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MILITARY HANDBOOK

BACHELOR QUARTERS



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ABSTRACT

This handbook is intended to promote a better understanding of bachelor quarters requirements and design criteria. The Navy facilities project's quality can be observed through its appearance, ambiance, and fulfillment of functional requirements and mission objectives. Quality is derived from a professional commitment by users, planners, programmers, and designers to achieve understated excellence through the delivery of complete and usable facilities. To achieve quality results, the proposed bachelor quarters shall satisfy the design intent, be easily maintained, and present a positive image of the Navy in its caretaker role of personnel as well as the environment. This handbook is presented for the use of:

- a) Public works officers
- b) Community planners
- c) Housing managers
- d) Major claimants (funding agencies)
- e) Engineering field divisions (EFDs)
- f) Engineering field activities (EFAs)
- g) Architects, engineers, contractors
- h) Landscape architects
- i) Interior designers

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FOREWORD

This handbook uses, to the maximum extent feasible, national and institute standards in accordance with Naval Facilities Engineering Command (NAVFACENGCOM) policy. Do not deviate from this handbook for NAVFACENGCOM projects without prior approval of NAVFACENGCOM Code 15C.

Recommendations for improvement are encouraged from within the Navy, other Government agencies, and the private sector; and should be furnished on DD Form 1426 provided inside the back cover to Commanding Officer, Southern Division, Naval Facilities Engineering Command, Attention: Mr. Tom Baker, Code 0712TGB, 2155 Eagle Drive, North Charleston, SC 29419-9010; phone commercial (803) 743-0330.

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.

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Section 1: INTRODUCTION

1.1 Scope. This military handbook, MIL-HDBK-1036, provides the basic criteria to plan, program, and design Navy bachelor quarters. It presents guidance for development of bachelor quarters, taking into account local program operations and requirements, as well as the new proposed Office of the Secretary of Defense (OSD) Construction Standards. The new metric standard module for the Navy will be 46 sq. m. This will include two 11 sq. m. bedrooms/living rooms, with closets, bath, and kitchenettes. The criteria herein applies to new bachelor quarters and major bachelor quarters renovations.

1.2 Purpose. This handbook is applicable to bachelor quarters projects in the Continental United States and overseas. It applies to new facilities and renovation projects. It provides criteria for determining:

- a) Program requirements
- b) Site evaluation and planning
- c) Facility design
- d) Landscape design
- e) Interior design

It provides information needed to produce a design for a specific project. Use this handbook in conjunction with other Navy and Department of Defense criteria that give related guidance.

This handbook is not a substitute for programming research by the designers, and it recognizes that local climates, geography, communities, mission needs, and changing programs necessitate some special requirements for bachelor quarters. It does, however, establish minimum design standards that must be followed. Designers are encouraged to exceed these standards where appropriate.

1.3 Cancellation. This handbook, MIL-HDBK-1036, dated 3 May 1995, cancels and supersedes DM-36.01, dated August 1981 with Change dated June 1982; DM-36.02, dated November 1983 with Change dated May 1985; and DM-36.03, dated August 1981 for both bachelor enlisted quarters (BEQs) and bachelor officer quarters (BOQs).

1.4 Related Criteria. Unique design requirements of a specific project are addressed individually by respective subject and/or engineering discipline design guidance.

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1.5 Acquisition Methods

a) A design build strategy is preferred for acquisition of bachelor quarters. There are several variations of design build strategies including two-step sealed bidding, source selection, and the Newport method. The two preferred contracting strategies used by NAVFACENGCOM in acquiring a bachelor quarters project are:

(1) RFP (Request for Proposal) is generally preferred for renovations. The RFP method involves use of a performance specification to obtain a technical proposal for design and construction of a project with award going to the best design without primary reference to price; therefore, "best value."

(2) IFB (Invitation for Bid) is preferred for new construction. The IFB method involves use of a performance specification to obtain lump-sum competitive bids for design and construction of a project with award going to the low bidder. The project design is developed by the low bidder after contract award in accordance with requirements of the performance specification. NAVFACENGCOM refers to this as Newport Design Build Strategy.

b) The principal steps in developing a design build package include:

(1) Developing project requirements (established at squatters session):

- a. Defining customer and user needs and requirements
- b. Site and environmental constraints
- c. Desirable features and amenities

(2) Determining applicable criteria and standards:

- a. Federal statutes and regulations
- b. Department of Defense (DOD), Navy, and NAVFAC criteria
- c. State and local regulations
- d. Activity standards (e.g., Base Exterior Architectural Plan (BEAP), Master Plan, Capital Improvement Plan (CIP))

(3) Preparation of the RFP or IFB:

- a. Contractual requirements:
 - 1. Standard construction contract clauses

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2. Special instructions to the proposer (e.g., evaluation factors, technical priorities)

3. Proposal forms (e.g., submittal requirements)

b. Technical requirements:

1. Systems performance specifications organized in accordance with the Construction Specification Institute UniFormat

2. Detailed performance specifications (e.g., civil drawings, finish schedules, specific item requirements)

(4) Solicitation and evaluation of proposals:

a. Pre-proposal conference provides key opportunity for dialog between design team and potential proposers

b. Review proposals for compliance with technical requirements

c. Evaluate proposals for quality of design and engineering solutions

d. Consistent review and evaluation of proposals is critical to avoid or defend against protests

1.6 Project Development Process

1.6.1 Project Stages and Coordination. The project development process includes several stages which ultimately lead to a finished project. These stages are outlined below. The success of the project depends on this process and continual involvement and communication between customer groups, the proposer, and designer.

1.6.2 Project Initiation (Planning). This handbook provides information required for preparation of DD Form 1391 or Step II's, which initiates project development. This includes information about functions, space allowances, overall building size, site evaluation, and special factors to consider in developing overall scope and cost estimates. It provides data and criteria needed at each stage of NAVFACENGCOM planning, project engineering, and design process; and interfaces with the Navy's planning, programming, and budget system.

Once a DD Form 1391 or other initial project documentation is prepared, a Facilities Study may be required to develop and define further the basic requirements of the project in terms of cost and scope. This study provides the design agent and the designer with information used in negotiating the design contract and serves as a starting point for the project engineering phase of the project.

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1.6.3 Site Selection. Site selection is a key aspect of the initial project work and requires thoughtful consideration. This is generally part of the comprehensive planning process. Guidance for this selection is provided in Section 3. After a site is selected, the project approved, and a designer is on board, thorough site and field investigations are performed.

1.6.4 Project Engineering Phase. The next stage after a project is initiated is analyzing and defining the project. During the project analysis stage, the project team meets to define the project to have a clear understanding of the project goals and objectives. The customer, design agent, and architect/engineer (A/E) team then develops project requirements based on an analysis of unique needs and requirements of the customer, established criteria, and site and environmental constraints. Information gathered provides the basis for defining the preliminary design. This information is intended to support the project engineering phase and the parametric estimating and programming (PEP) process. This includes the space planning guidance found in Section 2 and the site design, building design, and building elements concepts in Section 3. Unique local requirements concerning building program and design criteria are included in the PEP.

1.6.5 Conceptual Design. (Approximately 15 percent design completion.) Once the project requirements are understood, design drawings are prepared in the following stage of the project engineering process. Preliminary specifications (basis of design), and cost data serve to set the minimum acceptable quality for the project. A key to the success of the conceptual design is the use of the customer focused (squatters session) on-site workshop where the customer (bachelor quarters management staff, public works staff, activity planners, and end users as appropriate), design agent, and designers get together to develop and agree to the concept for the project. They also define the acquisition method, and choose an appropriate design build strategy. Project designs shall conform to the overall project design considerations described in Sections 3 and 4.

1.7 Renovations and Repairs of Existing Facilities. The criteria described in this handbook is written specifically for new and replacement construction, and may not be altered without official waiver. NAVFAC MSG 041230Z APR 95 states, "...designs may be adjusted to work within the constraints of the existing facility. To the extent feasible and within reasonable architectural practice, provide individual living/sleeping areas that are as close to 11 net sq. m. as possible. No more than two people sharing a bathroom." Refer to par. 2.6 for programming guidance.

1.8 Asbestos. A preplanning initial site investigation should identify existing asbestos probabilities affecting the project. In accordance with OPNAVINST 5100.23, Navy Occupational Safety and Health (NAVOSH) Program Manual, the Navy's objective for Asbestos Management Program Ashore is to eliminate personnel exposure to airborne asbestos fibers in occupied Navy buildings and workspaces through cost effective management of asbestos containing material (ACM). The program consists of three key elements:

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(1) Inventory, Survey and Material Evaluation, (2) Operations and Maintenance, and (3) Design and Abatement of Hazards. The first two elements are required for shore facilities. Facilities constructed before 1980 or targeted for renovation work should be given priority for completing the first two elements.

For renovation and repair projects, the Asbestos Survey and Operation and Maintenance (O&M) Plan should be verified during initial site investigations. Positive and assumed ACM should be noted in the contract documents based on the potential for disturbance. Any project scope involving removal and/or encapsulation of ACM would incorporate the third element of the Asbestos Management Program and comply with OSHA 29 CFR 1910.1101, Asbestos. A unit schedule should be included in the contract bidding schedule to quantify ACM identified in the inventory to deter costly change orders due to hidden conditions.

1.9 Lead. A preplanning initial site investigation should identify existing surface coatings and materials that contain lead probabilities affecting the project. A lead survey should be developed to identify any lead containing material before beginning any renovations. If a lead survey is not available, painted surfaces in pre-1082 facilities shall be considered as lead containing.

1.10 Historical. Initial planning should include the State Historical Representative if the building is eligible or listed as a historically significant structure.

1.11 Archaeological. A preplanning initial site investigation should include whether the affected area of construction involves earthwork in an archaeologically sensitive area.

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Section 2: PROGRAMMING

2.1 General. CNO MSG 250245Z MAR 95, directed implementation of a new standard size for bachelor quarters modules. The new standard module sizes will be used for all bachelor quarters other than open bay recruit barracks or other special exceptions for training.

2.2 Functions. The following basic functional activities shall be addressed in bachelor quarters. These three basic functional categories are interactive, and designers must fully understand the relationships between the categories. The designer must take a holistic approach to creating a fully integrated facility. The three basic functional categories are:

- a) Residential apartment (the standard module):
 - (1) Bedroom/living
 - (2) Personal hygiene
 - (3) Work/study desk area in the bedroom
 - (4) Personal storage closet
 - (5) Indoor relaxation
- b) Recreation and community:
 - (1) Outdoor sports
 - (2) Outdoor relaxation areas (these include individual and group activities)
- c) Service (core):
 - (1) Laundry
 - (2) Mail delivery
 - (3) Vending
 - (4) Food preparation
 - (5) Bulk storage
 - (6) Administrative support
 - (7) Housekeeping
 - (8) Group meetings and staff training

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(9) Big screen television

(10) Game rooms

2.3 Parameters

2.3.1 Planning Considerations. Consider the following items when planning the facility space program:

a) The current and projected resident population served by the proposed facility

b) The potential for retention and renovation of existing facilities

c) The need for additions and complete new construction projects

d) Existing community facilities on base and their adequacies relative to current and future needs

e) Locate bachelor quarters within walking distance of community facilities, such as dining facilities. Programmers shall address the capacity of existing community facilities and accommodate any additional requirements incurred by the proposed bachelor quarters increase.

f) Capacity of existing bachelor quarters using assignment standards discussed below.

2.3.2 Assignment Standards

2.3.2.1 Space and Privacy

a) The area and occupancy requirements listed in Table 1, are copied from Table 5-1 in DOD 4165.63M, DOD Housing Management and these requirements cannot be compromised without a waiver from the Bureau of Naval Personnel. These are assignment standards. See Table 2 for construction standards. Programmers shall establish the anticipated number of occupants and the grade mix as the first step in developing a bachelor quarters design.

b) When the assignment and construction standards are compared, construction standards exceed assignment standards to provide phased upgrades. Previously constructed buildings meeting current assignment and condition standards remain acceptable.

(1) Recruit quarters are open bay, central head facilities with net living area sized as one equal share of the open bay sleeping area. Typical sizes are 60 people per bay.

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Table 1
Room Assignment Requirements .

