH SECLUSION	VCT	R	GWP	GWP	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS
BRNP6	SECLUSION ANTEROOM	VCT/ CPT	R	GWV	ACT1	8'-0" 2400mm	4'-0" 1200mm	30-35	40	60 2.9	30	***
BROR1	BEDROOM, ORTHO, 1 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BROR2	BEDROOM, ORTHO, 2 BEDS	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BRPB1	BEDROOM, PED BED, 1 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS;R1
BRPB2	BEDROOM, PEDS BED, 2 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS;R1
BRPC1	BEDROOM, PED CRIB, 1 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS;R1
BRPC2	BEDROOM, PED CRIBS, 2	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	LS;R1
BRPC4	BEDROOM, PED CRIBS, 4	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	10G 30	R1
BRSD1	BEDROOM STEP DOWN, 1 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BRSD2	BEDROOM STEP DOWN, 2 BED	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BRSD4	BEDROOM STEP DOWN, 4 BEDS	VCT	R	GWP/GWV	ACT1	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	10G 30	LS;R1
BX001	EXCHANGE VENDING AREA	VCT	R	GWP	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	50	100 4.8	15	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
2OX	2MV	2MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	6	2	78F 26C	70F 21C	***	25%	80%	***	
				0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	2MV	1MA	2,16	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	2MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
1OX	1MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	2MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
4OX	4MV	2MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
2OX	3MV	1MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
4OX	6MV	2MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
8OX	12MV	4MA	2	0	4	2	78F 26C	70F 21C	***	25%	80%	***	
				***	***	***	***	***	***	***	***	***	16

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
CHC01	CART HOLDING, CLEAN	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-6 1050mm	35-40	40	100 4.8	5	***
CHS01	CART HOLDING, SOILED	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	5	***
CLR01	CLASSROOM, TABLE/CHAIR	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	45	60 2.9	70M	LE
CLR02	CLASSROOM, WRITING	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	45	60 2.9	70M	LE
CLR03	CLASSROOM/LIBRARY/TABLES	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	45	60 2.9	70M	LE
CLRS1	CLASSROOM SPEECH THERAPY	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	45	60 2.9	70M	LE
CLSC1	CLASSROOM STUDENT CARREL	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	45	60 2.9	70M	LE
COM01	COMM CLINICAL EMS	VCT	R	GWP/GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	L;EQ
COM02	COMM AMBULANCE DISPATCH	VCT	R	GWP/GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	L;EQ
COM03	COMM CENTRAL SECURITY	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	20	L;R
CRA01	CONF ROOM, ADMINISTRATIVE	CPT	R	GWV/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	40	60 2.9	30	LE
CRC01	CONF ROOM, COMMANDER'S	CPT	R	GWV/SP/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	40	60 2.9	30	LE
CRCS1	CONF ROOM, CLINICAL SERV	CPT	R	GWV/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	40	60 2.9	30	LE
CRR01	CONF ROOM, RADIOLOGY	VCT/ CPT	R	GWV/ GWP	ACT1 GWP	8'-6" 2600mm	3'-0" 900mm	25-30	40	60 2.9	30	LE

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES		INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide		1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac		AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
		+	4	1	78F 26C	70F 21C	***	25%	80%	***	
		-	10	1	78F 26C	70F 21C	***	25%	80%	YES	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	12	4	78F 26C	70F 21C	***	25%	***	YES	
		0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
		0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
		0	6	1.5	78F 26C	70F 21C	***	25%	***	***	

site utilities, and traffic flow

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
								NOISE LEVEL		PSF	ILL	EMERG
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	kPa	fc	POWER
CRWD1	CONFERENCE ROOM, WARD	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	25-30	40	60 2.9	30	LE
CSBG1	CENT STER BENCH TOP ETO	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	70	U
CSCL2	CENT STER CLINIC DECON	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	70	U
CSCL5	CENT STER CLINIC STER	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	70	U
CSCL8	CENT STER CL STER STOR	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	30	***
CSCQ1	CENT STER CART QUEUING	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	5	***
CSCR1	CENT STER CART RECEIVING	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	10	***
CSDS1	CENT STER DBL SINK/CNTR	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	70	U
CSEW1	CENT STER EQ WASH & DRY	QT	QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	70	U
CSHA1	CENT STER HOLDING AREA	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	***
CSIA1	CENT STER INSTRU ASSEMB	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	70	U
CSIS1	CENT STER INSTRU STOR	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	30	U
CSLG2	CENT STER LG ETO W/AERAT	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	U
CSLS1	CENT STER LG STEAM 1 DR	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	U

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
					-	10	--	78F 26C	68F 20C	***	***	***	YES	12,18
1OX	1MV	1MA		10	-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	18
					+	6	1.5	78F 26C	68F 20C	***	25%	80%	***	
					+	6	1.5	78F 26C	68F 20C	***	25%	***	***	
					+	6	1	78F 26C	68F 20C	***	25%	***	***	
					+	6	1	78F 26C	68F 20C	***	25%	***	***	
					-	10	2	78F 26C	68F 20C	***	25%	***	***	
					-	10	2	78F 26C	68F 20C	***	25%	***	YES	
					+	6	1.5	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA		10	+	6	1.5	78F 26C	68F 20C	***	25%	80%	***	
					+	6	1.5	78F 26C	68F 20C	***	25%	***	***	
					-	10	--	78F 26C	68F 20C	-	25%	***	YES	11,15 17
					-	10	2.5	78F 26C	68F 20C	-	25%	***	YES	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
CSLS2	CENT STER LG STEAM 2 DR	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	U
CSTW1	CENT STER TABLE AND WORK	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	70	U
CSUC1	CENT STER ULTRASONIC CL	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	70	U
CSWP1	CENT STER WASHER/DRIER	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	50	U
CSWS1	CENT STER WASHER STER	SV/QT	IV/QT	GWL	ACT2/GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	50	U
CWSH1	CART WASHER, MANUAL	QT	QT	CT	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	***
CWSH2	CART WASH, AUTO WASHER	QT	QT	CT	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	30	***
DAYR1	DAY ROOM, WARD	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	35-40	40	60 2.9	15	LE
DAYR2	DAY ROOM, PEDIATRICS	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	35-40	40	60 2.9	15	LE
DNPB1	DENT PROSTH/ORTHO LAB	SV/ VCT	IV/ R	GWL/ GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	70	***
DNPC1	DENT CERAMICS	SV/ VCT	IV/ R	GWL/ GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	50	60 2.9	70	***
DNSA1	DENT SUPPORT AREA	SV	IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	35-40	40	60 2.9	50	***
DNSP1	DENT SELF PREP AREA	SV	IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	50	***
DNTE1	DTR, ENDODONTIC	SV	IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150 M;E	U

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	4 TEMP WIN	5 REL HUM	6 FILTRATION PRE	6 FILTRATION FIN	7 EXH	NOTES
		-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	17
		+	6	1.5	78F 26C	68F 20C	***	25%	80%	***	
		-	6	1.5	78F 26C	68F 20C	***	25%	80%	YES	
		-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	17
		-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	17
		-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	17
		-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	17
		0	6	2	78F 26C	68F 20C	***	25%	80%	***	
1OX 1MV	3	0	6	2	78F 26C	68F 20C	***	25%	80%	***	
1GA 1DA 1LA 1PA 1LV	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1GA 1DA 1LA 1PA 1LV	3	-	10	2.5	78F 26C	68F 20C	***	25%	***	YES	18
1GA 1DA 1OE 2LA 1LV	3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
		0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX 1MV 1MA 1NO 2DA 2OE	5	0	6	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
DNTG1	DTR, GENERAL/PROPHY	SV	IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150 M;E	U
DNTS1	DTR, ORAL SURGERY	SV	IV	GWL	ACT1	10'-0" 3000mm	3'-6" 1050mm	30-35	40	60 2.9	200 M;E	U
o	DTR, PERIODONTIC	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150 M;E	U
o	DTR, PROSTHODONTICS	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150 M;E	U
o	DTR, COMPREHENSIVE	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150	U
o	DTR, ORTHODONTIC	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150	U
o	DTR, PEDIATRICS	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150	U
o	DTR, TRAINING	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150	U
o	DENTAL CENT STER	SV/QT	IV/QT	GWL	ACT2	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	150	U
o	DENTAL RECOVERY	SV	IV	GWL	ACT1	8'-6" 2600mm	3'-6" 1050mm	30-35	40	60 2.9	150	U
DNXC1	DENT XRAY, CEPH	VCT/ SV	R/ IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	10D	***
DNXD1	DENT XRAY (INTRA/PANO)	VCT/ SV	R/ IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	10D	***
DNXF1	DENT XRAY FILM PROC	SV	IV	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20S	***
DNXI1	DENT XRAY INTRAORAL	SV	IV	GWL/ GWP	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	40	60 2.9	10D	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	4 TEMP WIN	5 REL HUM	6 FILTRATION PRE	6 FILTRATION FIN	7 FILTRATION EXH	NOTES
1OX 2DA 2OE		0	6	2	75F 24C	68F 20C	***	25%	***	***	
1OX 1MV 1NO 1NI 2DA 2OE	17,5	++	12	3	68-78F 20-26C		--	25%	90%	***	14
1OX 1MV 2DA 2OE 1LV		++	12	3	68-76F 20-24C		***	25%	90%	***	14
1OX 1GA 2DA 2OE 1LA	14	0	6	2	75F 24C	68F 20C	***	25%	***	***	
1OX 1MV 1NO 1NI 2DA 2OE	5	0	6	2	75F 24C	68F 20C	***	25%	***	***	
1OX 2DA 2OE		0	6	2	75F 24C	68F 20C	***	25%	***	***	
1OX 2DA 2OE		0	6	2	75F 24C	68F 20C	***	25%	***	***	
1OX 1MV 1NO 1NI 1GA 2DA 2OE 1LA 1LV	5,14	0	6	2	75F 24C	68F 20C	***	25%	***	***	
2DA 2OE		+	6	2	75F 24C	68F 20C	***	25%	80%	***	
1OX 1MV 1DA		+	6	2	75F 24C	68F 20C	***	25%	***	***	
		+	6	2	75F 24C	68F 20C	***	25%	***	***	
		+	6	2	75F 24C	68F 20C	***	25%	***	***	
		-	10	2.5	75F 24C	68F 20C	***	25%	***	YES	
		+	6	2	75F 24C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
DOCK1	LOADING DOCK	CONC	SP	SP	SP	12'-0" MIN	10X10 SP	***	***	200 9.6	20	***
DROO1	DRESSING ROOM/CUBICLE	VCT/ CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	10	***
DROO2	DRESSING ROOM W/LOCKER	VCT/ CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	20	LE
DUTY1	DUTY ROOM, ONE OCCUPANT	CPT	R	GWP	ACT1	8'-6" 2600mm	4'-0" 1200mm	25-30	40	60 2.9	30	***
DUTY2	DUTY ROOM, TWO OCCUPANTS	CPT	R	GWP	ACT1	8'-6" 2600mm	4'-0" 1200mm	25-30	40	60 2.9	30	***
EVAC1	EVACUATION STAGING BED	VCT	R	GWP	ACT1	8'-6" 2600mm	4'-0" 1200mm	35-40	40	60 2.9	50	LS
EVPR1	EVOKED POTENTIAL RESP	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	35	100 4.8	30D	***
EXEN1	EXAM, ENT	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EXOA1	EXAM/OFFICE, AUDIOLOGIST	VCT/ CPT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	50	60 2.9	50	***
EXPS1	EXAM/OFFICE, SPEECH THER	VCT/ CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EXPO1	EXAM, PODIATRY	SV/ VCT	IV/ R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EXRG1	EXAM ROOM, GENERAL USE	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EXRP1	EXAM ROOM, PEDIATRICS	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EXUD1	EXAM ROOM, URODYNAMICS	VCT/ SV	R/ IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES						INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide						1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac						AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.					NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
						***	***	***	***	***	***	***	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	6	2	78F 26C	68F 20C	***	25%	***	***	
						0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			2	0	4	2	78F 26C	68F 20C	***	25%	80%	***	
1MV	1MA					0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV					0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA	1NI	1PA	3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
EXVE1	EXAM, VESTIBULAR (EAR)	CPT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	50	60 2.9	50	***
EYCL1	EYE CONTACT LENS FIT	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EYEL1	EYE EXAM/EYE LANE	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20D	***
EYEL2	EXAM/OFFICE - EYE LANE	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20G 50T	***
EYER1	EYE ELECTRORETINOGRAPHY	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20D	***
EYFC1	EYE FUNDUS CAMERA ROOM	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20D	***
EYFD1	EYE FIT AND DISP	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EYOT1	EYE OPTHALMIC TONO	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EYPL1	EYE PROSTHETICS EYE BANK	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
EYVF1	EYE VIS FIELD/PERIMETRY	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20D	***
EYVT1	EYE VISUAL TRAINING AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	20G 50T	***
FILE1	FILE ROOM, GENERAL USE	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	150 7.2	15	***
FSBR1	FD SVC, BAKE & ROAST	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	70	U
FSCD1	FD SVC, CAFETERIA DINING	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	20	U,LE

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	 WIN	5 REL HUM	6 FILTRATION PRE	 FIN	7 EXH	NOTES
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX 1MV 1MA		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	10	2	78F 26C	68F 20C	***	25%	***	YES	17
		0	12	2	78F 26C	68F 20C	***	25%	***		

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
FSCS1	FD SVC, CAFETERIA SERVING	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	50	U
FSCS1	FD SVC, CART STORAGE	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	***	40	100 4.8	5	U
FSDA1	FD SVC, DESSERT ASSEMB	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	70	U
FSDS1	FD SVC, DISH STORAGE	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	***	40	200 9.6	5	U
FSDW1	FD SVC, DISH WASHING	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	15	U
FSFC1	FD SVC, FRY CENTER	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	70	U
FSFV1	FD SVC, FRESH FRUIT/VEG	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	70	U
FSGB1	FD SVC, GRILL AND BROIL	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	70	U
FSIR1	FD SVC, INGREDIENT ROOM	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	***	40	150 7.2	15	U
FSMC1	FD SVC, MIXING CENTER	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	70	U
FSMP1	FD SVC, MEAT PROCESSING	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	70	U
FSPP1	FD SVC, PASTRY PREP	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	150 7.2	70	U
FSPT1	FD SVC, PAT TRAY LINE	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	70	U
FSPW1	FD SVC, POT WASHING	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	#2	15	U

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES		INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide		1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac		AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
		0	12	2	78F 26C	68F 20C	***	25%	***	YES	18
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		-	10	2	78F 26C	68F 20C	***	25%	***	YES	17
		-	10	2	78F 26C	68F 20C	***	25%	80%	YES	17
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		-	10	2	78F 26C	68F 20C	***	25%	***	YES	17
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		0	10	2	78F 26C	68F 20C	***	25%	80%	***	
		0	4	2	78F 26C	68F 20C	***	25%	80%	***	
		-	10	2	78F 26C	68F 20C	***	25%	***	YES	17

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
								NOISE LEVEL		PSF	ILL	EMERG
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	kPa	fc	POWER
FSSA1	FD SVC, SALAD ASSEMBLY	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	100 4.8	70	U
FSSC1	FD SVC, STEAM CENTER	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	150 7.2	70	U
FSWS1	FD SVC, NUTRITION	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	70	U
HAFR1	HEARING AID FITTING ROOM	CPT	R	AWF	ACT1	9'-0" 2750mm	3'-0" 900mm	20-25	40	60 2.9	50	U
ICEO1	ICE MACHINE AREA	SV	R	GWL	ACT1	8'-0" 2400mm	OPEN	35-40	40	#2	15	LS;EQ
JANC1	JANITORS' CLOSET	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	40-45	40	100 4.8	5	***
LBAP1	LAB ALLERGEN PREPARATION	SV	IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50	***
LBAR1	LAB AUTOPSY ROOM	ET/ CT	ET/ CT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	70G 100T	***
LBAR2	LAB AUTOPSY TEACHING	ET/ CT	ET/ CT	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	30-35	40	100 4.8	150 M;E	***
LBBD1	LAB BLOOD DONOR STATION	SV	IV	GWL	ACT2	8'-6" 2600mm	3'-6" 1050mm	35-40	40	60 2.9	50	LS
LBBD1	LAB BONE DISSECTION (ENT)	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	50	100 4.8	100	***
LBBD2	LAB BLOOD DONOR PHORESIS	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50	L;R
LBBG1	LAB BLOOD GAS CLINIC	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LBBG2	BLOOD GAS & ELECTROLYTES	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					0	10	2	78F 26C	68F 20C	***	25%	80%	***	
					-	10	2	78F 26C	68F 20C	***	25%	***	YES	17
					0	10	2	78F 26C	68F 20C	***	25%	80%	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	6	1.5	78F 26C	68F 20C	***	25%	***	YES (opt)	
					---	10	--	***	***	***	***	***	YES	
					+	6	2	78F 26C	68F 20C	***	25%	90/ 95%	***	17
2MV	1GA			3	-	12	3	78F 26C	68F 20C	***	25%	***	YES	18
2MV	1GA			3	-	12	3	78F 26C	68F 20C	***	25%	***	YES	18
1OX	1MV			3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1LA			3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	
1MV				3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	
OX	1MV	1MA	1PA	3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	
1OX	1MV	1MA	1PA	3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
LBBP1	LAB BODY PREP ROOM	QT	QT	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	50G 100	***
LBBS2	LAB FROZEN BLOOD	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	LS;EQ
LBBV1	LAB BODY VIEWING ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	30-35	40	100 4.8	30	***
LBCO1	LAB COAGULATION	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LBCP1	LAB CYTOGENETICS PREP	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LBCS1	LAB CADAVER STORAGE ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	***	40	100 4.8	15	LS;EQ
LBDE1	LAB DERMATOLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900MM	30-35	40	100 4.8	50G 100	***
LBDR2	LAB DECONTAMINATION ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50G 100	L;R
LBEM1	LAB ELECTRON MICROSCOPE	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50	***
LBEN1	LAB ENTOMOLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LBFC1	LAB FLOW CYTOMETER ROOM	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LBFM1	LAB FLOURESC MICROSCOPY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LBFS1	LAB FROZEN SECTION	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	20	LS;EQ
LBGE1	LAB GASTROENTEROLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1MV	1MA	1GA	3	-	10	2	78F 26C	68F 20C	***	25%	***	YES	
1MV	1GA	1LA	3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
				-	12	3	78F 26C	68F 20C	***	25%	***	YES	
1MV	1GA	1LA	3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA	3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	17
				-	10	2	78F 26C	68F 20C	***	25%	***	YES	
1OX	1MV		3	0	6	2	78F 26C	68F 20C	***	25%	***	***	17
1OX	1MV	1PA	3	-	10	2	78F 26C	68F 20C	***	25%	***	YES	
			3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1OX	1MV		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	
1MV	1GA	1LA	3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA	3	-	4	2	78F 26C	68F 20C	***	25%	90%	***	
1MV	1MA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
LBGW1	LAB GLASSWARE WASHING	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	20	L
LBIH1	LAB INDUSTRIAL HYGIENE	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	***
LBIR1	LAB INCUBATION ROOM	SV	R	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	LS;EQ
LBMR1	LAB MORGUE REFRIGERATOR	SV	IV	GWL	GWL	9'-0" 2750mm	3"-6" 1050mm	***	40	#3	15	LS;EQ
LBOB1	LAB OB/GYN CLINIC	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LBOH1	LAB ONCOLOGY/HEMATOLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LBRB1	LAB RESEARCH BIOCHEM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	LS;EQ
LBRC1	LAB RESEARCH CLEAN	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	LS;EQ
LBRC2	LAB RESEARCH CONTAINMENT	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	LS;EQ
LBRH1	LAB RHEUMATOLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***
LBRH1	LAB RESEARCH HAZ STUDIES	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	LS;EQ
LBRI1	LAB RADIO IMMUNO ASSAY	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	LS;EQ
LBRP1	LAB RADIATION PROTECTION	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***
LBSC1	LAB SPECIMEN COLLECTION	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	30G 50	L

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					0	10	2.5	78F 26C	68F 20C	***	25%	***	YES	18
1MV				3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV				3	+	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1MV				3	-	10	2	--	--	***	***	***	YES	
1MV				3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV	1GA	1LA		3	+	6	2	78F 26C	68F 20C	***	25%	***	***	17
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	***	17
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV	1GA	1LA	1LV	3	+	6	2	78F 26C	68F 20C	***	25%	***	***	
					0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV			3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	18

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
LBSM1	LAB SOLUTION & MEDIA PREP	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50	L;R
LBTS1	LAB TISSUE STORAGE AREA	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	30	LS;EQ
LBTS2	LAB TISSUE STOR REFRIG	PFB	PFB	PFB	PFB	9'-0" 2750mm	3'-0" 900mm	***	***	#3	20	LS;EQ
LBUL1	LAB ULTRA LOW TEMP AREA	PFB	PFB	PFB	PFB	9'-0" 2750mm	3'-0" 900mm	***	***	100 4.8	20	LS;EQ
LBUR1	LAB UROLOGY URINE LAB	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LBVP1	LAB VEINIPUNCTURE STAT	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	70G 100	L;R
o	LINEN CONTROL, CLEAN	VCT/ SV	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	150 7.2	30	***
LCSL1	LINEN CONTROL, SOILED	VCT/ SV	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	20	***
LDAT1	L&D, ANTEPARTUM TESTING	VCT/ SV	IV R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	30-35	45	60 2.9	50G 100	L;R
LDBR1	L&D, BIRTHING ROOM	SV/CPT	R	GWV	ACT2	10'-0" 3000mm	3'-6" 1050mm	30-35	45	60 2.9	100 E;D	LB;R
LDDR1	L&D, DELIVERY ROOM	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 E	LB;RA
LDEP1	L&D, EXAM AND PREP	VCT/ SV	R/ IV	GWL	ACT2	8'-0" 2400mm	3'-6" 1050mm	30-35	45	60 2.9	50G 100	L;R
LDLR1	L&D, LABOR ROOM	SV/ VCT	IV/ R	GWL	ACT2	8'-0" 2400mm	3'-6" 1050mm	30-35	45	60 2.9	30G 100	L;R1
LDNS1	L&D, NURSE STATION	VCT/ SV	R/ IV	GWL	ACT2	8'-0" 2400mm	OPEN	30-35	45	100 4.8	30G 70	L;R

