

CHAPTER 230: VETERANS HEALTH ADMINISTRATION: ENGINEERING SERVICE

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1 PURPOSE AND SCOPE

This document provides Space Planning Criteria for Engineering Service Chapter 230 as it applies to all medical facilities at the Department of Veterans Affairs (VA).

Engineering Service is responsible for improving, maintaining, and operating the medical center physical plant and equipment, and for construction projects.

2 DEFINITIONS

- A. Concept of Operations: A user-developed guide to the functional operation of the VA healthcare facility. It defines the function of the facility and the scope of services to be provided in the new or remodeled space.
- B. Departmental Net to Gross (DNTG) Conversion Factor: A parameter, determined by the VA for each space planning criteria chapter, used to convert the programmed Net Square Foot (NSF) area to the Department Gross Square Foot (DGSF) area. The **DNTG** Departmental Conversion Factor for **Engineering Service** is **1.30**.
- C. Full-Time Equivalent (FTE): A staffing parameter equal to the amount of time assigned to one full time employee. It may be composed of several part-time employees whose total time commitment equals that of a full-time employee. One FTE equals a 40 hours per week.
- D. Functional Area: The grouping of rooms and spaces based on their function within a clinical service. Typical Functional Areas are Reception Areas, Patient Areas, Support Areas, Staff and Administrative Areas, and Residency Program.
- E. Input Data Statements: A set of questions designed to elicit information about the healthcare project in order to create a Program for Design (PFD) based on the criteria parameters set forth in this document. Input Data Statements could be Mission related, based in the project's Concept of Operations; and Workload or Staffing related, based on projections and data provided by the VHA or the VISN about the estimated model of operation for the facility. This information is processed through mathematical and logical operations in VA-SEPS.
- F. Program for Design (PFD): A space program based on criteria set forth in this document and specific information about Concept of Operations, workload projections and staffing levels authorized.
- G. SEPS (VA-SEPS): Acronym for Space and Equipment Planning System, a digital tool developed by the Department of Defense (DoD) and the Department of Veterans Affairs to generate a Program for Design (PFD) and an Equipment List for a VA healthcare project based on specific information entered in response to Input Data Questions. VA-SEPS incorporates the propositions set forth in all VA Space Planning Criteria chapters. VA-SEPS has been designed to aid healthcare planners in creating a space plan based on a standardized set of criteria parameters.

3 OPERATING RATIONALE AND BASIS OF CRITERIA

- A. Workload Projections or planned services / modalities for a specific VA medical center, hospital, or satellite outpatient clinic project are provided by the VA Central Office (VACO) / VISN CARES Capacity Projection Model. The workload projections are generated by methodology based upon the expected veteran population in the respective market/service area. Healthcare planners working on VA medical center, hospital, or satellite outpatient clinic projects will utilize and apply the workload criteria set forth herein for identified services and modalities to determine room requirements for each facility.
- B. Engineering Service is responsible for construction projects and for improving, maintaining, and the operating the Medical Center's physical plant and equipment. The Department is organized with an Office of the Chief of Engineering Service and Five (5) other sections: maintenance and repair; operations; biomedical engineering; projects (construction); and safety, industrial hygiene and fire protection.
- C. Space planning criteria have been developed on the basis of an understanding of the activities involved in the functional areas of the Engineering Service and its relationship with other services of a medical facility. These criteria are predicated on established and/or anticipated best practice standards, as adapted to provide environments supporting the highest quality health care for Veterans
- D. These criteria are subject to modification relative to development in the equipment, and subsequent planning and design. The selection of the size and type of Engineering Service equipment is determined by VACO and upon Veterans Health Administration (VHA) anticipated Facility needs.

4 PROGRAM DATA REQUIRED (Input Data Questions)

- A. Mission Input Data Statements
 - 1. Is Engineering authorized to be located in a separate building? (M)
 - 2. Is a Biomedical Repair Shop authorized? (M)
 - a How many Biomedical Research Tech. FTE positions are authorized? (S)
 - 3. Is a Carpentry Shop authorized? (M)
 - a How many Technical Carpentry Shop FTE positions are authorized? (S)
 - 4. Is an Air Conditioning Shop authorized? (M)
 - a How many Technical Air Conditioning Shop FTE positions are authorized? (S)
 - 5. Is a Plumbing Shop authorized? (M)
 - a How many Technical Plumbing Shop FTE positions are authorized? (S)
 - 6. Is an Electrical Shop authorized? (M)
 - a How many Technical Electrical Shop FTE positions are authorized? (S)
 - 7. Is a Paint Shop authorized? (M)
 - a Is a Flammable Storage room authorized? (M)
 - b How many Technical Paint Shop FTE positions are authorized? (S)
 - 8. Is a Machine Shop authorized? (M)
 - a How many Technical Machine Shop FTE positions are authorized? (S)
 - 9. Is a Mason Shop authorized? (M)
 - a How many Technical Mason Shop FTE positions are authorized? (S)
 - 10. Is a Grounds Maintenance Shop authorized? (M)
 - a How many Technical Grounds Maintenance Shop FTE positions are authorized? (S)

