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MILITARY HANDBOOK

BASIC ARCHITECTURAL REQUIREMENTS AND DESIGN CONSIDERATIONS

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ABSTRACT

Basic architectural and design criteria for all naval shore facilities are presented for use by qualified designers. Emphasis is placed on quality of design, energy conservation, function, and efficiency. Contents include general criteria for project planning, site design, building design, interior design, and directions for special requirements such as life safety, building codes, and accessibility for the physically handicapped.

FOREWORD

This handbook is one of a series developed from a compilation of current and proven standards, criteria, and design principles established by NAVFACENGCOM, other Government agencies, and the private sector. This handbook should be used in developing project designs. This handbook was prepared using, to the maximum extent feasible, national professional society, association, and institute standards. Deviations from these criteria cannot be made without prior approval of NAVFACENGCOM HQ (Code 04).

Design cannot remain static any more than can the functions it serves or the technologies it uses. Accordingly, recommendations for improvement are encouraged and should be furnished to Commander, Atlantic Division, Naval Facilities Engineering Command (LANTNAVFACENGCOM), Code 04A4, Norfolk, VA 23511-6287; telephone (804) 444-9970.

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.

ARCHITECTURAL CRITERIA MANUALS

Criteria Manual	Title	PA
MIL-HDBK-1001/1	Basic Architectural Requirements and Design Considerations	LANTDIV
MIL-HDBK-1001/2	Materials and Building Components	LANTDIV
DM-1.03	Architectural Acoustics	LANTDIV
MIL-HDBK-1001/5	Roofing and Waterproofing	CHESDIV

BASIC ARCHITECTURAL REQUIREMENTS AND DESIGN CONSIDERATIONS

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Section 1: INTRODUCTION

1.1 Scope. This military handbook contains basic criteria, requirements, and considerations for Navy architectural and design projects. The information is to be used in conjunction with applicable Naval Facilities Engineering Command (NAVFACENGCOM) and Department of Defense (DOD) criteria as well as specific project user requirements.

1.2 Cancellation. This handbook, MIL-HDBK-1001/1, dated 30 April 1992, cancels and supersedes NAVFAC DM-1.01, Basic Architectural Requirements and Design Considerations, dated April 1986.

1.3 Related Criteria. Criteria in other publications related to basic architectural and design considerations are discussed in Section 5 of this handbook. Complete listings of related Naval Facilities Engineering Command (NAVFAC) publications are available in MIL-BUL-34, Engineering and Design Criteria for Navy Facilities. In addition, other criteria is included in MIL-HDBK-1001/2, Materials and Building Components, and MIL-HDBK-1001/5, Roofing and Waterproofing. Criteria are intended to serve as guidance and offer a certain degree of flexibility except in those instances based on law, executive order, DOD directives, federal regulations, and other governing standards.

1.4 NAVFACENGCOM Design Philosophy and Policy

1.4.1 Design Philosophy. The underlying philosophy is one of responsive, responsible, and defensible design for Navy shore facilities. This philosophy must be pursued for every facility acquisition at every management and technical level. A commitment to design principles and practices which are requirement-based, logical, conservative, and appropriate must be emphasized. The objectives are excellence in design and cost-effectiveness in facility construction and operation.

This philosophy is not direction for austerity or elimination of all building amenities. Excellent designs can be responsive and responsible, and can meet the user's needs, contribute to the shore environment, and reflect the quality and character of the naval service. The challenge is to strike a prudent balance between desire and need, and between ideal and realistic.

1.4.2 Design Policy. Designs must produce facilities that respond to user needs, but reflect a responsible use of public funds. They must be defensible in terms of scope, cost, and appearance. Appropriate, defensible design is as listed below:

a) Competently planned,

b) Functionally adequate,

c) Appropriate in form,

d) Cost-effective,

e) Constructible,

f) Adaptable and durable over time, and

g) Harmonious and simple in appearance.

Monumental structures, stylistic applications of ornament, highly articulated configurations, excessive automation or mechanization, poor choices of utility, mechanical, and electrical systems, and exotic landscaping or building materials are inconsistent with the objective of creating pleasant, efficient, and cost-effective facilities.

1.4.3 Design Practice. Appropriate design quality must be a consistent command attitude. Designs must meet but should not unnecessarily exceed the user's needs. Designers should question apparent excessive scope demands when encountered.

1.5 NAVFACENGCOM Appropriate Architecture Policy

1.5.1 Appropriateness. Appropriate architecture for naval facilities is derived from the successful blending of four elements: (1) respect of image (Navy characteristics), (2) respect of function, (3) respect of environment, and (4) respect of economy and value. Appropriate architecture seeks to balance these elements and not to allow one element to overshadow the others.

Appropriate architecture for naval facilities should be timeless. Architecture should be contemporary, but avoid extreme, transient, or faddish architectural styles which are short-lived or become obsolete and dated quickly. Appropriate architecture for naval facilities should respect the total context of a naval base. No single building on a naval base should dominate architecturally, but each building should become an integral part of the whole base. New facilities should integrate into a large complex of buildings constructed over many years.

Appropriate architecture for naval facilities should be rational and should clearly reflect the function it serves. Non-rectangular forms are appropriate when those forms are required for functional or economic reasons. The envelope of a building should emphasize function by providing order and orienting users.

Appropriate architecture for naval facilities should relate to the surroundings in terms of color, materials, detailing, geometric form, and scale. It should enhance the overall architecture of a base by recognizing and preserving significant architectural, historical, and local themes to bring consistency. The use of numerous materials and forms just for the sake of decoration or style is not appropriate. Use compatible materials, colors, and forms.

1.5.2 Navy Image. Architecture for naval facilities should be reflective and supportive of characteristics of the Navy's image. The Navy's image is timeless, dignified, and serious. The Navy's image is honest and rational and it is respectful of being one part of a larger whole.