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS								
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION		
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1MV	1GA	1LA		3	+	6	2	78F 26C	68F 20C	***	25%	90/ 95%	***	18
					+	6	2	78F 26C	68F 20C	***	25%	***	***	
					+	6	2	78F 26C	68F 20C	***	25%	***	***	
					+	6	2	SP	SP	***	25%	***	***	
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1OX	1MV			3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
					0	4	2	78F 26C	70F 20C	***	25%	***	***	
					-	10	2	75F 24C	-	***	25%	***	YES	
1OX	3MV	1MA		3	0	6	2	75F 24C	-	***	25%	90%	***	
2OX	2MV	2MA		6	+	6	2	75F 24C	-	***	25%	90%	***	
3OX	3MV	2MA	1NO	4,5	++	15	5	68-76F 20-25C		50-60	25%	90%		8,21
1OX	3MV	1MA		3	0	6	2	75F 24C	-	***	25%	90%	***	
1OX	3MV	1MA		3	0	6	2	75F 24C	-	***	25%	90%	***	
				15	0	6	2	75F 24C	-	***	25%	90%	***	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
LDRI1	L&D, RESUCITATION ISL.	ET/ SV	ET/ IV	GWL	GWL	10'-0" 3000mm	OPEN	30-35	45	100 4.8	50G 100	L;R
LIBB1	LIBRARY, BOOK STACK AREA	CPT	R	GWV	ACT1	10'0" 3000mm	OPEN	25-30	45	#4	30	LE
LIBC1	LIBRARY, CARD CATALOG	CPT	R	GWV	ACT1	10'0" 3000mm	3'-0" 900mm	25-30	45	150 7.2	50	***
LIBD1	LIBRARY, DESK, CHARGE	CPT	R	GWV	ACT1	10'0" 3000mm	3'-0" 900mm	25-30	45	100 4.8	50	***
LIBP1	LIBRARY, PERIODICALS	CPT	R	GWV	ACT1	10'0" 3000mm	3'-0" 900mm	25-30	45	#4	50	***
LIBS1	LIBRARY, SEATING AREA	CPT	R	GWV	ACT1	10'0" 3000mm	3'-0" 900mm	25-30	45	60 2.9	50	LE
LIBV1	LIBRARY, AUDIO/VISUAL	CPT	R	AWF	ACT1	10'0" 3000mm	3'-0" 900mm	25-30	45	150 7.2	50	***
LIBV2	LIBRARY, MICROFILM VIEW	CPT	R	GWP	ACT1	10'-0" 3000mm	3'-0" 900mm	25-30	45	60 2.9	20	***
LIBW1	LIBRARY, WORK AREA	CPT	R	GWP	ACT1	10'-0" 3000mm	3'-0" 900mm	25-30	45	100 4.8	70	***
LMAB1	LAB MODULE ANEROBIC BACT	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	L;R
LMBB2	LAB MODULE BLOOD BANK	SV	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	30-35	40	#3	50G 100	LS;EQ
LMCH2	LAB MODULE CHEMISTRY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMCY2	LAB MODULE CYTOLOGY	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMHS2	LAB MODULE HISTOLOGY	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
2OX	3MV	2MA		3,4	0	6	2	75F 24C	-	50-60	25%	90%	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	6	1.5	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA		3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	18
					0	6	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA		3	0	6	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18
1MV	1GA	1LA		3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
LMMO2	LAB MODULE MICROBIOLOGY	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMMP1	LAB MICROBIOLOGY/PARACIT	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMMY1	LAB MODULE MYCOLOGY	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMSO2	LAB MODULE SEROLOGY	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMSL2	LAB MODULE STAT LAB	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMTO2	LAB MODULE TOXICOLOGY	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMTO4	LAB MODULE, DRUG SCREEN	SV	IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMUO2	LAB MODULE URINALYSIS	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMVO2	LAB MODULE VIROLOGY	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LMVS1	LAB MODULE VIRO STERIL	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50G 100	L;R
LOBO1	LOBBY, HOSPITAL OR CLINIC	CPT/QT	SP	GWV/SP	ACT2/SP	VAR	SP	35-40	40	100 4.8	15	LE
LR002	LOCKER ROOM, 10 NSF/LOCK	SV	IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	20	LE
MEDP1	MEDICATION PREPARATION	VCT/SV	R	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	30-35	45	100 4.8	100	L;R
MICL1	MEDICAL ILLUS, COPY LAB	SV	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS										
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6	7			
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION				
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18	
1MV	1GA	1LA	3	0	4	2	78F 26C	68F 20C	***	25%	***	***		
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	68F 20C	***	25%	***	YES	17	
1MV	1GA	1LA	3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	18	
1MV	1GA	1LA	3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	18	
				0	6	2	78F 26C	68F 20C	***	25%	***	***		
				-	10	2	78F 26C	68F 20C	***	25%	***	***		
				0	4	1	78F 26C	70F 21C	***	25%	80%	***		
				0	4	1	78F 26C	68F 20C	***	25%	***	***		

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
MIDR1	MEDICAL ILLUS, DARK ROOM	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	15S	***
MIPF1	MEDICAL ILLUS, PHOTO	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***
MIPP1	MEDICAL ILLUS, PRINT PROC	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50	***
MIST1	MEDICAL ILLUS, STUDIO	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***
MIST3	MEDICAL ILLUSTRATION LAB	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50G 100	***
MMCR1	MEDICAL MAT'L CART REC	VCT	R	GWP	ACT1	10-0" 3000mm	3'-6" 1050mm	35-40	50	100 4.8	5	***
MMCR2	MEDICAL MAT'L CART HOLD	VCT	R	GWP	ACT1	10-0" 3000mm	3'-6" 1050mm	35-40	50	100 4.8	5	***
MMES1	MEDICAL MAT'L EQ STOR	VCT	R	GWP	ACT1	10'-0" 3000mm	3'-6" 1050mm	35-40	50	125 6.0	10	***
MMGS1	MEDICAL MAT'L GEN STOR	CONC.	R	GWP	ACT1	VAR/10' MIN	3'-PR 1800mm	35-40	50	125 6.0	10	***
MMRP1	MEDICAL MAT'L, REC/PROC	CONC.	R	GWP	ACT1	VAR/10' 3000mm	3'-PR 1800mm	35-40	50	100 4.8	20	***
MRMB1	MAIL ROOM, MAIL BOX AREA	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	50	100 4.8	50	***
MRRS1	MAIL ROOM, REC/SORT	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-PR 1800mm	35-40	50	125 6.0	50G 70	***
MRSO1	MED RECORDS STOR, FIXED	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	150	30	***
MRSO2	MED REC STOR, MOVABLE	VCT	SP	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	#4	30	***

gs of vertical planes, and the continuity of wall supports intersectio

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES		INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide		1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac		AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
		-	10	2	75F 24C	68F 20C	***	25%	***	YES	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	6	1.5	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	75F 24C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	75F 24C	55F 10C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
MRTO1	MED RECORDS TRANSCRIPTION	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	70	***
MRWK1	MEDICAL RECORDS WORK ROOM	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	70	***
NBCD1	BIOLOGICAL/CHEM DECON CTR	CONC	SP	SP	SP	SP	SP	35-40	50	100 4.8	50	L;R
NCWD1	NOURISHMENT CENTER, WARD	VCT/ SV	R	GWL	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	50	U
NMCR1	NUC MEDICINE, COMPUTER	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50	LS
NMDC1	NUC MEDICINE, DOSE CALIB	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	LS
NMDS1	NUC MEDICINE, DECAY STOR	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30	LS;EQ
NMGS1	NUC MEDICINE, GEN SCAN	SV	IV	GWL	ACT1	10'-0" 3000mm	4'-0" 1200mm	30-35	40	100 4.8	50D	LS
NMIR1	NUC MEDICINE, INJECTION	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	70D	LS
NMRP1	NUC MEDICINE, RADIOPHARM	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	100 4.8	50D	LS
NMWB2	NUC MED WHOLE BODY HIGH	SV	IV	GWL	ACT1	10'-0" 3000mm	4'-0" 1200mm	30-35	45	100 4.8	50D	LS
NPBF1	PSYCH BIOFEEDBACK TRMT	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	70D	***
NPGT1	PSYCH GROUP THERAPY	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	LE
NPPT1	PSYCH TESTING ROOM	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA	1PA	3	-	6	2	78F 26C	68F 20C	***	25%	90%	YES	17
					0	6	2	78F 26C	68F 20C	***	25%	80%	***	
					0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			-	6	2	78F 26C	68F 20C	***	25%	90%	YES	17
					-	6	2	78F 26C	68F 20C	***	25%	90%	YES	
1OX	1MV	1MA			0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			+	6	2	78F 26C	68F 20C	***	25%	***	YES	
1MV	1MA				-	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1OX	1MV	1MA			0	6	2	78F 26C	68F 20C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	***	
					0	6	2	78F 26C	68F 20C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
NPPT2	PSYCH PEDIATRIC TEST	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
NSTA1	NURSE STATION, WARD	CPT/ VCT	R	GWV	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	30G 70	L;R
NSTA2	NURSE STA, PHYSIO MON	VCT	R	GWV	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	30	L;R
NSTA4	NURSE STA, OUTPAT CLINIC	CPT/ VCT	R	GWV	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	30G 70	LE
NSTA5	NURSE STA, EMERGENCY	SV/ VCT	R/ IV	GWV	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	50G 100	L;RA
NSTA6	NURSE STA STEP DN UNITS	CPT/ VCT	R	GWV	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	30G 70	L;R
NYAO1	NURSERY ADMISSION/OBSERV	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;R
NYAR1	NURSERY ANTE ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	30	***
NYCC1	NURSERY CONTINUING CARE	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;R
NYFA1	NURSERY FEEDING AREA	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	50D	LS
NYIC1	NURSERY INTERMED CARE	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;R
NYIC2	NURSERY INTENSIVE CARE	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;RC
NYIR1	NURSERY ISOLATION ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;R
NYNN1	NURSERY NORMAL NEWBORN	SV/ VCT	IV/ R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	70D	L;R

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	 WIN	5 REL HUM	6 FILTRATION PRE	 FIN	7 EXH	NOTES
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
	15	0	6	2	78F 26C	68F 20C	***	25%	80%	***	
		0	6	2	78F 26C	68F 20C	***	25%	80%	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
	15	0	4	2	78F 26C	68F 20C	***	25%	***	***	
	15	0	6	2	78F 26C	68F 20C	***	25%	80%	***	
1OX 1MV 1MA	8	++	12	3	75-80F 24-27C		***	25%	90%	***	21
		+	12	3	75-80F 24-27C		50-60	25%	90%	***	21)
1OX 1MV 1MA	9	+	12	3	75-80F 24-27C		50-60	25%	90%	***	21
1OX 1MV 1MA		0	6	1.5	75-80F 24-27C		50-60	25%	90%	***	21
2OX 2MV 2MA	8	++	12	3	75-80F 24-27C		50-60	25%	90%	***	21
3OX 3MV 3MA	8	++	12	3	75-80F 24-27C		50-60	25%	90%	***	21
3OX 3MV 3MA		++--	6	2	75-80F 24-27C		50-60	25%	90%	***	21
1OX 1MV 1MA	9	++	12	3	75-80F 24-27C		50-60	25%	90%	***	21

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
NYNS1	NURSERY NURSING STATION	SV/ CPT	IV/ R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	100 4.8	30G 70	L;R
NYPR1	NURSERY PROCEDURE ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	25-30	45	60 2.9	50G 100	L;R
NYPT1	NURSERY TEACHING PARENTS	CPT	R	GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	45	60 2.9	70D	***
NYRR1	NURSERY RESP RESUSCIT	SV	IV	GWL	ACT2	9'-0" 2750mm	OPEN	30-35	45	60 2.9	50G 100	L;R
NYWE1	NURSERY WORK & EXAM AREA	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50G 100	L;R
OBSR1	OBSERV W/ONE WAY MIRROR	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	20-25	30	60 2.9	30D	***
OFAO1	OFFICE ADMIN, STD FURN	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFAO2	OFFICE, ADMIN, SYS FURN	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFCO3	OFFICE, COMMANDER	CPT	R	GWV	ACT1	8'-6" 2600mm	3'-0" 900mm	30-35	45	60 2.9	30G 50	***
OFDO1	OFFICE, MEDICAL PROVIDER	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFDO2	OFFICE MEDICAL RESIDENTS	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFDO3	OFFICE ANATOMIC PATHOL	SV	IV	GWL	ACT2	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFDR1	OFFICE DOCTOR RADIOLOGY	CPT	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFEO2	OFFICE, EXO/CH PROF SVCS	CPT	R	GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	TEMP WIN	5 REL HUM	6 FILTRATION PRE	FILTRATION FIN	7 EXH	NOTES
	15	0	6	2	78F 26C	70F 21C	***	25%	90%	***	***
2OX 2MV 2MA	8	++	12	3	75-80F 24-27C		50-60	25%	90/ 95%	***	21
		+	6	2	75-80F 24-27C		50-60	25%	***	***	21
2OX 2MV 2MA	8	++	12	3	75-80F 24-27C		50-60	25%	90%	***	21
1OX 1MV 1MA	8	++	12	3	75-80F 24-27C		50-60	25%	90%	***	21
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
OFER2	OFFICE EXECUTIVE RADIOL	CPT	R	GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFMO2	OFFICE, MID-MANAGEMENT	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OFWP1	OFFICE, NEURO-PSYCH	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30G 50	***
OPAI1	OUTPAT ALLERGY INJECTION	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	***
OPAS1	OUTPAT ALLERGY SKIN TEST	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	***
OPCR1	OUTPAT CAST ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	50	***
OPCT1	OUTPAT CHEMOTHERAPY	SV	IV	GWL	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPCT2	OUTPAT CHEMO TRMT PREP	SV	IV	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPDG1	OUTPAT DERM GRENZ	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	***
OPDU1	OUTPAT DERM UV BOOTH	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50D	***
OPEC1	OUTPAT ECG TESTING AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30	***
OPEC2	OUTPAT ECG WORK AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPEE1	OUTPAT EEG TESTING AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30D	***
OPEE2	OUTPAT EEG WORK AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	100	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV		3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV		3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	2MV	1MA	3	0	10	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV	1MA	3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	6	2	78F 26C	68F 20C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
				-	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV			0	4	2	78F 26C	70F 21C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV			0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
OPEM1	OUTPAT ESOP MOTILITY	SV	IV	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPHM1	OUTPAT HOLTER MONITOR	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPIA1	OUTPAT IMPEDANCE AUDIO	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	25-30	40	60 2.9	50	***
OPIR1	OUTPAT IMMUNIZATION	VCT/ SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	50	***
OPNR1	OUTPAT NEPHROLOGY RENAL	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	***
OPPE1	OUTPAT PHONO/ECHOCARDIO	CPT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPPF1	OUTPAT PULMO FUNCT LAB	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPPF5	OUTPAT PULMO FUNC TREADM	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	50	***
OPPF6	OUTPAT PULMO FUNC SLEEP	CPT	R	GWP	ACT1	8'-6" 2600mm	3'-6" 1050mm	20-25	50	60 2.9	10D	***
OPPM1	OUTPAT PACEMAKER WORK	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	100	***
OPPS1	OUTPAT PULMO FUNCT SCREEN	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPRC1	OUTPAT RESPIR CLEANING	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	100	***
OPRT1	OUTPAT RESPIR TMNT CUB	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPSS1	OUTPAT SOLAR SIMULATOR	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50D	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1OX	1MV				0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV			3	0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV				+	6	1	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	1	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA		3,16	-	6	1.5	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV				-	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA		3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA		3	0	6	2	78F 26C	68F 20C	***	25%	***	YES	17
1OX	1MV	1MA		3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
OPST1	OUTPAT STRESS TESTING	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	50	***
OPSW1	OPTICAL SVC WORK AREA	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	100	***
OPTM1	OUTPAT TREADMILL ROOM	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	50	***
OPVC1	OUTPAT VECTORCARDIO	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OPVL1	OUTPAT VASCULAR LAB	SV	R	GWL	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50G 100	***
ORCH1	OR CARDIAC MONITORING	SV	IV	GWL	ACT1	10'-0" 3000mm	4'-0" 1200mm	30-35	40	60 2.9	200 M;E	LB;RA
ORCS1	OR CYSTOSCOPIC SURGERY	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
ORCT1	OR CARDIOTHORACIC SURG	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
ORCW1	OR CLEAN WORK	ET/ SV	CT/ IV	CT/ GWL	GWL	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	100 M	L;R
ORDA1	OR DECONTAMINATION	CT/ SV	CT/ IV	CT/ GWL	GWL	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	30	L;R
OREC1	OR EQUIPMENT CLEANUP	VCT/ SV	R/ IV	CT/ GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	45	60 2.9	30	L;R
ORGS1	OR GENERAL SURGERY	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
ORHL1	OR HEART LUNG PUMP	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	***	***	60 2.9	20	LS
ORNE1	OR NEUROSURG EQ STOR	SV	IV	GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	***	***	125 6.0	20	LS

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES						INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide						1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac						AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.					NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1OX	1MV	1MA			3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
						0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA			3	0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			3	-	4	2	78F 26C	70F 21C	***	25%	***	***	
2OX	4MV	2MA			3	0	6	2	78F 24C	70F 20C	***	25%	90%	***	
1OX	3MV	1MA	1NO		5	++	15	5	68-76F 20-24C		50-60	25%	90%		8 21
4OX	7MV	4MA	2NO	2NI	5,7	++	15	5	68-76F 20-24C		50-60	25%	99.97%		8 21
						+	6	2	75F 24C	--	***	25%	90%	***	
1OX	1MV	1MA	1NI		10	--	10	2.5	75F 24C	--	***	25%	90%	YES	17
1OX	1MV	1MA	1NI		10	+	6	2	75F 24C	--	***	25%	***	YES	
4OX	7MV	4MA	2NO	2NI	5,7	++	15	5	68-76F 20-24C		50-60	25%	90%		8 21
						++	15	5	68-76F 20-24C		50-60	25%	99.97%		8 21
						+	6	1.5	75F 24C	--	***	25%	90%	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
ORNM1	OR NEUROSURG MONITORING	SV	IV	GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	30D	L;RA
ORNS1	OR NEUROSURGERY	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
OROE1	OR ORTHOPEDIC EQ STOR	SV	IV	GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	40-45	40	125 6.0	20	LS
OROP1	OR OUTPAT SURGERY	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
OROS1	OR ORTHO SURGERY	ET/ SV	CT/ IV	CT/ GWL	GWL	10'-0" 3000mm	4'-0" 1200mm	30-35	45	60 2.9	200 M;E	LB;RA
ORPH1	OR PATIENT HOLDING	SV	IV	GWL	GWL	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	20	L
ORPH2	OR PREP/HOLD/WORK	VCT/ SV	R/ IV	GWL	GWL	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	50G 100	L;R
ORPP1	OR PATIENT PREP/INDUCT	VCT/ SV	R/ IV	GWL	GWL	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	50G 100	L;R
ORSA1	OR SCRUB AREA	VCT/ SV	R/ IV	GWL	GWL	9'-0" 2750mm	OPEN	30-35	40	60 2.9	100	L
ORSR1	OR SUBSTERILE	ET/ SV	CT/ IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	L
ORSS1	OR STERILE STOR	VCT/ SV	R/ IV	GWL	GWL	9'-0" 2750mm	3'-0" 900mm	40-45	40	125 6.0	20	LS
OTCL1	OCC THER CHILD LIFE AREA	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
OTDL1	OCC THER DAILY SKILLS	CPT/ VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	45	60 2.9	50	***
OTEF1	OCC THER EXCEP FAM MBR	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES						INTERIOR MECHANICAL DESIGN CONDITIONS								
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.					NOTES	1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	 WIN	5 REL HUM	6 FILTRATION PRE	 FIN	7 EXH	NOTES
1OX	3MV	1MA			3,5	0	6	2	78F 26C	70F 21C	***	25%	90%	***	
4OX	7MV	4MA	2NO	2NI	7,5	++	15	5	68-76F 20-24C		50-60	25%	99.97%		8 21
						+	6	1.5	75F 24C	--	***	25%	90%	***	
4OX	7MV	4MA	2NO	2NI	7,5	+	15	5	68F-76F 20C-24C		50-60	25%	90%	***	8 21
4OX	7MV	4MA	2NO	2NI	7,5	++	15	5	68-76F 20-24C		50-60	25%	99.97%		8 21
1OX	1MV	1MA			3	0	6	2	75F 24C	--	***	25%	90%	***	
1OX	1MV	1MA			3	0	6	2	75F 24C	--	***	25%	90%	***	
1OX	1MV	1MA			3	-	6	2	75F 24C	--	***	25%	90%	YES	
						+	6	2	75F 24C	--	***	25%	90%	***	
						+	6	2	75F 24C	--	***	25%	90%	***	
						+	6	2	75F 24C	--	***	25%	90%	***	
						0	4	2	78F 26C	68F 20C	***	25%	***	***	
						-	4	2	78F 26C	68F 20C	***	25%	***	***	
						-	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
OTEV1	OCC THER EVAL AREA	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
OTGC1	OCC THER GEN CLINIC	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
OTPE1	OCC THER POWER EQ SHOP	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	70-80	50	60 2.9	50 70	***
OTSI1	OCC THER SENS INTEG DYSF	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	***
OTWT1	OCC THER WORK THERAPY	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
PAIA1	PATIENT ADMIN INTERVIEW	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
PEHS1	PHYSICAL HEAR SCREEN 1	CPT	R	AWF	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
PEHS2	PHYSICAL HEAR SCREEN 4	CPT	R	AWF	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	45	60 2.9	50	***
PEHW1	PHYSICAL HEIGHT/WEIGHT	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	50	***
PEVH2	PHYSICAL EYE/HEAR PEDS	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	***
PEVS1	PHYSICAL VISION SCREEN	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	60 2.9	50	***
PEWM1	PHYSICAL WEIGHTS/MEASURE	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	30	***
PHIV1	PHARM IV ADMIX CENTER	VCT/ SV	R/ IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	100 M	L;R
PHMP1	PHARM MFG & PREPACK	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	100 M	L;R