11. Is a Locksmith Shop authorized? (M)
12. Is a Multi Use Shop authorized? (M)

B. Workload Input Data Statements

1. How many patient beds in total are projected for this facility? (W)

C. Staffing Input Data Statements

1. How many Engineering Clerical FTE positions are authorized? (S)
2. How many Industrial Hygienist FTE positions are authorized? (S)
3. How many project Engineer FTE positions are authorized? (S)
4. How many Receptionist FTE positions are authorized? (S)
5. How many Technical FTE positions are authorized? (S)
6. How many Driver Dispatch FTE positions are authorized? (S)
7. How many Shop Supervisor FTE positions are authorized? (S)
8. How many Trainee FTE positions are authorized? (S)
9. How many Draftsman FTE positions are authorized? (S)
10. How many Engineering Technician FTE positions are authorized? (S)

D. Miscellaneous Input Data Statements

1. How many Engineering FTEs will work on peak shift? (Misc)
2. How many Engineering FTE positions are not authorized to have office or cubicle space? (Misc)

5 SPACE CRITERIA

A. Reception Areas

1. **Waiting (WRC01)**..... **120 NSF (11.2 NSM)**
Provide one per Engineering Service.
2. **Reception (RECP1)**..... **80 NSF (7.5 NSM)**
Minimum NSF; provide an additional 80 NSF per each Receptionist FTE position authorized greater than one.
3. **Toilet, Public (TLTU1)**..... **50 NSF (4.7 NSM)**
Provide one per Engineering Service.

B. Administrative and Operations Areas

1. **Office, Chief of Service (OFM01)** **150 NSF (14.0 NSM)**
Provide one per Engineering Service.
2. **Office, Assistant Chief of Service (OFA01 / OFA02)**..... **120 NSF (11.2 NSM)**
Provide one per Engineering Service; provide OFA01 if Standard Furniture is authorized; or, OFA02 if Systems Furniture is authorized.
3. **Office, Fire and Safety Specialist / Officer (OFA01 / OFA02)** **120 NSF (11.2 NSM)**
Provide one per Engineering Service; provide OFA01 if Standard Furniture is authorized; or, OFA02 if Systems Furniture is authorized.

All Engineering and Fire Safety Publications to be maintained in this office.

4. **Office, Industrial Hygienist (OFA01 / OFA02).....120 NSF (11.2 NSM)**
Provide one if an Industrial Hygienist FTE position is authorized; provide OFA01 if Standard Furniture is authorized; or, OFA02 if Systems Furniture is authorized.
5. **Office, Project Engineer (OFA01 / OFA02).....120 NSF (11.2 NSM)**
Provide one per Project Engineer FTE position authorized; provide OFA01 if Standard Furniture is authorized; or, OFA02 if Systems Furniture is authorized.
6. **Cubicle, Clerk (OFA03)64 NSF (5.9 NSM)**
Provide one per Clerical, Technical, Driver Dispatch, Shop Supervisor, and Trainee FTE positions authorized.
7. **Conference Room (CRA02)300 NSF (27.9 NSM)**
Provide one if a separate building for Engineering Service is authorized.
8. **Hospital Plans and Drafting Room (XXYYZ).....200 NSF (18.6 NSM)**
Minimum NSF; provide one per Engineering Service; provide an additional 85 NSF per each Draftsman FTE position and Engineering Technician FTE position authorized.

This room provides space for one Draftsman, plan storage, layout table, Computer workstation and Plotter / Printer.

9. **Interior Design Office / Library / Workroom (OFA01 / OFA02).....250 NSF (23.2 NSM)**
Provide one per Engineering Service.

C. Engineering Control Center

1. **Engineering Control Center (XXYYZ).....300 NSF (27.9 NSM)**
Provide one per Engineering Service.

This area houses the computer and control system that controls and monitors the HVAC system, emergency generators, and selected systems and equipment. H-08-3, the Department of Veterans Affairs Construction Standard 688-1, "Engineering Control Center" applies. If toilet facilities (Water closet and Lavatory: (50 NSF) are not conveniently available then the toilet facility will be included in the 300 NSF.

