# APPENDIX A

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Department of the Navy

Standardization Documents Order Desk
700 Robbins Avenue, Bldg. 4D
Philadelphia, PA 19111-5094

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U.S. Government Printing Office
Superintendent of Documents
U.S. Government Printing Office

Washington, DC 20402

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Arlington Heights, IL 60004-1893

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Arlington, VA 22203

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1827 Walden Office Square, Suite 104
Schaumburg, IL 60173-4268

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1200 19th Street, NW
Washington, DC 20036-4303

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950 N. Glebe Rd, Suite 160
Arlington, VA 22203-1824

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ACI INTERNATIONAL (ACI)
P.O. Box 9094 Farmington Hills, MI 48333-9094
Ph: 248-848-3800
Fax: 248-848-3801
Internet: http://www.aci-int.org

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1801 Alexander Bell Drive
Reston, VA 20190-4400
Ph: 800-548-2723
Fax: 703-295-6333
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e-mail: marketing@asce.org

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100 Bar Harbor Drive
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Falls Church, VA 22041

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445 Hoes Lane, P.O. Box 1331
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8501 E. Pleasant Valley Rd
Cleveland, OH 44131

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Walnut, CA 91789-2825

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5360 Workman Mill Road
Whittier, CA 90601-2298

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1440 South Creek Drive
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180 S. Washington Street
Falls Church, VA 22046

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1300 N 17th Street, Suite 1847
Rosslyn, VA 22209

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8575 Grovemont Circle
Gaithersburg, MD 20877-4121

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One Batterymarch Park
Quincy, MA 02269-9101

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Suite 600
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45 Bristol Drive, Suite 101
South Easton, MA 02375

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30200 Detroit Road
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Available from US Architectural and Transportation Barriers Compliance Board, 1111 18th Street, N.W., Suite 501, Washington, DC 20036-
3894, (202) 653-7834 v/TDD or (202) 653-7863 FAX

Manual on Uniform Traffic Control Devices- U.S. Department of Transportation,
Federal Highway Administration

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475

Fax: 800-525-5562
Internet: www.aashto.org

AIR FORCE GUIDELINES

Air Force Enlisted Dormitory Design Guide

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**APPENDIX B1**

**AIR FORCE ENLISTED DORMITORY DESIGN GUIDE**

# AIR FORCE ENLISTED DORMITORY DESIGN GUIDE

Vandenberg Air Force Base

PDF

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# CHAPTER I INTRODUCTION

## A. Purpose

This design guide provides the basic criteria to plan, program, design, and construct Air Force Pipeline Student Housing and Permanent Party Enlisted Dormitories. It presents guidance for development of Permanent Party Enlisted Dormitories taking into account local program operations and requirements.

While this guide focuses on Permanent Party Enlisted Dormitory requirements, it also describes basic requirements for Basic Military Training (BMT) and Pipeline Student Housing.

This design guide provides guidance developed from the Office of the Secretary of Defense (OSD) dormitory design standard, called the "1+1" standard issued on 6 November 95, and recently modified by OSD letter dated 25 June 01. The recent OSD changes provide excellent opportunities for the Air Force to improve the quality of life for our airmen living in Permanent Party Enlisted Dormitories. Adoption of this guidance will allow the services additional flexibility in designing and constructing unaccompanied housing by making better use of industry standards. More importantly, eliminating the module gross area restriction allows the services to better use limited space to increase the individual room spaces in each module. The previous 11 $m^2$ limitation on room size has been eliminated, allowing greater flexibility and livability, however, the new criteria changes do not permit increased costs over the previous criteria. The gross building area limitation remains unchanged, but flexibility within the building is enhanced.

## B. Measuring Quality

Air Force facilities project quality by their 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 enlisted dormitory must satisfy the design intent, be durable, easily maintained, incorporate applicable force protection measures, and present a positive image of the Air Force in its role as caretaker of personnel as well as the environment.

## C. Design Guide Scope and Use

### 1. Application

This Design Guide is applicable to all projects in the continental United States and overseas. It applies to new facilities and renovation projects. It provides basic criteria for determining:

- Programming requirements
- Site evaluation and planning
- Facility design
- Landscape design
- Interior design

The design criteria in this guide apply to all dormitory types (Corridor Access, Balcony Access, and Breezeway Access) unless noted otherwise.

### 2. Limitations

This document provides detailed general information needed to produce a programming plan or conceptual design for all projects. Use this guide in conjunction with other Air Force and Department of Defense documents that give related guidance. Unique design requirements of a specific project should be addressed individually at the local level. This design guide is not a substitute for research required by programmers and designers, and it recognizes that the Major Commands may and frequently do have special requirements for their dormitories. Adherence to base, Major Command facility design standards and facility excellence guides is critical. Required spaces and space requirements are mandatory as provided. All other programming, design requirements included in this guide are minimum standards and/or recommendations and are subject to local requirements and interpretation.

## D. Goals

This guide sets overall Air Force policy, but includes flexibility to meet local needs to the greatest extent. This design guide serves to provide a better understanding of the many issues involved in quality housing for our unaccompanied enlisted personnel. It also promotes cradle-to-grave teamwork in the project development and execution process from requirements identification through beneficial occupancy.

Air Force dormitory projects will exhibit leadership in sustainable and environmentally responsible design and construction. These projects will also comply with the latest edition of the DoD and USAF Force Protection Guide.

# CHAPTER 2 PLANNING AND PROGRAMMING

BUCKLEY AIR FORCE BASE

## A. OVERALL CONSIDERATIONS

### 1. PROJECT TEAM

A number of people have an interest in the delivery of quality enlisted dormitory facilities. Each has their own criteria for what is important, and each plays a vital role in establishing design criteria. The following is a list of these team members:

- Unaccompanied Enlisted Personnel
- Command Chiefs
- First Sergeants
- Commanders
- Community Planners, Architects, Landscape Architects, Engineers and Interior Designers
- Operations and Maintenance Personnel
- Dormitory/Housing/Furnishing Management Personnel
- Fire Department, Security Forces and Safety Personnel
- Environmental and Bioenvironmental Engineering Personnel

## 2. Project Definition

### Air Force Dormitory Master Plan

The Air Force Dormitory Master Plan (DMP) is conducted under the direction of Headquarters, United States Air Force, Housing Division (HQ USAF/ILEH). The overall objective of the plan is to perform an Air Force-wide analysis of unaccompanied enlisted personnel housing (UEPH) facility requirements, assess existing facility conditions, and provide future-year program renovation and new construction recommendations.

### Project Siting

Locate dormitories within a reasonable distance of all community facilities and services, such as dining facilities, postal service centers, base exchanges, commissaries, pedestrian circulation systems, bike paths, and mass transit routes. Programmers must address the capacity of existing community facilities and existing infrastructure, and accommodate any additional requirements incurred by the proposed dormitory increase. The proximity of dormitories to community services must be balanced with the need for quiet and privacy. To achieve the optimum site plan, each design discipline must work in concert with one another. All design disciplines involved in the site planning process must coordinate their design concepts to ensure the dormitory project presents a professional image of the Air Force, and encourages pride of ownership. Site planning is also influenced by base leadership through the Facilities Board. There are many factors that may influence dormitory siting decisions:

- Compliance with the General Plan
- Development potential
- Force protection considerations
- Environmental considerations
- Proximity to existing recreation facilities
- Relationship to community facilities
- Existing topography
- Existing landscape
- Available base infrastructure
- Adjoining land uses
- Off-base communities and adjoining neighborhoods
- Vehicle circulation system, including public transportation access
- Future expansion
- Existing permanent party enlisted dormitories
- Existing walkways, designated bike and jogging paths
- Facilities requiring demolition
- Other factors as might be determined by the design program, such as density, the development of a campus atmosphere, obtaining Leadership in Energy and Environmental Design (LEED) certification, etc.

## Site Requirements—Air Force Dormitories

| Functional Requirement | Minimum/Recommended |
|---|---|
| **Siting** | |
| Community Planning | Close proximity to dining hall, shopette, cleaners, club, etc. |
| **Circulation** | |
| Entrance Roads | 7.32m (24'-0") width minimum |
| Service Roads | 2.4m (8'-0") width minimum |
| Entrance Sidewalks | 2.4m (8'-0") width minimum |
| Sidewalks | 1.8m (6'-0") width minimum |
| Siting Setbacks | Per Force Protection requirements |
| **Parking** | |
| Resident Parking | 1 per resident/OCONUS may be reduced |
| Accessible Parking | 2% total parking/minimum 1 space (per UFAS) |
| Motorcycle Parking | 5% residents/varies based on local requirements |
| Bicycle Parking | 20% residents/varies based on local requirements |
| Visitor Parking | Optional based on local requirements |
| **Site Amenities** | |
| Pavilions/Outdoor Areas | Include as appropriate in dormitory master planning/projects |
| Site Furniture | Per base standards |
| Site Lighting | Per IES levels/base standards |
| Dumpsters/enclosures | Location per Force Protection requirements/base standards |
| Signage | Per AFP 32-1097 Sign Standards/base standards |
| **Landscape** | Per USAF Landscape Design Guide/local materials |