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES		INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide		1	2	3	4		5		6	7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac		AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
1PA		0	6	1.5	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	6	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
1MV 1LA	3	+	4	2	78F 26C	68F 20C	***	25%	***	***	
1MV 1LA	3	+	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
PHOD1	PHARM OUTPAT DISPENSING	CPT	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	100 M	L;R
PHUD1	PHARM UNIT DOSE CENTER	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	100	L;R
PLAY1	PLAY ROOM, PEDIATRICS	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	45	60 2.9	30	***
PLAY2	PLAY ROOM, ADOLES LOUNGE	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	45	60 2.9	30	***
PMCW1	PLANT MAINT WORK AREA	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-PR VAR	35-40	50	100 4.8	35G 70	***
PMDR1	PLANT MAINT DRAFTING	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	50G 100	***
PMWS1	PLANT MAINT WORK STATION	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	50	100 4.8	30G 70	***
PTAT1	PHYS THER AMPUTEE TRAIN	VCT/ CPT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTBT1	PHYS THER BACK THERAPY	CPT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTCB1	PHYS THER CONTRAST BATH	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	50	***
PTCW1	PHYS THER CUBICLE WORK	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTEA1	PHYS THER EXERCISE AREA	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTEM1	PHYS THER ELECTROMYOGRA	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTES1	PHYS THER EXERC STATION	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES			INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide			1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac			AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.		NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
			+	4	2	78F 26C	68F 20C	***	25%	***	***	
1MV	1LA	3	+	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	2	0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	2	0	6	1.5	78F 26C	70F 21C	***	25%	***	***	
1PA			0	6	1	78F 26C	70F 21C	***	***	***	YES	17
			0	4	1	78F 26C	68F 20C	***	***	***	***	
1PA			0	4	1	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
			0	6	2	78F 26C	70F 21C	***	25%	***	***	
			-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV	3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV	3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	3	-	6	2	78F 26C	70F 21C	***	25%	***	***	

[illegible] perpendicular to the central beam of radiation.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
PTEW1	PHYS THER EXTREM WHIRLP	QT/ CT	QT/ CT	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	20	***
PTGL1	PHYS THER GAIT OBS LANE	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTGT1	PHYS THER GAIT TANK	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	50	***
PTIS2	PHYS THER ISOKENETIC STA	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTLD1	PHYS THER DRYING AREA	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	20	***
PTLW1	PHYS THER LOWBOY WHIRLP	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	20	***
PTPR1	PHYS THER PED REHAB	CPT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTTC1	PHYS THER TRMT CUBICLE	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTTP1	PHYS THER THERAPU POOL	CT	CT	GWL	SP	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	20	***
PTUC1	PHYS THER ULTRASOUND CUB	VCT	R	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PTWB1	PHYS THER WHOLE BODY	CT	CT	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	50	***
PWST1	PHYS THER WHIRLPOOL TRMT	CT	CT	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	35-40	40	#3	20	***
RAAO1	CHAPEL ALTAR	CPT	R	GWV	ACT1	9'-0" 2750mm	OPEN	20-25	40	60 2.9	30D	***
RABS1	RELIGIOUS SACREMENT	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	20-25	40	60 2.9	30D	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1OX	1MV		3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	
				0	6	2	78F 26C	70F 21C	***	25%	***	***	
				-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV		3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
				-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV		3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV		3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA		0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA	3	-	6	2	78F 26C	70F 21C	***	25%	***	YES	
1OX	1MV	1MA	3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA	3	0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV			-	6	2	78F 26C	70F 21C	***	25%	***	YES	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	NOISE LEVEL IN RM	STC	PSF kPa	ILL fc	EMERG POWER
RAMR1	RELIGIOUS MEDITATION	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	20-25	40	60 2.9	30D	***
RARR1	RELIGIOUS RECONCILATION	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	20-25	40	60 2.9	30D	***
RASO1	CHAPEL SEATING AREA	CPT	R	GWV	ACT1	VAR	OPEN	20-25	40	60 2.9	15D	LE
RASR1	CHAPEL, SACRISTY/STORAGE	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	30-35	40	125 6.0	10	***
RCAO1	RESUSCITATION CART ALCOVE	VCT	R	GWL	ACT2	9'-0" 2750mm	OPEN	35-40	40	60 2.9	15	R
RDBO1	RENAL DIALYSIS BED STN(+)	VCT/ SV	R/ IV	GWL	ACT2	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	50G 100	L;R
RDBO2	RENAL DIALYSIS BED STN(-)	VCT/ SV	R/ IV	GWL	ACT2	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	50G 100	L;R
RDCO1	RENAL DIALYSIS CHAIR STA	VCT/ SV	R/ IV	GWL	ACT2	8'-6" 2600mm	4'-0" 1200mm	30-35	40	60 2.9	50G 100	L;R
RECP1	RECEP/CONTROL, OUTPAT	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	30G 50	***
RECP2	RECEP/CLERICAL CLINIC	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	60 2.9	30G 50	***
RECP3	INFORMATION DESK	CPT/ QT	R	GWV	ACT1	VAR	OPEN	35-40	40	60 2.9	30G 50	***
RPRO2	REPRO ROOM, HIGH VOLUME	CPT/ VCT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	50	150 7.2	70	***
RRBD1	RECOVERY BLOOD DONORS	CPT/ VCT	R	GWV	ACT1	8'-6" 2600mm	3'-6" 1050mm	30-35	40	60 2.9	30	LS
RRIA1	RECOVERY ISOLATION ANTE	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	INTERIOR MECHANICAL DESIGN CONDITIONS 1 AIR BAL	2 AIR CHG	3 MIN OA	4 TEMP SUM	4 TEMP WIN	5 REL HUM	6 FILTRATION PRE	6 FILTRATION FIN	7 EXH	NOTES
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	4	2	78F 26C	68F 20C	***	25%	***	***	
		0	***	***	***	***	***	***	***	***	16
1OX 1MV 2MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX 1MV 2MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX 1MV 2MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	4	1	78F 26C	70F 21C	***	25%	***	***	
		0	10	2	78F 26C	70F 21C	***	25%	***	***	
1OX 3MV 1MA	3	0	4	2	78F 26C	70F 21C	***	25%	***	***	
		-	6	2	75F 24C	--	***	25%	90%	YES	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
RRIR1	RECOVERY ISOL RECOV	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;R
RRLD1	L&D RECOVERY ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;R
RROP1	OUTPATIENT RECOVERY ROOM	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;R
RROP2	RECOV OUTPAT SEATED	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	LS
RRSS1	RECOV SURG SUITE INPAT	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;R
RRSS2	RECOV SURG SUITE OUTPAT	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 100	L;R
RRSS3	RECOV OUTPAT SEATED	SV	IV	GWL	ACT2	9'-0" 2750mm	4'-0" 1200mm	30-35	40	60 2.9	30G 70	LS
SECO1	SECRETARY, EXEC OFFICES	CPT	R	GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
SECO2	SECRETARY, GENERAL USE	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	***
SHRO1	SHOWER AREA	CT/ PFB	CT/ SP	CT/ PFB	GWL/ PFB/GWL	SP	3'-0" 900mm	35-40	45	60 2.9	20	***
SHRO2	SHOWER, WHEELCHAIR	CT/ PFB	CT/ SP	CT/ PFB	GWL/ PFB/GWL	SP	3'-0" 900mm	35-40	45	60 2.9	30	***
SLOO1	STAFF LOUNGE	CPT	R	AWF	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	45	60 2.9	20	LE
SRCH1	STOR RM, CHARGE, BATT/EQ	CONC/ VCT	R	GWP	GWP	8'-0" 2400mm	3'-6" 1050mm	35-40	40	200 9.6	5	EQ
SRCS1	STOR, CRUTCH AND SPLINT	VCT	R	GWP	GWP	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	10	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5		6	7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1OX	3MV	1MA	3	+	6	2	75F 24C	--	50-60	25%	90%	YES	20
1OX	3MV	1MA	3	+	6	2	75F 24C	--	50-60	25%	90%	YES	20
1OX	3MV	1MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	3MV	1MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	3MV	1MA	3	+	6	2	75F 24C	--	50-60	25%	90%		20
1OX	3MV	1MA	3	+	6	2	78F 26C	70F 21C	50-60	25%	90/ 95%		20
1OX	3MV	1MA	3	+	6	2	78F 26C	70F 21C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				-	6	1.5	78F 26C	75F 24C	***	25%	***	YES	
				-	6	1.5	78F 26C	75F 24C	***	25%	***	YES	
				0	5	1	78F 26C	68F 20C	***	25%	***	***	
				-	10	--	85F 29C	65F 18C	--	***	***	YES	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		PLR LD	ELECTRICAL	
								NOISE LEVEL		PSF	ILL	EMERG
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	kPa	fc	POWER
SREO1	STOR, EQUIPMENT	VCT	R	GWP	GWP	9'-0" 2750mm	3'-6" 1050mm	40-45	40	125 6.0	10	***
SRFO1	STOR, FREEZER	PFB	SP	PBF	PBF	SP/VAR	SP	***	***	275 13.2	20	LS;EQ
SRFO2	STOR FREEZERS/FREESTAND	QT	QT	GWL	GWL	SP/VAR	SP	40-45	40	#2	20	LS;EQ
SRGC1	STOR, GAS CYL(DOCK)	CONC	***/ R	BLK/ GWP	GWP	9'-0" 2750mm	3'-6" 1050mm	45-50	40	150 7.2	5	***
o	STOR, GAS CYL(SURG)	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	150 7.2	20	LS
SRHM1	STOR, HAZ CHEM, FLAM	CONC	***/ R	BLK/ GWP	GWP	9'-0" 2750mm	3'-6" 1050mm	45-50	40	125 6.0	10 EP	LS
SRLO1	STOR LAB MICROSCOPE SLID	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	125 6.0	10	***
SRLO2	STOR LAB PARAFIN BLOCKS	SV	R	GWL	ACT2	9'-0" 2750mm	3'-0" 900mm	35-40	40	125 6.0	10	***
SRPB1	STORAGE, PATIENT BAGGAGE	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	10	***
SRPP1	STOR, PEDIATRICS PLAY	CPT/ VCT	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	10	***
SRPS1	STOR, PARTS STORAGE	VCT/ CONC	R	GWP	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	10	***
SRRO1	STOR, REFRIGERATED	PFB	SP	PFB	PFB	SP/VAR	SP	***	***	275 13.2	20	LS;EQ
SRRO2	STOR REFRIG FREESTND	QT	QT	GWL	GWL	SP/VAR	SP	***	***	#2	20	LS;EQ
SRSO1	STOR, SHELVING	VCT/ CONC	R	GWP	ACT1	9'-0" 2750mm	3'-0 900mm	40-45	40	150 7.2	10	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES		INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide		1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac		AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.	NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	10	2	SP	SP	***	25%	***	YES	
		0	10	2	78F 26C	68F 20C	***	25%	***	YES	
		-	6	6	***	***	***	***	***	YES	12
		-	6	6	78F 26C	68F 20C	***	***	***	YES	12
		-	6	6	***	***	***	***	***	YES	12
		+	4	1	78F 26C	68F 21C	***	25%	***	***	
		+	4	1	78F 26C	68F 21C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	
		0	***	***	***	***	***	***	***	***	
		0	***	***	***	***	***	***	***	***	
		0	4	1	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
								NOISE LEVEL		PSF	ILL	EMERG
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	kPa	fc	POWER
SRSO2	STOR, MOBILE SHELVING	VCT/ CONC	R	GWP	ACT1	9'-0" 2750mm	3'-0 900mm	***	***	200 9.6	10	***
SRSE1	STOR, EQUIPMENT/SHELV	VCT/ CONC	R	GWP	ACT1	9'-0" 2750mm	3'-6 1050mm	***	***	150 7.2	10	***
SRTE1	STOR, TRACTION EQUIP	SV	IV	GWL	ACT1	9'-0" 2750mm	4'-0" 1200mm	***	***	125 6.0	10	***
SSCO1	SECURE STORAGE, CAGE	VCT/ CONC	R	GWP	ACT1	9'-0" 2750mm	3'-0 900mm	***	***	125 6.0	10	***
SSSO1	SECURE STORAGE, SAFE	VCT/ CONC	R	SP	SP	SP	SP	***	***	#3	10	***
SSVO1	SECURE STORAGE, VAULT	VCT/ CONC	R	CONC/ BLK	CONC/ BLK	SP/VAR	3'-0" 900mm	***	***	125 6.0	10	***
TCGS1	TRMT CUB GEN SURGICAL	SV	IV	GWL	ACT2	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TLTF1	TOIL FEM HANDICAPPED	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTF2	TOIL FEM/CHANGE COUNTER	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	30	***
TLTF3	TOIL/SHOW HANDICAP ACCES	SV	IV	GWL/PFB	GWL/PFB	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTF3	TOIL/SHOWER FEMALE	CT/ SV/PFB	CT/ IV	CT/GWL PFB	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTF4	TOIL/TUB/SHOWER/PEDS	CT/ SV/PFB	CT/ IV	CT/GWL PFB	GWL	8'-0" 2400mm	SP	35-40	40	60 2.9	20	***
TLTF5	TOIL/SHOW FEMALE OBSTET	CT/ SV/PFB	CT/ IV	CT/GWL PFB	GWL GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTF5	TOIL FEM OB WARD	SV	IV	GWL		8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	68F 20C	***	25%	***	***	
				0	***	***	***	***	***	***	***	***	
				0	6	1	78F 26C	68F 21C	***	25%	***	***	
1OX	1MV	1MA		+	12	3	68-76F 20-24C		***	25%	80%	***	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	
				---	10	--	--	***	***	***	***	YES	

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
TLTM1	TOIL MALE, HANDICAPPED	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTM2	TOIL MALE/CHANGE COUNTER	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	30	***
TLTM3	TOIL/SHOWER, MALE	CT/ SV/PRB	CT/ IV	CT/GWL/ PFB	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTP1	TOIL PSYCHIATRIC	SV/ PFB	IV/ SP	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTP3	TOIL/SHOWER PSYCHIATRIC	CT/ SV/PFB	CT/ IV	CT/GWL/ PFB	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TLTS1	TOIL SPECIM HANDICAPPED	SV	IV	GWL	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	20	***
TREE1	TRMT ENDO EXAM (UGI)	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TREN1	TRMT ENT	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	25-30	40	60 2.9	50G 100	***
TRET1	TRMT EMERG TRAUMA ROOM	CT/ SV	CT/ IV	CT/ GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	100	L;R
TRET2	TRMT EMERG TRAUMA W/XRAY	CT/ SV	CT/ IV	CT/ GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	50	60 2.9	100	L;R
TREY1	TRMT EYE - OPTHALMOLOGY	VCT/ SV	R/ IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRGM1	TRMT GENERAL MEDICAL	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRGS1	TRMT GENERAL SURGICAL	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRIF1	TRMT INFANT FEVER REDUCT	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	50	60 2.9	50G 100	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					---	10	--	***	***	***	***	***	YES	
					---	10	--	***	***	***	***	***	YES	
					---	10	--	***	***	***	***	***	YES	
					---	10	--	***	***	***	***	***	YES	
					---	10	--	***	***	***	***	***	YES	
					---	10	--	***	***	***	***	***	YES	
1OX	2MV	1MA			0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	68F 20C	***	25%	***	***	
2OX	3MV	2MA		3	+	12	3	75F 24C	--	***	25%	80%	***	
2OX	3MV	2MA		3	+	12	3	75F 24C	--	***	25%	80%	***	
1OX	1MV	1MA			0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA	1LA	3	0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
TRNP1	TRMT PSYCHIATRIC	CPT	R	GWP	ACT1	9'-0" 2750mm	3'-0 900mm	30-35	40	60 2.9	50	***
TROB1	TRMT OB/GYN	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TROR1	TRMT ORTHOPEDIC	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRPE1	TRMT PROCTO EXAM (LGI)	SV/ VCT	IV/ R	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRPE1	TRMT PULMONARY ENDOSCOPY	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TRWD1	TRMT WARD MEDICAL/SURG	SV	IV	GWL	GWL	9'-0" 2750mm	3'-6" 1050mm	30-35	40	60 2.9	50G 100	***
TUBO1	TUB ROOM WARD	CT/ SV	CT/ IV	CT/ GWL	GWL	8'-0" 2400mm	3'-6" 1050mm	35-40	40	#3	20	***
TUBO2	TUB ROOM PEDIATRICS	CT/ SV	CT/ IV	CT/ GWL	GWL	8'-0" 2400mm	3'-6" 1050mm	35-40	40	#3	20	***
UCCL1	UTILITY CLEAN CLINICS	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	20	***
UCWD1	UTILITY CLEAN WARD	VCT	R	GWL	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	20	***
USCL1	UTILITY SOILED CLINICS	VCT/ SV	R/ IV	GWL	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	20	***
USPS1	MAIL ROOM, U.S. POST OFF	VCT	R	GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	50	125 6.0	50G 70	***
USWD1	UTILITY SOILED WARD	VCT/ SV	R/ IV	GWL	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	20	***
UTCO1	UTILITY TRASH COLLECTION	CONC	R/ ***	GWL/ BLK-P	GWL	9'-0" 2750mm	3'-6" 1050mm	35-40	40	125 6.0	20	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	2MV	1MA			+	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	2MV	1MA			0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA			0	6	2	78F 26C	70F 21C	***	25%	80%	***	
					-	6	2	78F 26C	75F 24C	***	25%	80%	YES	
					-	6	2	78F 26C	75F 24C	***	25%	80%	YES	
					+	4	1	78F 26C	68F 20C	***	25%	***	***	
					+	4	1	78F 26C	70F 21C	***	25%	80%	***	
					-	6	1	78F 26C	68F 20C	***	25%	***	YES	
					0	4	1	78F 26C	68F 20C	***	25%	***	***	
					-	10	1	78F 26C	70F 21C	***	25%	80%	YES	
					-	10	1	78F 26C	68F 20C	***	25%	***	YES	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL		FLR LD	ELECTRICAL	
								NOISE LEVEL		PSF	ILL	EMERG
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	kPa	fc	POWER
UTCO2	INCINERATOR	CONC	***	CONC/ BLK	GWL	10'-0" 3000mm	3'-6" 1050mm	***	40	#2	5	***
WBGO1	WELDING BOOTH GEN USE	CONC	***	CONC/ BLK	GWL	9'-0" 2750mm	3'-6" 1050mm	60	50	100 4.8	70	***
BRCO1	WAITING RM, CHAIRS ONLY	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	LE
WRCO1	WAITING ROOM	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	30	LE
WRCH1	WORK ROOM, CHARTING AREA	CPT	R	GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	50	L
WRCL1	WAITING LITTER & CHAIR	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	30	LE
WRFO1	WAITING ROOM FAMILY	CPT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	60 2.9	30	LE
WRLO1	LITTER HOLDING	VCT	R	GWV	ACT1	9'-0" 2750mm	3'-6" 1050mm	30-40	40	60 2.9	10	***
XABP1	XRAY ANGIO BIPLANE DIGIT	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XACR1	XRAY ANGIOGRAPH CONTROL	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	U
XACV1	XRAY ANGIO COMPUTER	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	U
XAIR1	XRAY ANGIO INSTRUMENT	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	U
XAPP1	XRAY ANGIO PATIENT PREP	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50G 100	U
XASP1	XRAY ANGIOGRAPHIC SINGLE	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6		7	
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1PA				***	***	***	***	***	***	***	***	***	SEE NFPA
				***	***	***	***	***	***	***	***	***	SEE NFPA
				0	6	1	78F 26C	68F 20C	***	25%	***	***	
				0	6	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	70F 21C	***	25%	***	***	
				0	6	1	78F 26C	70F 21C	***	25%	***	***	
				0	6	1	78F 26C	68F 20C	***	25%	***	***	
				0	4	1	78F 26C	70F 21C	***	25%	***	***	
1OX	2MV	1MA		0	6	2	78F 26C	70F 21C	***	25%	***	***	
				0	6	2	78F 26C	70F 21C	***	25%	***	***	
				0	6	2	78F 26C	70F 21C	***	25%	***	***	19
				0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	2MV	1MA		0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	2MV	1MA		0	6	2	78F 26C	70F 21C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
XCCA1	XRAY CARDIAC CATH ADP	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	50 E;X	LB;RA
XCCC1	XRAY CARDIAC CATH CONTR	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30D	L;R
XCCE1	XRAY CARDIAC CATH EXPOS	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm.	35-40	40	100 4.8	30D	L;R
XCCI1	XRAY CARDIAC CATH INSTR	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	LS
XCCP1	XRAY CARDIAC CATH PREP	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50G 100	L
XCTC1	XRAY COMPUTED TOMO CONTR	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30D	U
XCTC2	XRAY COMPUTED TOMO COMPU	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	U
XCTP1	XRAY COMPUTED TOMO PREP	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50G 100	U
XCTS1	XRAY COMPUTED TOMOSCAN	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDCM1	XRAY DIAG CHEST/MAMO	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDCS1	XRAY DIAG CHEST STAND	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	30	U
XDCY1	XRAY DIAG CYSTO RAD ONLY	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	LB;RA
XDCY2	XRAY DIAG CYSTO/FLUORO	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	LB;RA
XDFO1	XRAY DIAG FLUOROSCOPIC	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
					+	15	5	68-76F 20-24C		***	25%	90/ 95%	***	8, 19
					+	15		68-76F 20-24C		***	25%	***	***	8
1OX	2MV	1MA	1NO	5	-	10	2	75F 24C	68F 20C	***	25%	***	YES	
					+	15	5	68-76F 20-24C		***	25%	90/ 95%	***	8
1OX	2MV	1MA	1NO	5	0	6	2	75F 24C		***	25%	90/ 95%	***	
					0	6	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	19
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	3MV	1MA	1NO	5	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	3MV	1MA	1NO	5	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
XDLR1	XRAY DIAG LITHOTRIPTER	SV/ VCT	R	GWL/ GWP	ACT2/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	50	#3	50 E;X	U
XDLT1	XRAY DIAG LIN TOMO/RAD	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDMO2	XRAY DIAG MAMO XEROGRAPH	SV/ VCT	R	GWL/ GWP	ACT1	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDMT1	XRAY DIAG MULTI TOMO	VCT/ SV	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDRO1	XRAY DIAG RAD/TILT TABLE	VCT/ SV	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDRF2	XRAY DIAG RAD/FLUORO DIG	VCT/ SV	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDRH1	XRAY DIAG RAD W/HEAD	SV/ VCT	R	GWL/ GWP	ACT1/ GWP	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XDSB1	XRAY SUP - BARIUM PREP	SV/ VCT	IV/R	GWL/ GWP	ACT2	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	70	U
XDUS1	XRAY DIAG ULTRASOUND	SV/ VCT	R	GWL/ GWP	ACT1	10'-0" 3000mm	4'-0" 1200mm	35-40	40	100 4.8	50 E;X	U
XFFA1	XRAY FILM FILES FIXED	VCT	R	GWP	ACT1	10'-0" 3000mm	3'-0" 900mm	35-40	40	250 12.0	30	***
XFFA2	XRAY FILM FILES MOBILE	VCT	R	GWP	ACT1	10'-0" 3000mm	3'-0" 900mm	35-40	40	350 16.8	30	***
XFPO2	XRAY FILM PROC DK RM	SV/ VCT	IV/ R	GWL/ GWP	GWL	8'-0" 2400mm	3'-0" 900mm	35-40	45	100 4.8	20S	U
XFSA1	XRAY FILM SORTING AREA	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	50	***
XFSR1	XRAY, FILM SORT/READING	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	60 2.9	50	***