1.5.3 Cost-Effectiveness. Architecture for naval facilities must be economical and cost-effective by providing necessary scope, function, and quality at the lowest reasonable life cycle cost. The appearance of the facility must also be consistent with economy and cost-effectiveness. More durable materials can be used when justified on a life cycle cost basis.

1.6 Navy as a Client. The Navy is a multifaceted client. The actual user of the facility will be an activity which is part of a systems command. A military base or area public works office may also be involved. NAVFACENGCOM, as the shore facilities design and construction agent for the Navy and occasionally for other agencies, will represent the Navy and coordinate functional requirements for facility design.

1.7 Functional Requirements. Functional requirements are defined in project programs, criteria manuals, or other technical references. Many Navy functions are similar to functions of facilities within the private sector. Personnel housing, for example, is quite similar to a school dormitory or a motel; a maintenance shop or an administration building is much like a private sector building serving similar functions. However, in many cases, there will be some functional requirements for Navy facilities which may differ from the private sector.

1.8 Budget. Budget is critical in Navy projects. Any significant deviation in anticipated project cost must be defined as early as possible so that adjustments in scope or budget can be made. The later in the project this occurs, the less flexibility there is to adjust without incurring cost increases and delaying the project.

1.9 Materials and Systems. Select materials and systems to meet requirements of the following facility categories and economic lives:

a) Permanent and semi-permanent (nonwood) buildings - 25 years

b) Semi-permanent (wood) buildings - 20 years

c) Temporary or rehabilitated buildings - 15 years

Consider function, appearance, security, resistance to vandalism, life cycle cost, and availability for selection of operating systems. Also consider the size and skill level of the operations and maintenance staff and the conditions under which they will work.

Section 2: PLANNING

2.1 Approach. General planning and design criteria apply to all phases and areas of architectural design. This criteria should be used to achieve the goals established in the NAVFACENGCOM Design Philosophy discussed in Section 1 of this handbook.

2.2 Programming. The process of programming will vary depending upon the specific project, location, and individual NAVFACENGCOM Engineering Field Division (EFD) requirements. A fully developed program includes a complete definition of functional areas, adjacencies, functional relationships, and area efficiencies. The program may be established by NAVFACENGCOM personnel and building user. An adequate program may be developed by the designer and appropriate personnel or users. The designer must analyze the program and resolve perceived deficiencies with the user and agency before design.

2.3 Square Footage Criteria. Square footage allocations may be established by specific user requirements or developed in conjunction with guidelines established by MIL-HDBK-1190, Facility Planning and Design Guide.

NAVFACENGCOM criteria manuals, definitive drawings, and other programming criteria may also contain square footage criteria for specific building types. Square footage limitations, as established by scope, may not be exceeded without reprogramming the project.

Section 3: SITE DESIGN

3.1 Site Planning. Projects will generally have a specific site selected and certain design criteria established by Base Master Plans and other data such as Base Exterior Architectural Plans (BEAP's). Building placement and site design must respect the contextual elements of the site such as existing building orientation, topography, sun and shade, scale, setbacks, circulation systems, climate and weather, and general base characteristics. The location of the building should allow for minimal disruption or removal of site features, or additional equipment for possible expansion. Refer to MIL-HDBK-1190 and NAVFAC P-960, Installation Design, for additional site planning and design criteria.

3.2 Energy. The geographical location of a project will dictate basic energy considerations for heating and cooling requirements. Orient buildings to optimize desired solar penetration or deflection depending upon heating, cooling, or natural light. Existing buildings or other site elements can be used to create desired solar shading or wind breaks, while the location of a new building should have minimal negative energy impact on existing surrounding buildings. Consider the beneficial energy conservation effects of natural site features such as topography and vegetation.

3.3 Landscaping. Landscaping criteria should always be considered as an integral part of site design. New plantings and landscaping can soften severe existing site and environmental conditions, screen undesirable elements, and aid in energy conservation. New plants should be compatible with existing plants, indigenous varieties, climatic factors, and building design in terms of plant shapes, growth rates, and seasonal foliage colors. Landscaping and plant layout must minimize requirements for maintenance and consider any restrictions or limitations on watering. Plants should be edged or located so that adjacent grass areas can be maintained by machine. Also, the use of native plants and non-organic landscaping should be considered in desert areas. NAVFAC P-905, Planting and Establishment of Trees, Shrubs, Ground Covers and Vines, should be reviewed.

3.4 Site Utilities. Information on the location and capacity of existing utilities may not always be available or accurate. Potential problems must be acknowledged in the initial planning stages, and a course of action determined by the designer and NAVFACENGCOM personnel.

3.5 Site Elements. Site elements such as lighting, site furniture, and signage must be compatible with the building and with BEAP's for these elements. Refer to BEAP guidelines when available.

3.5.1 Site Lighting. Site lighting must adequately, yet unobtrusively, provide illumination levels required by criteria for operations while enhancing the building, landscaping, and site. Avoid large lighting fixtures mounted on the building. Fixtures and standards must be durable and

vandal-resistant, and must require low maintenance. Lighting controls should address energy efficiency, seasonal changes, and variable levels required for proper security as well as the likelihood of changing needs.

3.5.2 Site Furniture. Site furniture such as benches, kiosks, or information boards should be integral parts of the project and not treated as individual decorative elements. Furniture should be durable, and should require infrequent maintenance and relate in color, texture, and form to the building design, established base character, and BEAP criteria.

3.5.3 Signage. Site and exterior building signage should be consistent and compatible with base characteristics and BEAP guidelines. Where no such guidelines exist, signage should be simple, clear, and bold and should relate to the building and its context. Refer to NFGS-10440, Signs, for additional criteria.

3.6 Handicapped Access. Consider handicapped access in the initial stages of site planning, except in those instances where it can be documented that handicapped access is not required in the facility. Generally, handicapped access is not required when the facility's intended use is specifically restricted to able-bodied military personnel. When required, access shall conform to Federal Standard FED-STD-795, Uniform Federal Accessibility Standards (UFAS).