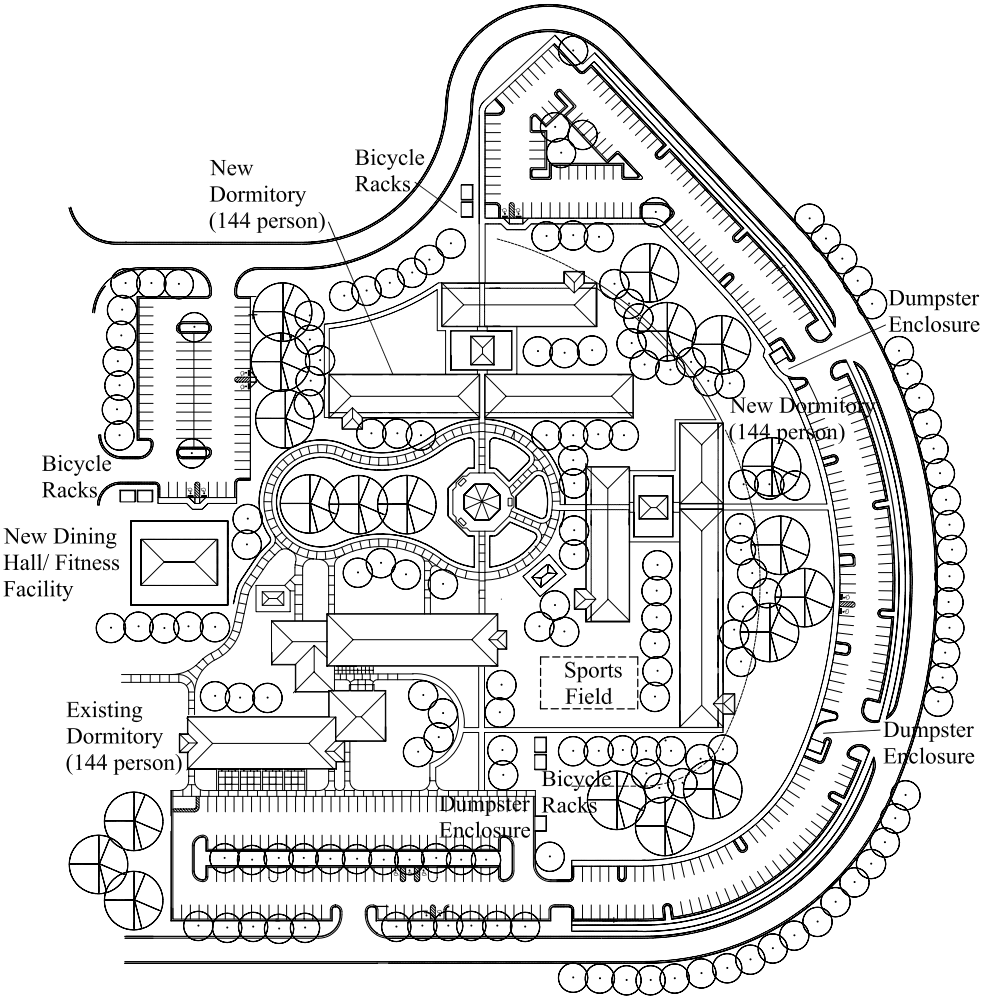
### Organization and Circulation

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. Insofar as possible, dormitory structures must not be overwhelming in apparent size. Site dormitories in relationship to one another to create outdoor spaces for use as passive or active recreation areas.

Most Air Force permanent party enlisted dormitories are three stories in height. This configuration, the maximum standard for force protection, ensures an efficient use of available real estate while avoiding the additional fire protection, inconvenience to occupants, and structural and life safety cost associated with buildings over three stories in height.

Achieve spatial balance and scale through thoughtful placement and arrangement of structures, landscaping and landforms. See Figures 1 for illustrations utilizing professional site development concepts for a typical Enlisted Dormitory project.

Expansion potential for dormitories usually involves the addition of more living units. It is generally impractical to build an addition onto an existing dormitory building. If the potential for adding additional living units to a dormitory project is identified during the initial programming stage, allow space in the site development plan for additional structures and size the site utilities accordingly.




Typical Enlisted Dormitory Site Development Plan Figure 1

### Climatic Considerations

Dormitory design and building orientation must take advantage of local climate conditions. Balcony Access dormitories with exterior balconies provide solar shading in warm and temperate climates where heat gain through windows is a concern, but tend to suffer from poor natural daylighting. Corridor Access dormitories with central hallways are more energy efficient due to the limited number of openings to the outdoors. Where practical, use passive solar construction techniques to reduce energy consumption. Local climate conditions must be considered as well as other site organization issues such as the creation of outdoor space, building scale or orientation to other facilities, when determining the best project site.

Site dormitories 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 orient operable windows to take advantage of summer breezes. Solar gain and prevailing winds can enhance energy conservation and yield significant cost savings. Building placement and design should also take advantage of views that are scenic, pleasant, or interesting. Designers must be sensitive to the approaches to the facility and strive to create a clear sense of arrival for newcomers.

Design roof overhangs to work with sun angles to provide solar shading. This configuration is a built-in by-product of Balcony Access dormitories. Achieve mutual shading by sensitively arranging adjacent structures. Avoid excessive east or west-facing glass and design for maximum cross-ventilation where feasible.

## 3. Codes and Standards

### Anti-terrorism/Force Protection

Follow the *Interim DoD Antiterrorism/Force Protection Minimum Construction Standards* for guidance on dormitory construction. Refer also to the *Air Force Installation Force Protection Guide* for additional information. Coordinate force protection counter-measure standards throughout the design process to ensure aesthetic consideration and compatibility. Landscape and landforms may be used to soften the impact of visual and physical barriers, as well providing buffer and set-backs. Architectural design can integrate required building and site components into the building and campus design as to enhance the success of the overall project.

Refer also to the *Air Force Installation Force Protection Guide* for additional information.

### Sustainability

Sustainability is defined as the responsible stewardship of our natural, human and financial resources through a practical and balanced approach. Sustainability requires changes to the facility delivery process to ensure the "best fit" of the built environment to the natural and cultural environment. Sustainability integrates "green" or environmentally responsible practices into the process from the very beginning. Sustainable practices are an investment in the future. Through conservation, improved maintainability, recycling, reduction, reuse and other actions and innovations, we can meet today's needs without compromising the ability of future generations to meet their own.

Incorporating sustainable design concepts into dormitories requires the following actions:

- Expanding our focus to include life cycle costs along with first costs
- Extending the life of facilities
- Changing the facility delivery process to minimize waste
- Breaking down the traditional individual discipline stovepipes and working as a team from the beginning

This subject is addressed in detail in the *USAF Environmentally Responsible Facilities Guide.*

Additionally, the Air Force has developed a *LEED Application Guide* for Lodging which gives specific guidance for lodging facilities, most of which is directly applicable to dormitories. *Hyperlink will be provided.* Use of this guide is required on all dormitory projects.

### Access for Persons with Disabilities

Design permanent party enlisted dormitories to accommodate the needs of able-bodied military residents. Military dormitories are exempt from accessible requirements per UFAS, thus, provisions for persons with disabilities are not required in any of the living units. As an exception, bases in Japan, Korea, and other OCONUS locations provide quarters for civilians (DoDDS teachers, AAFES, Red Cross, etc.) and may require special provisions for persons with disabilities. Temporarily disabled airmen should be assigned to accessible lodging units. Provide access by persons with disabilities to all public spaces on the first floor of a dormitory building. Provisions to accommodate such access include:

- Access ramps
- Sufficient door widths, appropriate hardware, and controls for ease of opening
- Proper fixtures and clearances in the public toilets
- Mounting height of drinking fountains and public telephones
- Designated parking spaces with convenient access to the main entry of the building.

The specific requirements for providing access and accommodating the special needs of persons with disabilities are published in the Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act (ADA) Accessibility Guidelines. In case of conflicting guidance regarding public areas, the stricter guidance should be followed.

## 4. Design Process

Successful dormitories require involvement of the entire facility delivery team early in the process to fully develop facility requirements to identify the appropriate cost, develop programming documents, and deliver the project on-time and within budget. The following project development stages apply to traditional design-bid-build projects as well as to design-build projects.

### Project Initiation

The Air Force Dormitory Master Plan is the principle planning document which defines basic Air Force dormitory requirements and must be followed. The Air Force Dormitory Master Plan uses guidelines in this design guide to score the condition of existing dormitories and prioritize dormitory renovation and replacement projects. It is critical that site selection and any base or MAJCOM facility standards be identified prior to project initiation.

### Site Selection

Specific guidance for selecting appropriate sites for permanent party enlisted dormitories is given in Section 2 of this chapter.