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ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES					INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide					1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac					AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.				NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
1OX	2MV	1MA	1NO	5	0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	YES	17
1OX	1MV				0	4	2	78F 26C	70F 21C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	***	
					0	4	2	78F 26C	68F 20C	***	25%	***	***	
					-	10	2.5	75F 24C	68F 20C	***	25%	***	YES	17
					-	10	2.5	75F 24C	68F 20C	***	25%	***	YES	17
					0	4	2	78F 26C	68F 20C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
XMRC1	XRAY, MRI CONTROL	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XMRC2	XRAY, MRI COMPUTER	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XMRE1	XRAY, MRI EQ ROOM	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XMRS1	XRAY, MRI SCANNER	SV/ VCT	R	GWL/ GWP	ACT1	11'-0" 3350mm	4'-0" 1200mm	35-40	40	#3	30	***
XMRV1	XRAY, MRI VIEWING	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XRMO1	XRAY, MOBILE RAD ALCOVE	SV/ VCT	R	GWV/ GWP	ACT1	8'-0" 2400mm	OPEN	35-40	40	100 4.8	15	EQ
XRMO2	XRAY MOBILE C-ARM STOR	VCT/ SV	R	GWP/ GWL	ACT1	9'-0" 2750mm	3'-6" 1050mm	35-40	40	100 4.8	15	***
XTCC1	XRAY THER COBALT CONTROL	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XTCE1	XRAY THER COBALT AUX EQ	SV/ VCT	R	GWL/ GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XTCT1	XRAY THER COBALT THER	SV/ VCT	R	GWL/ GWP	ACT1	10'-0" 3000mm	4'-0" 1200mm	35-40	40	#3	50 E;X	LS
XTLA1	XRAY THER LINAC	SV/ VCT	R	GWL/ GWP	ACT1	10'-0" 3000mm	4'-0' 1200mm	35-40	40	#3	50 E;X	LS
XTLB1	XRAY THERAPY PHYSICS LAB	SV/ VCT	R	GWL/ GWP	ACT1	9'-0" 2750mm	3'-0" 900mm	35-40	40	100 4.8	50	***
XTLC1	XRAY THERAPY LINAC CONTR	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	40	100 4.8	30	***
XTSG1	XRAY THERAPY GANTRY ROOM	SV/ VCT	R	GWL/ GWP	ACT1	10'-0" 3000mm	4'-0' 1200mm	35-40	40	100 4.8	30	***

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES				INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide				1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac				AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac.			NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	19
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA		0	4	2	78F 26C	70F 21C	***	25%	***	***	
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	***	***	***	***	***	***	***	***	16
				0	4	2	78F 26C	68F 20C	***	25%	***	***	
				0	6	2	78F 26C	68F 20C	***	25%	***	***	
				0	6	2	78F 26C	70F 21C	***	25%	***	***	
1OX	1MV	1MA		0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA		0	6	2	78F 26C	68F 20C	***	25%	***	YES	
				-	6	2	78F 26C	70F 21C	***	25%	***	***	
				0	6	2	78F 26C	68F 20C	***	25%	***	***	
1OX	1MV	1MA		0	6	2	78F 26C	70F 21C	***	25%	***	***	

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ROOM CODE	ROOM NAME	ARCHITECTURAL FINISHES					DOORS	ACOUSTICAL NOISE LEVEL		FLR LD	ELECTRICAL	
		FLOOR	BASE	WALL	CEILING	C'LG HT	SIZES	IN RM	STC	PSF kPa	ILL fc	EMERG POWER
XVC01	XRAY VIEW/CONSULT	SV/ VCT	R	GWL/ GWP	ACT1	8'-0" 2400mm	3'-0" 900mm	30-35	40	60 2.9	30	***
o	CORRIDORS, WARDS	VCT/ CPT	R	GWV	ACT1	8'-6" 2600mm	3'-6"PR 2100mm	35-40	45	80 3.8	15	LE
o	CORRIDORS, CLINICS	VCT/ CPT	R	GWV	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	45	100 4.8	10	LE
o	CORRIDORS, ADMIN	VCT/ CPT	R	GWV	ACT1	8'-0" 2400mm	3'-0" 900mm	35-40	45	100 4.8	10	LE
o	CORRIDORS, HEAVY CARTS	VCT	R	GWV	ACT1	8'-0" 2400mm	3'-6"PR 2100mm	35-40	45	100 4.8	15	LE
o	AIR HANDLING ROOMS	CONC	R	SP	SP	VAR	VAR	50-70	55	125 6	30	SP
o	CENTRAL PLANT ROOMS	CONC	R	SP	SP	VAR	VAR	50-70	55	250 12	30	SP
o	MECHANICAL ROOMS	CONC	R	SP	SP	VAR	VAR	50-70	55	#2 12	30	SP
o	COMPUTER ROOM	VCT	R	GWP	ACT1	8'-0" 2400mm	3'-6" 1050mm	35-40	40	100 4.8	50	LS
o	HYPERBARIC CHAMBERS RM	VCT	R	GWP	ACT1	VAR 1200mm	4'-0"	30-35	40	100 48	30	LB,RA

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

MEDICAL GASES	INTERIOR MECHANICAL DESIGN CONDITIONS									
OX-Oxygen MV-Med Vac MA-Med Air NO-Nitrous Oxide	1	2	3	4		5	6	7		
NI-Nitrogen GA-Gas DA-Dental Air OE-Oral Evac	AIR	AIR	MIN	TEMP		REL	FILTRATION			
LA-Lab Air PA-Process Air LV-Lab Vac. NOTES	BAL	CHG	OA	SUM	WIN	HUM	PRE	FIN	EXH	NOTES
	0	4	1	78F 26C	68F 20C	***	25%	***	***	
	0	4	1	78F 26C	68F 20C	***	25%	***	***	
	0	4	1	78F 26C	68F 20C	***	25%	***	***	
	0	4	1	78F 26C	68F 20C	***	25%	***	***	
	0	4	1	78F 26C	68F 20C	***	25%	***	***	
	-	***	***	***	50F 10C	***	***	***	***	
	-	***	***	***	50F 10C	***	***	***	***	
	-	***	***	***	50F 10C	***	***	***	***	
	0	6	2	70-74F 20-23C		***	25%	***	***	
	0	4	1	78F 26C	68F 20C	***	25%	***	***	

° DENOTES ADDED ROOM

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ARCHITECTURAL FINISHES: GENERAL NOTES

1. When two finishes are appropriate for a room, the preferred finish is shown first. The using Military Department may, during the review process, change to the alternate.

2. The bases under casework in damp or wet areas should be concrete and finished in the same material as the rest of the room.

3. Where CT is used as a wall finish, the CT should run all the way to the ceiling (or beyond) to avoid wainscotting, complex detailing, building trade problems during construction, and recurring maintenance from painting and "wall writers".

4. Areas in Radiology which require lead shielding shall use sheet lead or GW board with lead attached in all required locations.

5. Guard Rails shall be provided in all locations where cart traffic is considered "heavy" by the using Military Department, i.e., in all general circulation corridors; and in all corridors where patients might be assisted by the presence of guard/hand rails, i.e. corridors in nursing units, etc.

6. The acoustical noise level in the room is the design value for the NNC-Level for the background (ambient) noise level. This design value is generally considered as a minimum level.

7. The STC specifies the performance of the room enclosure in isolating against airborne sound. Where no door is specified, the remainder of wall partition/ceiling system should still be designed to this value. This design value is generally considered as a minimum rating.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ARCHITECTURAL FINISHES AND ABBREVIATIONS:

ACT1. Acoustical Ceiling Tile.

ACT2. Acoustical Ceiling Tile with waterproof sealer/coating.

AWF. Acoustical Wall Fabric. May be considered in Computer Rooms, Audiobooth Rooms, Copy Rooms, Keypunch rooms and Addressograph Rooms and such like where noise abatement is required. Must meet fire code and be installed according to manufacturer directions.

BLK. Structural element - may be concrete block, lightweight concrete block, structural clay tile, or cast-in-place concrete, i.e. vault.

BLK-L. Same as above only finished with liquid glaze or vitreous wall coating.

BLK-P. Same as above only finished with high quality, semi-gloss, lusterless enamel. Do not use lead based paints.

CONC. Concrete. (All interior horizontal concrete with no other finish scheduled shall be sealed for dusting.)

CPT. Carpet. Direct glue down, without separate pad. Integral polypropylene or vinyl backing is acceptable. Use no natural fibers for pile or backing. Use only dense, level-loop nylon pile with maximum pile height of one quarter inch. See using Military Department for further guidance. Use of carpet tiles is discouraged. Carpet is authorized in Lobbies, all offices, Libraries, Conference Rooms, Consultation Rooms, Dayrooms, Dining Rooms, Examination Rooms (not Treatment Rooms or Dental Treatment Rooms), and all corridors.

CT. Ceramic Tile. Matte-glaze finish (lusterless) only in all applications.

ET. Epoxy Terrazo.

GWL. Minimum 5/8th inch gypsum wallboard ("green board" for damp or wet areas) with liquid glaze or vitreous wall coating. This coating is a seamless, sprayed-on, lusterless semi-gloss two-component poly- ester epoxy or polyurethane finish. Locations calling for GWL may be substituted with VPL (veneer plaster with liquid glaze) where impact resistance, cleanability, and moisture resistance is a factor.

GWP. Minimum 5/8th inch gypsum wallboard with paint. Paint to be high quality, semi-gloss, lusterless, enamel selected from a prominent major paint manufacturer's standard colors. Paint materials shall not contain lead pigments.

ARCHITECTURAL FINISHES, NOTES, AND ABBREVIATIONS (Continued):

GWV. Minimum 5/8th inch gypsum wallboard with vinyl wall covering (VWC). Use type II VWC in all areas except corridors and cart traffic areas where type III VWC shall be used. Type III shall also be used in waiting rooms alcoved off major circulation corridors. Where GWV is used with a slash mark, it is to be used as an accent.

IV. Solid, seamless sheet vinyl base integral with the SV described below, using the same joint sealing application technique of grooved, melted, welded, vinyl for an impervious waterproof seal.

PFB. Prefabricated units such as audiobooths, walk-in freezer units, walk-in refrigerator units, shower stall units, and such like.

QT. Quarry Tile. Natural finish from oven firing. Use of "glazed" quarry tile is discouraged.

R. Rubber or vinyl coved base for use with resilient tile. Coved base shall terminate and butt at the face return of steel door jambs. A straight vinyl or rubber base or carpet base shall be used with carpet flooring. Fire-retardant wood blocking or metal runners shall be provided at the steel stud base channel runner for all gypsum board corridor walls.

SP. Special. Areas such as Ambulance canopies, docks, shelters, and such like.

SV. Sheet Vinyl. Solid, seamless vinyl in either roll or tile 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.

VAR. Varies or variable such as the ceiling heights in Auditorium, Ambulance Canopies and exterior patient protection canopies.

VCT. Vinyl Composition Tile. Shall not have integral asbestos fibers.

VP. Veneer Plaster. May be used as an alternate to "green board" in damp or wet areas as a substitute for GWV, GWL, CT; and, in corridors, litter holding, litter/wheelchair waiting/alcoves, Utility Rooms, Treatment Rooms, toilets without showers, Physical Therapy, Operating and Delivery Rooms, Nurse Stations, Laboratories and related spaces), Central Sterile Supply, patient bedrooms, and anywhere else water-resistance, cart abuse, cleanability, and impact resistance is required. Veneer Plaster Wallboard (VPW) is a suitable substitute for veneer plaster.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

STRUCTURAL NOTES:

1. Design for actual wheel loads or 150 psf (7.2 kPa) minimum.

2. Design for actual equipment loads or 150 psf (7.2 kPa) minimum.

3. Design for actual equipment loads or 100 psf (4.8 kPa) minimum.

4. Design for actual weight of shelves plus 3.1 pounds per filing inch (0.55 kg per Filing inch) or 150 psf (7.2 kPa) minimum on the floor.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

ELECTRICAL NOTES.

ILLUMINATION LEVEL NOTES:

D. Provide full-range dimming in room.

E. Provide O.R. Type Light Fixture or exam Light with dimmer at task location.

EP. Explosion Proof.

G. General illumination level. Second number listed is Task illumination level.

M. Provide multi-level switching with conventional on/off switching.

S. Provide Safelight for film processing.

T. Provide full-range dimming at task location.

X. Provide recessed ceiling mounted task illumination with full-range dimming.

EMERGENCY POWER NOTES:

EQ. Selected equipment connections.

L. Task Lighting.

LB. Task Lighting, General Illumination, and battery powered lighting (refer to section 10).

LE. Egress Lighting as required by NFPA 101.

LS. Selected lighting fixtures.

R. Selected receptacles.

R1. One receptacle per bed.

RA. All receptacles.

RC. Dedicated receptacles for critical care (refer to NFPA-70, Article 517).

U. Provide emergency power only as required by using Military Department.

MEDICAL GASES NOTES.

1. OX 50 PSIG OXYGEN. LOCATE OXYGEN PURITY MONITOR FOR INCOMING OXYGEN TO THE FACILITY AT THE DESIGNATED 24-HOUR CONTROL POINT, I.E. EMERGENCY OR BIOMEDICAL EQUIPMENT WORK AREA.

   MV 19 INCHES MERCURY FOR MEDICAL APPLICATIONS; HIVAC (DENTAL HIGH-VACUUM ORAL EVACUATION SYSTEMS) FOR DENTAL; IN COMPOSITE MEDICAL FACILITY WHERE DENTAL IS PART OF HOSPITAL, HIVAC MAY BE COMBINED WITH MV AS A SINGLE SYSTEM. SEE NOTE 5.

   MA 50 PSIG OIL-FREE MEDICAL AIR WITH DEW POINT OF 33°F. MA MAY NOT BE COMBINED WITH LA, DA, OR DLA PER NFPA 99.

   NO 50 PSIG NITROUS OXIDE.

   NI 160-200 PSIG NITROGEN FOR MEDICAL APPLICATIONS; SHDA (CENTRAL DENTAL SURGICAL HANDPIECE DRIVE AIR SYSTEMS) IN FREE STANDING DENTAL CLINIC. WHERE DENTAL CLINIC IS PART OF CMF, SHDA MAY BE REPLACED WITH HOSPITAL NITROGEN SYSTEM. SHDA MAY NOT BE COMBINED WITH DA, DLA, OR DCA.

   GA NATURAL GAS AT 5 INCHES WATER COLUMN.

   OE CENTRAL DENTAL HIGH VOLUME ORAL EVALUATION SYSTEMS (HVE) AT 12-15 CFM PER STATION AT 7-8 INCHES OF MERCURY.

   LA LAB AIR = 30 PSIG OIL-FREE AIR = DLA 30 (CENTRAL DENTAL LAB COMPRESSED AIR AT 30 PSIG OIL FREE AIR). LA, DA, DCA90 AND DLA30 MAY BE A COMBINED SYSTEM IN CMF.

   DA DCA90 CENTRAL DENTAL COMPRESSED AIR AT 85-100 PSIG (90 PREFERRED) OIL-FREE AIR WITH DEW POINT OF 33°F.

   PA PROCESSED AIR NON OIL-FREE AIR AT 120 PSIG.

   LV 1 INCH MERCURY FOR CENTRAL DUST COLLECTION REQUIREMENTS. SAME AS HVLE (PARA 9.5.4).

   WAGE WASTE ANESTHESIA GAS EVACUATION. PROVIDED WHERE ANESTHESIA GASES ARE ROUTINELY USED. SEE NOTE 5.

   AR AS REQUIRED BY FUNCTIONAL DESIGN

   "MEDICAL GAS OUTLET" IS THE SAME NOMENCLATURE AS "TERMINAL UNIT"

MEDICAL GASES NOTES (continued):

2. EACH PATIENT IS PROVIDED AN OXYGEN TERMINAL UNIT. IN PSYCHIATRY AND LIGHT CARE UNITS, PIPE MEDICAL GASES THROUGH THE ZONE VALVE BOX TO A POINT IMMEDIATELY ABOVE THE CORRIDOR CEILING WHERE THE PIPING WILL BE CAPPED.

   EACH PATIENT IS PROVIDED A MEDICAL VACUUM TERMINAL UNIT(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 PSYCHIATRIC PATIENTS. DO NOT PROVIDE IN PEDIATRIC PLAY AREA.

3. THE TERMINAL UNIT GROUPING WILL BE PER PATIENT STATION, WORKSTATION, ETC.

4. EACH OVERHEAD SERVICE COLUMN WILL CONTAIN 2 OX, 2 MV, 1 MA, 1 NO. IN ADDITION, 1 OX, 1 MA, 1 MV WILL BE WALL OR OVERHEAD TRACK MOUNTED, AS INDICATED, FOR INFANT RESUSCITATION. DEDICATED C-SECTION ROOMS MAY HAVE 2 COLUMNS.

5. ALL ANESTHETIZING LOCATIONS WILL HAVE A WASTE ANESTHETIC GAS EVACUATION SYSTEM (WAGE). USE OF MEDICAL VACUUM SYSTEM IS NOT RECOMMENDED FOR EVACUATION IN DoD FACILITIES.

   OE OR HVE MAY BE USED IN DTR'S FOR ANESTHESIA SCAVENGING WHERE A CENTRAL SYSTEM IS INSTALLED. FREESTANDING DENTAL CLINICS WITH LESS THAN 5 CHAIRS/UNITS MUST HAVE A COST ANALYSIS PRIOR TO 35% CONCEPT APPROVAL FOR CENTRAL SYSTEMS. APPROVAL OF CENTRAL SYSTEMS WILL BE MADE THROUGH DESIGN AGENT TO OASD-HA (DMFO).

6. ONE EACH OX, MA, MV TERMINAL UNIT IS REQUIRED IN BOTH THE HEADWALL UNIT AND THE INFANT RESUSCITATION AREA OF THE BIRTHING ROOM.

7. EACH OVERHEAD SERVICE COLUMN WILL CONTAIN 2 OX, 2 MV, 2 MA, 1 NO AND 1 NI. AN ADDITIONAL MV WILL BE PROVIDED ON EACH WALL AS APPROPRIATE.

8. THE TERMINAL GROUPING WILL BE PER BASSINET OR INFANT STATION.

9. THE TERMINAL GROUPING WILL BE PER 6-8 BASSINETS OR INFANT STATIONS. WHERE THE LDR BIRTHING ROOM CONCEPT IS USED, A MINIMUM OF ONE GROUPING WILL BE PROVIDED IN EACH LDR.