3.7 Protection of the Environment. Consider protection of the environment during and after site design and construction. Building location should minimize demolition or potential damage to existing trees or established grading and drainage systems. Measures should be implemented to prevent destruction or contamination of air, water, or other natural resources. Refer to NFGS-01560, Environmental Protection.

3.8 Snow Melting. Snow melting by mechanical piping or electric cable is generally discouraged, except when required for severe climates. If electric cable is used, install with a topping slab set on subslab. Consult the appropriate EFD points of contact for specific policy on snow melting requirements.

3.9 Parking. Provide sufficient parking to meet operational requirements and program needs. Specific guidance on determining counts and technical criteria is provided in MIL-HDBK-1190.

3.10 Security. Site security criteria concerning features such as fencing, intrusion detection, and guardposts are contained in MIL-HDBK-1013/1, Design Guidelines for Physical Security of Fixed Land-Based Facilities; DM-13.02, Commercial Intrusion Detection Systems; and the criteria manual series on Civil Engineering.

3.11 Contaminants. Programming and design must address previous site uses and the possible presence of contaminants in soil or existing structures. Previous industrial uses (such as forging) and service and maintenance facilities (such as service stations) which use underground storage are particularly problematical.

Section 4: BUILDING DESIGN, GENERAL CONSIDERATIONS

4.1 Approach. Building design is directly related to specific project and user needs as well as to the requirements of applicable NAVFAC and DOD standards, criteria, and guidelines. The building must reflect the NAVFACENGCOM Design Philosophy as discussed in Section 1 of this handbook.

4.2 Design. Building design should reflect current and proven design standards relating to building function, contextual elements, and BEAP requirements. Clean, simple, and straightforward buildings are functional and economical.

4.2.1 Function. Organization, space, and adjacency criteria must be provided in a workable, logical, and efficient manner and are reflected in efficient building net to gross ratios.

4.2.2 Appearance. Evaluation of aesthetics and design is a subjective process based on individual experience and perception. However, certain characteristics are consistently recognizable as elements of design quality. These elements include clear and logical building organization, efficient layout, and minimum use of dissimilar materials. Simple massing, scale, forms, and detailing also reinforce good design quality.

4.2.3 Context. Buildings must represent a sensitive response to the contextual fabric of the site. Existing adjacent buildings should be respected in terms of their forms, sizes, and materials. Positive design elements of existing buildings can serve as a basis for new buildings. Local architectural elements can provide insight into proven ways of responding to unusual local conditions. It is important that local, cultural, and design elements, especially in foreign countries, be respected and that new buildings not offend local conventions.

4.3 Energy. Buildings designed for the Navy must be energy efficient in terms of both energy consumption and the source of energy used. Active energy conservation systems such as solar collectors, geothermal systems, and heat recovery systems can be incorporated if specific project requirements, conditions, and construction budgets are favorable and the system can be justified on a life cycle cost basis. Passive energy conservation measures can be an effective and efficient means of reducing energy consumption and should be considered for all projects. Architectural elements responding to passive energy criteria will depend upon the specific geographical and climatic location of each project. MIL-BUL-34 lists available technical publications pertaining to wind, water, and solar energy conservation systems and equipment.

4.3.1 Building Form. Overall building form will be dictated by functional requirements and adjacency relationships. Energy conservation criteria also can directly affect the building form. Efficient layouts can minimize exterior wall areas and improve circulation efficiency. By limiting exterior surfaces, in temperate climates for example, heat loss can be minimized. In

the Northern Hemisphere, heating loads can be reduced by locating functions with minimal heating requirements, such as storage rooms, toilets, and mechanical rooms, along the north facade of a building. In temperate climates, rooms such as office areas with high lighting requirements should be located to maximize natural light benefits and reduce artificial lighting loads.

4.3.2 Glazing. Where required for solar protection, exterior glazing should be insulated glass, preferably tinted. The use of reflective glass may be prohibited by local conditions. Operable sash glazing systems may be considered to facilitate natural ventilation and reduce cooling loads. Operable windows can complicate the design and operation of heating, ventilating, and air conditioning (HVAC) systems. In the Northern Hemisphere, glazing should generally be maximized on the south facades and avoided or limited on the east and west. Glazing must be protected from different angles of solar penetration.

4.3.3 Solar Shading. Cooling loads can be reduced by protecting exterior surfaces and interior spaces from undesirable direct solar penetration. Stepped building forms and wing walls can permit a building to be self-shading. Overhangs, trellises, and screens will divert direct solar gain. The overall benefits of shading must be considered against the added costs, if any.

4.3.4 Daylighting. Cooling loads required to dissipate heat generated by artificial lights represent a major source of energy consumption in buildings. By maximizing desirable daylighting, the amount of artificial lighting can be reduced as well as the cooling load generated by the lights.

4.3.4.1 Daylighting Control. Daylighting should be minimized when the heat gain is more harmful than the benefits of natural light. Solar shading devices can also be used to control daylight penetration. Window blinds can also be used to control daylight and solar gain.

4.3.4.2 Light Shelves. Light shelves are highly reflective surfaces from which light is reflected onto the ceiling and back further into the room.

4.3.4.3 Clerestories. Interior spaces can be effectively illuminated by daylighting from clerestories augmented with artificial lighting fixtures. This can often provide a pleasant, effective work environment at minimal increased cost.

4.3.5 Artificial Light. Artificial lighting systems should have energy efficient fixtures and ballasts, and lamps should be controlled by dimmers or multiple switching to allow adjustment of lighting levels. Task lighting should also be considered. The initial cost of task lighting systems can be offset by energy savings resulting from a reduction of overhead artificial light fixture usage and heat dissipation. User comfort can also be increased

by better illumination from task lighting. Recent development in fluorescent and other forms of lighting provide effective and economical alternatives to incandescent lighting.