### Program Definition

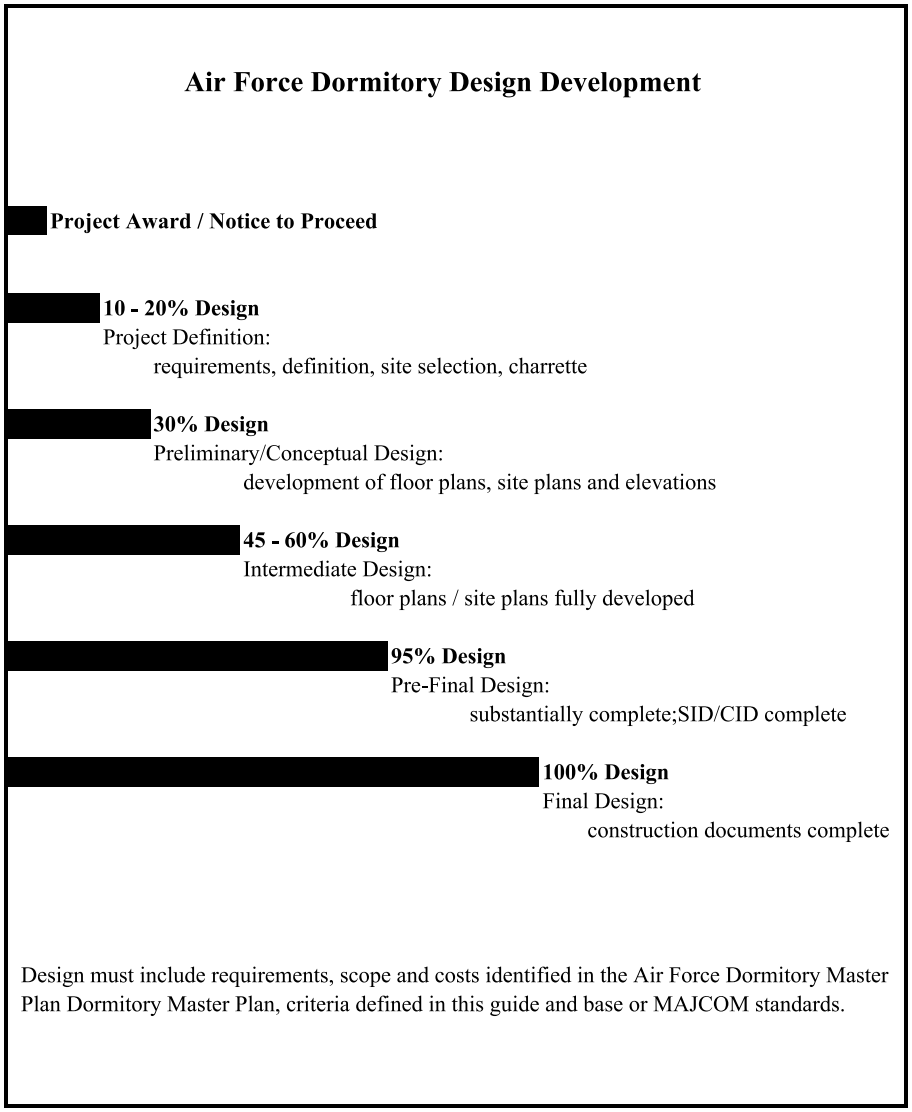
Requirement documents provide the design agent and the designer with information used in negotiating the design contract and completing the project definition phase of the project. The information in this design guide provides the basis for developing the requirements. Site selection has enormous affect on project costs, functionality, and customer satisfaction, and is generally part of the comprehensive planning process conducted at base level. Consideration to future demands placed on the capacity of supporting infrastructure and utilities in support of the project is critical and may also impact costs.

Project definition also includes the space planning guidance found in Section 10 of this Chapter plus the site design, building design and building systems concepts in Chapter 3—Facility Design. Unique local requirements concerning building program, design criteria, and code compliance should also be identified at this stage. Oversea projects must consider requirements of host nations to ensure requirements for certification of compliance are met.

Information required for the preparation of DD Forms 1391 is found in the Air Force Dormitory Master Plan which is based upon this design guide. Such information includes the functions, space allowances, overall building size, site evaluation, and special factors to consider in developing cost estimates. This guide provides data and criteria needed at each stage of the Air Force project development process.

## Design

Designs are developed using the pre-established project requirements and data are normally prepared in the following sequence: project definition (10 – 20% design), conceptual (30% design), preliminary (45 – 60% design), pre-final (95% design), and final working drawings (100% design). Designs must conform to the requirements, scope, and costs identified in Air Force Dormitory Master Plan, plus the criteria defined in this guide, and in any supplemental base or MAJCOM standards. Designs may also be accomplished by a variation on this sequence, or through a Design-Build process. Further guidance on the design process may be found in the Air Force Project Manager's Guide to Design and Construction (http://www.afcee.brooks.af.mil/dc/products/pmguide/pmguide.asp)




Design Process Diagram Figure 2

## 5. Air Force Dormitory Categories

Unaccompanied Air Force Enlisted personnel typically transition through 3 distinctly different types of dormitories during their career, starting with Basic Military Training dormitories, followed by Pipeline Student Housing, and ending with traditional Permanent Party Enlisted Dormitories.

## 6. Equity between Construction and Renovation Projects

It is very important to avoid noticeable disparity in Net Living Area and function space requirements between newly constructed dormitories and newly renovated dormitories. The criteria in this design guide are applicable to both new construction and renovation and are intended to produce similar facilities.

## 7. Special Considerations for Renovations

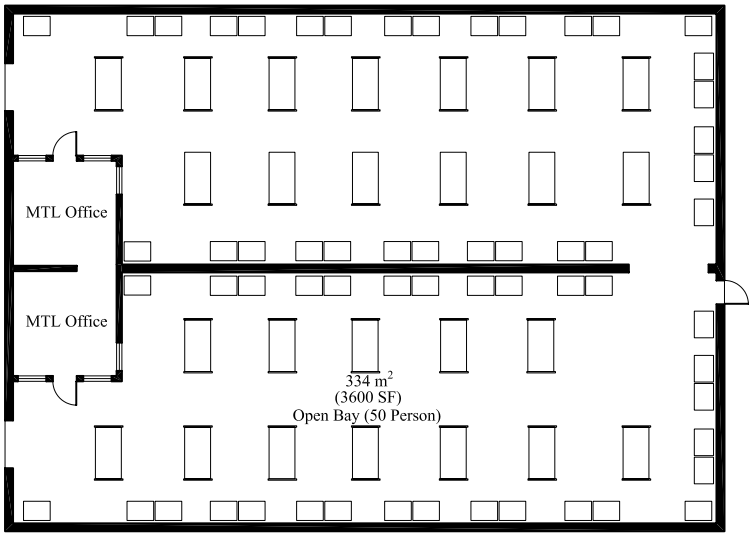
Renovations of dormitories range from building and system upgrades to complete demolition and reconfiguration. The requirements and recommendations set forth in this design guide apply to new construction and to renovations, and every attempt to meet these standards should be made. Flexibility in these construction standards may be considered based on pre-existing conditions, but renovation projects must meet the same Net Living Area and functional space criteria applicable to new dormitories. In some cases, criteria waivers are necessary due to existing conditions that cannot be altered. Such conditions shall be coordinated with the responsible MAJCOM.

### Basic Programming Requirements for Air Force Dormitories

| Grade Rank | Minimum Net Living Area per person | Maximum Gross Building Area per person |
|---|---|---|
| Grade E1 Basic Trainee | 6.7 $m^2$ (72 SF) | 12.3 $m^2$ (132 SF) |
| Grade E1 – E3 Tech Trainee | 9.17 m2 (98 SF) | 25.2 $m^2$ (269 SF) |
| Grade E1 through E6 | 12 $m^2$ (129 SF) | 33 $m^2$ (355 SF) |
| Grade E7 through E9 | 24 $m^2$ (258 SF) | 66 $m^2$ (710 SF) |

## 8. Basic Military Training Dormitories

Basic Military Trainees are housed in an open-bay configuration with 50 trainees per bay. BMT dormitory furnishings are limited to bunk beds and lockers for personal gear. Net Living Area is shared, but is based on 6.7 $m^2$ (72 SF) per person. The Gross Building Area for BMT dormitories is 12.3 $m^2$ (132 SF) per person.




Basic Training Bay Plan figure 3

## 9. Pipeline Student Housing

Pipeline Student Housing are designed and constructed to meet the needs of a specific category of personnel. These dormitories are utilized to house students who are recent graduates of Basic Military Training (BMT). Although they have completed BMT, they are still in a training atmosphere and must adhere to strict discipline and control. The pipeline dormitory design provides this atmosphere. Although many concepts in Pipeline Student Housing are similar to Permanent Party Enlisted Dormitories, there are differences in their physical layout and construction, including construction as individual structures to control entry. The general concepts applicable to Permanent Party Enlisted Dormitories will apply to Pipeline Student Housing unless specifically altered by this chapter.

The area and occupancy requirements listed in the following tables are construction standards for Pipeline Student Housing, not assignment standards. There is no direct correlation between assignment standards and construction standards. Normally, Pipeline Student Housing will be constructed in increments of 100 rooms. The optimum size will depend on the squadron size at each installation.