MINIMUM STANDARDS OF ACCEPTABLE SPACE AND PRIVACY, EXISTING INVENTORY		
Construction Criteria: For unaccompanied personnel housing approved and constructed, or upgraded by major renovation, under criteria exceeding the standards below, the construction criteria are the minimum standards for the facility.		
Grade	Minimum Standards	
	Transient Personnel	Permanent Party Personnel and PCS Students
Officers and Civilians	250 square feet net living area: private room; private bath	
W-3 - W-5, O3 and above:		400 square feet net living area: living room; bedroom; private bath; access to kitchen or officers dining facility receiving appropriated fund support.
O1-O2, W-1 - W-2		250 square feet net living area: bedroom/living room: private bath.
E7 - E9	250 square feet net living area: private room; bath shared with not more than one other.	270 square feet net living area: private room; private bath.
E5 - E6	135 square feet net living area: private room; bath shared with not more than one other.	135 square feet net living area: private room; bath shared with not more than one other.
E1 - E4	90 square feet net living area: not more than four to a room; except in open bay; central bath.	90 square feet net living area: not more than four to a room; central bath.
Recruits	72 square feet net living area: open bay; central bath.	72 square feet net living area: open bay; central bath.
<p>The net living area of a private room or suite is measured from the inside face of the peripheral wall and includes all such enclosed, unshared spaces and partitions. The net living area in a shared room comprises the clear area in the bedroom allocated for an individual's bed, desk area, and circulation; it excludes lounges, bathrooms, hallways, closet storage area designated for military mobility, and/or field gear or equivalent. In open bay, net living area is one equal share per person. The open bay comprises all within the peripheral walls.</p>		

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Table 2
Construction Standards

CONSTRUCTION STANDARD Bachelor Quarters	
Net Living Area/Space (when shared by E1-E4)	11 sq. m.
Gross Module Area includes: Sleeping/Living area above Kitchenette Bathroom Closets Internal Circulation	46 sq. m.
Gross Building Area per Module: M/E/C for sleeping area (allow approximately 8 sq. m.) Core Area (allow approximately 12 sq. m.)	66 sq. m.
Up to 4 sq. m. per module may be added to the building gross area for mid-rise (4 stories or higher) and site specific construction requirements.	
Open Bay sized for recruits at 6.7 sq. m., with Building Gross Area per Recruit of 13 sq. m., including M/E/C	
Note that net living areas shown are minimums.	

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(2) For Grades E1 to E4 (other than recruits), a standard module will be shared by two people. The net living area for the bedrooms is 11 sq. m.

a. Starting with FY96, "A" Schools will be built to the new standard for E1 to E4 personnel.

b. Officer Candidate School (OCS) includes a "boot camp" type experience in training, and candidates are assigned at E1 to E4 standards.

(3) For Grades E5 and above, provide a standard module as a private apartment, with one of the bedrooms furnished as a living room.

(4) For officers and civilians, provide a standard module as a private apartment, with one of the bedrooms furnished as a living room.

(5) Special operations training sites may construct open bay or other non-standard configurations for remote locations and limited duration deployments for officers and enlisted.

2.3.2.2 Apartment Module Measurement and Sizes

a) For assignment standards, net living area of a private room or apartment is measured from the inside face of the peripheral wall and includes all such enclosed space and partitions. As an unshared apartment this will be approximately 1.5 sq. m. less than the standard module size for construction measured to the outside of exterior walls and middle of interior walls.

b) For assignment as an unshared apartment, the standard module provides 44.5 sq. m. (479 sq. ft.) net living area, which exceeds the assignment criteria for all ranks.

c) For assignment as a shared apartment, the standard module provides 11 sq. m. (118 sq. ft.) of net living area for each bedroom. This exceeds the assignment criteria for E1 to E4 personnel.

2.3.3 Construction Standards

2.3.3.1 General Facility Styles. This handbook refers to three general facility styles: garden style, motel style, and hotel style. For functional description of these styles, refer to par. 3.1.3.

The standard size, two bedroom and living room apartments with kitchenette and bath applies to all styles. The standard size modules are like basic building blocks from which bachelor quarters programs are developed. The typical layouts, Figures 1, 2, and 3, are not mandatory standards, but are provided as examples. The module layout may vary if the minimum net living area, minimum dimensional clearances, and maximum gross building area conform.

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2.3.3.2 Net Living Area

a) Net living area is measured to the inside face of the room walls. Net living area is generally defined as floor area that is not incumbered by overhanging units. Provide a minimum total of 11 sq. m. (118.4 sq. ft.) net living area in each bedroom with 2 sq. m. (21.5 sq. ft.) closets with bath and kitchenette for 46 sq. m. (495 sq. ft.) total for each module. Limited space in the module total requires that variations above the minimums be small.

b) Net living area is measured inside face of wall to inside face of the opposing wall. Areas included in net living area calculations are:

- (1) Door swing areas.
- (2) Mechanical unit areas.
- (3) Bay window areas that are open from floor to ceiling.

c) Areas excluded from net living area calculations are:

- (1) Areas not privately controlled by a resident;
- (2) Bay windows providing shapes furred to hide through-the-wall equipment or used for storage;
- (3) Furred-out columns, pilaster, and mechanical or plumbing chases that extend into the living and bedroom area from the wall plane, if such items extend from floor to ceiling;
- (4) Bulk storage not accessible in the apartment.

d) Countless configurations are possible in the design of typical modules, and it is impossible to describe all configurations in this handbook. The method of measuring net living area for intricate designs may require interpretation by Engineering Field Division (EFD) or Engineering Field Activity (EFA) staff.

2.3.3.3 Gross Module Area. Gross module area is defined as the area within the walls comprising the perimeter of an apartment module. Wall thicknesses and chase areas within the perimeter walls are included. Gross module area is measured from the centerline of perimeter walls shared with interior corridors, common chases, or other rooms. It is measured to the outside face of exterior walls. Corner rooms with two exterior walls shall have the same interior dimensions as other rooms even though, technically, the gross module area for these corner rooms is slightly more than for other rooms. A gross module area of 46 sq. m. (495 sq. ft.) is preferred.

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2.4 Gross Building Area

a) Gross building area is measured to the outside face of exterior enclosure walls. Do not include normal roof overhangs in gross building area. Exterior covered areas such as balconies count as half scope, and are measured from the face of the enclosure wall to the edge of the covered area. Stairs and elevator shafts count as half scope per floor that they serve. Refer to NAVFAC P-80, Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations for more information on scope calculation. The gross building area for bachelor quarters shall not exceed 66 sq. m. per apartment module except for specifically justified space for mid-rise buildings not to exceed an additional 4 sq. m. (43 sq. ft.) per apartment module. This limitation emphasizes the need to efficiently design the apartment module and to provide more area outside the modules for recreation, community, and support functions. Apartment modules with a gross area of the recommended 46 sq. m. allow 20 to 24 sq. m. (215 to 258 sq. ft.) to apply to areas outside the module (66 or 70 sq. m. minus 46 sq. m.), whereas larger apartment modules, while allowed, limit the size and potentially the quality of areas providing recreation, community, and support functions.

b) Table 3 lists suggested functional features and sizes associated with core areas. This table is based on a conceptual bachelor quarters of 136 modules. There are no maximum allowable areas for the core spaces if the maximum gross area for the building or complex of 66 sq. m. per module is not exceeded. It is difficult to accommodate all of the suggested core spaces at their recommended sizes in many bachelor quarters, even if the module area is held at 46 sq. m. Local commands, therefore, must prioritize these optional spaces and their sizes based on individual project needs.

2.5 Site Selection

a) Follow the established planning process. Site selections are addressed by the base, with the Public Works Office and the bachelor quarters management staff making preliminary decisions. EFDs or EFAs can provide studies and support when requested by activities. Bachelor quarters managers should have a strategic plan for their bachelor quarters approved by the Base Commanding Officer. Bachelor quarters strategic plans include the development of a bachelor quarters Comprehensive Neighborhood Plan (CNP) to assist the bachelor quarters manager in programming. The bachelor quarters CNP shall include long range planning and site selection alternatives.

b) Quality of life factors of importance are:

- (1) Development potential
- (2) Proximity to existing support facilities
- (3) Relationship to community facilities

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Table 3
Core Area

CORE AREA			
Conceptual 136 apartment Bachelor Quarters Building 136 x 12 = 1632 sq. m. (17568 sq. ft.)			
Space	Per/apartment sq. m.	Building sq. m.	Building (sq. ft.)
Laundry	1.0	135	1,460
M/E/C	4.8	650	7,030
Recreation	0.5	70	730
Group Meetings	0.9	120	1,310
Reception	0.7	95	1020
Guest Toilets	0.3	40	430
Party Kitchen	0.2	30	300
Vending	0.2	30	300
Administration	0.4	55	590
Bulk Storage	2.0	270	2,930
Housekeeping	1.0	135	1,460
Total	12.0	1630	17,560
Site and function needs will require adjustments to the share of area for each space shown above. Designers and customers should make project specific adjustments to area share.			

- (4) Existing topography
- (5) Existing landscape
- (6) Available base infrastructure
- (7) Adjoining land uses
- (8) Vehicle circulation systems
- (9) Future expansion

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(10) Relation to existing bachelor quarters

(11) Existing walkways and designated bike and jogging paths

c) Previous site selections have placed many bachelor quarters in or near operations areas. Many of these sites are not good Quality of Life Neighborhoods. A simple rule of thumb for evaluating a bachelor quarters site is, "Would it make a good family housing site?" If not, then it is not a good location for a bachelor quarter. Long range planning will address relocation of existing bachelor quarters located in sites that cannot provide Neighborhood of Excellence Standards.

2.6 Renovations

a) Preliminary investigations should address any building deficiencies or environmental issues that could affect the project. Some criteria is required by statute or higher authority policy (e.g., OMB Circular, Executive Order, DOD Directive, etc.). This criteria shall be incorporated in all projects: new, replacement, and renovation.

b) Primary resources for project preparation should include:

(1) Adequacy. Size and condition are the two key factors used to determine adequacy. Projects should not be generated for quarters currently meeting assignment size standards for the sole purpose of meeting new construction size standards. Projects generated to correct inadequate size or condition problems should follow this guide.

(2) Special considerations.

a. A common type of wholesale renovation project is to convert an existing hotel style with interior access to a motel style facility with exterior access. This involves replacing the gang toilets and the double-loaded interior corridors with semi-private toilets. Access to the living units is provided by new exterior balconies and exterior stairways. This concept requires some flexibility in space requirements due to existing column locations, limited building widths, small mechanical rooms, etc. Although some flexibility is allowed due to these constraints, renovation projects shall comply with the authorized net living area applicable to new bachelor quarters.

b. Another common renovation project is to update old "Welton-Beckett" style quarters. The units group four bedrooms around a central entrance, and occasionally have a problem with fire exiting requirements. With the new NFPA 101, and the availability of sprinklers, and new windows designed as second exits, this is easily solved. Bathrooms having doors connecting separate apartments should be sealed for security.

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The use of a quarters, as well as the authorized net living area for the residents may change over time. Designers must take this into account, and design new facilities to allow easy conversion to another use, such as from permanent party to transient, to single occupancy suites.

c) Technical criteria in this handbook shall be used as guidance in developing repair projects where applicable (e.g., if a project involves remodeling kitchens, cabinets and appliances shall be replaced in accordance with the technical section of this handbook which describes cabinets).

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Section 3: FUNCTIONAL AREA AND SPACE CRITERIA

3.1 General. Bachelor quarters are a residential complex of homes. The quality benchmark is a mid-level multi-family apartment complex.

3.1.1 Functional Areas. This section presents guidance applicable to the functions of areas within a bachelor quarters complex. These include:

a) Residential (module) areas:

- (1) Living room and bedroom
- (2) Vanity
- (3) Bath
- (4) Kitchenette
- (5) Storage

b) Core (clubhouse) areas:

- (1) Administration
- (2) Circulation space
- (3) Public toilets
- (4) Training, big screen TV, and group meetings
- (5) Video game rooms
- (6) Laundry facilities
- (7) Mail services
- (8) Vending
- (9) Mechanical/electrical/circulation (M/E/C) space

c) Recreation areas:

- (1) Active sports
- (2) Passive leisure

3.1.2 Basic Requirements. Design considerations are presented for each area indicating the anticipated use, performance, organization, character, and relationships of specific areas. Criteria are included herein for size and

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critical dimensions. Section 4 provides the more detailed technical requirements information and quality standards.

3.1.3 Basic Configurations. The Navy uses three apartment module styles for bachelor quarters; the garden style, the motel style, and the hotel style. Garden style quarters and motel style quarters offer private access to individual living units from exterior balconies or sidewalks, and are the preferred configurations which offer increased privacy. They convey a feeling of a more private apartment rather than the observed hotel-like feeling presented by interior corridors. The motel style permits higher density housing than garden style, but more comfortable features than hotel style.