10. FOR EQUIPMENT TESTING AND CALIBRATION, EQUIPMENT SHALL BE TESTED WITH THE SPECIFIC GAS USED IN NORMAL OPERATION.

MEDICAL GASES NOTES (continued):

11. PROVIDE VALVED REGULATOR STATION.

12. SOME EQUIPMENT IN PATHOLOGY MAY REQUIRE HIGHER PRESSURE AIR THAN LA. IN THESE CASES PROVIDE PIPED, REGULATED AIR SUPPLY FOR DIRECT CONNECTION TO EQUIPMENT AT THE PRESSURE REQUIRED BY EQUIPMENT IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

13. EACH UTILITY CENTER REQUIRES 1 DA AND 1 OE.

14. GA (COUNTER-MOUNTED) AND LA (UNDER COUNTER-MOUNTED) WILL BE PROVIDED AT EACH DENTAL WORK STATION AS SHOWN IN APPENDIX A.

15. PROVIDE SHUT-OFF VALVE BOX AND ALARM PANEL, PROVIDE MASTER ALARM IN PLANT FACILITY MAINTENANCE AND AT EMERGENCY ROOM 24-HOUR CONTROL POINT.

16. ALL CONTINGENCY BEDS REQUIRE 1 OX, 1 MV, 1 MA PER BED STATION. IN BED EXPANSION SITUATIONS IN "PEACE TIME" FACILITIES ALSO PROVIDE 1 OX, 1 MV, 1 MA PER CONTINGENCY BED EXPANSION REQUIREMENTS NOTED IN THE PFD.

17. CMTF'S MAY USE NITROGEN FOR DRIVING SURGICAL HANDPIECE IN ORAL SURGERY DTRS. FOR FREESTANDING DENTAL CLINICS, USE SURGICAL COMPRESSED AIR AT 100-110 PSIG (SHDA) IN ORAL SURGERY DTRS FOR HANDPIECE POWER.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

INTERIOR MECHANICAL DESIGN CONDITIONS
FOR SPECIFIC AREAS, MEDICAL AND DENTAL TREATMENT FACILITIES

1. Air Balance.

++ Room exhaust and/or return is 20% less than supply.

\+ Room exhaust and/or return is 10% less than supply.

0 Room exhaust and/or return is equal to supply.

\- Room exhaust and/or return is 10% more than supply.

-- Room exhaust and/or return is 20% more than supply.

--- Room totally exhausted without supply.

2. Minimum Air Change is the minimum total air changes per hour required to meet ventilation requirements at design conditions. 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.

3. Minimum Outside Air is the minimum outside air changes per hour required to meet ventilation requirements at design conditions.

4. Temperature for Heat Gains Calculations.

Temperatures indicated in column 4 of Appendix A are in degrees Fahrenheit (F) and degrees Celsius (C).

Summer (Min): Min. design temp. for summer months. Temperature can go above but not below from the specified temperature.

Winter (Max): This is the maximum design temperature for the space during heating season.

Temperature can fall below the specified value but cannot exceed the specified temperature.

When the only temperature listed is for the summer condition, this temperature will be used for year around operation. When cooling is required during winter, such as in interior zones, temperature listed under summer conditions should be used.

APPENDIX A
ARCHITECTURAL AND ENGINEERING DESIGN REQUIREMENTS

INTERIOR MECHANICAL DESIGN CONDITIONS
FOR SPECIFIC AREAS, MEDICAL AND DENTAL TREATMENT FACILITIES (continued):

5. Relative Humidity (RH). This is the relative humidity to be maintained in a space as part of the designed conditions. The humidity may vary from 30 percent to 60 percent except where other design values are given or where there is no requirement for humidity control. Specific summer RH control is not required except for those areas provided under specific notes. Winter RH control is not required except as provided under notes.

6. Filtration. Up to three filter types may be required. The Orthopedic Operating Room requires a 25 percent prefilter, a 90 percent intermediate filter, and a 99.97 percent final filter. The values for the first two filters (see Appendix A) are by the atmospheric dust spot efficiency test. The atmospheric dust spot efficiencies are the minimum average and are based on ASHRAE Standard 52-76. The third filter where required is a HEPA filter which uses the DOP (Dy-Octyl Phthalate, or bis(2-ethylhexyl phthalate) test method. The DOP test efficiency is based on MIL-STD 282. All filters should be installed to prevent leakage between the filter segments and between the filter and its supporting frame.

7. Exhaust Outside. This column lists areas that require 100% exhaust directly to the outside.

8. Air supply shall be 15 air changes per hour unless a higher rate is required to meet cooling requirement and may be totally exhausted when the room is in use. The option as whether to utilize recirculated air during an operation is left to the discretion of the individual Military Departments. Should recirculated air be utilized the minimum outside air requirements would apply. During period of non-use, either (1) 75% of the air may be recirculated or (2) the air volume may be reduced to 3 air changes per hour, while maintaining the required air balance. All systems shall, if cost effective, use exhaust air energy recovery to precondition the incoming outside air.

9. Room exhaust directly over patient stations.

10. For negative isolation, room shall be negative to anteroom and positive to toilet. For positive isolation, room shall be positive to both anteroom and toilet. Anteroom shall be negative to corridor at all times. For isolation room used for patients with a high susceptability to infection from leukemia, burns, bone marrow transplant, organ transplant, or Acquired Immunodeficiency Syndrome, HEPA should be used on air supply system.

11. Exhaust all to outside applicable to process only.

INTERIOR MECHANICAL DESIGN CONDITIONS
FOR SPECIFIC AREAS, MEDICAL AND DENTAL TREATMENT FACILITIES (continued):

12. Utilize NFPA 99, para 4-3.1.2.1.

13. May require vehicle exhaust.

14. Oral Surgery Room in hospitals will be treated as Operating Rooms for air circulation and exhaust requirements. See Note 8.

15. The space that houses ethylene oxide (ETO) sterilizers should be designed to meet the following guidelines:

    1) Provide a dedicated local exhaust system with adequate capture velocity (i.e., with a minimum capture velocity of 200 feet per minute) to allow for the most effective installation of an air handling system, i.e., exhaust over sterilizer door, sterilizer vent for safety valve, exhaust at sterilizer drain, and exhaust for the aerator and multiple load station.

    2) Provide negative pressure in ETO source areas such as service/aeration areas.

    3) Ensure that air flow is away from sterilizer operators.

    4) Various systems offered by the sterilizer manufacturers for their equipment, that meet the exhaust criteria, should be considered.

    5) Provide a dedicated exhaust system for the ethylene oxide sterilizers and aerators with exhaust outlet at least 30 feet from any air intake. The exhaust system shall be fitted with audio-visual alarm system located in the sterilizer area to indicate less than design air flow.

    6) The gas lines from the cylinder area to the sterilizer shall be fitted with hand service valves at both ends.

16. Air supplied from the corridor.

17. Verify hood requirements.

18. Provide hoods as required.

19. Verify computer heat load requirement.

20. Provide adjustable (to user) humidistat within the room.

21. Provide adjustable (to user) thermostat and humidistat within the room.

APPENDIX B
UNIVERSAL MEDICAL DIAGNOSTIC X-RAY ROOM DESIGN CRITERIA

B.1 Definition of Universal X-Ray Room. "The universal X-ray room shall be capable of accepting all routine radiographic, fluoroscopic, and tomographic equipment, up to 1200 ma, 150 kvp, regardless of manufacture, during initial installation and subsequent replacement actions with little, if any, facility modification. The procedures shall 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.

B.2 Criteria.

B.2.1 Planning and Programming. The universal room shall be a maximum of 300 net square feet including space for equipment, control booth, and circulation. Critical room dimensions and layouts are given in Figure 1.

B.2.2 Electrical Raceway System. An extensive raceway system is provided so the universal room will accept any manufacturer's equipment without additional raceways, facility modifications, or use of exposed wiring. The raceway system consists of laying floor and wall ducts, and ceiling cable trays or wireways as shown on Figure 1.

B.2.2.1 Floor ducts are nominal 3.5 by 12 inches with a 14-inch cover plate that has the same weight bearing capacity as the structural floor. Cover plate must be installed flush with and have the same finish as the floor. Provide a gasket on the cover plate to maintain water tightness.

B.2.2.2 Wall ducts are nominal 3.5 by 10 inches with 12-inch wide flush mounted cover plates finished to match the walls.

B.2.2.3 Ceiling cable trays are nominal 3.5 by 12 inches NEMA class with 12A ladder type installed above the finished ceiling. Wireways, nominal 3.5 by 10 inches, may be used in lieu of cable trays.

B.2.2.4 Partitions must be provided in all ducts, cable trays, and wireways to separate high and low voltage cables.

B.2.3 Electrical Service Requirements. Each universal room must have adequate power service so all X-ray equipment can be installed without additional facility related electrical work. All feeder conductors will be copper.

B.2.3.1 Power Quality. The facility power system must provide the specified nominal voltage (480 V or 240 V) plus or minus 5 percent to

each universal room. Special power conditioning equipment, if required, should be identified and provided with the X-ray installation.

B.2.3.2 Three-Phase Rooms. If the room will receive three-phase X-ray equipment, provide 150 amp, 480 volt, three-phase (3-wire and ground) service to the room. Provide an adjustable trip, 150 amp, 3-pole, shunt trip circuit breaker in a NEMA 1, flush mounted enclosure.

B.2.3.3 Single-Phase Rooms. If the room will receive single-phase X-ray equipment, provide 150 amp, 240 volt, single-phase (3-wire and ground) service to the room. Provide an adjustable trip, 100 amp, 2-pole, shunt trip circuit breaker in a NEMA 1, flush mounted enclosure.

B.2.3.4 Emergency Shutdown. Provide a large, clearly identified push-button to actuate the shunt trip circuit breakers, and disconnect all power to the X-ray machine and accessories.

B.2.3.5 120/208 Volt Auxiliary Panelboard. If required by using Military Department, provide a 120/208 volt, single-phase, 100 amp panelboard with a 50 amp shunt trip main breaker to support the single-phase loads in each room. Provide a 20-pole-space panelboard with at least two 20 amp 2-pole circuit breakers, and five 20 amp 1-pole circuit breakers. This panelboard may be served from the nearest general purpose 120/208V transformer; a dedicated stepdown transformer may be provided and fed from the 480V service in 3-phase rooms. (Calculations should be based on 180 amp maximum demand for 3-phase rooms, and 300 amp maximum demand for single-phase rooms.)

B.2.3.6 Voltage Drop and Regulation. Total voltage drop in a branch circuit and feeder conductors must not exceed 2 percent from the facility distribution transformer to the X-ray rooms. Total voltage regulation of the distribution transformer, feeder, and branch circuit conductors must not exceed 5%. For circuits which serve only one room, calculations should be based on the maximum demand current of the single X-ray generator. For circuits which serve more than one room, calculation should be based on the maximum demand current of the two largest rooms. (Calculations should be based on 180 amp maximum demand for 3-phase rooms and 300 amp maximum demand for single-phase rooms.)

B.2.3.7 Distribution Transformers. Distribution transformers should not be dedicated solely to X-ray equipment. The voltage regulation is better if X-ray machines are connected to transformers which are partially loaded with other equipment. X-ray machines should always be connected line-to-line, never line-to-neutral.

B.2.3.8 Emergency Power. Emergency power for X-ray equipment, illumination, and duplex receptacles shall be in accordance with the using Military Department guidance documents.

B.2.4 Warning Lights, Interlocks, and Illumination. Warning lights, interlocks, and illumination are to be provided in accordance with the using agent's guidance documents.

B.2.5 Structural Requirements.

B.2.5.1 Walls. Provide studs on either side of the vertical electrical raceways. Design walls to support 220 pounds vertical-to-horizontal pull. Double walls must be provided between adjacent x-ray rooms.

B.2.5.2 Ceiling Support System. Provide an overhead tube-mount support system in accordance with Figure 2 with a load bearing capacity of 900 pounds vertical point load and 50 pounds per square foot uniformly distributed load. Spanning members should be mounted perpendicular to the centerline of the X-ray table and positioned at 25-5/8 inches on center to provide 2 feet clear between members. The acoustical ceiling tiles are to be suspended from the structural grid. Bottom of members should be flush with the finished ceiling.

B.2.6 Case Work.

B.2.6.1 Case work shall be as specified by the using Military Department.

B.2.6.2 A hand sink with hot and cold water and drain will be provided.

B.2.7 Radiology Shielding.

B.2.7.1 As a minimum:

a) Comply with the design requirements of NCRP Nos. 33, 34, and 49, the latest edition, and certify accordingly.

b) Lead shielding shall be 1/16 inch lead or lead equivalent up to 7 feet above the finished floor. Penetrations through the shielding should be avoided.

c) Where possible, lead shielding shall be applied to exterior side of wall partitions, i.e., laminated behind gypsum board for protection.

B.2.7.2 Use of modular shielding for operator's booth is permitted.

B.2.7.3 All ductwork, grilles, registers, and diffusers shall be located at a height higher than seven feet clear above the finished floor. Thermostats with associated transmission lines shall be surface-mounted.

FIGURE B-1

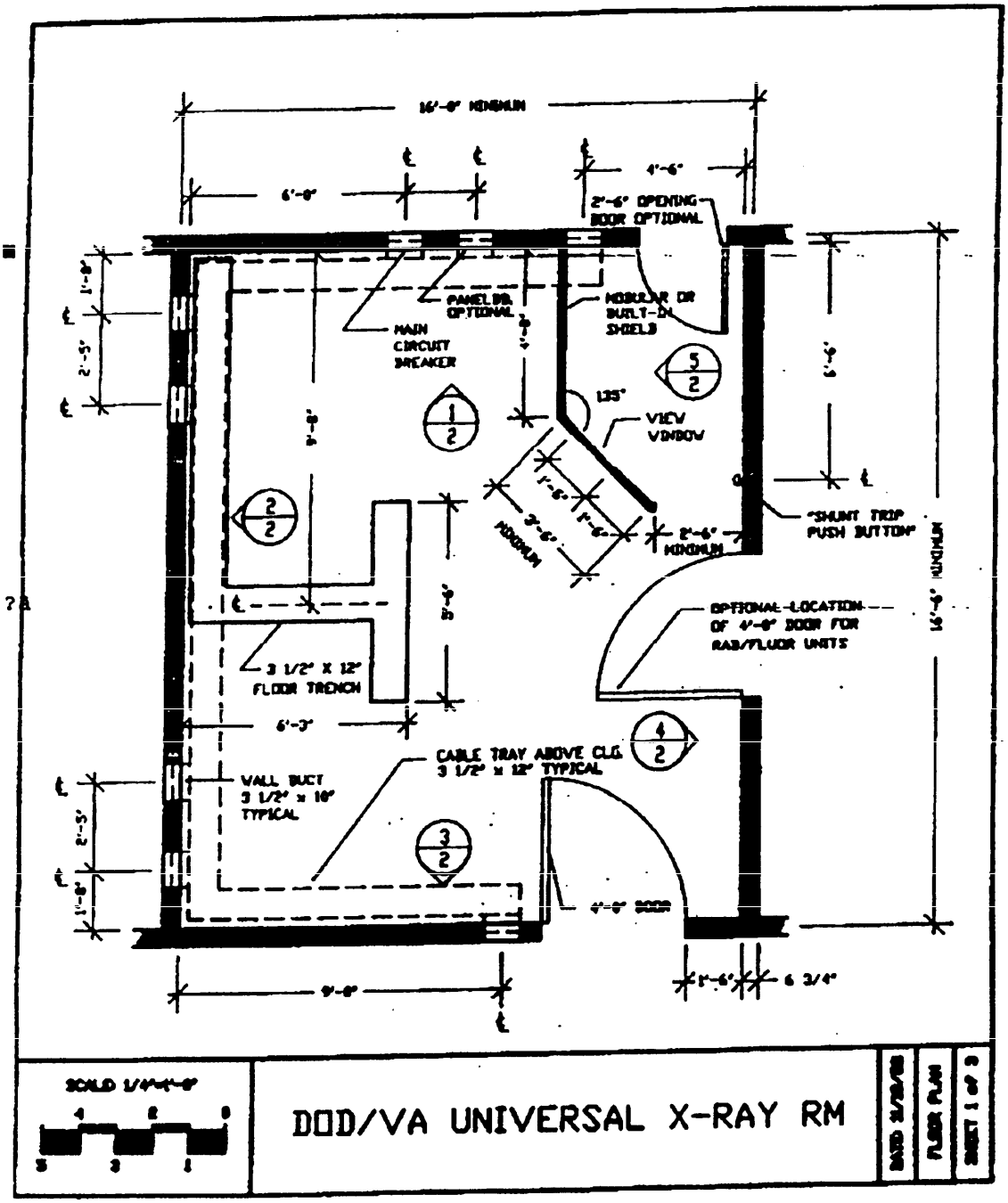


FIGURE B-1 (cont)

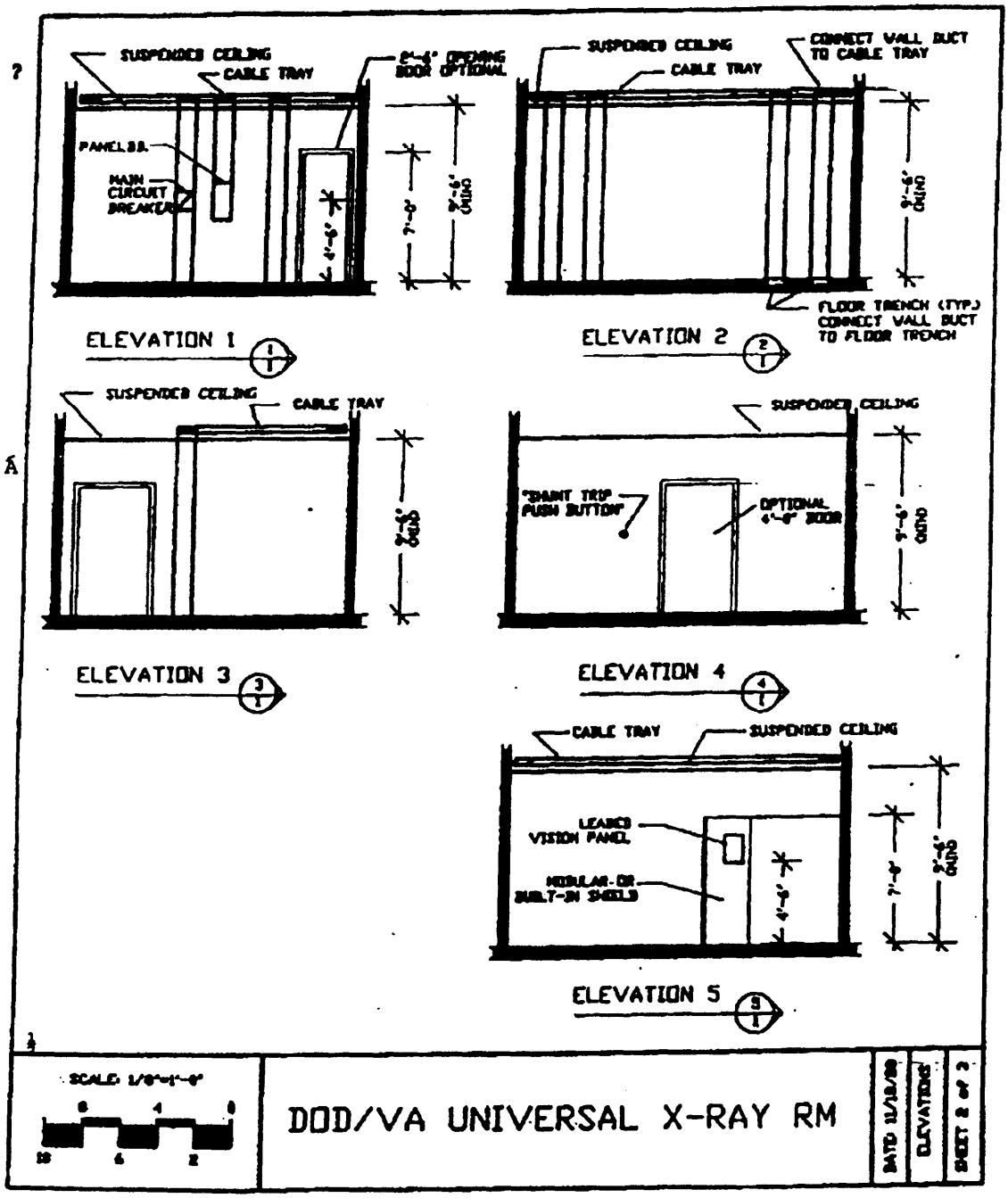
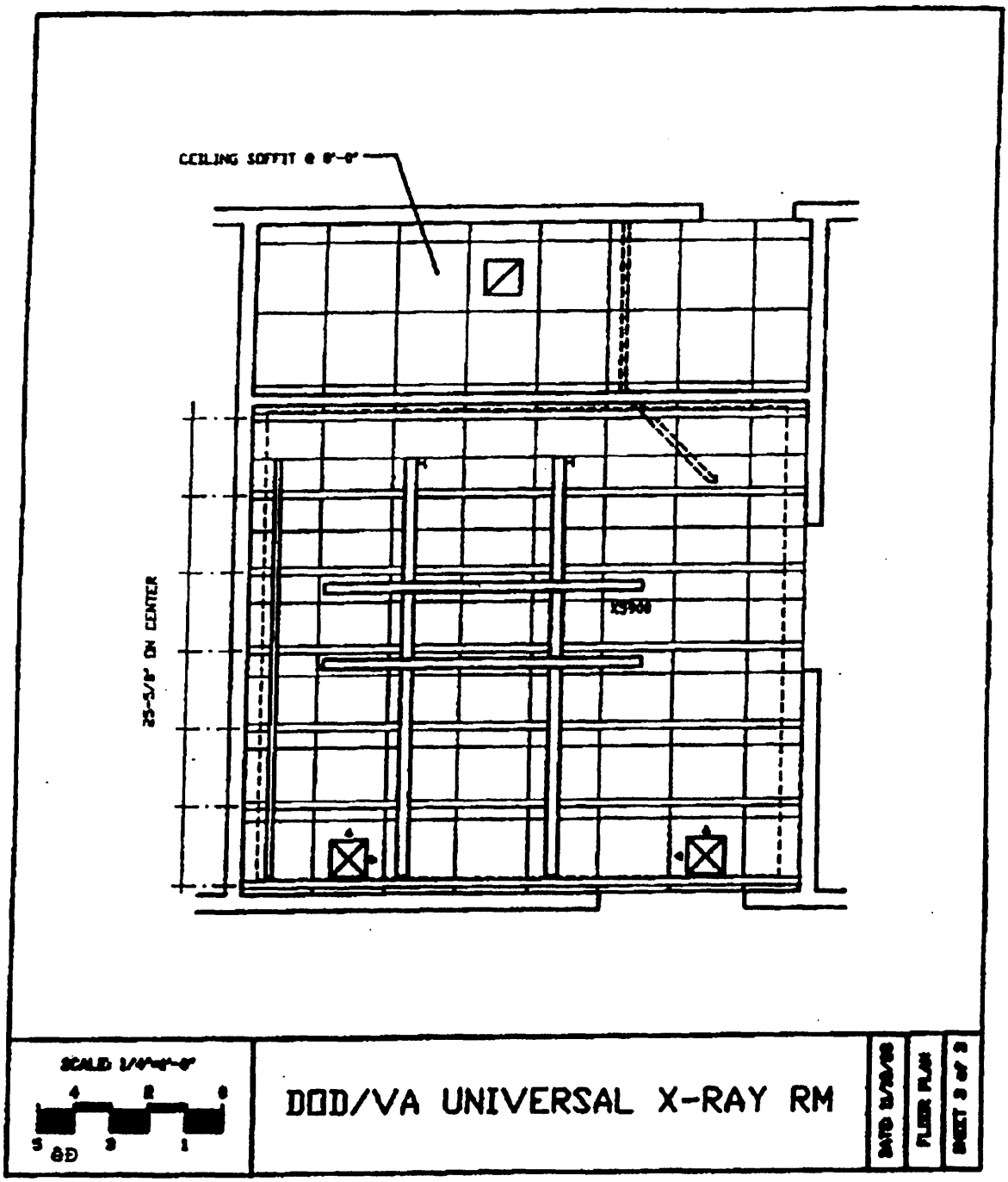


FIGURE B-1 (cont)



APPENDIX C
REQUEST FOR LIFE SAFETY CODE EQUIVALENCY
TRADITIONAL PROCEDURE

(This is an "official" Joint Commission on Accreditation of Healthcare Organizations procedure and documentation format.)