### Required Spaces—Pipeline Student Housing

| Functional Space | Minimum Net Area | Maximum Net Area | Recommended Net Area |
|---|---|---|---|
| Living/Bedroom Area—2 per module | 18.2m² (196 SF) | 18.2m² (196 SF) | 18.2m² (196 SF) |
| Shared Bathroom—1 per room (1 toilet,1 shower) | 2.3m² (25 SF) | Based on available area | 2.3m² (25 SF) |
| Private lavatory vanity—2 per room, integral top, separate from shared bath, immediately adjacent to the bathroom | 900mm (3 LF) per lavatory/ vanity | Based on available area | Approximately 900mm (3 LF) per lavatory/ vanity |
| Closets—2 per room | 1.86m² (20 SF) | 1.86m² (20 SF) | 1.86m² (20 SF) |
| Laundry Facilities (a minimum of 1 washer/ 12 persons and one dryer/8 persons)—may consist of small laundries per floor or single laundry serving entire building | Based on number of resident | Based on number of resident | 2.3m² (24 SF) per appliance |
| Bulk Storage | Not required | Not required | Not required |
| Utility | As required | As required | Requirement dependent on local conditions |
| Mail Service—1 box per student (inside building) | As required | As required | Requirements dependent on local conditions/force protection requirements |
| Circulation space | Dependent on layout | Dependent on layout | 7.4m² (80 SF) per room, varies with layout |

### Optional Spaces—Pipeline Student Housing

| Functional Space | Minimum Net Area | Recommended Net Area |
|---|---|---|
| Multi-Purpose Area (May be programmed as meeting/study room,television rooms, exercise rooms, etc.) | 13.9 m² (150 SF) for each multi-purpose area | 0.19 m² (2 SF) for each room for each multi-purpose area |
| Game Room | 28 m² (300 SF) | 0.19 m² (2 SF) per room |
| Vending | 18.6 m² (200 SF) per floor | 18.6 m² (200 SF) per floor |
| Accessible Public Toilets (ground floor location) | 46.5 m² (200 SF) per dormitory | 46.5 m² (200 SF) per dormitory |
| Supply Storage Area | 18.6 m² (200 SF) per dormitory | 26.4 m² (500 SF) per dormitory |
| Administration Area | 1.4 m² (15 SF) per room | 1.4 m² (15 SF) per room |
| Public Telephone Area | 18.6 m² (200 SF) per floor | 18.6 m² (200 SF) per floor |

### Construction Standards—Pipeline Student Housing

| | |
|---|---|
| Net Living Area per Person | 9.1 m² (98 SF) |
| Maximum Number of Person per Room | 2 |
| Bathroom Configuration | 1 per room shared by 2 students |
| Corridor | Central |

## Recommended Spaces and Sizes

Access to Pipeline Student Housing rooms will be from interior double-loaded corridors. Modules are based on a standard of 18.2 $m^2$ (196 NSF) living space. Net living area is generally defined as the floor area of the living/bedroom space, measured to the inside face of the room walls. The net living space is neither a minimum nor maximum but must be met exactly.

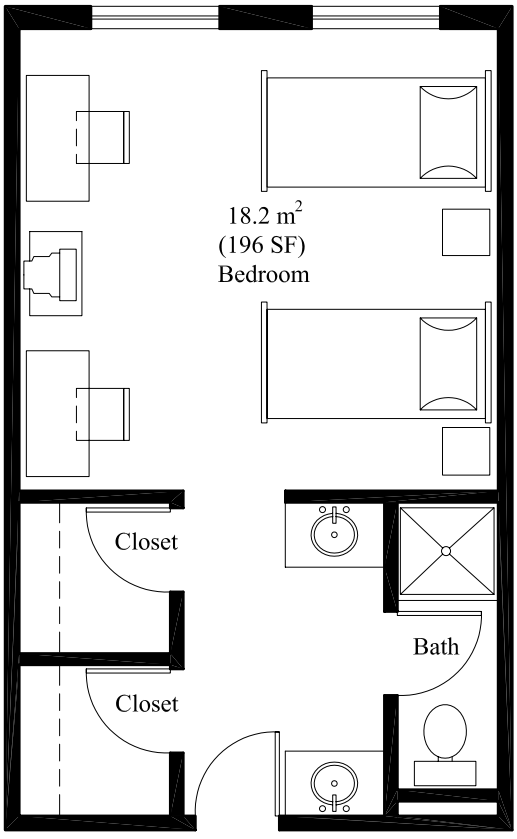
The following items are included when determining Net Living Area calculations:

- All door swings that encroach upon the living/bedroom area
- Mechanical equipment such as heat/air-conditioning units, radiators and baseboard heaters.

The following items are excluded from Net Living Area calculations:

- Items extending from floor to ceiling, which have been boxed-in and extend into the room from the wall plane (such as columns, pilasters, vertical pipes and air ducts).
- Closets are not included as Net Living Area.

All Pipeline Student Housing will be of a standard design.




Typical Pipeline Student Housing Floor Plan figure 4

## 10. Permanent Party Enlisted Dormitories

The area and occupancy requirements listed in the following table are construction standards for Permanent Party Enlisted Dormitories, and not assignment standards. Programmers must use the anticipated number of occupants established by the current approved Dorm Master Plan process as the first step in developing a dormitory design.

### New Construction

#### Background

Considerable detailed analyses have been conducted in the preparation of this design guide to determine the optimal configuration and basic requirements for Permanent Party Enlisted Dormitories. Various analyses focused on space requirements, programming limitations, comparative construction costs, building proportions, and many other factors. Enlisted dormitories have traditionally been based on a "2-room" concept. For many years, the Air Force built what were known as "2+2" dormitories, which featured two-room modules with two airmen assigned to each room, and a shared bath within the module serving the four residents. Each shared room provided approximately 8.4 $m^2$ (90 SF) per person. This standard was changed to the "1+1" concept in 1996 which provided two small private rooms in each module with two persons sharing a bath and a small kitchen. OSD established a rigid Net Living Area requirement of 11$m^2$ (118.4 SF) for each of the two rooms, and placed a 47 $m^2$ (506 SF) limit on the gross area of the module. Additionally, a limit of 66 $m^2$ (710.4 SF) per module (33 $m^2$ per person) was placed on the gross building area of the dormitory. The new OSD guidance under which this guide was developed allows a range of 11 to 17 $m^2$ (118.4 to 183 SF) for Net Living Area, eliminates the gross module area limit, but retains the 33 $m^2$ per person gross building area limit.

#### New Criteria and Constraints

The Air Force has conducted several dormitory workshops to develop specific guidance toward the development of this design guide. Dormitory Management, Major Command, Air Staff, and Command Chief representatives provided excellent input, but it quickly became evident that it would be very difficult to include all the desired space and amenities and still remain within the gross building area limit. Under the previous 1+1 criteria, designers were particularly challenged in accommodating all the functions of a dormitory within the maximum gross building area. Modules could be no larger than 47 $m^2$ with the gross building area limited to 66 $m^2$ per module, leaving only 19 $m^2$ per module for circulation space, common areas, wall thickness, exterior covered areas, utility chases, etc. While modules can now be larger, dormitory buildings are still constrained in their maximum gross area. This creates even greater difficulty in accommodating required spaces outside of the modules.

#### Prototype Development

Goals established at the workshops included the need for larger bedrooms, private baths, shared social spaces, and laundry areas within each module. Numerous prototypes were developed to explore the ramifications of meeting these goals within the modules while

staying within the maximum gross building area. Two-bedroom, three-bedroom, and four-bedroom modules were developed for Corridor Access, Balcony Access, and Breezeway Access dormitories, respectively. These modules were then used to create conceptual 96-person dormitory building prototypes. A 96-person dormitory was purposefully chosen acknowledging that smaller dormitories have a tighter ratio between the area taken up by the modules and the maximum gross building area. Also, this is the smallest dormitory the Air Force typically builds. The assumption was made that the successful application of the programming criteria for a smaller dormitory could certainly be repeated for larger dormitories as the building's efficiency increases. Additionally, three other two-bedroom Corridor Access prototype modules and their resulting dormitory buildings were developed exploring the impact of retaining shared baths, providing laundry facilities on each floor, or providing a single consolidated laundry room within the building core. Comparative parametric cost estimates were prepared for all the prototype buildings.

### Analysis

Initial efforts to include all the functional goals within each of the prototype building configurations resulted in most prototypes exceeding the maximum gross building area limit. A second revision reduced all but one of the prototypes down to 33 $m^2$ per person, but only by eliminating functional shared social spaces in the two-bedroom and three-bedroom modules. These modules still included a nominal sized shared kitchen/entrance foyer area, but offered no space for shared dining or seating areas. Additionally, the net living area/bedroom size of these two-bedroom and three-bedroom modules were minimum due to linear two-bedroom building configurations and inefficiencies within the three-bedroom module designs. Thus these units did not benefit from either larger bedroom sizes or the addition of a shared common area within the individual module as referenced in the table below.

### 4 Bedroom Modules

Only the four-bedroom modules successfully incorporated all of the Air Force goals while meeting the gross building area requirement. Further consideration justified the four-bedroom concept from an operational viewpoint. Airmen of mixed grades can be assigned to a module to encourage mentoring of the junior airmen by the more senior residents. Due to the provision of private baths, genders may be mixed within a four-bedroom module much more easily than could be done in a two-bedroom or three-bedroom module.

The table above confirmed that while it is slightly more expensive to provide private baths than shared baths, this cost is offset by only providing half as many shared kitchen spaces in a four-bedroom module than are required for two-bedroom modules. The cost of constructing new dormitories to meet this new standard is comparable to the cost of 1+1 dormitories, since the overall building size has remained constant. Additionally, the goals of the Air Force to provide larger private rooms with private baths, shared common areas including a kitchen, shared social space and laundry within each module, are emphasized with the introduction of the four-bedroom module as the new standard for Air Force Dormitory construction.