3.1.3.1 Garden Style. The most economical bachelor quarters are garden style quarters not more than three stories in height. This configuration maximizes efficient use of available real estate while avoiding additional costs associated with buildings over four stories in height. Use of residential grade construction with NFPA 13R sprinkler systems results in savings in materials, and housing contractors are more familiar with construction methods. See Figure 1.

3.1.3.2 Motel Style. The motel style quarters are entered from an exterior walk or balcony and the configuration supports outside social interaction and interior separation. Residents in motel style quarters tend to close their window coverings to gain privacy from outside walkways. Single loaded motel style quarters provide increased exposure of outside walls and coupled with elimination of pipe chases provides features similar or equivalent to garden style quarters. See Figure 2.

3.1.3.3 Hotel Style. The hotel style quarters are entered from an interior corridor. Vertical mechanical and plumbing chases, elevators, trash chutes, and safety and structural space can increase a mid-rise building size as much as 4 sq. m. per module. This translates into a 6 percent increase in building costs. The view from hotel style living unit windows can be direct to the exterior without having to look across a balcony. Hotel style quarters generally support interior socialization. See Figure 3.

3.2 Central Chase. Some designs have the disadvantage of a large pipe chase for centrally located plumbing systems where toilets are grouped back to back down the center of the building without being interrupted by a corridor. This provides limited advantages for maintenance at the expense of critically needed area. A central chase uses between 3 and 4 sq. m. per module and translates into a 6 percent increase in building costs.

3.3 Life Cycle Cost Analysis. A life cycle cost analysis was prepared to compare these styles for Navy Bachelor Quarters. The lower first cost for garden style apartments is also the dominant component in sensitivity. O&M costs for equivalent quality of life type apartments in each building style were similar.

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3.4 Applicability. The design criteria that follows applies to all three styles of bachelor quarters complexes unless noted otherwise.

3.4.1 Residential Areas. Residential areas are semi-private apartments composed of the following:

3.4.1.1 Living Room and Bedroom Area. The Living room and bedroom area is the net living space for two E1 to E4 personnel (11 net sq. m. each, minimum) shown graphically in Figures 1, 2, and 3. Issues of personal security, hardware, locks, doors, windows, and configuration are detailed in Section 4.

3.4.1.2 Vanity Area. Plan the vanity area to make the most efficient use of limited space. For new construction, the vanity area should be included in the bathroom. For renovation of existing quarters, minimize reconfigurations, and use the existing layout when possible.

3.4.1.3 Kitchenette. The kitchenette shall provide a safe hygienic place for preparation of snacks and occasional meals, and is not intended as a full service food preparation area. Provide the kitchenette with a counter and outlet for a small microwave oven, another over counter outlet for extra appliance, an under counter refrigerator and freezer, a two burner cooking top, a sink, and over counter cabinets.

3.4.1.4 Toilet. The toilet will be shared by two E1 to E4 personnel. For Grade E5 and above, the toilet will be private. For new construction, provide toilets with a combination tub and shower. A shower-only configuration may be maintained in renovation, but a tub and shower conversion is preferred.

3.4.1.5 Personal Closets. Provide one in-room storage closet of 2 sq. m. located in each bedroom. Provide two storage closets per apartment. Provide each closet with closet organizers with storage extending to the ceiling, and solid core wood doors with heavy duty, lockable hardware. Provide additional storage in kitchenette and circulation areas as appropriate. Closets should be full-height, using the space above normal door height for bulk storage. Provide integral full-length hanging rods for coats and double hanging for shirts and shelves. Ventilate closets to resist mold and mildew growth. Use the HVAC system to do this.

a) Light all closets. A light with motion activated switch is required in deep closets and is recommended in others. Carefully placed lighting outside two-foot-deep closets is acceptable. The goal is to allow clear view of closet contents and, in the case of clothes closets, to facilitate color choice and dressing.

b) Secure closets with standard hinged doors with non-removable pin hinges and locking hardware. Bi-fold and sliding doors are discouraged since they are less durable than hinged doors.

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3.5 Recreation and Community Areas. These areas shall include the following passive and active outdoor recreation facilities:

- a) Sand area for volleyball and a hard surface for basketball are typical minimums for smaller buildings.
- b) Par golf courses, tennis courts, and softball fields for larger complexes. Bachelor quarters managers should identify their choice of sports.
- c) Site benches, covered picnic tables, and barbecue stations as typical passive facilities.

3.6 Core Building Public/Administration Spaces. Central common spaces include at a minimum: lobby with entry vestibule, telephone cubicles, public toilets, group meeting room, video game room, laundry, and vending area. Additional areas may be justified by bachelor quarters distance from existing facilities: exercise room, video tape library.

3.6.1 Lobby and Entry Vestibule. Locate the lobby and its vestibule for easy identification by arriving guests. Include a seating area for visitors and guests waiting for transportation. Locate the seating area for clear view of arriving automobiles and of the front desk. Choose and arrange lighting fixtures to organize and identify the space. Provide duplex outlets at no more than 6 meter intervals along walls for cleaning equipment. Finish the lobby and entrance with attractive, durable, and easily cleaned materials.

3.6.2 Telephone Cubicles. Enclose cubicle on at least three sides and provide a writing surface and a fixed seat. Provide at least one cubicle that is accessible to disable persons.

3.6.3 Public Toilets. Provide commercial grade fixtures. Quantity is to be based on project size. Public toilets must be accessible to disabled persons. Provide light at the lavatory mirror. Provide ceramic mosaic tile floor and base and full height ceramic tile walls. Use solid surfacing material for lavatory counters and solid plastic, continuous anchorage toilet partitions. Provide a floor drain placed out of the usual traffic pattern and close to the water closets. Include dispensers for soap, towels, toilet tissue, and waste receptacle.

3.6.4 Meeting Room. Provide area for individual recreation and group parties. Isolate the area acoustically, and locate close to public toilets. Provide a counter on which to set a microwave oven, waste receptacles, and other similar food warming equipment for parties. Provide locked storage for related supplies and for game equipment such as pool cues. Provide the space with light and power for games and for food warming equipment. Finishes should be easily cleaned and endure hard use.

3.6.5 Video Game Room. Provide a TV/lounge acoustically isolated from the meeting room, and close to public toilets. Design for possible use of

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recreational equipment. Provide window coverings and hardware to allow for darkening room with blinds or shades and provide light dimmers. Finishes should be easily cleaned, and endure hard use and food spills.

3.6.6 Vending Area. Provide vending space with appropriate outlets. Allow space for ice dispenser, soft drink and food vending machines, at least one 460 millimeter diameter waste receptacle and at least one 765 millimeter diameter recycling container. Locate space for security of users and for ease of service. Provide appropriate sound isolation between vending and other spaces. Floor and base finishes should resist heavy wear and be easily cleaned.

3.6.7 Exercise Room. Provide this space if an equivalent facility is not available near the quarters. Provide area and storage for exercise mats, free weight training and a multi-purpose trainer. Provide mirrors on at least one wall. Provide increased ventilation appropriate to the varying activity in the space.

3.6.8 Housekeeping Closet. Provide one secure space of about 3 sq. m. net area on each floor for housekeeping equipment and supplies. Finish floor, base, and wall at the mop receptor to resist water. Quarry tile or ceramic tile are examples of acceptable finishes. Provide motion-activated light.

3.6.9 Bachelor Quarters Administrative Area. Provide the staff with a secure, efficient and comfortable environment from which to manage the building.

a) Reception Desk. Provide area for enclosed space or counter/workspace. Locate the counter for visual control of the lobby and other central common spaces. Arrange the counter for sign-in by several persons at once with electronic cash register and computer, key control and forms storage. Light counter surfaces for writing, mount duplex outlets above work surface and provide computer and telephone cables and connections.

b) Mount building directory and a generously sized bulletin board in the group meeting room.

3.6.10 Central Laundry Room. Provide one room to accommodate personal laundry. Provide one washing machine and two dryers for every 15 residents. This is intended to support peak use prior to inspections. Locate the laundry room for easy access and provide acoustic separation from other areas. Consider locating the laundry room adjacent to a lounge area to provide a place from which to monitor one's laundry. Provide 3 linear meters of folding table with hanging rod above and 1.25 meters of full height hanging for drip dry clothing.

3.6.11 Public Corridors. Arrange corridors to give a clear idea of one's location in the building. Arrange corridors to emphasize apartment entrances. Consider providing a recessed light at each entrance. Size the corridor to

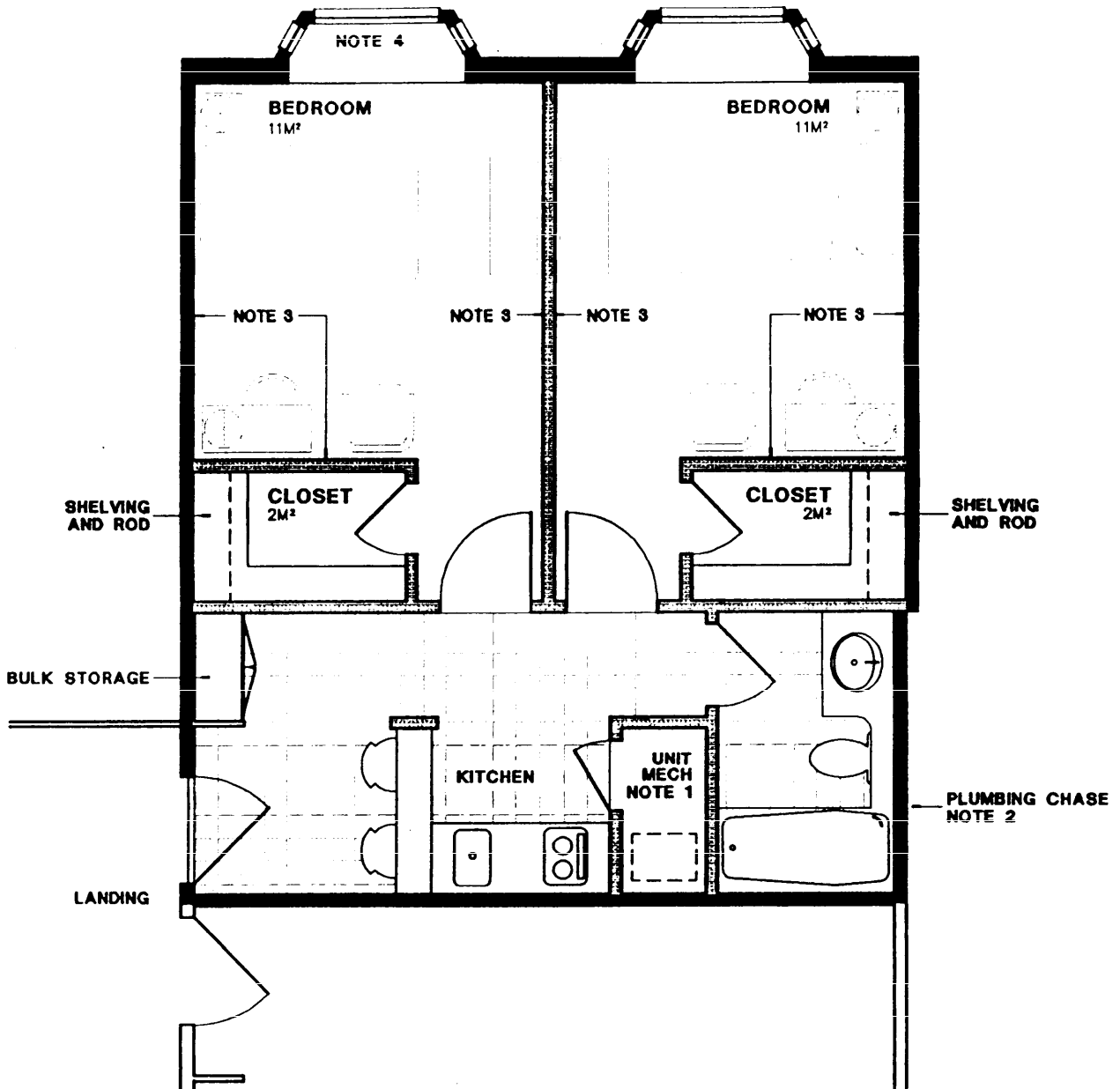
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meet NFPA 101 requirements with a minimum clear width to accommodate two persons with suitcases, about 1600 millimeters. Specify walls to provide no less than 52 decibels of sound separation between public and private spaces and to satisfy fire separation code requirements. Use materials to absorb sound and withstand abrasion and dirt. Provide a Type II heavy duty vinyl wall covering on corridor walls.