4.3.6 Miscellaneous Means. Energy conservation can be enhanced by other measures. In some climates, mass heat storage areas can be effective means of reducing heating loads by capturing excess solar heat gain during the day and radiating the captured heat at night. Natural ventilation, berms, and planting are other measures to consider.

4.4 Transportability and Availability. Design and select building components, systems, and materials to ensure, as much as possible, that their transportability to the project site can be easily accomplished. Dimensional limitations of length, width, height, and weight of materials must be considered to permit generally unrestricted worldwide movement. Other factors, such as handling volatile or dangerous materials and the need for temperature or humidity control for the materials, will affect transportability measures. OPNAVINST 4600.22, DOD Engineering for Transportability, describes standard DOD criteria and physical limitations for materials transportability. This publication also prescribes procedures necessary to obtain transportability reviews and variances when any materials under design, development, or procurement exceed the established criteria and limits. Another important consideration is availability and lead time requirements for materials, furnishings, and equipment. In certain instances, it may be necessary to separately identify long lead time items for preconstruction procurement.

4.5 Acoustics. Facilities shall be designed for appropriate noise suppression from equipment and shall provide the proper degree of security as required. Refer to DM-3.10, Noise and Vibration Control for Mechanical Equipment (will be superseded by U.S. Army Technical Manual TM 5-805-4, Noise and Vibration Control) for criteria and guidance.

4.6 Project Cost. It is imperative that projected construction costs be closely monitored throughout the project. The completed design must ensure as far as practicable that competitive bids will be within the proposed budgets. Any deviations from budget must be addressed as early as possible.

4.7 Value Engineering. Value Engineering (VE) is an organized program which seeks to ensure that a project's required functions are met at the lowest reasonable cost, consistent with performance, reliability, and maintainability. VE provides a method to attain a balance between first costs and follow-on life cycle costs. Independent VE studies are required for major military appropriation projects typically at the 35 percent design phase and/or during the preliminary design phase.

Section 5: BUILDING DESIGN, SPECIFIC CRITERIA

5.1 Approach. Specific architectural and design criteria must be used for Navy building projects. Some criteria, such as NAVFAC and DOD criteria, will be applicable to new and renovation projects. Other criteria, such as security and historic restoration guidelines, will be applicable only to specific projects. These criteria serve as minimum standards of quality for design and construction. While strict adherence to certain of these criteria is required by law or other governing directives, creative interpretation of other criteria is encouraged where benefits can be defined.

5.2 Related Criteria

5.2.1 NAVFAC Criteria. Guidelines and criteria have been developed by NAVFACENGCOM for general planning and design for a variety of building types. These publications are listed in MIL-BUL-34 and NAVFAC P-272, Definitive Designs for Navy and Marine Corps Facilities.

5.2.1.1 Criteria Manuals. NAVFAC criteria manuals and related P-publications are available for other general and specific criteria. These publications offer necessary guidance and criteria for architectural and engineering development.

5.2.1.2 Definitive Drawings. Definitive drawings are available for some specific building types and are listed in NAVFAC P-272. It is not the intent of NAVFACENGCOM to require mandatory use of the definitives without exception, nor is it intended that users shall have complete freedom to modify or discard these definitives. Modifications may be necessary to meet specific site requirements or local conditions. While it is not the responsibility of the designer to review definitive designs for technical accuracy, if errors are discovered, or if the design or layout is not suitable for a specific project, the designer must immediately inform the appropriate NAVFACENGCOM personnel. Major modifications or elimination of definitive drawings must be fully supported and cleared with the appropriate NAVFACENGCOM EFD prior to proceeding with further planning.

5.2.1.3 Standard Drawings. Standard drawings are available for a limited number of specific building types and details. These drawings are listed in MIL-BUL-34. Compliance with criteria is mandatory unless specific waivers are requested and granted.

5.2.1.4 Guide Specifications. NAVFAC guide specifications (NFGS's) (see MIL-BUL-34) provide information on required specification format as well as standard NAVFACENGCOM requirements for specific product and materials performance and usage.

5.2.2 DOD Standards. MIL-HDBK-1190, establishes space allowances and sets standards for architectural and engineering design and fire protection requirements. Compliance with criteria is mandatory unless specific waivers are requested and granted.

5.2.3 Other Government Standards. Criteria manuals, guide specifications, and other NAVFAC criteria may refer to military or federal codes, criteria, and regulations which must be adhered to. These Government guidelines, such as military standards and federal specifications, are listed in MIL-BUL-34.

5.2.4 Building Types. Criteria manuals are available for the following facility types.

5.2.4.1 Medical

a) DM-33.01, Medical Facilities, Preliminary Design Considerations

b) DM-33.02, Naval Hospitals

c) DM-33.03, Medical Clinics and Dental Clinics.

5.2.4.2 Maintenance, Training, and Storage

a) MIL-HDBK-1028 series, Maintenance Facilities.

b) MIL-HDBK-1027/3, Range Facilities and Miscellaneous Training Facilities Other than Buildings

c) MIL-HDBK-1032/2, Covered Storage.

5.2.4.3 Administrative. MIL-HDBK-1034, Administrative Facilities.

5.2.4.4 Housing

a) MIL-HDBK-1035, Family Housing

b) DM-36.01, Unaccompanied Personnel Housing

c) DM-36.02, Unaccompanied Enlisted Quarters

d) DM-36.03, Unaccompanied Officer Quarters.

5.2.4.5 Recreational. MIL-HDBK-1037/3, Outdoor Sports and Recreational Facilities.

5.2.4.6 Miscellaneous. DM-37.06, Chapels and Religious Educational Facilities.

5.2.5 Security Criteria. Specific security requirements will depend upon individual projects, mission, and location. MIL-HDBK-1013/1 and NAVFAC instructions (NAVFACINST's) 5510.11, Naval Facilities Engineering Command Information and Personnel Security Manual and 5530.1, Physical Security and Loss Prevention Manual contain specific security design criteria. Also refer to NAVFAC DM-5.12, Fencing, Gates and Guard Towers.