D. Biomedical Engineering Repair Shop

1. **Office, Biomedical Engineer (OFA01 / OFA02).....120 NSF (11.2 NSM)**
Provide one if Biomedical Repair Shops is authorized in Concept of Operations; provide OFA01 if Standard Furniture is authorized; or, OFA02 if Systems Furniture is authorized.

This office contains technical manuals for instrumentation and manufacturer's equipment catalogs.

2. **Receiving and Cleaning (BMRA1).....100 NSF (9.3 NSM)**
Provide one if Biomedical Repair Shop is authorized in Concept of Operations.

This area provides space where equipment can be broken down and cleaned, and where new medical equipment can be inspected.

3. **Repair (BMER1)** **400 NSF (37.2 NSM)**
Minimum NSF; provide one if Biomedical Repair Shop is authorized in Concept of Operations; provide an additional 100 NSF per Biomedical Technical FTE position authorized greater than one.

This function is divided into a mechanical repair area and an electronic repair area. A large amount of testing equipment is required on work benches.

4. **Storage (SRE01)**..... **100 NSF (9.3 NSM)**
Minimum NSF; provide one if Biomedical Repair Shop is authorized in Concept of Operations; provide an additional 25 NSF per Biomedical Technical FTE position authorized.

This area provides for storage of special spare parts and for equipment awaiting repair.

E. Shop Areas

1. **Carpentry Shop**

- a **Floor mounted Tools and Equipment, Carpentry Shop (PMCW1)** **500 NSF (46.5 NSM)**
Provide one if four Technical Carpentry Shop FTE positions or greater are authorized.

This area provides space for large size tools and equipment that are normally mounted to the floor.

- b **Workbench and Worktable, Carpentry Shop (PMCW1)** **400 NSF (37.2 NSM)**
Provide one if four Technical Carpentry Shop FTE positions or greater are authorized; provide additional NSF per Table 1.

TABLE 1: WORKBENCH AND WORKTABLE AREA CALCULATION

NUMBER OF FTE POSITIONS AUTHORIZED	AREA
4	400 NSF (37.2 NSM)
5	480 NSF (44.6 NSM)
6	520 NSF (48.4 NSM)
7	540 NSF (50.2 NSM)
8	560 NSF (52.1 NSM)
9	580 NSF (53.9 NSM)
10	590 NSF (54.9 NSM)
Greater than 10	590 NFS (54.9 NSM) plus 10 NSF per FTE position greater than ten.

This area normally contains wall benches, freestanding worktables, bench mounted tools, equipment, and devices necessary for a wide variety of tasks associated with maintenance and repair of the physical plant and grounds.

- c **Storage, Carpentry Shop (SRE01).....250 NSF (23.3 NSM)**
Provide one if four Technical Carpentry Shop FTE positions or greater are authorized; provide an additional 24 NSF for each Technical Carpentry Shop FTE position authorized greater than four.

This area provides storage of a 30 day supply of equipment, parts, supplies, and tools. Special heavy duty tools, machines, materials for recurring maintenance, and testing equipment must be maintained to minimize “down time”.

2. Air Conditioning Shop

- a **Floor-Mounted Tools and Equipment, Air Conditioning Shop (PMCW1).....300 NSF (27.9 NSM)**
Provide one if four Technical Air Conditioning Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Air Conditioning Shop (PMCW1).....400 NSF (37.2 NSM)**
Provide one if four Technical Air Conditioning Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- c **Storage, Air Conditioning Shop (SRE01).....250 NSF (23.3 NSM)**
Provide one if four Technical Air Conditioning Shop FTE positions or greater are authorized; provide an additional 24 NSF per each Technical Air Conditioning Shop FTE position authorized greater than four.

3. Plumbing Shop

- a **Floor-Mounted Tools and Equipment, Plumbing Shop (PMCW1) 200 NSF (18.6 NSM)**
Provide one if four Technical Plumbing Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Plumbing Shop (PMCW1) 400 NSF (37.2 NSM)**
Provide one if four Technical Plumbing Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- c **Storage, Plumbing Shop (SRE01) 200 NSF (18.6 NSM)**
Provide one if four Technical Plumbing Shop FTE positions or greater are authorized; provide an additional 24 NSF for each Technical Plumbing Shop FTE position authorized greater than four.