C.1 Identify each deficiency.

C.1.1 Reference the applicable Life Safety Code (1988 edition) paragraph, include the Code reference number.

C.1.2 State intent of the Code.

C.2 Propose an alternate solution.

C.2.1 Explain the proposal in writing.

C.2.2 Provide detailed drawings showing existing and proposed solution (maximum size of drawings - 11" x 17").

C.2.3 Indicate the total cost and describe the source, availability, and commitment of funds for the proposed alternate solution.

C.2.4 Provide a timetable of events from present through completion.

C.3 Have one of the following certify, in writing, that to the best of his or her knowledge, your proposed alternate solution meets either the intent of the Code identified in 1A above or will provide an equivalent level of Life Safety:

C.3.1 Fire protection engineer,

C.3.2 Registered architect, or

C.3.3 Local authority having jurisdiction (over enforcement of fire safety).

C.4 Submit to: Joint Commission on Accreditation of
Healthcare Organizations
Department of Plant and Technology Management
875 North Michigan Avenue
Chicago, Illinois 60611

NOTE: Equivalency requests will be returned if the above procedure is not followed or the information submitted is incomplete.

REQUEST FOR LIFE SAFETY CODE EQUIVALENCY
FIRE SAFETY EVALUATION SYSTEM (FSES) PROCEDURE

C.5 Survey facility to determine all Life Safety Code (LSC) deficiencies. Reference document is NFPA 101, Life Safety Code, latest edition.

C.6 Provide a current JCAHO Statement of Construction (SOC) for each building where an equivalency is requested.

C.7 Perform the FSES equivalency evaluation. Reference document is NFPA 101M, Alternative Approaches to Life Safety, latest edition. For each FSES Fire/Smoke Zone:

C.7.1 Complete FSES Tables 3-1 through 3-7. Evaluate zone as it presently exists. Drawings, SOC, and LSC deficiencies must support point values selected.

C.7.2 List all LSC deficiencies (include Code reference numbers) identified within the zone during step number 1 above.

C.7.3 Provide a floor plan. Drawings are limited in size to a maximum of 11" x 17"; scale must be specified. Indicate zone boundaries. Features of fire protection or life safety, if credit is taken on FSES Table 3-4, should be illustrated.

C.8 Complete FSES Table 3-8 for each building containing one or more zones being evaluated.

C.9 Determine if an equivalent condition exists:

C.9.1 Review FSES Table 3-7 for each zone being evaluated. Any FSES Table 3-7 containing a NO response indicates that an equivalent condition does not exist in that zone.

C.9.2 Review FSES Tables 3-8 for each building containing zones being evaluated. Any FSES Table 3-8 containing a NOT MET response indicates that an equivalent condition does not exist in any zone within that building.

Those zones having all YES responses to FSES Table 3-7 and either MET or NOT APP. responses to FSES Table 3-8 indicate that an equivalent condition presently exists.

FIGURE C-1

FIRE SAFETY EVALUATION SYSTEM (FSES)

SAFETY PARAMETERS	AS IS				ALT. 1			
	CONTAINMENT (S_1)	EXTINGUISHMENT (S_2)	PEOPLE MOVEMENT (S_3)	GENERAL SAFETY (S_G)	CONTAINMENT (S_1)	EXTINGUISHMENT (S_2)	PEOPLE MOVEMENT (S_3)	GENERAL SAFETY (S_G)
1. CONSTRUCTION								
2. INTERIOR FINISH (CORR. & EXIT)								
3. INTERIOR FINISH (ROOMS)								
4. CORRIDOR PARTITIONS/WALLS								
5. DOORS TO CORRIDOR								
6. ZONE DIMENSIONS								
7. VERTICAL OPENINGS								
8. HAZARDOUS AREAS								
9. SMOKE CONTROL								
10. EMERGENCY MOVEMENT ROUTES								
11. MANUAL FIRE ALARM								
12. SMOKE DETECTION & ALARM								
13. AUTOMATIC SPRINKLERS			½				½	
A. TOTAL VALUE								
B. MANDATORY VALUES								
C. DIFFERENCE BETWEEN A AND B								
D. IF C IS 0 OR MORE, CHECK BOX								

GLOSSARY OF TERMS, ABBREVIATIONS, AND ACRONYMS

AAFES. Army and Air Force Exchange Service.

ACD. Automatic Call Distribution--telephone system.

ACGIH. American Conference of Governmental and Industrial Hygienists.

ACI. American Concrete Institute.

ADL. Area Dental Laboratory. Regionalized laboratory for the preparation of dental bridgework, prosthesis, and prosthodontic devices too sophisticated and complex to be accomplished at the installation level.

ADP. Automated Data Processing. Data processing by electronic information processing equipment to include central processing units, peripheral storage devices, communications controllers, and associated peripheral input/output devices.

ADPE. Automatic Data Processing Equipment. General purpose, commercially available automatic data processing equipment, and the systems created by them.

ADPS. Automated Data Processing System. The personnel, facilities, computer, and its associated storage, controlling, and output devices used in ADP.

ADS. Automated Data System. An assembly of procedures, processes, methods, routines, or techniques united by regulated interaction to form an organized whole and specifically designed to make use of ADPE.

Aeromedical Staging Facility (ASF). A medical facility which has aeromedical staging beds, located on or in the vicinity of an emplaning or deplaning air base or air strip that provides reception, administration, processing, ground transportation, feeding, and limited medical care for patients entering or leaving an aeromedical evacuation system.

AET. Annual Energy Target.

AFM. Air Force Manual.

AFOMS/SGSF. HQ U.S. Air Force Surgeon General-Support-Facilities. The Office of Primary Responsibility (OPR), and the designated using Military Department representative of the U.S. Air Force Surgeon General for all policy, criteria decisions, and medical functional input regarding design and construction of U.S. Air Force medical projects worldwide. Focal point for coordination of programming and planning

activities between DMFO and the using activity(ies) on the Air Force medical MILCON Program.

AFR. Air Force Regulation.

AFRCE. Air Force Regional Civil Engineer.

AHERA. Asbestos Hazard Emergency Response Act. 40 CRF 763.

AICUZ. Air Installation Compatible Use Zone.

AIDS. Acquired Immunodeficiency Syndrome.

Air Handling Unit. A fan and coil unit designed and sized for supplying conditioned air to a given zone or space(s).

Air, Oil-Free, Dry. Air complying, as a minimum, with Grade "D" in CGA Pamphlet G-7.1, Commodity Specification for Air, and having a maximum dew point of -20 degree F(-28.9 degree C).

AISC. American Institute of Steel Construction.

AISI. American Iron and Steel Institute.

Alteration: Spaces within an existing structure requiring some level of modification to bring the space into compliance with code(s), regulations, or functional requirements. (See section 1).

Alternate Power Source. One or more generator sets, or battery systems where permitted, intended to provide power during the interruption of the normal electrical service; or the public utility electrical service intended to provide power during interruption of service normally provided by the generating facilities on the premises.

Ambulant, Ambulatory. Able to walk; not confined to bed.

Ambulatory Care Clinic. An entity or unit of a medical or dental treatment facility that is organized and staffed to provide healthcare and holds regular hours in a designated place.

Ambulatory Health Care Center. A building or part thereof used to provide services or treatment to four or more patients at the same time and meeting either 1) or 2) below. Ambulatory health care centers exhibit some of the occupancy characteristics of business occupancies and some of the charac- teristics of health care facilities. Ambulatory care medical clinics and similar facilities that are contiguous to health care occupancies but are primarily intended to provide outpatient services may be classified as a business or ambulatory care occupancy provided the facilities are separated from health care occupancies by not less than 2-hour fire-resistive construction.

a) Those facilities that provide, on an outpatient basis, treatment for patients that would render them incapable of taking action for self-preservation under emergency conditions without assistance from others, such as hemodialysis units or freestanding emergency medical units.

b) Those facilities that provide on an outpatient basis surgical treatment requiring general anesthesia.

Ampacity. Current-carrying capacity of electric conductors expressed in amperes.

Ancillary. Subsidiary, subordinate, auxiliary, or supplementary.

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.

ANSI. American National Standards Institute.

Antisepsis. The prevention of sepsis by exclusion or destruction of microorganisms.

Antiseptic. The prevention of decay, putrefaction or, sepsis through use of an agent that will prevent or arrest the development of microorganisms.

Antistatic. That class of materials that includes conductive materials.

Apparatus. Furniture, laboratory hoods, centrifuges, refrigerators, and commercial or man-made on-site equipment used in a laboratory.

Appliance. Electrical equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions.

AQCESS. Automated Quality of Care Evaluation Support System. An interactive, menu-driven patient administration and quality assurance computer system which provides inpatient facilities with the capability to collect, store, and retrieve data important for day to day management. The system is composed of four subsystems, three of which are functional (Admission and Disposition, Clinical Records, and Quality Assurance). These subsystems allow entry, updating, and display of data, as well as the production of reports for MTFs and higher command.

Architect-Engineer (A-E or A/E). A properly credentialed and insured company composed of professional, board certified, registered architects and engineers capable of producing a set of contract documents (plans and specifications) for the purpose of designing and constructing a Department of Defense (DoD) Medical Treatment Facility (MTF).

Area of Refuge. Areas identified in NFPA 101. A fire zone with a minimum of one horizontal exit and one egress to the exterior, either directly or via a fire stair.

ARI. Air Conditioning and Refrigeration Institute.

ARMS. Automated Review Management System.

Asbestos. A natural mined mineral which 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.

Asepsis. A condition free of germs or infection. Sterile.

ASHRAE. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

ASTM. 1) American Society of Testing and Materials.

2) American Standard Test Material.

ATBCB. Architectural and Transportation Barriers Compliance Board.

ATC. Air Transportable Clinic. Designed to provide limited medicine support/clinic service to an operational squadron of approximately 300-500 personnel at a limited or bare base. The assumption is that supporting hospital services will be nearby and/or aeromedical evacuation capability will be readily available. The ATC is intended to provide patient holding capability. The ATC is intended to provide interior care until the arrival of a follow-on tactical medical unit if duration of the operation warrants.

ATH. Air Transportable Hospital. This surgical/general hospital has 50 beds and one operating room (two operating tables) which provide resucitative surgery and post-operative stabilization, medical and dental care for patients in accordance with evacuation policy for evacuation/return to duty within two to fourteen days. Its staff of general/orthopedic, surgical, and internal medical personnel can perform 12 major surgeries, and can accommodate a peak of 20 admissions and limited/definitive outpatient care for 50 patients each day. After patient evacuation, the unit can relocate and reestablish in 24 hours, excluding travel time. This unit is capable of all weather, combat zone operation and requires external support services.

Atmosphere. The pressure exerted by, and gaseous composition of, an environment.

Atrium. A floor opening or series of floor openings connecting two or more stories that is covered at the top of the series of openings and is used for purposes other than an enclosed stairway; elevator hoistway; escalator opening; or utility shaft used for plumbing, electrical, air conditioning, or communication facilities.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure. For Department of Defense Medical and Dental Treatment Facilities, and the MIL-HDBK 1191, the authority having jurisdiction is the Defense Medical Facilities Office (DMFO). See also Governing Body.

AUTODIN. Automatic Digital Network. A worldwide DoD computerized general purpose communication system which provides for transmission of narrative and data pattern traffic.

Automatic. 1) Providing a function without the necessity of human intervention.

Automatic. 2) Self-acting, operating by its own mechanism when actuated by some impersonal influence as, for example, a change in current, voltage, pressure, temperature, or mechanical configuration.

AWG. American Wire Gauge.

AUTOVON. Automatic Voice Only Network. Worldwide military telephone system.

BAS. Battalion Aid Station.

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. (See Section 6).

BDS. Battalion Dressing Station.

Bed Capacity. Number of beds that a hospital can accommodate.

Beneficial Occupancy Date (BOD). The date on which a facility is available to serve the mission for which it is constructed.

Biomedical Equipment Maintenance Technician (BEMT or BMET). Responsible for inspecting, servicing, lubricating, adjusting, repairing, modifying, and replacing parts or assemblies and subassemblies of medical equipment in DoD MTF's.

BLAST. Building Loads Analysis and System ThermoDynamics.

BLAST/CB Protection. Refers to the sealing and pressurization, and decontamination of personnel and material(s) to preclude chemical-biological (CB) agents from entering a facility without compromising the CB protection or "shirt-sleeve" working environment within the facility.

Branch Circuit. The circuit conductors between the final overcurrent device protecting the circuit and the outlets(s).

Btu. British Thermal Unit.

Btuh. British Thermal Unit per Hour.

Budget Fiscal Year. The next consecutive fiscal year following the current fiscal year. The year following the budget fiscal year appears as the first year in the proposed Six-Year Military Construction Program.

Building. Any structure used or intended for supporting or sheltering any use or occupancy. The term building shall be construed as if followed by the words "or portions thereof."

Building, Existing. 1) Any existing structure erected prior to the adoption of the latest edition of the National Fire Protection Association (NFPA) 101 Code.

2) Those structures which are in existence at the date when the Design Authorization (DA) is issued, as existing buildings, structures, or exit facilities.

Building Subsystem. One of coordinated groups of components, each performing a higher function, which combine to form a building system.

Building System. 1) Any specific building production process or method.

2) Any set of coordinated building components intended for application as a group.

Built-in Equipment. That equipment which is affixed to the facility and usually included in the construction contract.

BUMED. HQ U.S. Navy Bureau of Medicine and Surgery.

Business Occupancy. Business occupancies are those used for the transaction of business, for the keeping of accounts and records, and similar purposes. Doctors' offices, treatment and diagnostic facilities intended solely for outpatient care and physically separated from facilities for the treatment or care of inpatients, but otherwise associated with the management of an institution, may be classified as Business Occupancy.

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 3200 lb (1452 kg), approximately 28,000 cu ft (793 m3) (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 cu ft (566 m3) of oxygen (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.

BW/CW. Biological and Chemical Warfare. Provides defense against biological and/or chemical agents which may be used during combat situations.

C. Celsius.

CAPOC. Computer Assisted Practice of Cardiology.

Cardio. Has to do with the heart.

Catchment Area. The geographical area of responsibility assigned to a health care facility providing services to the eligible population as listed in the Catchment Area Directory.

Category Code. Term used to identify real property building types by function. Example: Medical and Dental Treatment Facilities (MTF's) fall into category code 500.

CATV. Cable Television system for entertainment purposes.

CBA. Cost Benefit Analysis. The process of assessing all pertinent costs and benefits, usually performed in terms of an expected life-cycle of the system.

CBD. Commerce Business Daily.

CBTZ. Combat Zone.

CCA. Contamination Control Area.

CCP. Casualty Collection Point.

C-CS. Communications-computer system agreements with Host Nations OCONUS.

CCTV. Closed Circuit TV for security systems.

CDR. Call Detail Recording--telephone system.

CERCLA. Comprehensive Environmental Response Compensation and Liability Act.

CERL. Construction Engineering Research Laboratory.

CFA. Commission of Fine Arts.

CFC. Chlorofluorocarbon.

CFR. Code of Federal Regulations.

CGA. Compressed Gas Association.

CHAMPUS. Civilian Health and Medical Program for the Uniformed Services. Program administered by the Department of Defense that cost-shares for care delivered by civilian health providers to retired members, dependents of active and retired members, certain survivors of deceased members, and certain former retired members, certain survivors of deceased members, and certain former spouses of members of the seven uniformed services of the United States.

CHATH. Chemically Hardened Air Transportable Hospital.

CHCS. Composite Healthcare (Computer) Systems. Successor of Tri-Service Medical Information Service (TRIMIS) which was a part of the "new- generation" design concept. The TRIMIS Program Office initiative to implement a standardized, Tri-service, integrated health care management information system throughout the three MILDEPS.

Clinic A medical or dental treatment facility intended and appropriately staffed and equipped to provide primary ambulatory care services, limited specified secondary care services, and certain nontherapeutic activities related to the health of the personnel served, such as physical examinations, immunizations, medical administration, preventive medicine services, and health promotion activities.

CMTF. Contingency Medical Treatment Facility. An entity within the services' wartime organization structure which provides medical care during the contingency, war, or national emergency. Contingency Medical Treatment Facilities include medical treatment facilities afloat, deployable medical systems (DEPMEDS), and organizational medical assets.

Code. A document containing only mandatory provisions using the word shall to indicate requirements and in a form generally suitable for adoption into law.

COE. Corps of Engineers.

Cold Room. A refrigerated area large enough for personnel to enter.

Combustion Products. The gases, volatilized liquids and solids, particulate matter, and ash generated by combustion.

Common Path of Travel. That portion of exit access that must be traversed before two separate and distinct paths of travel to two exits are available. Paths that merge are common paths of travel. Common path of travel is measured in the same manner as travel distance but terminates at the point where two separate and distinct routes become available.

Commission of Fine Arts. A regulatory body in the U.S. National Capital Region (NCR) which helps determine applicability of all Federal MILCON funded medical Treatment Facilities and Composite Medical Treatment Facilities within the U.S. National Capital Region. [See National Capital Planning Commission (NCPC).]

Compaction. A waste-handling methodology whereby the volume of waste materials is reduced for ease of disposal.

Composite Medical Facility (CMF). A MILCON funded facility made up of Health Care Occupancy and Business Occupancy (Outpatient Clinics and/or Dental Treatment Facilities) and/or Ambulatory Care Facilities. (See MTF).

Concepts. The first phase of design which 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 which is called the "working drawings" phase of design.

Conductive. Not only those materials, such as metals, that are commonly considered electrically conductible, but also that class of materials which, when tested in accordance with this document, have a resistance not exceeding 1,000,000 ohms. Such materials are required where electrostatic interconnection is necessary.

Constructability. An analytical study which reviews the methodology, ease (or difficulty) with which a project can be administered, bid, built, enforced, understood, and phased which determines degrees of difficulty and construction time required to build a Medical Treatment Facility. (See section 2).

Construction Agent. The agency designated by the Secretary of Defense (SECDEF) responsible geographically (or by agreement) to erect, via contract, designs of Medical Treatment Facilities which have been coordinated by the Design Agents. Responsible for the project from Invitation for Bids (IFB) through Beneficial Occupancy (BOD) through the Warranty period(s). Current Construction Agents are:

a) The Corps of Engineers (COE)
b) The Naval Facilities Engineering Command (NAVFAC)
c) The Air Force Engineers (AF/LEEDF) in the United Kingdom and selected MIP installations.

Continuing Education. Education beyond initial professional preparation that is relevant to the type of patient care delivered in the organization, and/or provides current knowledge relevant to an individual's field of practice, and/or health care delivery in general.

Contract Documents (CD's). Those design drawings and specifications which, as a unit, constitute the basis for receiving bids and awarding a contract for construction. CD's are the basis on which a building is constructed.

CONUS. Continental United States.

Conventional Construction. Existing traditional building methods as they are currently applied.

Court. An open, uncovered, unoccupied space, unobstructed to the sky, bounded on three or more sides by exterior building walls.

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 allowable.