3.6.12 Mailboxes. Provide one U.S. Postal Service approved mailbox per resident. The mailboxes may be located indoors or in an outdoor covered area, gazebo, or where size warrants, or even in a separate enclosed building subject to local postal rules. Prior to design, the bachelor quarters manager and public works office should discuss plans with local postmasters.

3.6.13 Bulk Storage. Provide lockable bulk storage space outside of the apartments for personal items. Examples of items typically stored in bulk storage areas include luggage, original stereo system cartons, snow tires, bicycles, surf boards, ski equipment, and other sports gear. Most storage is limited to rectangular cubes, but a limited shape variety is needed, for masts and other bulky items.

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TYPICAL GARDEN STYLE APARTMENT PLAN 46m²

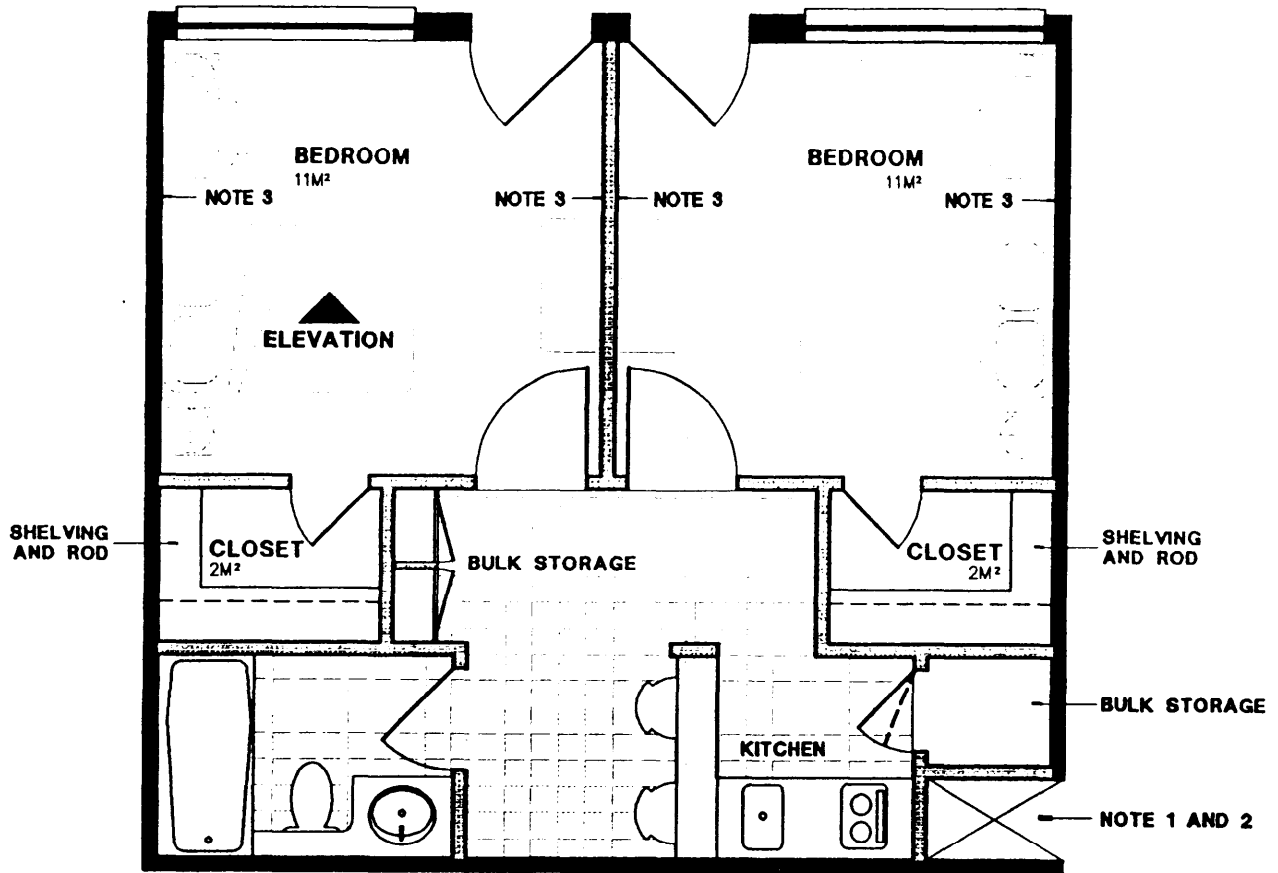
NOT TO SCALE

NOTES:

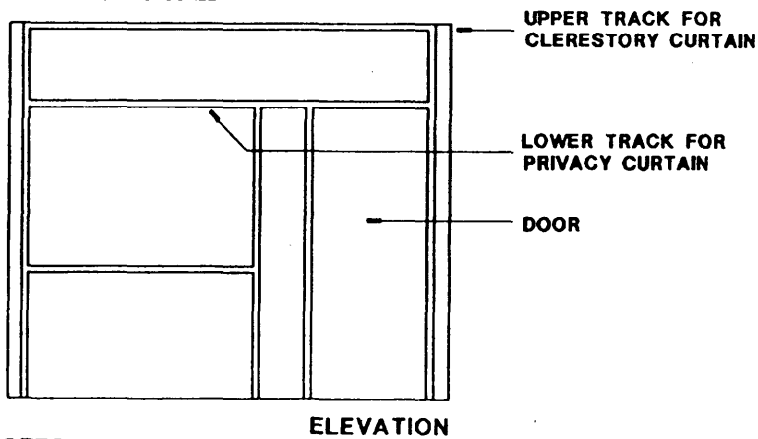
- 1 Apartment specific mechanical unit areas are included in net unit area calculations.
- 2 Mechanical and plumbing chases serving multiple floors are excluded from net area calculations.
- 3 Provide a minimum of two quadruplex outlets, each containing a dedicated phone outlet, a dedicated television outlet and a duplex electrical receptacle.
- 4 Bay window areas which are not open from floor to ceiling are excluded from net unit area calculations.

Figure 1

BALCONY ACCESS



TYPICAL MOTEL STYLE APARTMENT PLAN 46m²
NOT TO SCALE

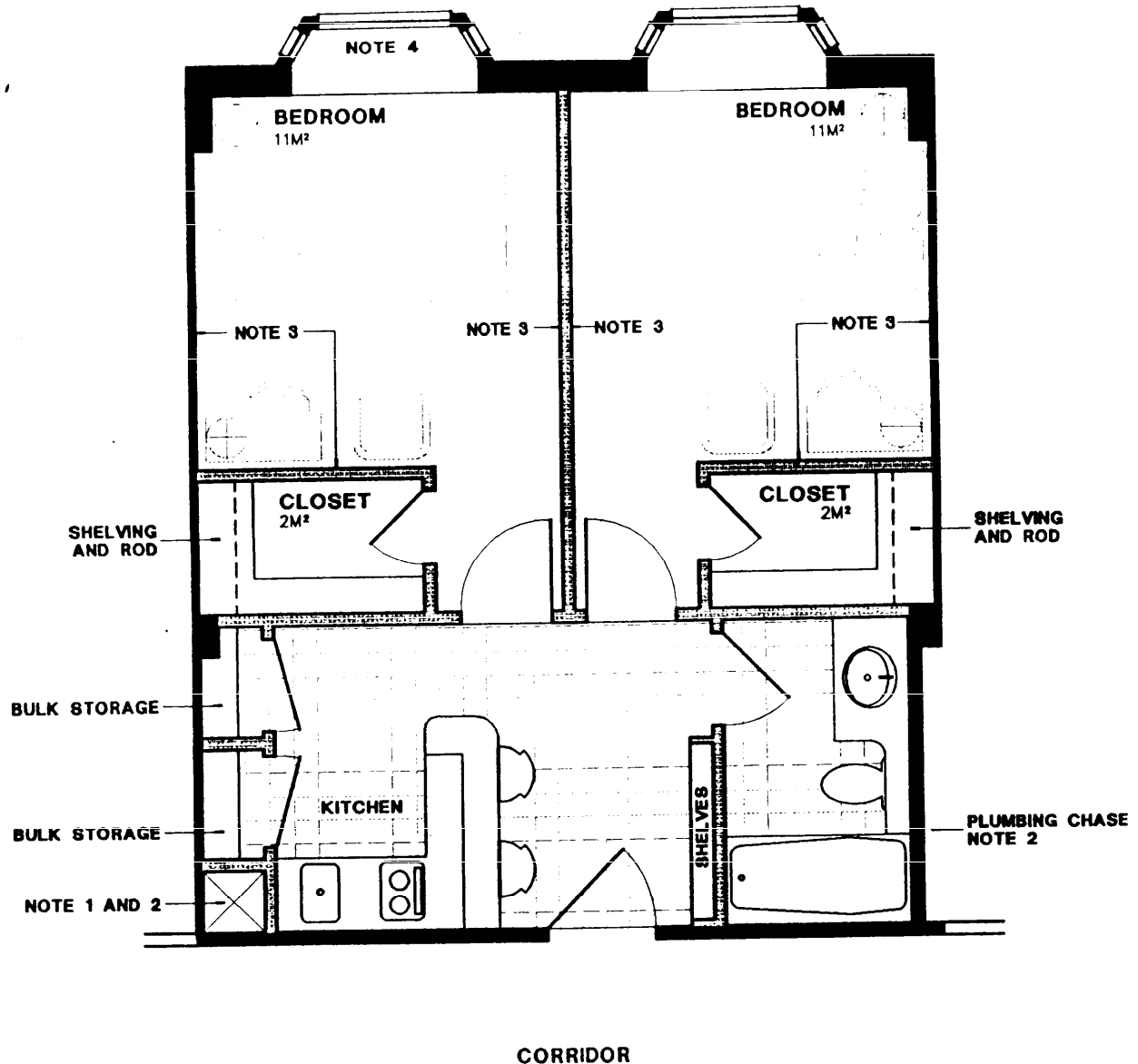


NOTES:

- 1 Apartment specific mechanical unit areas are included in net unit area calculations.
- 2 Mechanical and plumbing chases serving multiple floors are excluded from net area calculations.
- 3 Provide a minimum of two quadraplex outlets, each containing a dedicated phone outlet, a dedicated television outlet and a duplex electrical receptacle.

Figure 2

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TYPICAL HOTEL STYLE APARTMENT PLAN 46m²

NOT TO SCALE

NOTES:

- 1 Apartment specific mechanical unit areas are included in net unit area calculations.
- 2 Mechanical and plumbing chases serving multiple floors are excluded from net area calculations.
- 3 Provide a minimum of two quadruplex outlets, each containing a dedicated phone outlet, a dedicated television outlet and a duplex electrical receptacle.
- 4 Bay window areas which are not open from floor to ceiling are excluded from net unit area calculations.

Figure 3

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Section 4: QUALITY STANDARDS

4.1 Site

4.1.1 Planning. Site planning requires an interdisciplinary involvement of the community planner, landscape architect, architect, interior designer, and civil, mechanical, and electrical engineers. Analysis of existing site conditions (e.g., utilities and plant material, traffic patterns, land use, community facilities, and off-site workplaces) is needed for effective site design. Evaluate and analyze the following siting quality standards to ensure the optimum solution is selected.

4.1.1.1 Comprehensive Neighborhood Plans (CNP). Any site planning should support CNP that brings together the various aesthetic and functional quality of life issues outside the bachelor quarters facilities. The quality of life standards should not be isolated to the buildings, but a CNP should be developed to continue the quality standards into the site. To do this, site planning must approach the relationship between new and existing buildings, site structures, vehicular and pedestrian circulation, and recreational facilities on a residential/community scale and appeal. Site concepts that reflect institutional conditions should be avoided. A successful CNP requires a well coordinated interdisciplinary effort between the community planner, landscape architect, architect, interior designer, and civil, mechanical, and electrical engineers. Each of these design disciplines play a critical part and must be included in the site planning process. A thorough analysis of existing site conditions (e.g., utilities and plant material traffic patterns, land use, community facilities, and off-site workplace) is needed for effective site planning.

4.1.1.2 Orientation. Site bachelor quarters to take advantage of the positive features of the site. Provide protection from undesirable winds and glare, shading from excessive sun in warm climates, and orientation of operable windows to take advantage of summer breezes. Refer also to par. 4.2.2.4 for building design.

4.1.1.3 Site Organization. Pay special attention to building orientation, mass and scale in developing the site plan. Develop a sense of order, arrival, orientation, and community in planning the site. Site quarters in relationship to one another to create outdoor spaces for use as passive or active recreation areas. Achieve spatial balance and scale through thoughtful placement and arrangement of structures, landscaping, and landforms. Organize the site using functional zones and the appropriate relationship of functions. Intermittent functions such as trash collection, vending machine service, furniture moving, and mechanical repair shall not interrupt residents' activities.