4. Electrical Shop

- a **Floor-Mounted Tools and Equipment, Electrical Shop (PMCW1) 150 NSF (14.0 NSM)**
Provide one if four Technical Electrical Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Electrical Shop (PMCW1) 400 NSF (37.2 NSM)**
Provide one if four Technical Electrical Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- c **Storage, Electrical Shop (SRE01) 250 NSF (23.3 NSM)**
Provide one if four Technical Electrical Shop FTE positions or greater are authorized; provide an additional 24 NSF for each Technical Electrical Shop FTE position authorized greater than four.

5. Paint Shop

- a **Floor-Mounted Tools and Equipment, Paint Shop (PMCW1)..... 80 NSF (7.5 NSM)**
Provide one if four Technical Paint Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Paint Shop (PMCW1)..... 400 NSF (37.2 NSM)**
Provide one if four Technical Paint Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- c **Storage, Flammable, Paint Shop (SRHM1)..... 100 NSF (9.3 NSM)**
Minimum NSF; provide one if four Technical Paint Shop FTE positions or greater are authorized and a Flammable Storage is authorized in Concept of

Operations; provide an additional 24 NSF for each Technical Paint Shop FTE position authorized greater than four.

- d **Paint Area, Paint Shop (XXYYZ)500 NSF (46.5NSM)**
Provide one if four Technical Paint Shop FTE positions or greater are authorized.

This area provides a control and isolated area for paint work.

6. Machine Shop

- a **Floor-Mounted Tools and Equipment, Machine Shop (PMCW1)300 NSF (27.9 NSM)**
Provide one if four Technical Machine Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Machine Shop (PMCW1)400 NSF (37.2 NSM)**
Provide one if four Technical Machine Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- c **Storage, Machine Shop (SRE01)100 NSF (9.3 NSM)**
Minimum NSF; provide one if four Technical Machine Shop FTE positions or greater are authorized; provide an additional 24 NSF for each Technical Machine Shop FTE position authorized greater than four.

7. Mason Shop

- a **Floor-Mounted Tools and Equipment, Mason Shop (PMCW1)100 NSF (9.3 NSM)**
Provide one if four Technical Mason Shop FTE positions or greater are authorized.
- b **Workbench and Worktable, Mason Shop (PMCW1)400 NSF (37.2 NSM)**
Provide one if four Technical Mason Shop FTE positions or greater are authorized. Provide additional NSF per Table 1.
- c **Storage, Mason Shop (SRE01)100 NSF (9.3 NSM)**
Minimum NSF; provide one if four Technical Mason Shop FTE positions or greater are authorized; provide an additional 24 NSF for each Technical Mason Shop FTE positions authorized greater than four.

8. Grounds Maintenance Shop

- a **Workbench and Worktable, Grounds Maintenance (PMCW1)400 NSF (37.2 NSM)**
Provide one if four Technical Grounds Maintenance Shop FTE positions or greater are authorized; provide additional NSF per Table 1.
- b **Storage, Grounds Maintenance (SRE01)100 NSF (9.3 NSM)**
Provide one if four Technical Grounds Maintenance Shop FTE positions or greater are authorized; provide an additional 24 NSF per each Technical

Grounds Maintenance Shop FTE position authorized greater than four.

- c **Storage, Covered Outside, Grounds Maintenance (XXYYZ) 400 NSF (37.2 NSM)**
Provide one if less than four Technical Grounds Maintenance Shop FTE positions are authorized.

This space provides for storage of grounds maintenance equipment, flammable liquids, sand, gravel, seasonal bulk supplies, etc. The requirement for this space is determined on an individual project basis. The amount of space may vary depending on the location of the medical center and the size of the campus.

9. **Locksmith Shop**

- a **Workbench and Worktable, Locksmith Shop (PMCW1) 120 NSF (11.2 NSM)**
Minimum NSF; provide one if the total number of projected patient beds are between 10 and 350; provide an additional 40 NSF if the total number of patient beds is greater than 350.
- b **Storage, Locksmith Shop (SRE01) 80 NSF (7.5 NSM)**
Provide one per Locksmith Shop.

10. **Multi Use Shop**

- a **Floor-Mounted Tools and Equipment, Multi Use Shop (PMCW1) 350 NSF (32.6 NSM)**
Provide one if less than four Shop Areas Technical FTE positions in total are authorized for Engineering Service.
- b **Workbench and Worktable, Multi Use Shop (PMCW1) 450 NSF (41.8 NSM)**
Provide one if less than four Shop Areas Technical FTE positions in total are authorized for Engineering Service.
- c **Storage, Multi Use Shop (SRE01) 250 NSF (23.3 NSM)**
Provide one if less than four Shop Areas Technical FTE positions in total are authorized for Engineering Service.
- d **Storage, Flammable, Multi Use Shop (SRHM1)..... 100 NSF (9.3 NSM)**
Provide one if less than four Shop Areas Technical FTE positions in total are authorized for Engineering Service.