CPCS. Combat Personnel Control System. Commonly called the "electronic dog-tag," this is a developmental program to investigate the applicability of electromagnetic storage and data retrieval on combat personnel. Includes personnel and limited medical information.

CP&D. Central Processing and Distribution. An all-inclusive term for that function in a hospital which 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.

Criteria. Military Handbooks, criteria manuals, guide specifications, definitive designs, using Military Department guidance, standard designs, and other related guidance published to promote quality facilities' engineering, design, construction, and maintenance.

Critical Branch. A subsystem of the emergency system consisting of feeders and branch circuits supplying energy to task illumination, special power circuits, and selected receptacles serving areas and functions related to patient care, and which can be connected to alternate power sources by one or more transfer switches during interruption of normal power source.

Critical Care Areas. Operating Rooms, Delivery Rooms, Cystoscopy Rooms, Oral Surgery, Recovery (Stage 1), Coronary Care Units, Intensive Care Units, Emergency Care Unit, Labor Rooms, Neonatal Intensive Care Nursery, Cardiac Catheterization, Angiography Exposure Rooms, Hemodialysis, Surgery Suite, Hyperbaric Chambers, Special Procedure Rooms, (and associated Computer Rooms), Pharmacy Dispensing, Radiation Therapy (and associated Computer Rooms), and Nuclear Medicine Gamma Camera Room.

Critical Equipment. That equipment essential to the safety of the occupants of the facility.

Critical Path. The linear path through a work schedule network determining the shortest time within which all work can be completed.

Critical System. A system of feeders and branch circuits in nursing homes and custodial care facilities arranged for connection to the alternate power source to restore service to certain critical receptacles, task illumination, and equipment.

CRREL. U.S. Army Cold Regions Research and Engineering Laboratory. Hanover, NH.

CRS. Corrosion-resistant steel.

CRT. Cathode Ray Tube. A television-type systems input/output device for display of graphic and alpha-numeric characters.

CRTS. Casualty Receiving and Treatment Ship.

CSH. Combat Support Hospital.

Current Working Estimate (CWE). The current cost of the project based on actual takeoff's from Contract Documents. Required at certain levels of effort of design to compare against programmed amount (PA) to determine whether the project is executable given projected funds availability.

CWCT. Chemical Warfare Casualty Treatment Facility. A passively protected 2-E Contingency MTF.

DA. DCA90. Central Dental Compressed Air at 85-100 psig (90 preferred) oil-free air with dew point of 33 degrees F (0.55 degrees C).

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. (See Section 6).

Damp Location. As opposed to wet and/or dry areas. That location where routine housekeeping procedures and incidental spillage of liquids do not define a wet location. There are no long-term significant amounts of water associated with "Damp" locations which may harm the building structure or finishes as could occur in "wet" locations.

DCIS. Defense Criteria Information Systems.

DEERS. Defense Enrollment Eligibility Reporting System. Automated system of verification of a person's eligibility to receive Uniformed Service benefits and privileges.

Defense Contracting Audit Agency (DCAA). That agency in the Department of Defense (DoD) responsible for auditing bookkeeping records as prescribed by requirement. Example: The DCAA audits perspective Architect-Engineer records for amount of work and cost(s) to produce work to be certain that the A-E firm can perform and to be reasonably certain the government can negotiate a fee within prescribed limits.

Defense Medical Facilities Office (DMFO). The Office of Primary Responsibility (OPR) for all DoD MILCON funded Medical Treatment Facilities (MTF's). Organizationally the DMFO is a part of the DASD Health Services Operations under the Assistant Secretary of Defense for Health Affairs (OASD-HA).

Demolition. The wrecking or taking out of any load-supporting structural member(s) of a facility together with any related handling operations. 40 CFR 61.

Department of Defense Dependent Schools (DoDDS). The functional agency responsible for the design, construction, operations, maintenance, and staffing of schools for DoD dependents assigned overseas. Similar to DMFO, DoDDS is also the agency with which the using Medical Military Departments coordinate use of their schools as "buildings of opportunity" for contingency operations during wartime.

Departmental Gross Area. The functional space within a department plus intra-departmental circulation. Does not include "general" circulation.

DEPMEDS. Deployable Medical System(s). Contingency medical treatment facilities which are capable of being transported and located in a desired or required area of operation during a contingency, war, or national emergency. Deployable medical systems are composed of fixed

contingency hospitals and other fixed contingency hospitals which are not normally used for patient care during peacetime.

DEQPPM. Defense Environmental Quality Program Policy Memoranda.

Design Agent (DA). That agency, designated by the Secretary of Defense (SECDEF), responsible geographically (or by agreement) to technically design, via contract, Medical Treatment Facilities (MTF's) which have been coordinated with the Using Military Department(s) for functionality. Design Agents are also called MFDO's--Medical Facility Design Offices. Design Agents are responsible for the design of projects from receipt of a Design Authorization from DMFO through turning it over to the Construction Agents after 100% design but prior to Invitation for Bid (IFB). Design Agents are:

a) The Corps of Engineers (COE).
b) The Naval Facilities Engineering Command (NAVFAC).
c) The Air Force Engineers (AF/LEEDF) in the United Kingdom and selected MIP installations.

Design Authorization (DA). The notice from DMFO to the Design Agents to proceed with A-E selection and design of a project to a designated level of effort. Usually designates project, project fiscal year, project location, programmed amount (PA), scope of the project (size in square feet), which meetings DMFO will attend, any deviations from the submittal requirements in this MIL-HDBK, and whether or not DMFO wishes to participate in the A-E selection process.

Design Instruction (DI). Notification from DMFO to the Design Agents, or from Design Agents to subordinate field divisions, giving specific guidance on a particular project. May change or expand guidance provided in the Design Authorization and/or Engineering Instructions.

Design Process. The trial and error processes in architecture which continue until intuition is satisfied, fulfilling functional, economical, technological, aesthetic, efficient, and contemporary cultural values; all tempered by user desires and criteria.

DHA. Defense Health Agency.

DHC. Defense Health Council. Made up of using Military Department Surgeons General or their designated representatives to determine the validity and support of new medical technology, i.e., Hyperbaric Medicine, Magnetic Resonance Imaging (MRI), Positron Emission Technology (PET), Lithotripsy, etc. and which installation MTF's will receive the new technology.

DIN. Deutche's Industrial Norms. Specification system developed in the Federal Republic of West Germany and widely used throughout Western European Countries as the basis for specifying building materials, equipment, etc.

Disabled Person. An individual who has a physical or mental condition which, 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 extend of constituting a substantial physical, mental, or vocational handicap.

Disease. Morbus; illness; sickness; an interruption, cessation, or disorder of body functions, systems, or organs due to an entity characterized usually by at least two of these criteria: a recognized etiologic agent (or agents), an identifiable group of signs and symptoms, or consistent anatomical alterations.

DLA. Defense Logistics Agency. The agency of the DoD which, under its director, is responsible for the wholesale management, procurement, and distribution of items of supply common to the military departments.

DMEL. Design Master Equipment List.

DMIS. Defense Medical Information System. Provides management information to the OASD(HA), field activities, and military medical departments. Contains information on beneficiary populations, facilities, direct care costs and workloads, Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) costs, and other aspects of the delivery of health care services within DoD.

DMSB. Defense Medical Standardization Board. Group of clinicians and logistics personnel responsible for readiness contingency standardization of DEPMED sets, iso-shelter, and temper-tent configuration for the using Military Departments. A single contact point between DLA and other government agencies in all matters involving medical logistics.

DoD Medical Space Planning Panel. A panel that is responsible for developing health facility sizing criteria and for programming policy recommendations. The panel includes representatives of the Surgeons General of the Military Departments, the ASD(HA), and the ASD(MRA&L).

DPSC. Defense Personnel Support Center. Responsible for providing the most effective and economical support of designated common supplies (clothing and textile, medical and subsistence), medical equipment, and services to the military departments, and other DoD components.

DRB. Defense Review Board.

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.

EA. Economic Analysis. A cost benefit analysis done to identify the relative cost-effectiveness of delivering healthcare to a projected beneficiary population under different MTF sizing scenarios. PL 97-337 (15 October 1982), amending Section 1087 of Title 10, U.S.C., requires an Economic Analysis be done to determine the space to be programmed in MTFs for military retirees and their dependents.

EDP. Electronic Data Processing.

EEG. Electroencephalogramy.

EIS. Environmental Impact Statement.

Electrical Life Support Equipment. Electrically powered equipment whose continuous operation is necessary to maintain a patient's life.

EMCS. Energy Monitoring and Control System.

EMS. Emergency Medical Service.

Endemic. A disease of low morbidity that is constantly present in human community.

Engineering Instructions. Technical data from the Design Agents or Medical Facilities Design Offices (MFDO's) which expands the Design Authorization, clarifies numerous issues to be included in the Scope of Work (SOW), and specifies how the project is to be designed.

EPABX. Electronic Private Automatic Branch Exchange--telephone switch.

Equipment Grounding Bus. A grounding terminal bus in the feeder circuit of the branch circuit distribution panel that serves a particular area.

Equipment System. A system of feeders and branch circuits arranged for automatic or manual connection to the alternate power source and which serves primarily three phase power equipment.

Equivalency. Documented evidence that compliance with the intent of a standard has been achieved in a manner other than that prescribed by the standard.

ESCS. Engineered Smoke Control System.

Essential Electrical System. A system comprised of alternate sources of power and all connected distribution systems and ancillary equipment, designed to assure continuity of electrical power to designated areas and functions of a health care facility during disruption of normal power sources and also designed to minimize disruption within the internal wiring system.

Essential Facilities (Seismic). A seismic damage risk classification category. Facilities in the category are necessary for post-disaster

recovery and require continuous operation during and after an earthquake (see Section 6). Efforts to control damage due to earthquake in this category are the greatest.

Etiologic Waste. Any viable microorganism or its toxins which causes or may cause human disease.

ETS. European Telephone System.

EUCOM. European Command. The operating agency arm for the Joint Chiefs of Staff (JCS) in Europe.

Evaluation. Implies an analysis to be performed by the designer (A-E) in the basic contract (as opposed to "studies" or "investigations", which are extra services to be performed to complete the contract intent and requirements).

Explosion Protection. Where hazardous processes or storage are of such a character as to introduce an explosion potential, explosion venting, or an explosion suppression system specifically designed for the hazard involved shall be provided.

Exposed Conductive Surfaces. Those surfaces which are capable of carrying electric current and which are unprotected, unenclosed, or unguarded permitting personal contact. Paint, anodizing, and similar coatings are not considered suitable insulation unless they are listed for use.

Facilities. Building(s), equipment, and supplies necessary for the implementation of services by personnel.

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, Inventory of Military Real Property.

FAR. Federal Acquisitions Regulation.

Fast Track. An accelerated scheduling technique characterized by overlapping of activities traditionally performed in a linear sequence, requiring early commitment to general decisions, but allowing postponement of specific decisions.

FAX. Facsimile machine which transmits printed or written material over telephone line.

FCGS. Federal Construction Guide Specification.

Feeder. All circuit conductors between the service equipment or the source of a separately derived system and the final branch-circuit overcurrent device.

FEMA. Federal Emergency Management Agency.

FEMP. Federal Energy Management Program.

Fire Barrier. A fire barrier is a continuous membrane, either vertical or horizontal, such as a wall or floor assembly that is designed and constructed with a specified fire resistance rating to limit the spread of fire and that will also restrict the movement of smoke. Such barriers may have protected openings.

Fire Compartment. A fire compartment is a space within a building that is enclosed by fire barriers on all sides including the top and bottom.

Fire Protection Engineer. A person, persons, or firm specializing in building fire protection design who (which) is qualified to interpret and design fire protection drawings and specifications in accordance with NFPA, JCAHO, UBC, and other regulatory requirements.

Fire Resistance Rating. The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials.

Fire Window. A window assembly, including frame, wired glass, and hardware that under NFPA 257, Standard for Fire Tests of Window Assemblies, meets the fire protective requirements for the location in which it is to be used.

Fixed. Fastened to walls, floors, or ceiling or to steam, gas, plumbing, electrical power, sensor lines in a permanent manner.

Flame Spread. The propagation of flame over a surface.

Flammable. An adjective describing easy ignition, intense burning, and rapid rate of flame spread during combustion. It may also be used as a noun to mean a flammable substance. Many substances nonflammable in air become flammable if the oxygen content of the gaseous medium is increased.

Flammable Anesthetics. Gases or vapors, such as fluroxene, cyclopropane, divinyl ether, ethyl chloride, ethyl ether, and ethylene, which may form flammable or explosive mixtures with air, oxygen, or reducing gases such as nitrous oxide.

Flammable Anesthetizing Location. Any area of a facility that has been designated to be used for the administration of any flammable inhalation anesthetic agents in the normal course of examination or treatment. DoD facilities do not use flammable anesthesia except in some training situations in major medical centers.

Flammable Gas. Any gas that will burn when mixed in any proportion with air, oxygen, or nitrous oxide.

Flammable Storage Cabinet. A cabinet for the storage of flammable and combustible liquids constructed in accordance with NFPA 30, Flammable and Combustible Liquids Code.

Flash Point. The minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitible mixture with air near the surface of the liquid within the vessel as specified by appropriate test procedures and apparatus.

Floor Area, Gross. Gross floor area shall 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 shall be understood to be gross area unless otherwise specified. (See Section 2 and Figure 2-7 for expanded explanation.)

Floor Area, Net. Net floor area shall be the actual occupied area in a functional space, not including thickness of walls, chases, columns, or general circulation, etc. (See Section 2 and Figure 2-8 for expanded explanation.)

FM. Frequency Modulation--radio signal.

Friable. (Asbestos). Any material that contains more than 1% asbestos by weight and that can be crumbled, pulverized, or reduced to powder, when dry, by hand pressure.

FSC. Federal Stock (or Supply) Class/Code. A four-digit numeric which identifies a commodity by model, type, or material.

FSES. Fire Safety Evaluation System. In accordance with NFPA 101M.

Full-Time Equivalent (FTE). Work force equivalent of one individual working full-time for a specific period which may be made up of several part-time individuals or one full-time individual.

Functional Requirements. Those requirements necessary to ensure a particular facility continually meets the objective of the function for which it was constructed.

Governing Body. The individual, group, or agency that has ultimate authority and responsibility for the overall operation of the organization.

Ground-Fault Circuit Interrupter (GFCI). A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Grounding System. A system of conductors that provides a low-impedance return path for leakage and fault currents. It coordinates with but may

be locally more extensive than the grounding system described in Article 250 of NFPA 70, National Electrical Code.

GSA. General Services Administration. A federal agency established by act of Congress in 1949 to consolidate the functions of several other agencies and to provide economical, efficient, and serviceable administration in the procurement, supply, utilization, disposal, and records management of certain real and personal property and services.

Handrail. A bar, pipe, or similar member designed to furnish persons with a handhold. (A handrail, if of suitable design, may also serve as part of a guard.)

Hazard Current. For a given set of connections in an isolated power system, the total current that would flow through a low impedance if it were connected between either isolated conductor and ground.

Hazardous Area in Laboratories. The area inside fume hoods or enclosures where tests or procedures are being conducted.

Hazardous Areas. Areas of structures, buildings, or parts thereof having a degree of hazard greater than that normal to the general occupancy of the building or structure, such as storage or use of combustibles or flammables, toxic, noxious, or corrosive materials, or use of heat-producing appliances.

Hazardous Location. An anesthetizing location or any location where flammable agents are used or stored.

Hazardous Waste. Waste which is 1) toxic, 2) infectious, 3) radioactive, 4) reactive, ignitable (spontaneously), or corrosive.

HBV. Hepatitis B Virus.

HCFC. Hydrochlorofuorocarbon.

HDD. Heating Degree Days.

Health. A condition in which all functions of the body and mind are "normal" and active.

Health Care Occupancies. Health care occupancies are those used for purposes such as medical or other treatment or care of persons suffering from physical or mental illness, disease or infirmity; and for the care of infants, convalescents, or infirm aged persons. Health care occupancies provide sleeping facilities for four or more occupants and are occupied by persons who are mostly incapable of self-preservation because of age, physical or mental disability, or because of security measures not under the occupants' control.

Health care occupancies include:

a) Hospitals.
b) Nursing homes.
c) Limited care facilities.
d) Ambulatory health care centers.

Hematology. The science of the blood.

HEPA. High Efficiency Particulate Air.

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 Rise Building. A building more than 75 ft (23 m) in height. Building height shall be measured from the lowest level of fire department vehicle access to the floor of the highest occupiable story.

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. (See Section 6).

Histology. Study of the microscopic structure of tissue.

HIV. Human Immunodeficiency Virus.

HIVAC. Central Dental High-Vacuum Oral Evacuation System. Should be combined with MV in CMTF's.

Home Care Department/Service/Program. A formally structured organizational unit of the hospital that is designed to coordinate the effective provision of physician-directed nursing and other therapeutic health care services in the patient's residence and that provides at least one therapeutic service directly.

Hospital. An inpatient medical treatment facility with an organized professional staff which has beds available 24 hours a day and is capable of providing definitive inpatient care. It is staffed and equipped to provide diagnostic and therapeutic services in the fields of general medicine, surgery, and preventive medicine services and has the supporting facilities to perform its assigned mission and functions. A

hospital may, in addition, discharge the functions of a clinic and/or dental clinic.

Hospital Bed. A bed for an adult or child patient. Bassinets for newborns in maternity units, beds in labor rooms, recovery rooms, and other beds used exclusively for emergency purposes are not included in this definition.

HVAC. Heating, Ventilation, and Air-Conditioning.

HVE. Central Dental High Volume Oral Evacuation systems at 12 to 15 CFM per station at 7 to 8 inches of mercury. Same as OE, Oral Evacuation.

HVLE. Same as DLV. Central Dental High Volume Laboratory Evaluation Systems.

Hyperbaric. Pressures above atmospheric pressure.

Hypobaric. Pressures below atmospheric pressure.

ICU. Intensive Care Unit.

IES. Illuminating Engineering Society.

Incineration. In waste handling, the act of burning pathological and other designated waste/infectious waste in an incinerator in order to render the waste material(s) harmless.

Indirect Contract. A construction contract through the Host Country design or construction agent, often through a Status of Forces Agreement (SOFA); vis-a-vis "Direct" contracts through the U.S. COE or NAVFAC.

a) Isolation wastes.

b) Cultures and stocks of infectious agents and associated biologicals.

c) Human blood and blood products.

d) Pathological wastes.

e) Contaminated sharps.

f) Contaminated animal carcasses, body parts, and bedding.

Information Systems. Information systems are defined as all modes of computer applications used for communication between the Medical or Dental Treatment Facility and other agencies (external) and between departments, patient, and staff, and sections within the Medical or Dental Treatment Facility (internal). (See Figure 1-2).

Installation Medical Master Plan. A general site plan showing all existing medical structures proposed for retention or abandonment and all proposed project sites required to accomplish the projected medical mission.

Interdepartmental Circulation. General circulation. Circulation which provides access to and from various departments; includes elevators, stairs and major corridors.

Interface. 1) A common boundary between two systems or components.

2) A boundary detail designed to maintain a specified relation between adjacent systems or components.

Interstitial Space. Unfinished or non-habitable space utilized for building service subsystems, of sufficient size to accommodate workmen, and permit maintenance and alteration without interruption of activities in functional areas.

Intradepartmental Circulation. The area reserved for corridors and passages which are found immediately within the departmental area.

Invitation For Bids (IFB). That point in the design-construction process when all review comments from the 100% design submittal have been incorporated, the CWE is within the Project Amount, DMFO has notified the Design/Construction Agent that funds are available, and DMFO has notified the Design/Construction Agent to advertise the project for bids. It is generally that point in the process when the project ceases to be a design effort and becomes a "Construction Project".

Isolated Power System. A system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors. (See NFPA 70, National Electrical Code.)

Isolation Transformer. A transformer of the multiple-winding type with the primary and secondary windings physically separated which inductively couples its secondary winding to the grounded feeder systems that energize its primary winding.

JCS. Joint Chiefs of Staff. That agency within the DoD which jointly controls coordinated war planning for the Military Departments.

Joint Commission on Accreditation of Healthcare Organizations (JCAHO). 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.

JSN. Joint Schedule Number. The number used to identify equipment on architectural drawings and plans supporting military constuction projects.

KTU. Korean Telephone Upgrade.

Laboratory Work Area. A room or space for testing, analysis, research, instruction, or similar activities that involve the use of chemicals. This work area may or may not be enclosed.

LAN. Local Area Network. A modular communication methodology whereby the MTF is prewired during construction for current and future communications (telephone, CHCS, etc.) needs without having to surface mount additional wires or coax in the future and reduce future communication installation costs.

Langelier's Index. A calculated number used to predict whether or not a water will precipitate, be in equilibrium with, or dissolve calcium carbonate.

LCCA. Life Cycle Cost Analysis.

Life-Cycle-Cost (LCC). The determination, evaluation, and presentation of all costs incurred by and in a facility being engineered/designed. Includes costs of planning, designing, engineering, constructing, operating, and maintaining the facility.

Life Safety Branch. A subsystem of the emergency system consisting of feeders and branch circuit, meeting the requirements of Article 700 of NFPA 70, National Electrical Code, intended to provide adequate power needs to ensure safety to patients and personnel, and which can be automatically connected to alternate power sources during interruption of the normal power source.

Life Safety Code (L.S.C.). Standard developed and updated regularly by the National Fire Protection Association that specifies construction and operational conditions to minimize fire hazards and provide a system of safety in case of fire.

Life Safety Code Upgrade. The term used when the primary purpose for a project at a DoD Medical Treatment Facility is to compartmentalize, provide for egress, and generally bring the MTF up to the L.S.C. standard for access and exiting requirements.