### USAF Dormitory Prototype Analysis
### 2, 3, and 4 Bedroom—Balcony Access

| Description | 1+1 Dorm Balcony | 2BDRM/ Balcony | 3BDRM/ Balcony | 4BRDM/ Balcony |
|---|---|---|---|---|
| Gross Building Area | 33m² (34,088 SF) | 33m² (34,088 SF) | 33m²( 34,088 SF) | 33m² (34,088 SF) |
| Number of Baths | 48 | 96 | 96 | 96 |
| Number of Kitchens | 48 | 48 | 32 | 24 |
| Net Living Area per Person | 11m² (118 SF) | 12m² (129 SF) | 13m² (139 SF) | 12.4m² (132 SF) |
| Gross Module Area per Person | 24 m² (253 SF) | 26.5 m² (284 SF) | 26 m² (280 SF) | 28.5 m² (305 SF) |
| Building Plan Efficiency | 71% | 80% | 80% | 86% |

## Renovation

### Prototype Development

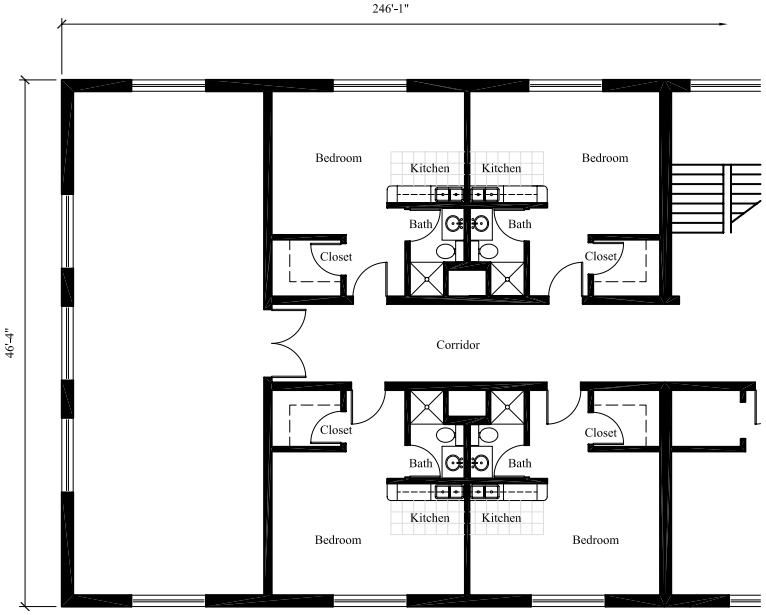
The four-bedroom module design, developed for new construction and based upon the improved and increased Air Force criteria, has also proven valid for renovation, based upon additional analysis and prototype development. Numerous module plans were developed based on two existing building configurations to explore the possibility of incorporating the same standards and benefits of the four-bedroom module design into renovation standards. Using a typical Balcony Access dormitory and a typical Corridor Access dormitory for background building plans, combinations of Corridor Access, Balcony Access, and Breezeway Access dormitories were studied. Based on the configuration of a four-bedroom module within an existing building footprint, new Balcony Access plans and Corridor Access plans were developed, with an option for the Corridor Access plan to incorporate interior or exterior Breezeway Access concepts dependent upon the installation's location and climate.

### Analysis

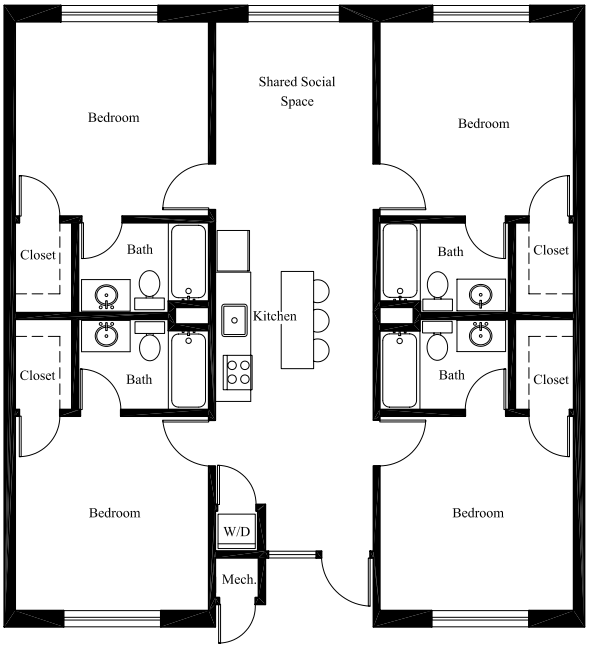
The existing Balcony Access plan adapted well to a new Balcony Access configuration, allowing the exterior shell and stairwells to remain intact. A Corridor Access configuration was also developed, but requires the addition of interior stairwells to access module entrances. The existing Corridor Access plan, while also keeping the exterior shell in place, required a new balcony system to be introduced within the building configuration for a Balcony Access plan. This plan adapted best to a Corridor Access configuration, although requiring the existing interior stairwells to be relocated within the footprint, which will impact overall project costs. This plan does allow the most efficiency, though, and greatly increases the number of modules per floor.In most configurations, the original occupancy of the existing dormitory buildings will typically be higher than the number of rooms/modules attained with the new four-bedroom module design. These numbers will vary, though, based on building systems requirements and other local considerations.

## 4 Bedroom Modules

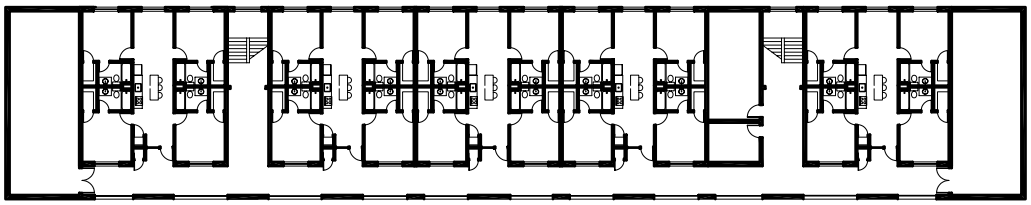
Although it is slightly more expensive to provide private baths than shared baths, this cost is offset by only providing half as many shared kitchen spaces in a four-bedroom module than are required for two-bedroom modules. The cost of renovating existing dormitories to meet this new standard is comparable to renovations cost using the 1+1 standards, since in both configurations, the building would be significantly gutted, retaining only building shell and/or existing stairwells, and replacing all building systems regardless. Additionally, the goals of the Air Force to provide larger private rooms with private baths, shared common areas including a kitchen, shared social space and laundry within each module, are emphasized with the introduction of the four-bedroom module as the new standard for new and renovated Air Force Dormitory construction