- 11. **Housekeeping Aids Closet - HAC (JANC1) 40 NSF (3.8 NSM)**
Provide one for every two Engineering Shops.

D. Staff Lounge, Lockers and Toilets:

The spaces below provide programming of Lounge, Lockers, and Toilets at department / service / chapter level. Alternatively, sum all departments/services data for Lockers, Lounges and Toilets, and program space in Chapter 410-EMS Lockers,

Lounges, Toilets and Showers. Either/or – do not duplicate space. Provide locker space only for those FTEs without office or cubicle space.

1. **Lounge, Staff (SL001)****80 NSF (7.5 NSM)**
Minimum NSF; provide an additional 15 NSF per each projected FTE on peak shift greater than five.

For less than five FTE combine Lounge facilities with adjacent department or sum in chapter 410.

2. **Locker Room, Staff (LR001)** **80 NSF (7.5 NSM)**
Minimum NSF if total number of FTE positions not authorized to have office or cubicle space is between five and thirteen; provide an additional 6 NSF per FTE position if total number of FTE positions not authorized to have office or cubicle space is greater than thirteen.

Provide locker space only for those FTEs without assigned office or cubicle space. For less than five FTE combine Locker Room facilities with adjacent department or sum in chapter 410.

3. **Toilet, Staff (TLTU1)** **50 NSF (4.7 NSM)**
Minimum one; provide an additional staff toilet for each increment of five projected FTEs on peak shift greater than thirteen.

6 PLANNING AND DESIGN CONSIDERATIONS

- A. Departmental Net-to-Gross factor (**DNTG**) for **Engineering Service** is **1.30**. This number when multiplied by the programmed Net Square Foot (NSF) area determines the Departmental Gross Square Feet (DGSF).
- B. Administrative offices should be located in proximity to the main hospital administration complex. (Different floors are acceptable).
- C. Shop areas should be located adjacent to the loading dock and accessible to interior transport system. If not adjacent to the dock then a double exterior opening door should be considered. Access is needed to move lengths of pipe and large sheets plywood and sheetrock.
- D. The engineering control room (ECC) shall be totally enclosed, air conditioned, and designed acoustically to provide an ambient noise level of not more than 50 Decibels. The control room shall be located so that visual surveillance of both the water chilling equipment and boiler plant equipment can be maintained. If this is not feasible, then the control room shall be located to provide visual surveillance of the water chilling equipment (or as recommended by the Engineering Officer)
- E. A vacuum system is required for the equipment utilized in carpentry work. A fume hood is required where welding is accomplished.
- F. Individual shops may be combined to form larger shops or all shops may be combined into one large shop area. Shop storage areas may be combined.

- G. AMES/ MERS is the abbreviation for Automated Engineering Management System / Medical Equipment Reporting System. This may be a web based system. PC of Wyse based or terminal is needed.
- H. The office for the Biomedical Engineer may be located either with the biomedical Engineering shop or in the administrative office area.
- I. If an automatic transport system (ATS) is planned for the medical center, then an ATS repair shop is required. The ATS shop should consist of a test track, workbench area, and a battery recharging area. Space must be determined on a project by project basis.
- J. Refer to the latest edition of the Guidelines for the Design and Construction of Health Care Facilities published by and available from the American Institute of Architects, 1735 New York Avenue, NW, Washington DC 20006.

7 FUNCTIONAL RELATIONSHIPS

Relationship of Engineering Service to services listed below:

TABLE 2: FUNCTIONAL RELATIONSHIP MATRIX

RELATIONSHIP OF ENGINEERING SERVICE TO	ADMIN.	SHOPS	ENG. CTRL. CTR.	BIOMED REPAIR
Audiology and Speech Pathology		X	X	
Building Management - Administration	3			
Cardiology Laboratory				3
Dietetic Service - Food Proceeding		3		
Dialysis Center				3
Director's Suite	3			
Laboratory				3
Laboratory - E.M. Suite		X	X	
Nursing Units – CCU				3
Nursing Unit – MICU				3
Nursing Unit – SICU				3
Pulmonary Medicine				3
Radiology - Main Suite				3
Supply Service - Administration	3			
Supply Service - S.P.D. Central				3
Supply Service - Warehouse		3		
Surgical Service - Operating Suite	X			3

Legend:

Relationship:

- 1. Adjacent
- 2. Close / Same Floor
- 3. Close / Different Floor
- Acceptable
- 4. Limited Traffic
- X. Separation Desirable

8 FUNCTIONAL DIAGRAM