4.1.1.4 Circulation Systems. Grade circulation ways and size to allow barrier-free access to the first floor of buildings and to outdoor areas. Light circulation ways for safety without spilling light into residential

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units. Pedestrian ways shall be located and sized to pleasantly and efficiently connect residents with site amenities, parking, station transportation, community facilities, and workplaces. Place pedestrian ways with emphasis on functional rather than formal needs. Walkways to building entrances shall be 8 feet (2.5 meters) wide. Other sidewalks are 6 feet (2 meters) wide. Provide corridor connections to other functional areas of the base with pedestrian circulation systems.

4.1.1.5 View of the Site. Design disciplines involved in the site planning process must evaluate and re-evaluate their design concepts to ensure the bachelor quarters project presents a professional image of the Navy, and represents "pride of ownership." As a minimum, consider the "first time" view presented to visitors and the more personal view or impression of the user.

4.1.1.6 Vehicular Access. Provide access to the bachelor quarters from secondary (collector) streets to reduce congestion associated with main arterial streets. Where possible, divide main entrances with landscaped traffic medians between entry and exit lanes. Because of high volume of traffic using the entrances, the width of non-divided entrances shall be a minimum of 7.5 meters in width.

4.1.1.7 Parking. Resident, visitor, staff, and service personnel parking shall be convenient, safe, and pleasant to use. Parking shall be accessible to persons with disabilities and shall be placed convenient to the building entrance. Locate and shape parking areas to improve the residential environment. Use land forms such as berms, retention ponds, and tree islands to separate parking from other functional zones and to buffer the residential area from possible surrounding adverse environment. Provide parking in these amounts:

- a) Automobile parking for a maximum of 70 to 75 percent of residents, and 40 to 45 percent of recruit barracks.
- b) Motorcycle parking for 5 percent of residents. Provide dedicated space with concrete paving and tiedowns.
- c) Bicycle parking for at least 15 percent of residents. Provide secure, weather protected, conveniently located facilities.
- d) Car wash area (sized for one car) when not available within 1 mile (1 kilometer). Provide concrete paving, water source, and drain with oil separator. Provide waste container location.
- e) Provide one visitor space per 50 residents (2 percent).
- f) Staff parking for each staff member.

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g) Barrier-free parking spaces (e.g., residents, visitors, and staff) in accordance with UFAS and ADAAG. Use the criteria that provides the greatest barrier-free design requirements.

h) Maintenance parking for service functions. Dedicated space is not required. Use expected frequency of use to determine whether dedicated parking is needed. Locate service access and parking to avoid disturbing residents.

4.1.1.8 Service

a) Vehicles. Design access streets and parking areas to accommodate service vehicles and fire protection equipment. Where interior court areas are being proposed between adjoining bachelor quarters, consider designing the main pedestrian walks to accommodate service and fire protection vehicles. For example, the minimum width of such walkways shall be a minimum of 8 feet (2.5 meters) wide and shall be constructed using reinforced concrete to accommodate medium weight vehicles. Consider treating the walkways with a patterned concrete system to minimize the negative impact of the wider access route. Use materials such as concrete grassroad type pavers to provide access for infrequent service vehicles.

b) Entrances. Where possible, separate service entrances associated with mechanical rooms or mechanical enclosures from parking areas.

4.1.1.9 Bus Route Access. Consider developing shelters and walks to serve personnel needs if the base provides bus service. Bus shelters shall be compatible with the architectural style of existing buildings, BEAP, and existing bus shelters on base. Where existing shelter design needs upgrading, the site planner shall coordinate with the base in selecting a new style that is programmed with new projects. Program at least one bus stop shelter for each major dormitory complex.

4.1.1.10 Utility Corridors. The site planner shall develop utility corridors in coordination with the base community planner, electrical, mechanical, and civil engineers. Size corridors to accommodate future expansion. Locate utility corridors not closer than one and one-half times the crown width of mature trees or 10 meters, whichever is the greater amount. Locate utility corridors to allow for future street tree plantings.

4.1.1.11 Fire Protection Access. Site bachelor quarters a minimum of 12 meters laterally from the closest adjoining building. Provide access to fire protection vehicles from three sides. Obtain width, weight, and turning radii of firefighting vehicles from the base fire department.

4.1.1.12 Site Lighting. Site lighting is an integral part of any bachelor quarters project. Provide lighting to ensure occupants have a means of safely moving between outdoor spaces. Refer to the BEAP in the selection of luminaires and poles and signs. Provide adequate site lighting at any point

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where there is a change in grade requiring steps, near handicapped and motorcycle parking areas, and near main entrances to buildings. Provide a lighted sign for night visitors. Use the recommendations of the Illuminating Engineering Society of North America (IES Lighting Handbook) to establish illumination levels.

4.1.1.13 Site Furniture. Site furniture that is in harmony with the architectural style of the bachelor quarters facilities, compliments the building, and makes the outdoor spaces more usable and organized. The landscape architect shall coordinate the selections with the architect and interior designer to ensure smooth transitions are made in the procession from within the building to the outdoors and vice versa. Effective transitions are affected when building materials, colors used in the building exterior and interior areas, and design details from the building are incorporated into the paving materials and site furnishings. Durable site furnishings are to be used to support various site functions. Consider trash receptacles, seating, picnic shelters and grills, lighting, and bus shelters.

4.1.1.14 Finished Floor Elevation (FFE). Establishing the finished floor elevation of bachelor quarters is one of the most important aspects of site planning. The FFE affects grading, cut and fill, and visual impact of the facility and interior-exterior transitions. In addition, the FFE has a significant impact on the landscape architect's ability to effectively introduce plant materials into the new environment. When the approach is to "level the site" without sensitivity to other demands, the results are catastrophic, resulting in barren sites lacking visual interest. The landscape architect, architect, and civil engineer shall work closely together to achieve the most optimum design results.

4.1.1.15 Storm Drainage. Depending on the geographic location and the availability of nearby subsurface storm drains, provide underground storm drainage for each bachelor quarters complex. Site water shall either be intercepted in drop inlet structures or be designed to drop directly into a subsurface system. If subsurface storm drains are not available at the proposed site, then program them as part of the bachelor quarters project. As a minimum, divert surface water to an underground system to a point where it is discharged into aboveground storm drains. Discharge water from downspouts onto splash blocks. Provide for drop inlets as necessary to intercept surface runoff and prevent walkways from being flooded.

4.1.1.16 Mechanical Enclosures. Screen mechanical equipment such as chillers, evaporating condensers, switchgear, and electrical transformers. Architectural screening materials shall compliment the architectural style and materials used to construct the bachelor quarters. Use landforms to screen objects in the landscape that do not require enclosures.

4.1.1.17 Trash Dumpsters. While trash dumpsters shall have convenient access by the residents and by large trash handling trucks, they shall be located in areas away from main entrances. Screen trash dumpster locations with any

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combination of hard wall materials, earth forms, and landscaping to reduce their impact. Where hard wall materials are used, the materials shall compliment the materials used in the project and adjacent facilities.

4.1.2 Landscape Design

4.1.2.1 Planting and Vegetation. Develop plantings to create an aesthetically pleasing landscape that conserves water and resources while minimizing maintenance requirements. Proper planning and design, plant selection, and use of turf alternatives and mulch materials, zoning of plants in accordance with water requirements, soil improvements, efficient irrigation, and appropriate maintenance are the fundamentals of good landscape planting.

4.1.2.2 Landforms. The landscape architect and the civil engineer shall work together to use landforms to soften the impact of parking on the landscape. Use landforms such as mounds and swales in conjunction with landscape plant materials to soften or obscure the parking areas, provide spatial articulation, or enhance drainage structures or surface water retention areas. Use landforms to add interest and diversity to the project. In particular, landforms can perform an important function around outdoor activity areas by screening undesirable views.

4.1.2.3 Transition Zones. Grading can create a transition zone within parking areas, between parking and bachelor quarters, and between multiple groups of bachelor quarters facilities. For instance, terraced parking areas can break up the expanse of parking and reduce the visual impact.

4.1.2.4 Grading. Grade the site to achieve an orderly transition from the point where personnel enter the site by automobile or on foot to the point where personnel are at the first floor elevation. Consider the impacts of the parking area, the bachelor quarters, bus stop shelters, sidewalks, outdoor passive use areas, mechanical equipment, and trash dumpsters on site grading. Where appropriate, use grading to control the negative impacts these man-made facilities have on the visual environment, such as shielding trash dumpsters, etc. Quarters tend to be linear and relatively narrow in their configuration; therefore, lending themselves to an orientation paralleling existing contours. Determine if storm water retention is required by local building codes. Where on-site retention is required, the location of retention areas shall be carefully thought out in terms of the function as well as their visual impact. Use large retention sites for outdoor recreation areas.

4.1.2.5 Visual

a) Visual Enhancement. Plantings made for utilitarian purposes, such as screening service areas or shading, will simultaneously improve the attractiveness and enhance the livability of an area. The use of shrubs and small trees arranged in strategic groups around a building improves the

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appearance by softening structural lines. This also helps in integrating the building with its site and diverting attention from unattractive structural features.

b) Visual Screening. Screen unattractive views or objects identified by the site analysis with appropriate plant material to obscure their negative impacts. Examples of screening needs include trash dumpster areas, pad-mounted electrical transformers, parking areas, and mechanical yards. While plant materials can be used solely for screening purposes, a combination of plant and architectural materials offers an ideal solution to screening needs. Landforms coupled with plant materials will provide an immediate effect while waiting for the plant materials to mature. Skillful use of plant materials around buildings, along walkways, and around parking areas significantly increases the energy efficiency of buildings and reduces the ambient air temperature around the bachelor quarters project. By intercepting the direct and reflected radiation, plant materials control the absorption of heat energy by the building and parking areas.

4.1.2.6 Wind Control. Use plants as wind control devices by breaking, guiding, deflecting, or filtering the wind. Knowledge of the direction and speed of prevailing winds at different seasons of the year is necessary. The most effective density is a screen of approximately 60 percent. Irregular forms provide a more effective windbreak than evenly spaced plants. A variety of plant species and sizes also provides a better windbreak than one consisting of one species. For climates where occasional to frequent snow accumulation occurs, consider how wind affects snow drift.

4.1.2.7 Spatial Articulation. Use plants to create enclosed spaces and to separate spaces one from another. Also use plants to direct people through outdoor spaces by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement depends upon the density, form, and type of plants used, keeping in mind deciduous plants vary with the season, whereas most evergreen trees do not.

4.1.2.8 Landscape Maintenance. Provide landscape establishment and maintenance within the initial contract for installation of plant materials. The duration of the establishment period shall be one year in all cases and shall not be included as a contract option. The establishment requirements shall include irrigation, mowing and edging, replacing mulch, inspection and control of pests and weed control, tightening staking and guying materials, pruning, fertilization, and maintaining watering saucers.

4.1.2.9 Irrigation Development. Provide bachelor quarters projects developed in arid and semi-arid climatic regions with irrigation systems. Minimize water requirements through use of plants that are suitable for growing in limited water environments. Use bubbler or drip irrigation systems adjacent to building facades to minimize impact of overspray. Provide irrigation systems with solid-state automatic multi-station controllers, state-of-the-art control valves, and backflow preventers in accordance with

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building codes. In cold climates, locate backflow preventers in the mechanical room. Where freezing is not a problem, locate backflow preventers within screened mechanical enclosures. Include adjusting turf spray coverage, duration of watering cycles, repairing leaks, and general maintenance to ensure proper functioning during the maintenance period for irrigation systems. Water conservation is a high priority factor in development of the irrigation design.

4.1.3 Recreation Facilities

4.1.3.1 Active Outdoor Recreation. Support active outdoor recreation by providing sand volleyball court and full basketball facility or other appropriate amenity. Light at least some of these facilities for evening use. The number of courts or area to be lighted is to be determined by local conditions.

4.1.3.2 Passive Outdoor Recreation. Passive outdoor recreation is to be supported by grouped seating, picnic facilities, and lawns with shaded areas. Locate these recreation functions to reduce interference from other functions on and near the site. Shelter or screen active and passive recreation facilities to temper wind and other climate elements.

4.1.3.3 Recreation Structures. Where appropriate, install a pavilion as integral part of the bachelor quarters complex. Pavilions should compliment the architectural style and materials of the bachelor quarters. Compliment these use areas with additional facilities such as barbecue grills, tables, benches, lighting, and landscape plant materials.