5.2.6 Securing Emergency Exit Doors. MIL-HDBK-1190 and MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design, and Construction require that emergency exit doors conform to the requirements of National Fire Protection Association (NFPA) 101, Code for Safety to Life from Fire in Buildings and Structures. Refer also to NFGS-08710, Finish Hardware, for criteria on door hardware. In addition, the designer must ensure that the securing of emergency exit doors conforms to any specific functional requirements. Emergency egress should normally be provided from higher restricted to lesser or unrestricted spaces. Floor plan configurations or arrangements which provide for emergency egress from unrestricted or lesser restricted to higher restricted spaces shall be avoided. Emergency exit doors from restricted or unrestricted rooms should be capable of rapid opening from the inside, and should not be operable from the outside.

5.2.6.1 Floor Plan. Ideally, the emergency exit doors should be located within view of a work or duty station. When this is not feasible, proper exit signage must be used.

5.2.6.2 Door Hardware. To avoid the use of exit devices (panic hardware) which tend to compromise security, use equivalent capacity single exit doors with locksets in preference to double doors. When single exit doors are not feasible, specify an Underwriters Laboratories, Inc. (UL) removable mullion (to facilitate the passage of large items) in conjunction with a pair of rim-type exit devices for exterior double door openings. This hardware is recommended in lieu of vertical rod exit devices. It is recommended that exit devices be provided of the type that do not require outside hardware. Specify exit devices when required by NFPA 101 for public assembly or educational occupancy classifications where occupancy exceeds 50 persons. As an aid to security, it should be noted that under certain conditions exit doors may be locked during periods of non-use.

5.2.6.3 Intrusion Detection Devices. Intrusion detection devices detect or restrict the unauthorized use of emergency exit doors, provide a high degree of control over the use of emergency exit doors, and provide constant surveillance in areas not feasible for security guards to patrol. The following types of detection devices are available and are designed to be used in conjunction with emergency exit doors without impeding or preventing emergency use.

a) Exit Alarm. This self-contained alarm is installed on an interior wall beside a doorway or on the interior surface of the door. The alarm is equipped with high-decibel horns which are triggered by a mechanical actuator or electrical triggering device. Authorized personnel with special keys can enter and exit the door without triggering the alarm. Exit alarms generally are the most economical anti-intrusion devices.

b) Panic and Alarm Hardware. Panic and alarm hardware is a combination of panic hardware and an exit alarm which permits instant egress by pushing a bar that allows a deadlocking latch-bolt to withdraw and an alarm

to sound. The alarm can only be silenced by an authorized key. Panic and alarm hardware is available with contacts for signaling to a remote indicating panel and with outside key control to permit authorized entry.

c) Remote Indicating Panels and Door Switches. Indicator panels allow remote monitoring of doors connected to the console. Light and buzzer signals indicate whether doors are locked, open, or violated. The channel indicating the intrusion cannot be reset until correction is made at the point of the intrusion. Wiring is closed circuit and is connected to door switches which are sensing devices that detect door openings and trigger the signal on the indicator panel. Key control switches can be obtained to permit authorized passage through doors. Exit alarms can be installed in conjunction with the remote indicating panel. Refer to DM-13.02 regarding the type of device best suited for the level of intrusion detection desired for a particular installation. For information on manufacturers of intrusion detection devices, contact NAVFACENGCOM Headquarters Code 04.

d) Television Monitoring System. Interior closed-circuit television (CCTV) can be used to observe exits in remote or hidden locations. A basic CCTV system consists of a camera, a television monitor, an interconnecting cable, and a source of power for operation. This basic system can be expanded to include several cameras and one or more monitors with means for manually switching from one camera to another. Where required, remote controls can be implemented to aim cameras in a given direction (e.g., pan and tilt) and to control camera focal length (e.g., zoom, iris, and focus). Exterior CCTV is also possible, but is more complex and costly and usually requires special lighting.

5.3 Local Codes and Standards. Foreign, state, municipal, county, and other local building and zoning codes and ordinances should be reviewed for possible conflicts with NAVFACENGCOM and other federal project requirements. While it is not mandatory that NAVFAC projects comply with these regulations, the designer is encouraged to cooperate with local officials and NAVFAC personnel to accommodate the basic intent of the codes as much as possible.

5.4 National Codes and Standards. Certain national codes and standards are referred to specifically in this and other NAVFAC criteria manuals, guide specifications, and other technical publications. Compliance with these referenced standards when required by law or other directive is mandatory. The following codes and standards are among those cited.

5.4.1 Building Codes

a) Building Officials and Code Administrators International, Inc. (BOCA), BOCA National Building Code (generally used in central states).

b) International Conference of Building Officials (ICBO), Uniform Building Code (UBC) (generally used in western states and pacific protectorates).

c) Southern Building Code Congress International, Inc. (SBCC), Standard Building Code (generally used in southern states).

5.4.2 Fire Code. NFPA 101.

5.4.3 Electrical Code. NFPA 70, National Electrical Code (NEC).

5.4.4 Plumbing Code. National Association of Plumbing-Heating-Cooling Contractors, National Standard Plumbing Code (NSPC).

5.4.5 Standards

a) American Institute of Steel Construction (AISC).

b) American National Standards Institute (ANSI).

c) American Society for Testing and Materials (ASTM).

d) Underwriters Laboratories, Inc. (UL).

e) Uniform Federal Accessibility Standards (UFAS).

5.5 *Occupational Safety and Health*. Occupational safety and health requirements in facilities design are a broad and complex subject which cannot be adequately discussed in this handbook. Any attempt to incorporate all of the applicable standards and codes could result in omissions and, at the same time, create a false impression with the designer that these regular requirements cover all hazards. The following are NAVFACENGCOM endorsed considerations for various issues. Generally, compliance is mandatory if the requirement is generated by law or directive.