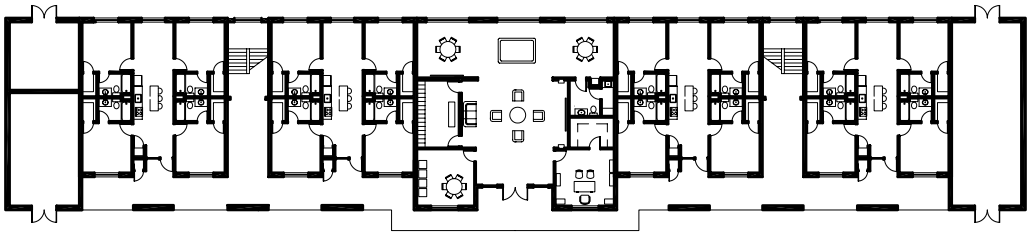

Existing Balcony Access Dormitory Plan figure 5a




balcony Access Floor Plan Figure 5b

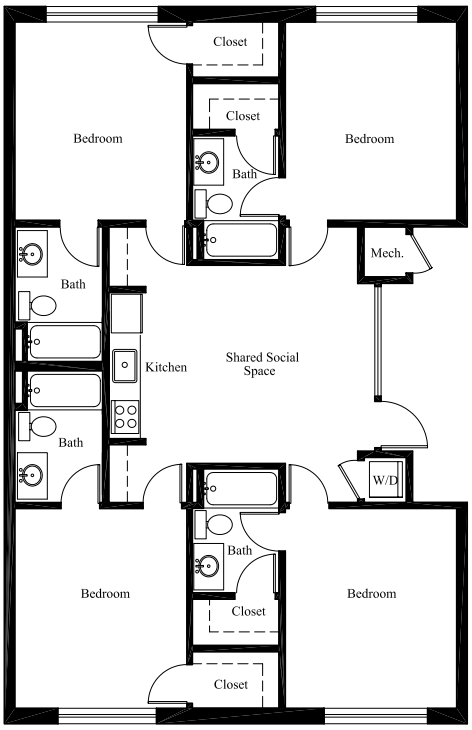


2nd and 3rd Floors

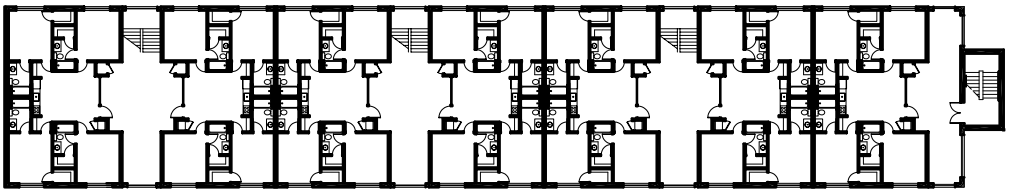


Ground Floor

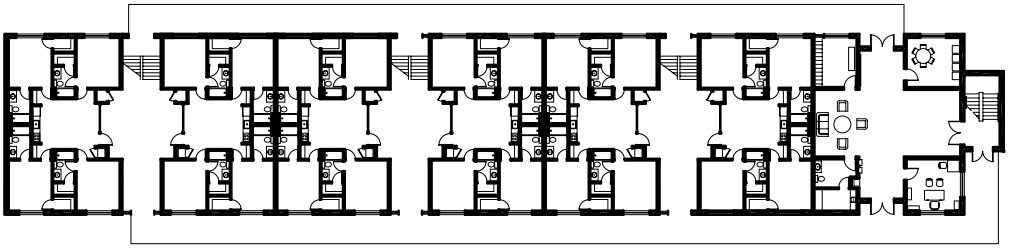
Balcony Access Building Plan figure 5c




Corridor Access floor Plan figure 5d

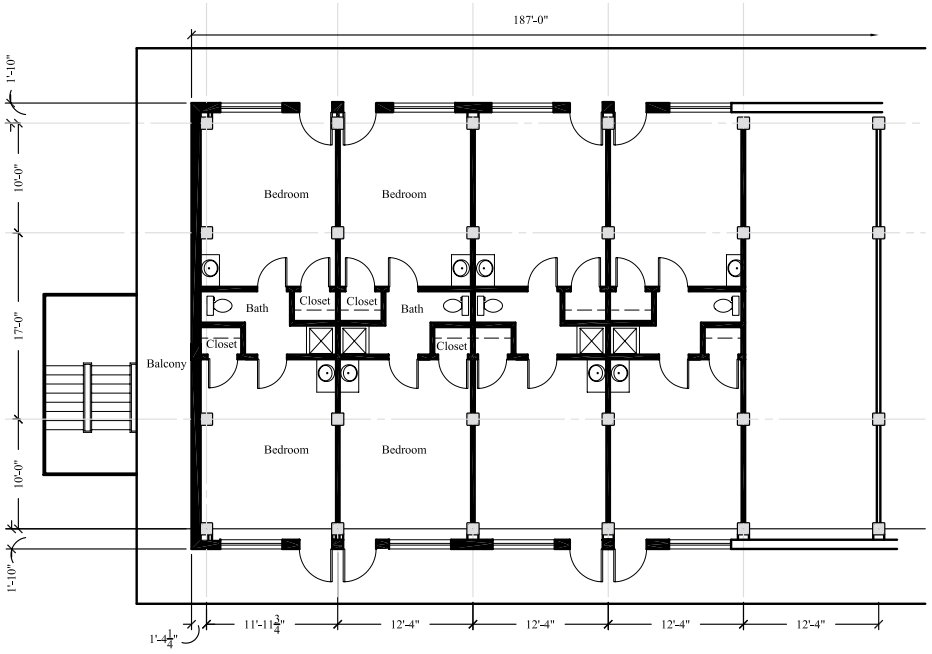


2nd and 3rd Floors

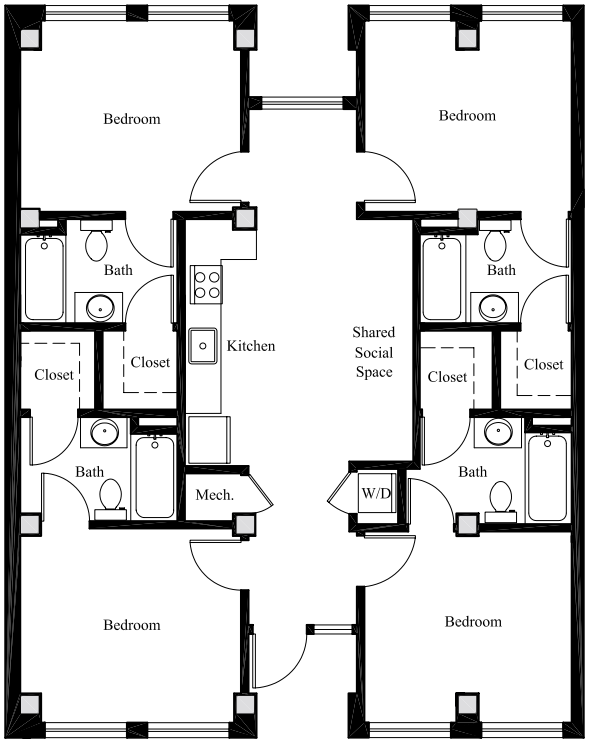


Ground Floor

Corridor Access Building Plan figure 5e

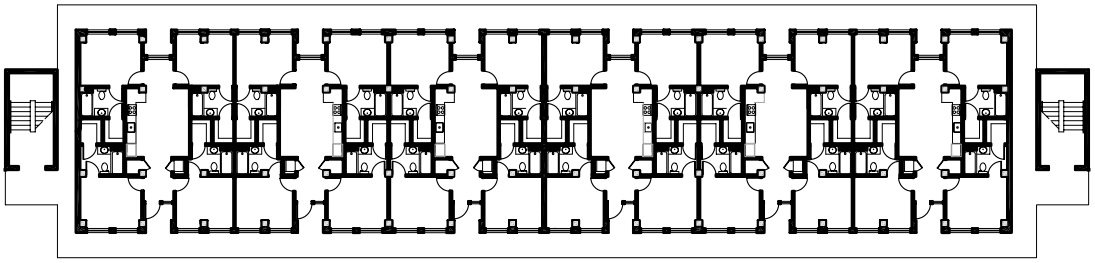



Existing Corridor Access Dormitory Plan figure 5f

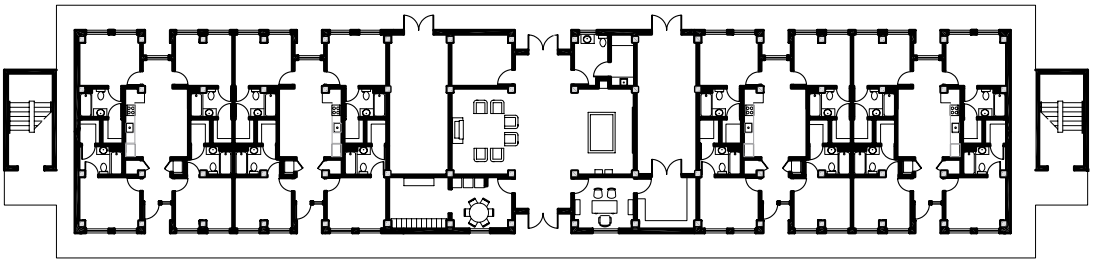



Net Living Area 12.0 $m^2$

Balcony Access Floor Plan figure 5g

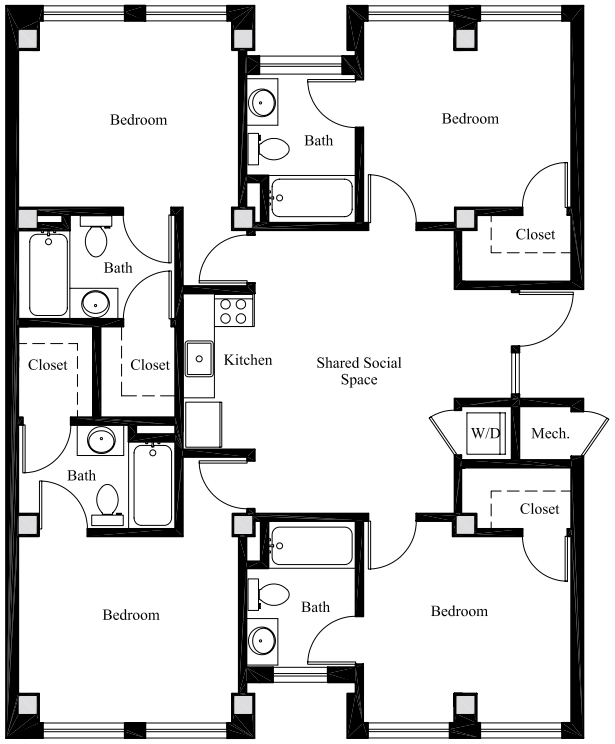


2nd and 3rd Floors



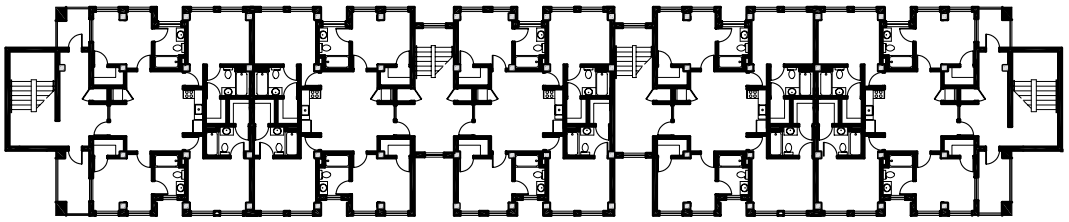
Ground Floor

Balcony Access Building Plan figure 5h

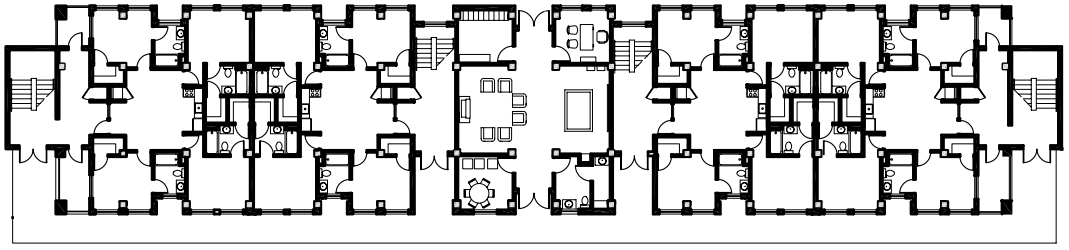



Net Living Area 12.0 m

Corridor Access Floor Plan figure 5i



2nd and 3rd Floors



Ground Floor

Corridor Access Building Plan figure 5j

### Construction Standards—New Construction and Renovated Permanent Party Enlisted Dormitories

| | |
|---|---|
| Grade | E1 – E4 |
| Minimum Net Living Area per Person | 12 $m^2$ (129 SF) |
| Recommended Net Living Area per Person | 12 – 14 $m^2$ (129 – 150 SF) |
| Maximum Net Living Area per Person | 17 $m^2$ (183 SF) |
| Number of persons per module | 4 |
| Kitchen configuration | Semi-private (shared by 4) |

New Permanent Party Enlisted Dormitories and major dormitory renovation projects must meet the construction standards cited in the table above. Additionally, newly constructed Permanent Party Enlisted Dormitories must include the required spaces with their associated prescribed sizes as listed in the table below. Some flexibility is allowed for renovated Permanent Party Enlisted Dormitories, but they must include the required spaces to the greatest practical degree.

## Required Spaces and Sizes—New Construction and Renovation
## Permanent Party Enlisted Dormitory

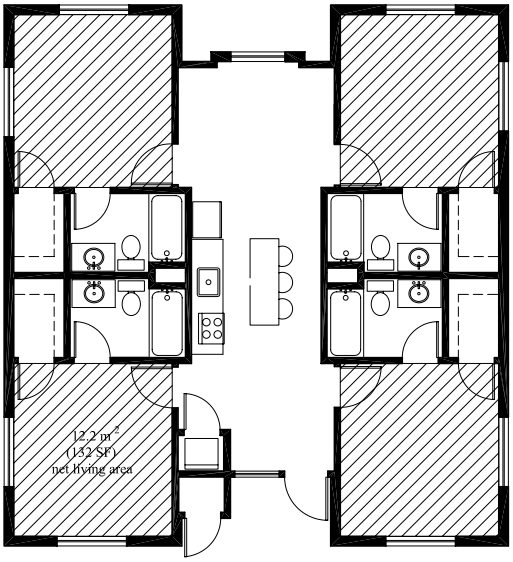
| Required Functional Space | Minimum Net Area | Maximum Net Area | Recommended Net Area |
|---|---|---|---|
| Private Living/Bedroom Area, 1 per person | 12 $m^2$ (129 SF) | 17 $m^2$ (183 SF) | 12 – 14 $m^2$ (129 – 150 SF) |
| Private Bathrooms—1 per person (1 toilet, 1 combination tub/shower or 1 separate shower, and 1 lavatory vanity—min 762 mm (30 inches) wide) | 3.2$m^2$ (34 SF) | Based on available area | 3.2 $m^2$ (34 SF) |
| Private Walk-in Closet—1 per living/bedroom area | 1.86 $m^2$ (20 SF) | Based on available area | 1.86 $m^2$ (20 SF) |
| Shared Common Area (1 kitchen per module, 1 shared social space per module, 1 laundry area per module, and utility space as required, shared 4 persons) | Minimum 11.5$m^2$ (123 SF) | Based on available area | 11.5 $m^2$ – 28$m^2$ (123 – 300 SF) including shared kitchen, shared social space and/or seating/dining area, laundry and utility |