Line Isolation Monitor. A test instrument designed to continually check the balanced and unbalanced impedance from each line of an isolated circuit to ground and equipped with a built-in test circuit to exercise the alarm without adding to the leakage current hazard. "Line isolation monitor" was formerly known as "ground contact indicator."

Load, Live. The weight superimposed by the use and occupancy of the building not including wind load, earthquake load, or dead load.

Long-Range Plan. A listing of proposed health facilities construction considered appropriate for inclusion in the Six-Year Defense Program that reflects total health facilities requirements. Synonymous with "Six-Year Defense Program" and SYDP.

MASH. Mobile Army Surgical Hospital.

May. "May" is used to indicate provisions which are used at the option of the designer.

MDF. Main Distribution Frame for telephone system.

Means of Egress. A means of egress is a continuous and unobstructed way of exit travel from any point in a building or structure to a public way and consists of three separate and distinct parts:

a) The exit access.
b) The exit.
c) The exit discharge.

A means of egress comprises the vertical and horizontal travel and shall include intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

Mechanical Space. The area which houses the primary and intermediate components of the air conditioning, plumbing, electrical and ventilation systems. This area includes chases and shafts as well as mechanical and electrical equipment rooms.

Medical Air. Compressed air generally used as breathing air for human respiration. The air may be supplied from cylinders or bulk containers or that has been reconstituted from oxygen U.S.F. and nitrogen N.F. and that complies with Grade D in ANSI Z86.1, Commodity Specification for Air (CGA Pamphlet G-7.1).

Medical Military Construction Program (MILCON). That portion of the President's budget devoted exclusively to the renovation, upgrade, and replacement of Medical Treatment Facilities which costs more than $200,000. MILCON is not supposed to include Operations and Maintenance (O&M) or Repair and Maintenance (R&M) unless the area which 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 JCAHO requirements.

Medical and Dental Treatment Facility (MTF). A facility established for the purpose of furnishing medical and/or dental care to eligible individuals.

MEDRAMS. Medical Readiness Assemblage Material System. An information system to assist in the inventory and equipment management for prepositioned contingency supplies and equipment.

MERC. Medical Equipment Repair Center. A consolidated intermediate level maintenance activity designated to provide medical equipment maintenance and engineering support to DoD medical activities.

Mezzanine. An intermediate level between the floor and the ceiling of any room or space and covering not more than one-third of the floor area of the room or space in which it is located.

MFRCL. Medical Facilities Room Contents List.

MHSS. Military Health Services System.

Military Construction Programming. The annual processing, review, and approval of military construction project proposals by the Military Department Secretaries, the OSD, and the OMB for submission to the Congress.

Mixed Occupancies. Sections of health care facilities may be classified as other occupancies if they meet all of the following conditions:

a) They are not intended to serve health care occupants for purposes of:

1. Housing, or
2. Treatment, or
3. Customary access by patients incapable of self-preservation.

b) They are adequately separated from areas of health care occupancies by construction having a fire resistance rating of at least 2 hours.

MODEM. Modulator-Demodulator. Communications device used to link computers with remote terminal devices or other remotely located computers.

Modernization. Alteration, repair, remodeling, replacement and renovation of existing buildings (including initial equipment thereof) and replacement of obsolete, built-in equipment of existing buildings. It does not include replacement of a facility or a portion to a capacity greater than the capacity of the existing facility.

Modular. 1) Having commensurable dimensions.

2) Capable of arrangement with exact fit in more than one sequence or direction.

3) Composed of/or containing predetermined dimensional and/or functional units such as repetitive structural bays or service modules.

MPRC. Medical Planning Review Committee.

MSDS. Material Safety Data Sheets.

MTMC. Military Traffic Management Command.

Must. Indicates a mandatory requirement. Analogous to shall.

National Capital Planning Commission (NCPC). A regulatory body in the U.S. National Capital Region (NCR) which helps determine applicability of all Federal MILCON funded Medical Treatment Facilities and Composite Medical Treatment Facilities within the U.S. National Capital Region. (See definition of Commission of Fine Arts and National Capital Region.)

National Fire Codes. Codes published by the National Fire Protection Association (NFPA).

NATO. North Atlantic Treaty Organization.

NAVAIDS. Air and Sea Navigational Aids.

NAVFAC. Naval Facilities Engineering Command.

NAVFACINST. Naval Facilities Division Instructions. U.S. Navy design and construction guidance for use in the design and construction of Navy Facilities.

NC-LEVEL. Noise Criteria-Level. Refers to a set of contours, roughly corresponding to the ear's response to Sound Pressure Level at various frequencies, which define the background sound level existing within a space.

NCRP. National Council of Radiation Protection and measurements.

NEPA. National Environmental Policy Act.

NESHAPS. National Emission Standards for Hazardous Air Pollutants.

NIOSH. National Institute for Occupational Safety and Health.

NIST. National Institute of Standards and Technology.

Noncombustible Material. A material (as defined in NFPA 220, Standard on Types of Building Construction) that, in the form it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials reported as noncombustible when tested in accordance with the Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C, ASTM E136, shall be considered noncombustible materials.

Nonflammable Anesthetic Agent. Refers to those inhalation agents that because of their vapor pressure at 98.6 degrees F (37 degrees C) and at atmospheric pressure cannot attain flammable concentrations when mixed with air, oxygen, or mixtures of oxygen and nitrous oxide.

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.

Nosocomial. Pertaining to or originating in a hospital.

NPDES. National Pollutant Discharge Elimination System.

NSN. National Stock Number. Medical equipment identification consisting of an applicable four-digit class code number plus the nine-digit national item identification number.

Nursing Care Unit (NCU). An organized jurisdiction of nursing service in which nursing services are provided on a continuous basis.

Nursing Services. Activities related to nursing care performed by nurses and other professional and technical personnel under the supervision of a registered nurse.

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.

OASD-HA. Office of the Assistant Secretary of Defense - Health Affairs.

Occupancy. The purpose for which a building or portion thereof is used or intended to be used.

Occupant Load. The total number of persons that may occupy a building or portion thereof at any one time.

Occupiable Story. A story occupied by people on a regular basis. Stories used exclusively for mechanical equipment rooms, elevator penthouses, and similar spaces are not occupiable stories.

OCONUS. Outside the Continental United States.

OHCS. OSHA Hazard Communication Standard.

Operational Level Category (Seismic). These categories define the post-earthquake performance requirements for various Military Medical and Dental Treatment Facilities with respect to operational mission, disaster prepared- ness, and medical post-earthquake needs.

Operations and Maintenance (O&M) FUNDS. Those funds other than MILCON used for the express purpose of upgrading and maintaining existing

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facilities and equipment, or for the purchase of government furnished equipment and furnishings (not built-in) to provide a complete and usable facility at BOD.

OSHA. Occupational Safety and Health Administration.

OSHOSP. Overseas Hospital.

PACOM. Pacific Command. The operating arm for the Joint Chiefs of Staff (JCS) in the Pacific. Located in Hawaii.

Patient Care Area. Any portion of a health care facility wherein patients are intended to be examined or treated.

PCCIE. Power Condition and Continuation Interfacing Equipment. Electronic devices to help smooth power fluctuations to computer systems. Precludes sudden loss of power or damaging spikes in current flows.

Permanent. For the purposes of Medical MILCON construction, any structure designed for a useful life-span of 25 years or longer.

PET. Positron Emission Tomography.

Plan of Correction, Conditional Accreditation. An organization's written plan, approved by Joint Commission staff, that outlines the activities that the organization will take to address compliance issues that caused the Accreditation Committee to make a decision of Conditional Accreditation. The plan will be the basis for the follow-up survey six months following approval of the plan.

Plan of Correction. An organization's written statement, approved by Joint Commission staff, that details the procedures to be taken to correct existing life safety deficiencies and lists the extraordinary safety measures to be implemented to temporarily reduce the hazards associated with the deficiencies.

POL. Petroleum, Oils, and Lubricants.

POM. Program Objective Memorandum. Formal document to identify major initiatives, their resource consumption estimates, and their operational justification used to prioritize and allocate manpower and fiscal resources.

Post Occupancy Evaluation (POE). An evaluation of the design and construction of a Medical Treatment Facility performed after BOD to obtain lessons-learned which can be applied to present and future designs to avoid making repeated mistakes.

PRC. Program Review Council. Review body who makes recommendations on POM initiatives as part of the overall program review process.

Precious Metals Recovery Program. Promotes the economical recovery of precious metals from excess and surplus materials, and the use of recovered precious metals as Government Furnished Material.

Pre-Engineered Buildings (PEB's). For the purpose of this criteria, pre-engineered buildings shall be 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.

Prefabrication. The on-site or off-site advance manufacture of building systems and components traditionally fabricated in place during installation.

Pressure Reducing Regulator. A device that automatically reduces gas under high pressure to a usable lower working pressure. In hospitals, the term "regulator" is frequently used to describe a regulator that incorporates a flow-measuring device.

Preventive Maintenance. The care and servicing of facilities or equipment for the purpose of retaining it in a serviceable condition.

PRISM. Provider Requirements Integrated Specialty Model. Automated information system used to analyze current and projected manpower requirements by provider specialty codes.

Programmed Amount (PA). The initial programmed amount is the estimated cost of a Medical or Dental Treatment Facility based on the DoD Cost Guidance and 1391 preparation prior to any design effort which 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 CWE from the Design Agents. This PA (new) may be the amount sent to Congress and the basis of Final Contract Document Design phases through Invitation for Bid (IFB).

Protective Construction. Protective construction is defined as those measures which can be effected by construction related activities to reduce or nullify the effects of an attack upon the installation and/or enhance the recuperability of the installation after attack. The term includes dispersion and duplication of structures and activities, strengthening (hardening) of structures, camouflage or "tone-down" painting and physical protection against chemical, biological, and radiological agents.

Protected Structure. (Also a "hardened structure".) Structures designed to protect the occupants and functions therein from the effects of blast pres= sure, penetration, fragmentation, and ground shock due to use of conventional weapons against the facility.

Provider. Healthcare professional or facility or group of healthcare professionals or facilities that provide healthcare services to patients.

Public Way. Any street, alley, or other similar parcel of land essentially open to the outside air, deeded, dedicated, or otherwise permanently appropriated to the public for public use and having a clear width and height of not less than 10 ft (3m).

PVC. Polyvinyl chloride.

RA. Risk Analysis. The process by which designs are evaluated to assess the security and information system privacy safeguards they must possess.

Rad/Fluoro. Radiographic/Fluoroscopic.

Ramp. A ramp is a inclined floor surface or a surface in an accessible space that has a running slope greater than 1 in 20.

RAS. Regimental Aid Station.

RCRA. Resource Conservation and Recovery Act. 42 USC 6973.

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.

Relocatability. The ability to economically dismantle, transport to a new location, and re-erect a facility.

Relocatable Contingency Medical Treatment Facility (CMTF). A CMTF designed specifically for mobility. Mobility is a quality or capability that permits these CMTFs to move from place to place while retaining the ability to fulfill their primary mission for the Military Services.

RFI. Request for Information. A procurement device which provides commercial industry with a background statement of a system(s) requirement and requests industry to comment on the requirement noting its expected technical feasibility and its possibilities for meeting projected cost and milestone schedules.

RFP. Request for Proposal. A procurement document released to commercial industries outlining a requirement for development and/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.

Resource Analysis and Planning System (RAPS). An automated tool that provides users the capability of assessing the impact of alternative assumptions and policy decisions on the beneficiary populations, utilizations, manpower requirements, and costs of the Military Health Services System (MHSS). It is intended primarily as an analysis tool, not as an authoritative data retrieval system, although it may be used to provide the best population estimates currently obtainable.

Respiratory Care Department/Service. An organizational unit of the hospital that is designed for the provision of ventilatory support and associated services to patients.

Risk. The possibility of suffering harm, disease, or loss.

Risk Management. Function of planning, organizing, implementing, and directing a comprehensive program of activities to identify, evaluate, and take corrective action against risks that may lead to patient, visitor, or employee injury and property loss or damage with resulting financial loss or legal liability.

RPIE. Real Property Installed Equipment. Items of equipment attached to or installed in real property.

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.

SCPS-M. Survivable Collective Protection System-Medical. Sometimes called the "French Sewer Pipe Solution." One, of many solutions, to provide an overpressured environment in a chemical-biological (CB) contaminated environment to provide a clinically sound "shirt-sleeve" working environment for patients and providers in the Combat Zone. Consists of 10 foot (minimum) concrete pipe sections overburdened with earth and a maze entry. An outgrowth of survivable collection shelters used for air crews and other "sortie-generating" personnel who have to remain in the Combat Zone during a conflict.

Section 2807, Title 10, U.S.C. The appropriate committees of Congress must be notified of the intent to award a contract for architectural and engineering services and construction design for the proposed military construction project if the estimated cost of such services exceeds $300,000. This notification must include the scope of the proposed project and the estimated cost of such services and must be made not less than 21 days before the initial obligation of funds for such services.

Semi-Permanent. For the purposes of medical MILCON construction, any structure designed to last between 5 and 25 years of useful life. An

example might be an overseas free-standing contingency facility off-base.

Shall. Indicates a mandatory requirement, synonymous with "will."

Should. Indicated a recommendation or alternative that is highly advised but not absolutely required.

SID. Structural Interior Design. That 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, i.e., walls, floors, ceilings, columns, fixtures, casework, equipment, exteriors, etc. as opposed to comprehensive Interior Design (CID) which is an option to design services and relates to moveable, mobile, portable equipment, fixtures, furnishings, etc. 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. (See sections 2 and 4.)

Simulation. The use of a computer program as a model of a real situation.

Six-Year Defense Program (SYDP). Includes all military construction projects proposed by the Military Departments for the next six (6) years. The program is updated annually. Synonymous with "Long-Range Plan."

SMDR. Station Master Detail Recording--telephone system.

Smoke Barrier. A smoke barrier is a continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly, that is designed and constructed to restrict the movement of smoke. A smoke barrier may or may not have a fire resistance rating. Such barriers may have protected openings.

Smoke Compartment. A smoke compartment is a space within a building enclosed by smoke barriers on all sides including the top and bottom. In the provision of smoke compartments utilizing the outside walls or the roof of a building, it is not intended that outside walls, roofs or any opening therein be capable of resisting the passage of smoke.

Smoke Detector. A device that senses visible or invisible particles of combustion.

Statement of Work or Scope of Work (SOW). A formalized document describing the details of an effort to be accomplished through contracted resources.

Special Care Unit (SCU). A medical care unit in which there is appropriate equipment and a concentration of physicians, nurses, and

others who have special skills and experience to provide optimal care to critically ill patients.

State-of-the-Art. The scientific and technical level attained at a given time.

Station Outlet. An outlet point in a piped medical gas distribution system at which the user makes connections and disconnections.

Status of Forces Agreements (SOFA). Agreements between the United States government and the government of a foreign nation (host nation) which allows U.S. Forces to engage in some activity (such as occupy, build, or otherwise have temporary rights) which otherwise would not be possible. SOFA agreements usually stipulate governing rules, codes and standards which must be followed in the course of construction on that nation's soil.

STC. Sound Transmission Class. A single-number rating system which compares the Sound Transmission Loss of a test specimen with a standard contour.

Sterilization. One of many methods of waste handling. Sterilization relates to rendering hazardous or infectious wastes harmless (i.e., free from living microorganisms, etc.) by antiseptic solution, heat, steam, and/or pressure.

Storage Cabinet, (Flammable). A cabinet for the storage of flammable and combustible liquids constructed in accordance with NFPA 30, Flammable and Combustible Liquids Code.

Story. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above. Stories shall be counted starting at the primary level of exit discharge and ending at the highest occupiable level. For the purposes of this definition, the primary level of exit discharge of a building shall be that floor that is level with or above finished grade of this exterior wall line for 50 percent or more of its perimeter. All DoD facilities shall conform to this definition.

Street. Any public thoroughfare (street, avenue, boulevard) 30 ft (9.1 m) or more in width that has been dedicated or deeded to the public for public use and is accessible for use by the fire department in fighting fire. Enclosed spaces and tunnels, even though used for vehicular and pedestrian traffic, are not considered as streets for the purposes of this definition.

Street Floor. Any story or floor level accessible from the street or from outside the building at ground level with floor level at main entrance not more than three risers above or below ground level at these points and so arranged and utilized as to qualify as the main floor. Where, due to differences in street levels, there are two or more stories accessible from the street, each is a street floor for the

8.4.3.4 Ceiling Support System. Provide an overhead tube-mount

purposes of this handbook. Where there is no floor level within the specified limits for a street floor above or below ground level, the building shall be considered as having no street floor.

SWDA. Solid Waste Disposal Act.

Systems Analysis. Analysis of a sequence of activities or management operations to determine which activities or operations are necessary and how they can be be accomplished.

Systems Approach. 1) An approach which involves identifying and describing each component of a system process and determining the relationships among the stages, including the inputs and outputs for each stage, so that the functioning of the total process relative to its environment can be understood.

2) A strategy of problem definition and solution which emphasizes the interaction between problem elements and between the immediate problem and its larger context and which specifically avoids traditional methods of independent and separate treatment of the various elements.

Systems Integration. 1) The combination of a group of relatively independent parts into a coordinated whole to improve performance through controlled interaction.

2) The joint use of a component by two or more systems.

TA. Table of Allowance. An equipment allowance document which prescribes basic allowances of organizational equipment and provides the control to develop, revise, or change EAID.

T-AH. Hospital Ship.

TAMMIS. Theater Army Medical Management Information System. A developmental information processing system to support U.S. Army field medical activities linking them to appropriate DoD patient regulating and transportation agencies and to the hospitals of the Army Medical Service.

Task Illumination. Provisions for the minimum lighting required to carry out necessary tasks, including safe access to supplies and equipment and access to exits.

TDA. Table of Distribution and Allowances.

TDY. Temporary Duty.

TOE. Table of Organization and Equipment.

Total Gross Area. The total area including intra-departmental circulation, inter-departmental circulation, walls and structure, mechanical space, and total net area.

Triage. The evaluation and classification of casualties for purposes of treatment and evacuation. It consists of sorting patients according to type and seriousness of injury and the establishment of priority for treatment and evacuation.

TSCA. Toxic Substances Control Act.

TSRS. Telephone Station Requirement Schedule.

TV. Television.

UCA. Uniform Chart of Accounts. The formal cost accounting process for health care management in the three MILDEPS. Accumulates, through standard work center allocations, costs for inpatient and outpatient services.

UCA/ASDC. Uniform Chart of Accounts/Automated Source Data Collection. The system to automatically collect workload and cost allocation data associated with the Uniform Chart of Accounts.

Uniform Federal Accessibility Standards (UFAS). Published as 49 CFR 31528 on August 7, 1984, the Department of Defense adopted the UFAS on May 8, 1985, and published the UFAS as FED STD 795 on April 1, 1988. The UFAS is the sole document (as amended) and the basis for all "handicapped" criteria for MILCON funded Medical Treatment Facilities. See Section 12 of MIL-HDBK 1191. All other published ETL's, criteria, etc. by the Military Departments are superseded by the UFAS.

Universal X-Ray Room. The universal x-ray room shall be capable of accepting all routine radiographic, fluoroscopic, and tomographic equipment up to 1200 ma, 150 kvp, regardless of manufacture, during initial installation and subsequent replacement actions with little, if any, facility modification. The procedures shall 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. (See Appendix B).

UPS. Uninterruptible Power Supply. A system of batteries and capacitance power storage devices to preclude catistropic failure of critically important information processing systems. During an electrical power failure, it provides a continuous flow of power to a computer system for a specified period of time during which system operators may shut down a system without loss of information or loss of data base addressing structures.

USA. Unites States Army.

USACE. United States Army Corps of Engineers.

USAF. United States Air Force.

USAMRDC. U.S. Army Medical Research and Development Command.

USC. United States Code.

Use Point. A room, or area within a room, where medical gases are dispensed to a single patient for medical purposes. A use point may comprise a number of station outlets of different gases.

Using Military Department. Synonymous with using Service, i.e., the U.S. Army, Navy, or Air Force.

USMC. United States Marine Corps.

USN. United States Navy.

USPS. United States Postal Service.

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. The main objectives of VE studies are reduced life cycle cost and improved quality of design. The application of value engineering shall not result in a lowering of criteria, quality standards, or reduction of scope as established by the guidance in this document. (See section 2).

VAV. Variable air volume.

WAGE. Waste Anesthesia Gas Exhaust.

Wet Locations. Those patient care areas that are normally subject to wet conditions, including standing water on the floor, or routine dousing or drenching of the work area. Routine housekeeping procedures and incidental spillage of liquids do not define a wet location. (See sections 4, 10).

WMP. War Mobilization Plan. Provides WRM programs and objective time frames for each location.

Working Drawings. The second half of the Design Phase which includes the final development of all contract documents to prepare for the bidding phase.

WRM. War Reserve Material. That material required to augment peacetime assets to completely support forces, missions, and activities reflected in DoD/JCS war plans.

X-Ray Installations (Long-Time Rating). A rating based on an operating interval of 5 minutes or longer.

X-Ray Installations (Mobile). X-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.

X-Ray Installations (Momentary Rating). A rating based on an operating interval that does not exceed 5 seconds.

X-Ray Installations (Portable). X-ray equipment designed to be hand carried.

X-Ray Installations (Transportable). X-ray equipment to be installed in a vehicle or that may be readily disassembled for transport in a vehicle.

Yard. An open, unoccupied space other than a court, unobstructed from the ground to the sky, except where specifically provided by the NFPA Codes, on the lot on which a building is situated.

CUSTODIANS:
ARMY - CE
NAVY - YD
AF - 04

PREPARING ACTIVITY: YD

PROJECT NO.
FACR-0317