5.5.1 System Safety Engineering

5.5.1.1 Description. While standards and codes are minimum requirements necessary to meet the letter of the law and provide ready solutions to common problems, a more useful approach is the method generally referred to as System Safety Engineering. The approach has several distinct advantages: potential hazards which may or may not be addressed in codes or standards can be identified; the facility can be more efficiently integrated with the personnel, equipment, and processes it will contain; and cognizant managers will have a rational basis for accepting or rejecting safety and health risks which may be associated with the facility. Because of these and other advantages, the Department of Defense and the Department of the Navy have required that System Safety be used during the planning, design, and construction of select naval facilities. For further information, refer to OPNAVINST 5100.24, Navy System Safety Program, and NAVFACINST 5100.11, NAVFACENGCOM Safety and Health Program.

5.5.1.2 Implementation. In implementing the system safety approach, the customer activity is responsible for preparing or providing funds to the EFD for obtaining a Preliminary Hazard Analysis (PHA). The information from the PHA shall be used during design to ensure that hazards are eliminated or controlled through engineering or a combination of measures. The designer shall consult with the EFD Occupational Safety and Health Manager to determine specific safety and health requirements for each design and to coordinate contacts with EFD system safety personnel.

5.5.2 Fire Protection. MIL-HDBK-1008 contains NAVFACENGCOM requirements for fire protection such as building separations, construction, exit requirements, and sprinkler design. It is mandatory that required fire and safety protection features be identified and incorporated at initial project discussion stages to eliminate costly additions later.

5.5.3 Asbestos Protection. NAVFACENGCOM policy on asbestos is stated in OPNAVINST 5100.23, Navy Occupational Safety and Health (NAVOSH) Program Manual. This document requires that building materials containing asbestos be substituted with building materials containing no asbestos where suitable substitutes exist. Life cycle cost, durability, maintenance requirements, and fire- and heat-resistant properties are among the characteristics to consider in determining the suitability of substitute materials. For some renovation projects, asbestos removal and disposal may not be identified in the project's scope of work. If materials are suspected to contain asbestos, the designer should contact the NAVFACENGCOM EFD project manager for procedures to identify, test, and remove the materials containing asbestos. Refer also to NFGS-02080, Removal and Disposal of Asbestos Materials.

5.5.4 Explosion Protection. Facilities where explosions may occur, such as ammunition depots and fusing-defusing buildings, must have explosion safety features. Blow-out windows, doors, panels and roof elements, as well as explosion-proof electrical fixtures are mandatory. MIL-HDBK-1028 series contain additional criteria.

5.5 Radiation Protection. Facilities with nuclear and radiological features shall be designed according to Code of Federal Regulations 10 CFR 20, Standards for Protection Against Radiation, and to applicable requirements of the National Council on Radiation Protection and Measurements (NCRPM) and the National Institute of Standards and Technology (NIST). Assistance in determining the extent of applicability of these criteria will be provided by the Director, Naval Sea Systems Command Detachment, Radiological Affairs Support Office (RASO), Yorktown, VA 23691.

5.5.6 Termite Protection. DOD policy requires that buildings be protected from termite damage in geological locations where termite infestation is present. General Navy policy is to provide protection by soil treatment. Individual EFD points of contact should be contacted for local policy on termite protection. For example, in buildings without wood components or with little wood (such as wood doors on metal frames or wood blocking at the roof level), one EFD policy is to omit soil treatment. Another EFD policy in this

same situation is to provide soil treatment if it is anticipated that future interior renovations will occur involving wood framing or wood building components. Where termite protection is required, care must be taken to prevent contamination by the termiticides of the buildings and to ensure a healthful environment for the occupants. To ensure that proper precautions are met, the following DOD policy on building construction and the use of termiticides must be followed.

5.5.6.1 Prohibited New Construction. The following types of new construction are prohibited in any geographical location where subterranean termite infestations are known to exist:

a) Buildings with subslab heating or cooling ducts.

b) Buildings with plenum type subfloor ventilation systems, as defined in Federal Housing Administration minimum acceptable construction criteria guidance.

c) Buildings with ventilation ducts within an enclosed crawl space.

d) Buildings with other ground level subfloor or intrafloor ventilation into occupied areas.

e) Wood frame construction below the level of the top plate of first floor framing.

5.5.6.2 Existing Construction. Existing buildings corresponding to the above criteria shall not be treated with soil-incorporated termiticides until the ducting and ventilation systems have been converted to above-floor systems not amenable to termiticide contamination. Where existing buildings meeting the above criteria have been previously treated with soil-incorporated termiticides, a monitoring system shall be implemented to ensure no occupant health risk until the ducting and ventilation systems renovations have been completed.

5.5.6.3 Types of Termiticide. Any termiticide registered by the Environmental Protection Agency (EPA) may be used in DOD pest management programs, provided such usage complies with the above criteria. Chlordane, heptachlor, and aldrin are generally recommended due to their low cost and high performance characteristics. The choice of termiticides will also be affected by applicable state and local regulations.

5.5.6.4 Related Criteria. Refer also to additional criteria contained in NFGS-02284, Soil Treatment for Subterranean Termite Control, and NAVFAC Maintenance and Operations Manual MO-310, Military Entomology Operational Handbook.

5.6 Metric System. Projects in certain locations may be required to be completed in or with metric (SI) equivalents. Comply with the requirements of NAVFACINST 4120.10, Use of the Metric System of Measurement in the Acquisition of Facilities and Related Equipment. Also refer to ASTM E380, Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System); ASTM E621, Standard Practice for the Use of Metric (SI) Units in Building Design and Construction; and American National Metric Council (ANMC) Publication 90-1, Metric Editorial Guide.