4.2 Building Design

4.2.1 Building Organization. Form buildings to make arrival and movement through them orderly and clearly understandable by users (visitors, residents, staff, and service personnel). Use circulation to organize and zone activities and to indicate the relative importance of areas. Provide a clear entrance to the building and to different functional areas within the building. Locate functions and shape circulation space serving functions to ensure the safety of users. Avoid placing necessary functions in isolated areas, leaving hidden corners or dark areas.

4.2.1.1 Building Styles. Bachelor quarters may be designed using any one of three building styles: garden style, motel style, and hotel style. Garden style is preferred for its high quality of life and lower life cycle costs.

4.2.1.2 Building Types

- a) "Low rise" describes structures of three stories or less.
- b) "Mid rise"/"high rise" describe structures of four stories or more.

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4.2.1.3 Quality in Privacy. Privacy for residents is of utmost importance. Recognize that bachelor quarters serve as homes for the residents, and design accordingly. Motel and garden style quarters allow greater privacy.

4.2.2 Architectural Character and Scale. The architectural character of the facility shall be in context with its surroundings, and shall relate not only to the immediate site and adjacent buildings, but also to the base itself. The desired architectural character is usually defined in the BEAP which most installations have published. These standards provide a basis for compatibility and order within the built environment. The intent of these standards is not to create "sameness," but to promote a sense of harmony and respect for local and regional design standards. The following elements are part of a successful design solution.

4.2.2.1 Regional Character. Some of the local influences that affect regional character fall under the category of historic, ethnic, cultural or traditional, topographic, and/or climatic. Well designed quarters respect the characteristics of the built environment in the local region through architectural style, choice of construction techniques, materials, and form.

4.2.2.2 Residential Character. Quarters should provide a residential environment through both exterior and interior elements. Exterior building forms are to signal the residential character of bachelor quarters. These residential images can be reinforced through the following:

a) Provide gable or similar roof shapes.

b) Limit building height to three stories unless extreme land shortage can be documented. Where three stories cannot be used, investigate using several building heights to introduce some residential qualities to the complex.

c) Bay windows may be used to change the exterior appearance from institutional to more residential.

4.2.2.3 Compatibility. Achieve architectural compatibility by integrating a vocabulary of scales, forms, color palettes, and materials that blend with and respect the built and natural environment. The result is a combination of facilities that compliment each other and create balance and harmony. Architectural compatibility guidelines are not intended to compromise design expression, but rather to provide a framework for the development of quality design.

4.2.2.4 Orientation. Orient buildings or groups of buildings with sensitivity to climatic conditions. Solar gain and prevailing winds can enhance energy conservation and affect a significant cost savings. Building placement and design shall take advantage of views that are scenic, pleasant, or interesting. Designers shall be sensitive to the approaches to the facility and strive to create a clear sense of arrival for newcomers. Design

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roof overhangs to work with sun angles to provide solar shading. This configuration is a built-in by-product of bachelor quarters that have exterior balconies. Achieve mutual shading sensitively arranging adjacent structures. Avoid excess east or west facing glass and design for maximum cross ventilation where feasible.

4.2.2.5 Human Scale. Architectural scale is defined as the comparative relationship of a structure or space to the human form. Individuals perceive a sense of personal comfort based on influences from their physical environment. Those environments that enable a person to feel comfortable and accepted as a part of the environment are considered to possess a "human" scale. The height, form, and bulk of a building or space as well as its formal relationship to other buildings or spaces contribute equally to achieving this sense of scale. Quarters should provide a homelike environment with an architectural scale that imparts a clear sense of relative comfort, ease, and satisfaction.

4.2.2.6 Building Mass. Building mass is defined as the overall bulk or total volume of space a building occupies. Large buildings such as bachelor quarters, aircraft hangars, and maintenance facilities often have a greater relative mass than other buildings on a base. Modulating the form and facade of these buildings with setbacks, repetitive details, and less dominant colors softens their physical appearance and develops a blending of facilities in terms of their form, proportion, and perceived size. The size, shape, proportion, repetition, and placement of design features such as fenestration, roofs, and columns are elements that combine to project the architectural character of a building. Building form should reduce the impression of size and institutional regularity and emphasize more individual interior and exterior scale.

4.2.3 Life Safety. Determine fire and life safety requirements from NFPA publications and from MIL-HDBK-1008B. Use the more stringent requirement where regulations conflict. Meet the following minimum requirements for bachelor quarters.

4.2.3.1 Fire Protection Sprinkler System. Provide sprinkler systems in bachelor quarters. For both new construction and rehabilitation projects, install in accordance with NFPA 13R, Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height. Fire protection systems shall conform to MIL-HDBK-1008B and to NFPA fire codes, particularly NFPA 101. Bachelor quarters are classified by NFPA as new hotel and bachelor quarters occupancy or as existing hotel and bachelor quarters occupancy (in the case of minor renovation projects). Fire and life safety safeguards shall comply with requirements of this occupancy. Mid-rise/high-rise bachelor quarters shall be protected throughout by an approved, supervised automatic sprinkler system installed in accordance with requirements specified in NFPA 101, NFPA 13R, and other fire codes referenced therein.

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4.2.3.2 Fire Alarm Systems. Install fire alarms systems compatible with and connected to the base system.

4.2.3.3 Occupancy Requirements. Provisions for life safety shall conform to requirements in NFPA 101. Occupancy of bachelor quarters is classified by MIL-HDBK-1008B as personnel housing, by NFPA 101 as hotel or dormitory for recruits, and as apartments for all others.

4.2.3.4 Smoke Detectors. Provide each bedroom and each living room with a smoke detector powered from the building electrical system. Provide heat and smoke detectors in other public and service spaces as required by MIL-HDBK-1008B and the reviewing fire protection engineers. Locate smoke detectors on walls in accordance with NFPA 72, National Fire Alarm Code.

4.2.3.5 Exit Egress. Travel distance to exits is of particular concern in designing quarters. The placement of stair towers or stairwells shall be part of the preliminary building planning process. This requires experimentation to determine the maximum number of living units which can be served by one stair while still conforming to the maximum allowable travel distance. Construction of the fire wall, ceiling, and floor assemblies around each living unit is another issue of paramount importance to bachelor quarters design. The construction of such assemblies as required by NFPA 101 shall be closely coordinated with the sound attenuating techniques used.

4.2.4 Accessibility Requirements. Barrier-free design shall be in accordance with the UFAS and the ADAAG. Use the criteria that provides the greatest barrier-free design requirements. Spaces in bachelor quarters that are open to the public, civilian staff, visitors, and transients shall be barrier free. In transient bachelor quarters at least 5 percent of the apartments shall be barrier free. Apartments in quarters serving only able-bodied personnel are not required to be barrier free.

4.2.5 Acoustics. Careful attention to acoustic design is required for bachelor quarters to ensure a high degree of privacy for residents within their living units and in study areas. Designers shall address isolation of noise from a variety of sources, including:

- a) Adjacent living units
- b) Spaces on a floor level above or below
- c) Hallways and balconies
- d) Mechanical rooms and systems
- e) Exterior generated sound such as aircraft and automobile noise

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f) Walls between living units and between living units and corridors, and exterior walls of living units shall have a sound transmission class of at least STC 52.

g) Floor and ceiling assemblies shall be at least STC 55 and have an impact isolation class of at least IIC 60. Telephone, cable television, convenience outlets, and mechanical ducts shall not compromise the acoustical integrity of wall, floor, or ceiling assemblies. Select fluorescent lamp ballasts to minimize noise generation.

4.2.6 Structure. Select an economical structural system based on:

- a) Facility size
- b) Projected load requirements
- c) Subsoil conditions
- d) Local availability of materials and labor
- e) Feasibility of prefabrication
- f) Local construction practices
- g) Resistance to fire, wind, snow, seismic, geologic, and permafrost conditions

Recognize that quarters are modular and repetitive in nature; therefore, decisions concerning the structural system have substantial affect on construction costs. Coordinate column spacing and layout with the building's floor plan so that they occur within or in alignment with walls. Hold columns occurring within spaces to a minimum and limit them to larger public spaces such as the laundry room. Analyze the proposed structural system that is the most economical method of realizing the architectural design intent.

4.2.6.1 Vapor Barriers. Calculate vapor permeability and temperature through the entire wall sections including interior finishes to ensure dew point does not occur within the wall system. Special construction considerations not limited to heating, ventilating, and air conditioning (HVAC) systems are required in humid areas.

4.2.6.2 Roof Systems. Design and detail roof systems to resist maximum wind for the area. Provide a residential character through the use of gable or similar sloped forms.

4.2.6.3 Doors. Specify doors, frames, and hardware to meet sound separation, fire separation, and security requirements unique to bachelor quarters. Bedroom doors may be vented as necessary for HVAC movements.

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Exterior doors shall be fully weatherstripped and include a heavy-duty metal threshold which prevents drafts, dirt, water, and insect entry. Exterior doors shall be solid core, thermally insulated.

a) Provide lobby and entry vestibules with glass commercial style store front doors with automatic openers for major entrances. Bachelor quarters managers should designate which entrances require this feature.

b) Other entry doors shall be solid core wood or thermal insulated metal to provide sound separation.

c) Provide apartment entry with solid core wood or thermal insulated metal door to provide sound isolation. Provide a wide angle peephole and electromechanical or plastic coded key lock system.

d) Provide bedrooms with solid core wood door with ventilation openings as required for the apartment system. Provide a lock with non-removable hinge pins and keyed to match the associated closet door only.

e) Provide closets and bedrooms with solid core wood doors with non-removable hinge pins and locking hardware keyed to match the closet door lock with its associated bedroom door locks.

4.2.6.4 Hardware and Locks. Provide dead bolt locks and night latches. Hinges shall conform to Builders Hardware Manufacturers Association (BHMA) 101, Butts and Hinges. Locks shall conform to BHMA 601, Bored and Preassembled Locks and Latches.

4.2.6.5 Windows. Place windows to avoid breaking and entering, e.g., by reaching adjacent entry door hardware and to avoid other means of breaking and entering. Size glazed opening equal to at least 10 percent of apartment floor area. Size the operating section to meet NFPA 101 standards for egress.

a) Specify commercial grade window with heavy-duty insect screen for operating section. Consider insulating glass and thermal break frames for comfort where heat loss does not require it.

b) Use tight-fitting, insulating, commercial grade windows. Solar glazing with low "E" glass is required in regions with plentiful sunlight. Install heavy-duty insect screens on operable windows. Size windows at between 10 and 15 percent of the floor area they serve. Windows serving residential units shall be operable and sized for emergency egress. Windows shall be compatible with the type of window coverings desired.

c) At motel style configurations, where windows are likely to be kept covered for privacy, higher fenestration with a separate covering mechanism is recommended to allow light to enter the room while maintaining privacy at eye level.

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4.2.6.6 Walls and Partitions. Design walls and partitions to meet appearance and acoustic and durability requirements of bachelor quarters.

a) Choose wall and partition assemblies to provide at least 52 decibel sound separation between apartment and adjacent spaces on the outside. Place electrical outlet boxes, HVAC openings, etc., to maintain the sound separation of the wall assembly. Clearly direct the Contractor to seal edges of wall assemblies to adjacent construction to avoid flanking sound paths.

b) Specify smooth durable finishes for walls and partitions in apartments. Public spaces may include other than smooth surfaces for architectural emphasis. Consider ease of repair and refinishing when choosing wall finishes.

c) Provide stud walls covered with dry wall for one hour minimum fire rating, or as required by code. Avoid concrete masonry unit (CMU) walls in new construction. For CMU walls in renovation.

d) Locate vapor barriers to allow venting of wall assemblies and avoid trapping moisture within wall assemblies. Review the use of materials such as vinyl wall covering and foil faced gypsum board that may act as vapor barriers carefully.

4.2.6.7 Ceilings. Toilet ceilings shall be off-white and smooth finish. Other ceilings may be off-white or provide a light colored acoustical textured treatment. Suspended acoustical tile ceilings are prohibited.

4.2.7 Interior Design. See Table 4 for additional information.

4.2.7.1 Wall Finishes. Avoid exposed CMU block walls as an interior wall finish. Use a Type II (minimum 20 oz./lin. yd.) vinyl wall covering over smooth walls. Accent walls are optional, but shall not be so bright or so dark as to shorten the room or negatively affect the interior lighting. Consider a textured wall covering as an accent instead of a dramatic contrasting color. Accent colors can be introduced in textiles used as draperies and upholstery fabrics.

4.2.7.2 Paint

a) Interior surfaces, except factory prefinished material, shall be painted a minimum of one prime coat and two finish coats. Walls and ceilings in kitchenette, toilet, core areas, laundry, and utility rooms, and painted trim shall be painted with latex semi-gloss enamel. Other interior finishes should be egg-shell finish. Blown-on acoustic finish is not allowed, except in public core areas. Textured paint is optional in some areas. See Table 4.