| • Kitchen—1 per module, shared by 4 persons | Included in Shared Common Area | Included in Shared Common Area | At a minimum includes: double-bowl sink; 2-burner cook topm combination microwave/convection oven, range hood with exhaust fan, storage cabinets, and disposal where permitted |
| • Laundry Area—1 washer/1 module—shared by persons (may be stacked) | Included in Shared Common Area Area | Included in Shared Common | 0.93 $m^2$ (10 SF) per appliance. Laundry per module recommended—centralized laundry as option with allowed ration 1 washer/8persons and 1 dyer/6 persons |
| Multi-Purpose Area—at least one such space per dormitory (includes game room, television room, exercise room, administration area, etc. | 25 $m^2$ (270 SF)total | Based on available area | 0.19 $m^2$ (2 SF) per person for each multi-person area plus 7.4$m^2$ (78 SF) administration area—total area to be used based on local requirements |
| Vending Area—one area per dormitory recommended | 2.32 $m^2$ (25 SF) each vending area | Based on available area | 7.43 $m^2$ (80 SF) per vending area based on local requirements |

## Required Spaces and Sizes—New Construction and Renovation
## Permanent Party Enlisted Dormitory continued

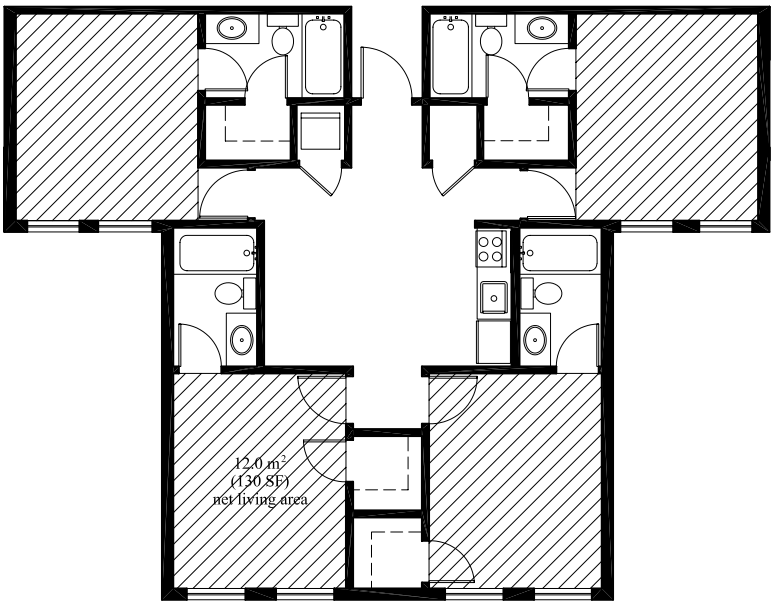
| Required Functional Space | Minimum Net Area | Maximum Net Area | Recommended Net Area |
|---|---|---|---|
| Mail Service—1 box per person, centrally located within the dormitory campus—location per force protection requirements. | As required | As required | Requirements dependent on local conditions—not applicable at OCONUS locations |
| Accessible Public Toilets | 9.3 $m^2$ (100 SF) per dormitory | Based on available area | 9.3 $m^2$ (100 SF) per dormitory |
| Supply Storage Room | 9.3 $m^2$ (100 SF) per dormitory | Based on available area | 9.3 $m^2$ (100 SF) per dormitory |
| Bulk Storage (may be in-room, in-module or centralized area) | 2$m^3$ (70.6 CF) per storage cubicle | Based on Available Area | 2 $m^3$ (70.6 CF) per storage cubicle. Recommended 1 cubic/area per 4 person to vary based on local requirements |
| Utility | As required | As required | 8% of Gross Building Area dependent on building system requirements |
| Circulation | Dependent on layout | Dependent on layout | Dependent on layout |

## Net Living Area

Net Living Area is generally defined as the floor area of the living/bedroom space, measured to the inside face of the room walls as indicated by the shaded areas on the follow module plans. Provide a total of between 12 and 14 $m^2$ (129 – 150 SF) Net Living Area in each room. In no case should the Net Living Area per person be less than 12 $m^2$ (129 SF).




Typical Balcony/Breezeway Access Floor Plan figure 6a




Typical Corridor Access Floor Plan figure 6b

The width of a living/bedroom area should not be less than 3048 mm (10'-0"). The recommended minimum width is 3353 mm (11'-0").