5.7 Slanting. The design of increasing the resistance of permanent facilities, materials, and personnel to damage by enemy attack or natural disasters, and to reduce the necessary time for recovery, is called slanting. These provisions are to be included without appreciable added costs or reduced functional efficiency. NAVFACENGCOM personnel must direct the designer to the degree, if any, that slanting measures are to be included in a specific project.

5.8 Provisions for the Physically Handicapped. It is the policy of NAVFACENGCOM that every facility be designed to provide for full accessibility and usage by persons temporarily or permanently physically handicapped. Exceptions to this policy exist when the intended use of a facility is specifically restricted to able-bodied military personnel.

This policy applies to both new construction and renovations to existing facilities. The designer must design a facility for full accessibility unless directed otherwise by NAVFACENGCOM. For two-story buildings where elevators are not required for functional purposes, platform lifts should be considered for accessibility. Provisions for the physically handicapped shall comply with FED-STD-795. Requirements for providing accessibility are established in MIL-HDBK-1190.

Section 6: INTERIOR DESIGN

6.1 Scope. This section covers the selection, design, and color coordination of interior building surfaces and other components which are built-in, integral to, or attached to the structure and included in the plans and specifications.

6.2 Approach. The structure-related elements must be fully coordinated throughout the design process with the design, arrangement, and color coordination of the furniture, furnishings, and accessories that will complete the total interior design. The interior design should enhance the facility, complement the building design, and support the user in the activities for which the facility is designed.

6.3 Related Criteria. Criteria in this section are general in nature and consistent with the basic design concepts of this handbook. More detailed, specific criteria are included in the following NAVFAC criteria manuals: DM-14.01, Interior Design Guide; MIL-HDBK-1001/2; and DM-3.10. In addition, review NFGS series (refer to MIL-BUL-34), related technical notes, and MIL-HDBK-1190 for specific material performance criteria.

6.4 Materials and Finishes. The selection of interior materials, finishes, and colors should be based primarily on building function and user requirements. Changeable, movable, and demountable materials should be considered where functional requirements are likely to change. The appearance of finished materials must be compatible with the building design, exterior materials, and with existing interior materials in renovation projects.

6.4.1 Material Selection. In evaluating materials, consider the use of indigenous materials and availability, and evaluate initial and life cycle costs including service life and maintenance requirements. A limited variety of materials tend to create a more unified appearance and, in most cases, will minimize construction costs.

6.4.2 Detailing. Interior detailing should be consistent throughout a building and should respond to material characteristics. Complicated detailing, solely for decorative effect, is generally discouraged. Simple, straightforward detailing enhances design and minimizes initial costs and future maintenance.

6.5 Color

6.5.1 Approach. A color plan should be developed that is consistent with the building program. Color plays an important part in creating emotional responses to buildings and environments. The psychological and functional effects of color should be exploited. For example, color may be used to direct and orient users to color-keyed functions on floors. In cold climates, warm colors can create a "warm" feeling, while cool colors can be used to

"cool" environments in warmer climates. Careful color selection can also support maintenance management. Strategic use of practical colors can camouflage soiling and damage to building surfaces.

6.5.2. Selection. Color schemes should not be drab; however, extreme, high contrast accent colors are generally considered inappropriate. Color and texture must provide visual interest and serve as unifying elements to the overall facility design. As a general rule, fixed building materials (e.g., pavers, ceramic tile, resilient flooring, ceilings, etc.) should be relatively neutral. Stronger accent colors should be introduced on more changeable finishes (e.g., paint, wall coverings, carpet, furniture, etc.). This will allow color changes at minimal cost as areas are refinished in the future.

6.6 Built-In Casework. Bookshelves, counters, storage units, and other built-in or millwork items should be appropriate to the design and should relate to adjacent architectural elements. Refer to MIL-HDBK-1001/2, Materials and Building Components.

6.7 Signage. Interior signage should include informational, directional, identification, and regulatory signage. The system should, insofar as possible, use commercially available, nonproprietary products. The system should relate to and reinforce the concept of the facility design and its functional operation; provide effective and consistent communication and direction for users; incorporate flexibility where future change is likely; and create an orderly, attractive graphic image for the facility. Refer to NFGS-10440, Signs.

6.8 Interior Scale. Program requirements should address interior scale, volume, and dimensions such as ceiling height and window area as well as floor area. Scale and especially ceiling height must change to reflect room size, dimensions, and type as well as duration and intensity of use. Scale issues must likewise be coordinated with lighting requirements.

6.9 Acoustics. Care must be taken to ensure proper sound transmission and acoustic isolation for interior design issues. Refer to DM-3.10.

6.10 Specialties

6.10.1 Interior Landscaping. Interior landscaping can enhance the building environment. Such plantings should, however, be limited to major public spaces. In any case, the value and desirability should be carefully evaluated in terms of initial construction costs and the long term maintenance commitments inherent in this building amenity. Plant species should be carefully selected with consideration to maintenance, and planters should be located for optimum climate and visual enhancement. Requirements for light, water, and drainage should be considered and coordinated with architectural, plumbing, and electrical systems.

6.10.2 Miscellaneous

6.10.2.1 Information Handling and Displays. Design should consider the need for information and notice postings, display of trophies, unit emblem displays, official staff photographs, and similar items. Bulletin boards should be located in circulation areas used by target audiences. They should serve not only as communication medium, but to confine miscellaneous postings to orderly, planned areas. Location of other displays, trophy cases, etc., should be consistent with the nature of the materials displayed.

6.10.2.2 Window Treatment. Properly shaded or protected glazing may not require additional window treatment. However, when privacy, light diffusion, or additional solar control are required, blinds, shades, or draperies should be indicated. Draperies and drapery hardware are not usually included in the plans and specifications, but detailing and specifications must address mounting and operating requirements. For major public areas or special assembly spaces, however, tracks and hardware may be designed integral to the window openings when required for design consistency. Refer to NFGS-12540, Draperies and NFGS-12510, Blinds, Venetian (and Audio Visual).