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Table 4
Interior Finishes

CORE AREA			
AREA/SPACE	FLOORS	WALLS	CEILING
Administration	Carpet	Paint, Optional Accent Vinyl	Paint, Optional Texture
Lounge/Meeting/ Game Room	Carpet	Paint, Optional Accent Vinyl	Paint, Optional Texture
Public Toilets	Hard Surface	Hard Surface Full Height	Paint
Vending	Hard Surface	Paint	Paint, Optional Texture
Bulk Storage	Hard Surface	Paint	Paint, Optional Texture
Housekeeping	Hard Surface	Paint	Paint
Laundry	Hard Surface	Paint or Hard Surface	Paint
Public Corridors	Carpet	Paint, Vinyl Wall Covering, Optional Accent Vinyl	Paint, Optional Texture
Bedrooms	Carpet	Paint, Optional One Wall Accent Vinyl	Paint, Optional Texture
Kitchenettes	Hard Surface	Paint or Vinyl Wall Covering	Paint
Apartment Toilets	Ceramic Tile	Ceramic Tile	Paint
Bedroom Closets	Hard Surface	Paint	Paint
Entry Doorswing Areas	Hard Surface or Carpet	Paint, Optional One Wall Accent Vinyl	Paint, Optional Texture
Note: Accent walls with vinyl wall covering are encouraged options.			

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b) Exterior surfaces requiring painting shall receive a minimum of one prime coat and two finish coats. Wood trim frames, etc., shall be back primed. Exterior semi-transparent sealing stains shall have two coats minimum.

c) Select neutral colors for the more permanent surfaces (e.g., ceramic tiles, laminates, etc.) to facilitate future finish material changes.

4.2.7.3 Hard Surface Floor Finishes. Provide minimum Composition 2, Class 2 (through pattern) vinyl composition tile, or provide sheet vinyl Type I, Grade 1 or Type II, Grade 2 minimum with Class A (fibrous) backing. Avoid "no wax" surfaces, and white as a predominant color.

4.2.7.4 Carpet

a) Carpet shall be branded yarn dyed, Type 6,6 hollow filament nylon with stain and soil protection permanent or chemically bonded to the fiber or branded 100 percent solution dyed, Type 6,6 or 6 hollow filament nylon with a published 10-year colorfast warranty and stain and soil protection. Carpet tiles are acceptable for common areas and for administration spaces.

b) Carpet shall be commercial grade, bulk continuous 100 percent nylon filament, tufted, or woven, and a heavy wear classification. Acceptable textures include level loop, textured loop, or cut and loop pile (cut pile should not exceed one-half of the total surface). Carpet shall be of a neutral color base with a small pattern or heathered appearance (flecked with various colors). Solid, very light or very dark colors are unacceptable.

c) Carpet face weight shall be 26 ounces minimum; pile height .187 inch minimum; stitch rate 8.5 per inch minimum; and gauge 1/8 inch minimum (two-ply yarn).

d) Primary backing shall be of synthetic woven polypropylene. Secondary backing shall be a commercial performance graded integral cushion backing system in 12 foot or 6 foot widths. Integral cushion backing system shall consist of a sealant base and polyurethane cushion or a closed-cell vinyl cushion, each with releasability characteristics, providing a moisture barrier. Integral urethane cushion backing system shall have a minimum cushion thickness of 4/32 inch and a 20 pound per cubic foot backing density. Integral vinyl cushion backing system shall have a thickness of .156 inch and a density of 18.5 pounds per cubic foot. Carpet with a primary and secondary backing shall not contain latex filler.

e) Performance requirements:

(1) Warrant that under normal use the carpet will not ravel at seams or edges for 15 years.

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(2) Secondary backing adhesion shall be guaranteed not to delaminate for a minimum of 15 years.

(3) A wear guarantee of no more than 10 percent of face yarn loss shall be provided for a minimum of 15 years when installed and maintained in accordance with manufacturer's procedures.

(4) A 20 pound tuft bind shall be guaranteed for a minimum of 15 years for urethane cushion backed products and a 7 pound tuft bind shall be guaranteed for 15 years for vinyl backed products.

(5) Carpet shall not give static discharges in excess of 3.5 kilovolts when tested under the American Association of Textile Chemists and Colorists (AATCC) 134, Electrostatic Propensity of Carpets.

f) Test requirements:

(1) Flame and smoke resistant standards. Provide carpet complying with ratings as indicated for the following tests:

a. Flooring Radiant Panel Test - ASTM E 648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source and/or NFPA 253, Standard Test Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source - carpet shall have a minimum critical radiant flux of 0.22 watt per square centimeter or be considered a minimum of Class 2 rating;

b. Passes Methenamine Tablet Test - DOC-FF-1-70 and/or ASTM D 2858, Standard Test Method for Thermal Conductivity of Electrical Grade Magnesium Oxide;

c. Smoke Density Test - NFPA 258, Standard Research Test Method for Determining Smoke Generation of Solid Materials and/or ASTM E 662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials - 450 or less.

(2) Fade resistance standards. Provide carpet complying with ratings for AATCC 16, Colorfastness to Light, light colorfastness test: for dark colors, a gray scale rating of 4 or better after 180 standard fading hours as compared to AATCC gray scale for evaluation of change in color.

g) Installation and maintenance shall be in accordance with manufacturer's printed installation and maintenance instructions.

4.2.7.5 Individual Bedroom Toilet Finishes. Use slip resistant ceramic floor tiles in baths and toilets. Specify a mottled or shaded tile to hide

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discoloration from detergents, etc. Use ceramic wall tile from floor to ceiling around bathtubs and showers. Other walls may receive wainscot-height tile.

4.2.8 Specialties. Provide specialties including but not limited to those listed below. Provide durable materials consistent with building design. Building signs and other items on the building exterior shall meet the BEAP.

4.2.8.1 Cabinets and Millwork. Built-in cabinets shall be well constructed with sturdy hardware. Avoid particleboard and glued joints. Recessed pulls are preferred. Finish shall be able to withstand frequent cleaning and shall coordinate with the other finish materials within the space. Neutral colors are recommended for cabinets and millwork to facilitate future color scheme changes. Hinges shall comply with BHMA 101. Locks and latches shall comply with BHMA 601, Series 4000, Grade 2. Closers shall comply with BHMA 301, Door Controls, Closers.

4.2.8.2 Toilet Accessories. Toilet accessories may be surface mounted or recessed, of non-corrodible metal or tile, and shall have a toilet paper holder, soap dish, combination tumbler and toothbrush holder, bathrobe hooks, and towel bars. Provide shower curtain rod. Specify rod at proper height for conventional shower curtains (72 inches by 72 inches). Provide a timer-controlled infrared heat lamp for auxiliary heating in toilets with bathtub or shower.

4.2.8.3 Window Covering Considerations. Make window coverings (blinds or heavy-duty drapery hardware) an integral part of the construction contract. Arrange curtain hardware so drapes lap window openings to reduce light leakage. Use double carriers similar to Kirsh "Ripple fold" attachment. Mini blinds, vertical blinds, draperies, or a combination are authorized. Consider solar conditions when selecting a window treatment. Window treatments shall be flame resistant. Drapery pleats that are either stack pleated, roll pleated, or accordion-type pleated are preferred instead of pinch pleated. The drapery lining shall hang independently from the finished drapery treatment. Install blackout linings in dormitories. Traverse rods shall be of commercial quality. Drapery lining and drapery are not considered part of the construction contract.

4.2.8.4 Furniture Considerations. Furniture shall be of matching style and finish. Furniture shall be well constructed of solid hardwoods and veneers with plastic laminate top surfaces. Refer to the bachelor quarters managers "Whole Room Concept" Design Standards and Procurement Catalog. Recessed pulls are preferred. Maximize storage capabilities. Provide a study area and a lounge chair for each occupant. Public furnishings shall be extremely sturdy. Lounge furniture should be constructed with solid wood or steel frames. Avoid lounge seating with upholstered arms and sides. Plastic laminate tops should be used on table surfaces. Maximize the use of individual lounge chairs and love seats instead of sofas. Furniture selection will be included in the

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interior design option. However, a furniture design layout is required for public spaces (lounges, lobby, offices, etc.) as well as typical bedrooms, and shall be clearly marked "For Information Purposes Only."

4.2.8.5 Artwork and Accessories. Provide artwork for all areas except living units and storage rooms. Graphics and interior signage shall be well designed and shall coordinate with the architectural style and finish materials. Silk plants are recommended for public areas. Provide wall protection for recreational games such as dart boards and billiards. Provide bulletin boards in service areas and the main entry. Provide nameplate signage with removable inserts to identify each occupant. Interior signage and bulletin boards should be an integral part of the construction contract. Artwork is considered collateral equipment and will be included in the interior design option.

4.2.8.6 Building Directories. Provide a building directory located appropriately in the lobby of the building.

4.2.8.7 Directional Signage. Provide a building number sign and building identification sign near the building entrance as described in the BEAP. Provide a room number sign for each dwelling unit and a room number and description for all other rooms.

4.2.8.8 Closet Accessories. Provide living and bedroom closets with vinyl clad metal shelves and hanging systems. Use heavy-duty materials median braced for heavy loads.

4.3 Systems

4.3.1 Cargo Lifts. Provide at least one cargo lift or elevator in each bachelor quarters building of two or more floors to move furniture, equipment, and service carts. Choose size, weight capacity, speed, and location for furniture, not passenger service. In garden style buildings where a permanent cargo lift would be uneconomical, provide a concrete pad on which a mobile lifting device can be positioned for brief periods.

4.3.2 Elevators. Provide elevators for mid-rise/high-rise buildings sized for furniture moving.

4.3.3 Heating, Ventilating and Air Conditioning (HVAC). HVAC shall provide individual modules choice of heating and cooling year round with individual units to permit maintenance without overnight outages of either heating or cooling. The selection of the type of HVAC system used for a quarters significantly impacts the initial construction cost and the life cycle cost of the facility.

4.3.3.1 Controls. Provide an individual climate control in each apartment. Plan the location of individual HVAC units within each module to minimize

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utility runs to the units. Provide heating or cooling in any season without regard for operation of adjacent apartments.

4.3.3.2 Energy Conservation. Design of new facilities shall ensure that building energy consumption does not exceed DOD energy budget figures. Use these references: American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Handbook, Fundamentals; ASHRAE 62, Ventilation for Acceptable Indoor Air Quality; NAVFAC DM-3.03, Heating, Ventilating, Air Conditioning, and Dehumidifying Systems; MIL-HDBK-1190, Facility Planning and Design Guide to design mechanical systems; NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems; and MIL-HDBK-1008B to design smoke control features. Modify these references with the following specific guidance:

- a) Choose inside and outside design conditions from MIL-HDBK-1190, Chapter 10. Use the criteria variations for humid areas where they apply.
- b) Base heating and cooling load calculations on ASHRAE procedures.
- c) Use ASHRAE procedures to design general mechanical pipe systems. Use flow control valves on equipment to allow attachment of portable flow measurement meters. Avoid placing chilled water pipe in walls or above ceilings.
- d) Use ASHRAE procedures to design duct systems. Provide ducted supply and returns. Use prefabricated spiral weld duct as a first choice.
- e) Use ASHRAE 62 for ventilation. Assume two persons per apartment to allow flexible room assignment. Supply 15 percent more air than is exhausted. When using large forced air systems, heat recovery from exhaust air shall be run-around-coils or heat pipes. Do not use heat wheel systems.
- f) Exhaust air through a central ducted system. Design exhaust system to run continuously and interlock it with the building supply air system. Use manual volume damper accessible from the space for balancing. Exhaust air from bathrooms and closets in modules. An exhaust duct for the cooking area is desired, but not required.

4.3.4 Plumbing. Provide hot and cold water to public toilets, private bathrooms, kitchenettes, janitor closets, and laundry rooms. Provide shutoff valves at fixtures. Provide tank-type low water volume water closets in toilet rooms, of elongated or round, one-piece construction with a closed-front seat and a lid. Water closets and bath fixtures shall match and shall be neutral in color.

- a) Provide hose bibbs on exterior walls of each building at 50 foot intervals; frost-free as dictated by climatic conditions.
- b) Provide floor drains in janitor closets and laundry rooms.