APPENDIX A
INDEX

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/MILITARY SPECIFICATIONS, STANDARDS, BULLETINS, HANDBOOKS, AND NAVFAC GUIDE SPECIFICATIONS:

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

GUIDE SPECIFICATIONS

NFGS-01560	Environmental Protection
NFGS-02080	Removal and Disposal of Asbestos Materials
NFGS-02284	Soil Treatment for Subterranean Termite Control
NFGS-08710	Finish Hardware
NFGS-10440	Signs
NFGS-12510	Blinds, Venetian (and Audio Visual)
NFGS-12540	Draperies

BULLETINS

MIL-BUL-34	Engineering and Design Criteria for Navy Facilities

STANDARDS

FED-STD-795	Uniform Federal Accessibility Standards

HANDBOOKS

MIL-HDBK-1001/2	Materials and Building Components
MIL-HDBK-1001/5	Roofing and Waterproofing
MIL-HDBK-1005 Series	Civil Engineering
MIL-HDBK-1008	Fire Protection for Facilities Engineering, Design, and Construction

MIL-HDBK-1013/1	Design Guidelines for Physical Security of Fixed Land-Based Facilities
MIL-HDBK-1027/3	Range Facilities and Miscellaneous Training Facilities Other than Buildings
MIL-HDBK-1028 Series	Maintenance Facilities
MIL-HDBK-1032/2	Covered Storage
MIL-HDBK-1034	Administrative Facilities
MIL-HDBK-1035	Family Housing
MIL-HDBK-1037/3	Outdoor Sports and Recreational Facilities
MIL-HDBK-1190	Facility Planning and Design Guide

NAVY DESIGN MANUALS, P-PUBLICATIONS, AND MAINTENANCE AND OPERATIONS MANUALS:

Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, Attention: Defense Publications; phone (703) 487-4684; FAX (703) 487-4841.

DESIGN MANUALS

DM-3.10	Noise and Vibration Control for Mechanical Equipment (will be superseded by U.S. Army Technical Manual TM 5-805-4, Noise and Vibration Control)
DM-5.12	Fencing, Gates and Guard Towers
DM-13.02	Commercial Intrusion Detection Systems
DM-14.01	Interior Design Guide
DM-33.01	Medical Facilities, Preliminary Design Considerations
DM-33.02	Naval Hospitals
DM-33.03	Medical Clinics and Dental Clinics
DM-36.01	Unaccompanied Personnel Housing
DM-36.02	Unaccompanied Enlisted Quarters
DM-36.03	Unaccompanied Officer Quarters

DM-37.06	Chapels and Religious Educational Facilities

P-PUBLICATIONS

P-272	Definitive Designs for Navy and Marine Corps Facilities
P-905	Planting and Establishment of Trees, Shrubs, Ground Covers and Vines
P-960	Installation Design

MAINTENANCE AND OPERATIONS MANUALS

MO-310	Military Entomology Operational Handbook

NAVY DEPARTMENT INSTRUCTIONS: Available from Commanding Officer, Naval Publications and Forms Center, ATTENTION: Code 3015, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

NAVFAC 4120.10	Use of the Metric System of Measurement in the Acquisition of Facilities and Related Equipment
NAVFAC 5100.11	NAVFACENGCOM Safety and Health Program
NAVFAC 5510.11	Naval Facilities Engineering Command Information and Personnel Security Manual
NAVFAC 5530.1	Physical Security and Loss Prevention Manual
OPNAV 4600.22	DOD Engineering for Transportability
OPNAV 5100.23	Navy Occupational Safety and Health (NAVOSH) Program Manual
OPNAV 5100.24	Navy System Safety Program

OTHER GOVERNMENT DOCUMENTS AND PUBLICATIONS:

10 CFR 20	Standards for Protection Against Radiation

Available from General Services Administration, 7th and "D" Streets, SW, Washington, DC 20407.

NON-GOVERNMENT PUBLICATIONS:

AMERICAN NATIONAL METRIC COUNCIL (ANMC)

ANMC 90-1	Metric Editorial Guide

Available from American National Metric Council, 1620 Eye Street, NW, Suite 220, Washington, DC 20006.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E380	Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)
ASTM E621	Standard Practice for the Use of Metric (SI) Units in Building Design and Construction

Available from American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.

BUILDING OFFICIALS AND CODE ADMINISTRATORS INTERNATIONAL, INC. (BOCA)

BOCA National Building Code

Available from Building Officials and Code Administrators International, Inc, 4051 W. Flossmoor Road, Country Club Hills, IL 60478-5795.

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

Uniform Building Code

Available from International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, CA 90601.

NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS

National Standard Plumbing Code (NSPC)

Available from National Association of Plumbing-Heating-Cooling Contractors, 1016 20th Street, NW, Washington, DC 20036.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electrical Code
NFPA 101	Code for Safety to Life From Fire in Buildings and Structures

Available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL, INC. (SBCC)

Standard Building Code

Available from Southern Building Code Congress International, Inc. (SBCC), 900 Montclair Road, Birmingham, AL 35213-1206.

CUSTODIAN
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PREPARING ACTIVITY
NAVY - YD

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FACR-1070

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-HDBK-1001/1	2. DOCUMENT DATE (YYMMDD) 920430

3. DOCUMENT TITLE
BASIC ARCHITECTURAL REQUIREMENTS AND DESIGN CONSIDERATIONS

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial (2) AUTOVON *(If applicable)*	7. DATE SUBMITTED *(YYMMDD)*

8. PREPARING ACTIVITY

a. NAME Commander Atlantic Division	b. TELEPHONE *(Include Area Code)* (1) Commercial: (804) 444-9970 (2) AUTOVON: 564-9970
c. ADDRESS *(Include Zip Code)* Naval Facilities Engineering Command Code 04A4 Norfolk, VA 23511-6287	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340