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- c) Provide a separate water heating system for laundry rooms.
- d) Provide drinking fountain for public areas.
- e) Plan plumbing systems for bachelor quarters taking advantage of stacking bathrooms and placing fixtures back to back. Mechanical engineers, architects, and structural engineers shall work together to carefully plan the size and location of plumbing chases with minimal impact on usable living space. Consider collocating plumbing chases with exhaust risers serving each room.
- f) Small localized hot water heaters for each apartment are preferred by the energy conservation designers. Avoid plumbing chases whenever possible by placing plumbing in wall cavities. For residential construction, the life cycle cost for a pipe chase exceeds the cost of not having one, most homes do not use pipe chases.
- g) Use the following fixtures as standards:
 - (1) Washerless faucets at lavatories.
 - (2) Single lever faucets at tub showers.
 - (3) Shutoff valves for each fixture.
 - (4) Tank type, water saver, single piece, elongated bowl water closets with closed front seat, and lid in private living units.
 - (5) In-line flow restricter at shower.
 - (6) Acid-resisting cast iron bathtubs with metal stopper. Arrange as tub and shower with full height surround.

4.3.5 Lighting. Provide lighting fixtures and lighting levels to support residential character, to ensure safety, and to control maintenance cost and energy use.

- a) Fluorescent lighting fixtures shall be used in bathrooms and kitchenettes of living units and public, administrative, and service spaces.
- b) Incandescent ambient light may be provided in private living rooms and bedrooms. Provide lights with ceiling fans where clearance is adequate.
- c) Use a combination of ambient and task lighting in living units. The designer shall be cognizant of lighting for both day and night situations.

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4.3.6 Electrical Systems

a) Provide the following as required:

- (1) Distribution equipment
- (2) Wiring
- (3) Receptacles and grounding
- (4) Interior and exterior lighting
- (5) Emergency lighting
- (6) Telephone
- (7) Fire detection and annunciation
- (8) Cable television
- (9) Intrusion detection systems.

b) Base electrical system design calculations on multi-family occupancy rather than hotel occupancy since the bachelor quarters is the full-time home of the residents, and therefore has a higher demand factor.

c) Provide metering for electric power. Include provisions to add meters for water, gas, or other utilities.

d) For direct entrance rooms, provide three-way switches at the entrance door and in the vanity area so that the living room and bedroom area lighting is controlled at either location. Also, provide motion sensor switches at bathroom doors to control the bathroom light fixture. Provide 20 ampere outlets throughout the apartment. In bedrooms, provide 20 ampere dedicated quadruplex outlets combined with television and data outlets as described. Provide quadruplex and duplex outlets in the kitchenette area.

e) Provide each apartment with two dedicated lines for telephone, and data outlet. Dedicate each line solely to a bedroom, providing each bedroom with two combination outlets with duplex, telephone, and data outlet. Locate on opposite walls to facilitate and coordinate with the room furniture layout.

f) Provide a ceiling fan.

g) Provide incandescent or fluorescent ambient lighting in each room. The use of fluorescent fixtures in living rooms/bedrooms is allowed, but shall be carefully selected to fit into the residential environment. Fixtures in module rooms shall not appear "institutional." Do not rely

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solely on table lamps for room lighting. Ambient light level at desk height shall average 50 footcandles (500 lux) in each bedroom.

h) Conceal wiring; exposed surface metal raceways or conduits are not allowed.

i) Provide exterior lighting in parking areas, building entrances, and walkways. Refer to Section 2 for more information concerning exterior lighting. Use NFPA 70, National Electrical Code, the IES Lighting Handbook, and NFPA 101 for lighting calculations. Provide one exterior light fixture outside each room entrance door for motel and garden style quarters.

j) Perform lightning protection risk assessment in accordance with NFPA 780, Lightning Protection Code.

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Section 5: NAVY VISION FOR BACHELOR QUARTERS

5.1 Program Definition. Refer to the CNO Navy Neighborhoods of Excellence, Volume II, the Commanding Officer's Guide to Quality Bachelor Quarters.

5.1.1 Mission. The Navy Neighborhoods of Excellence Bachelor Quarters mission is to provide a quality living environment and customer services that meet the needs of the residents. The physical forms of housing have psychological, social, and functional implications that promote comfort and security for their residents and encourage their fullest development as individuals and group members.

5.1.2 Concept. Service members can better support the Navy's mission if their quarters satisfy their immediate need for suitable shelter. Services and facilities must support their personal and professional goals and give them a sense of dignity, pride, and place within the Navy community.

5.1.3 Standards for Housing Neighborhoods. Quality facilities standards range widely in scope and scale. The elements listed here help define quality bachelor quarters and neighborhoods. They are the basic standards of the excellent living environments which we seek to provide all personnel. Although not all inclusive, the following elements have a major influence on the feeling and usefulness our quarters provide to the customer:

- a) Sense of arrival
- b) Sense of order
- c) Sense of neighborhood
- d) Sense of completeness
- e) Quality interiors
- f) Quality exteriors
- g) Compatibility with the environment
- h) Reliability, maintainability, and energy efficiency

5.1.4 Focus. The Navy is currently authorized to program on-base housing for unaccompanied personnel, although Grades E7 and above may elect to live off-base. The Navy plans to focus new construction on the new standard module. This apartment style module can house E1 to E4 personnel at two people per apartment and can house Grades E5 and above privately.

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5.1.5 Basis. A Navy bachelor is entitled to a quality of life equal to that of a married person. In addition to equal quality, the House of Representatives Armed Services Committee has tasked DOD to "...give similar priority to barracks as it gives to family housing."

5.2 Priority Features of New Quality of Life Standards

5.2.1 Apartments. Apartment style quarters consist of private sleeping area, shared kitchenette, bathroom, large closets, additional bulk storage areas, and a central clubhouse style core area.

5.2.2 Economics. Consider the following improvement methods to minimize construction costs:

a) Repairs will improve existing buildings to the extent appropriate under the repair by replacement rules for special projects.

b) Renovations will result in minimum expenditures to achieve size and features similar to new construction standards, by downloading existing rooms; for example, an existing two plus two room can provide similar features by downloading the room to one plus one and adding a kitchenette and closet.

c) Replacement of a building that cannot provide quality of life is the most effective improvement.

Perform an economic analysis at least every 5 years on bachelor quarters buildings over 55 years old. Also evaluate buildings less than 55 years old that are ineffective or difficult to maintain for replacement by economic analysis.

Evaluate existing buildings, with features such as central heads, that can be converted to other uses effectively, for conversion. Complete new bachelor quarters before converting the existing quarters. Any economic analysis that is close or tied for renovation versus replacement should elect the replacement option.

5.2.3 Planning for the Future. Existing quarters lose approximately 50 percent of their capacity in renovation to new standards. Plan renovation projects to follow the completion of new facilities needed to replace those losses.

5.2.4 Goals. The goals for improvement of Navy bachelor quarters are:

a) In 10 years, upgrade substandard and replace inadequate facilities.

b) In 20 years, eliminate the deficit.

c) By 2004, eliminate critical backlog of maintenance.

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5.3 Long Range Strategy

5.3.1 Replace the Existing Inventory. The long range goal is to replace all bachelor quarters buildings on a 60 year cycle. To house E1 to E6 personnel on base, the Navy will need to construct approximately 1672 modules annually to sustain approximately 100,352 modules.

E1 to E4 personnel (PN) (115,139 PN)/(2 PN per apartment) = 57,569 apartments.
E5 to E6 PN (42,783 PN)/(1 PN per apartment) = 42,783 apartments.

Total 100,352 apartments.

1672 modules per year x 60 years = 100,352 modules

5.3.2 Renovations. Allowing three renovations per 60 year life cycle at 50 percent of replacement value, we would need to do an additional 1.5 times the annual new construction in military construction (MILCON) level renovations.

5.3.3 Tactical Programming. Mission changes and short term goals such as deficit elimination fall below long range strategy levels and will not meet projected 60 year replacement goals.

Funding construction at a lower level will extend the replacement cycle thereby increasing costs for repairs, operation, and maintenance. Funding at a higher level will reduce the time required for a replacement cycle and lower costs for repairs, operation, and maintenance.

Additional life cycle savings can be achieved by minimizing renovations and spending that money on accelerated replacement of existing buildings with new construction. The resulting shorter replacement cycle will create additional savings in maintenance and operations by increasing the percentage of the inventory that is new and efficiently designed. For this reason, any economic analysis that is close or tied for renovation versus replacement should elect the replacement option.

In general, repair by replacement of components and systems within a building are a good investment. However, evaluate carefully major renovations requiring structural work, wall relocations, and plumbing changes against the replacement option which offers a superior end product.

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REFERENCES

NOTE: THE FOLLOWING REFERENCED DOCUMENTS FORM A PART OF THIS HANDBOOK TO THE EXTENT SPECIFIED HEREIN. USERS OF THIS HANDBOOK SHOULD REFER TO THE LATEST REVISIONS OF CITED DOCUMENTS UNLESS OTHERWISE DIRECTED.

FEDERAL STANDARDS, MILITARY HANDBOOKS, NAVFAC P-PUBLICATIONS, AND DESIGN MANUALS:

Unless otherwise indicated, copies are available from the Naval Publications and Forms Center, Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

HANDBOOKS

MIL-HDBK-1008B Fire Protection for Facilities Engineering,
Design, and Construction

MIL-HDBK-1190 Facility Planning and Design Guide

DESIGN MANUALS

DM-3.03 Heating, Ventilating, Air Conditioning, and
Dehumidifying Systems

STANDARDS

FED-STD-795 Uniform Federal Accessibility Standards

NAVFAC P-PUBLICATIONS

NAVFAC P-80 Facility Planning Factor Criteria for Navy and
Marine Corps Shore Installations

OTHER GOVERNMENT DOCUMENTS AND PUBLICATIONS:

DOD 4165.63M DOD Housing Management

OPNAVINST 5100.23 Navy Occupational Safety and Health (NAVOSH)
Program Manual

(Unless otherwise indicated, copies are available from the Naval Publications and Forms Center, Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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NON-GOVERNMENT PUBLICATIONS:

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	Colorfastness to Light
AATCC 134	Electrostatic Propensity of Carpets

(Unless otherwise indicated, copies are available from the American Association of Textile Chemists and Colorists (AATCC), 1 Davis Drive, P.O. Box 12215, Research Triangle Park, NC 27709.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2858	Standard Test Method for Thermal Conductivity of Electrical Grade Magnesium Oxide
ASTM E 648	Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM E 662	Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

(Unless otherwise indicated, copies are available from the American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103-1187.)

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS, INC. (ASHRAE)

ASHRAE 62	Ventilation for Acceptable Indoor Air Quality
ASHRAE Handbook, Fundamentals	

(Unless otherwise indicated, copies are available from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle N.E., Atlanta, GA 30329-2305.)

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION, INC. (BHMA)

BHMA 101	Butts and Hinges
BHMA 301	Door Controls, Closers
BHMA 601	Bored and Preassembled Locks and Latches

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(Unless otherwise indicated, copies are available from Builders Hardware Manufacturers Association, Inc. (BHMA), 355 Lexington Avenue, New York, NY 10007.)

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IES)

IES Lighting Handbook

(Unless otherwise indicated, copies are available from Illuminating Engineering Society of North America (IES), United Engineering Center, 345 E. 47th Street, New York, NY 10017.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13R	Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 101	Life Safety Code
NFPA 253	Standard Test Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
NFPA 258	Standard Research Test Method for Determining Smoke Generation of Solid Materials
NFPA 780	Lightning Protection Code

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GLOSSARY

AATCC. American Association of Textile Chemists and Colorists

ADAAG. Americans With Disability Act Accessibility Guidance

ACM. Asbestos containing material

A/E. Architect/engineer

ASHRAE. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.

ASTM. American Society for Testing and Materials

BEAP. Base Exterior Architectural Plan

BEQ. Bachelor enlisted quarter

BHMA. Builders Hardware Manufacturers Association, Inc.

BOQ. Bachelor officer quarter

BRAC. Base realignment and closure

CIP. Capital Improvement Plan

CMU. Concrete masonry unit

CNP. Comprehensive Neighborhood Plan

DOD. Department of Defense

EFD. Engineering field division

EFA. Engineering field activity

HVAC. Heating, ventilating, and air conditioning

IES. Illuminating Engineering Society of North America

IFB. Invitation for bid

IIC. Impact insulation class

M/E/C. Mechanical/electrical/circulation

MILCON. Military construction

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NFPA. National Fire Protection Association
OCS. Officer Candidate School
O&M. Operation and maintenance
OSD. Office of the Secretary of Defense
PEP. Parametric estimating and programming
RFP. Request for proposal
STC. Sound transmission class
UFAS. Uniform Federal Accessibility Standards
VCT. Vinyl composition tile

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