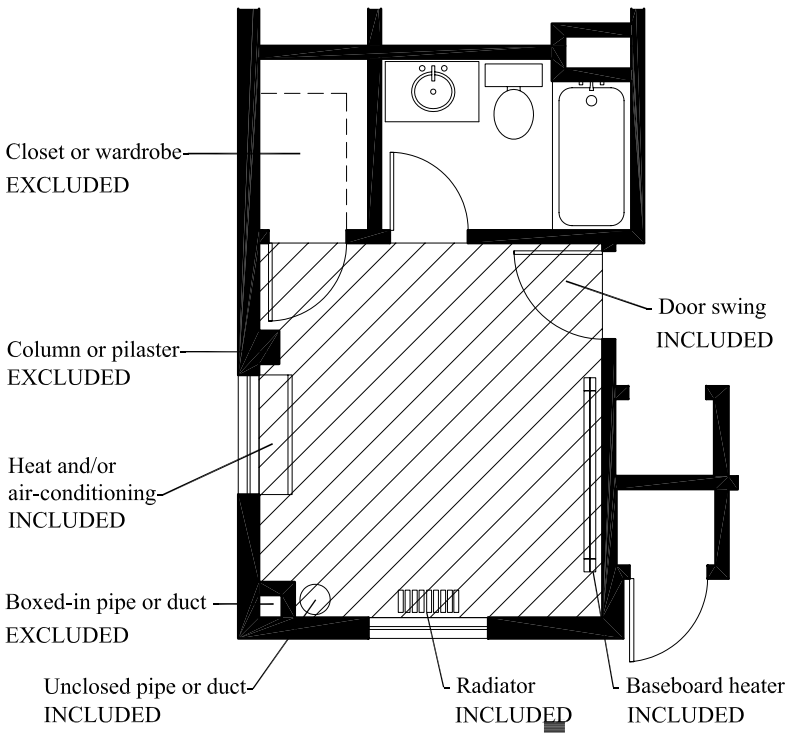
Items included in Net Living Area calculations are:

- All door swings that encroach upon the living/bedroom area (typical in Balcony Access dormitories).
- Mechanical equipment that occurs within the living/bedroom area, such as heat/air-conditioning units, radiators, and baseboard heaters.

Items excluded from Net Living Area calculations are:

- Items extending from floor to ceiling, which have been boxed-in and extend into the room from the wall plane (such as columns, pilasters, vertical pipes and air ducts)
- The area occupied by the vanity, when the vanity is within the living/bedroom area
- Closets and wardrobes

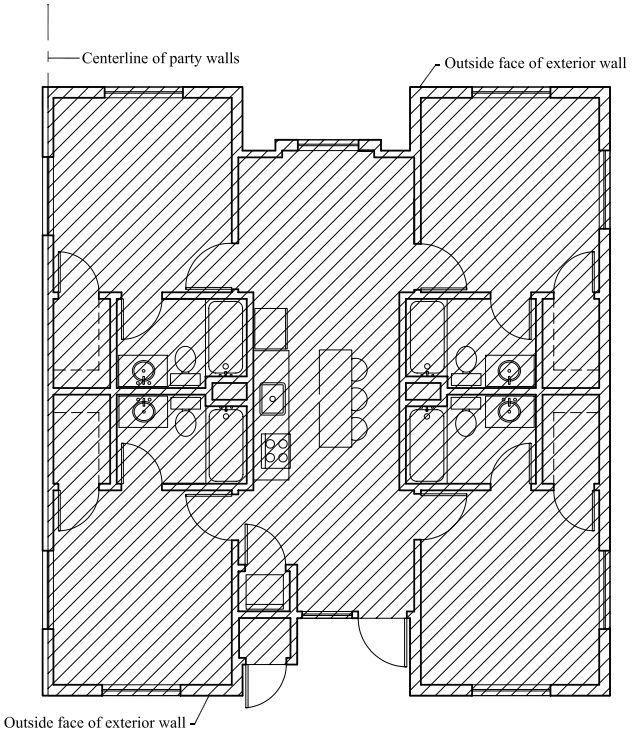
The range of 12 – 14 $m^2$ (129 – 150 SF) should allow sufficient flexibility for the Net Living Area requirement to be met for renovation projects as well as for newly constructed dormitories. There may be physical limitations present in existing dormitories, such as load-bearing walls, that affect the flexibility of the module layouts, but most existing dorm configurations will permit meeting the minimum Net Living Area requirements.




Measuring Net Living Area Figure 7

### Gross Module Area

Gross Module Area is not restrained to a specific area measurement for newly constructed or renovated enlisted dormitories, but is still limited due to the requirement to stay within the Gross Building Area limitation while satisfying all functional and minimum area requirements required for the spaces within the facility. A recommended range is 26.5 – 28.5m² (129 – 150 SF) per person. Designers must remember that the difference between the Gross Module Area and the Gross Building Area must accommodate all of the dormitory functions that occur outside of the module, such as circulation, utility spaces, and exterior wall thickness.




Example of Groos Module Area figure 8

### Gross Building Area

Gross building area is measured to the outside face of the exterior enclosure walls. Do not include normal roof overhangs in gross building area. Normal roof overhangs are generally less than three feet wide and are unsupported by columns. 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. Exterior unenclosed stairs count as half scope per floor that they serve, but interior stairs and elevator shafts count as full scope per floor that they serve. *Refer to AFH 32-1084, Facility Requirements* for more information on scope calculation.

The gross building area for Permanent Party Enlisted Dormitories must not exceed 33 $m^2$ (355 SF) per person. This limitation may be increased by 2 $m^2$ (21.5 SF) per person for high-rise dormitories (4 stories or more) or for dormitories with site-specific programming requirements.

Newly constructed projects must comply with the design and construction guidance establishing the minimum and maximum size for the Net Living Area and the maximum size of the Gross Building Area. Cost-effective dormitory renovation projects must also comply with the minimum and maximum Net Living Area, but may exceed the maximum Gross Building Area due to pre-existing conditions. Commands desiring a waiver from these planning factors must submit a fully justified request to their MAJCOM/CE, who has final waiver authority.

### Special Project Considerations

The following special factors should be considered when establishing initial estimates of project costs in the Air Force Dormitory Master Plan:

Special Design Features. Expenses associated with special design features in a dormitory room can account for a large portion of the total project cost because the features are repeated in every module. Programmers and designers must be aware of current unit cost factors. Programmers will only use unit costs; therefore, designers must be concerned about the cost impact of special design features. A good example is kitchen equipment, where the cost can vary greatly, depending upon the quality of each item.

Utility Systems. Utility requirements for dormitories often exceed those of other facilities of similar size because of the higher energy demands and occupancy densities. Programmers must determine these requirements and include them in the construction budget if they are associated with the cost of supporting facilities. Otherwise, accomplish the program requirements within the unit cost. The cost of pipe tunnels and trench systems associated with dormitories can have a significant impact on construction costs.

Mechanical Systems. The type of mechanical system selected for a dormitory has a major impact on the cost of the project. An existing steam and chilled water distribution system from a central energy plant may have the capacity to supply the new dormitory. In other cases, the new dormitory complex may justify its own central energy plant, or it may be more cost effective to provide each dormitory with a separate mechanical system, or to provide individual systems for each module. Make these decisions as early in the programming or design process as possible. Life cycle cost analysis is especially important for mechanical systems in dormitories due to unique user requirements.

Fire Protection Systems. Fire protection systems for dormitories should receive special attention regarding their impact on construction costs. These systems may incur additional costs due to the repetitive nature of dormitory designs, their occupancy classification, and dependent on selection of system, may increase the water demand for the project.

Sustainability. Incorporating sustainable design features into dormitories may result in higher initial costs, but should always be justified by a thorough life-cycle cost analysis.

Force Protection. Follow the Interim DOD Antiterrorism/Force Protection Minimum Construction Standards for dormitories, and consider the impact these standards have on the overall construction cost of the project. Coordinate with the base security forces personnel for additional local guidance or requirements.

Other Factors. Preliminary soils analysis is essential to determine whether extensive site work and foundation costs are required. Local environmental and climatic conditions can also impact costs. Dormitories located in areas prone to seismic activity generally cost more. Climatic influences such as heavy snow loads, wind loads, high humidity, and extreme temperatures result in additional costs due to structural and insulation requirements. Dormitories that occur in designated historic districts may incur additional cost in order to ensure compatibility with historic structures.

Module Proportions. The dimensional proportions of modules are critical to the overall construction cost of a dormitory. Designers must consider not only efficiency in design of the individual modules, they must also focus on how the modules string together to create a building. While module proportions, interior wall quantity, and the number of doors can be optimized to produce the lowest cost, designers must also consider the impact these factors may have on privacy, functionality, and aesthetics.

# CHAPTER 3 FACILITY DESIGN

WRIGHT PATTERSON AIR FORCE BASE

## A. SITE DESIGN

### 1. SITING REQUIREMENTS

Site planning is one of the more important elements of any project design and can make or break the overall success of the enlisted dormitory project. The art of site planning requires the interdisciplinary involvement of the community planner, architect or landscape architect, interior designer, and civil, mechanical, electrical, and communication engineers, as well as the Housing and Dormitory Managers. The quality of the design will suffer if one of these design disciplines is left out of the site planning process. The landscape architect should lead and be responsible for the development of the site plan, coordinating with the other disciplines. Coordination with DoD and Air Force force protection construction standards, and UFAS and/or ADAAG accessibility guidance is critical, and should become part of the design solution.

Community planning is an integral part of site planning. Although the emphasis in dormitory campus planning is to create a residential neighborhood atmosphere, somewhat separated from surrounding base administrative and mission related functions, proximity and access to common public use facilities is desired. The design of vehicular paths, pedestrian paths and landscape can help define layers of boundary around the dormitory campus to provide this separation, but can also enhance the flow into and out of the adjacent community areas, such as the dry cleaner, shopette, post office, food court, theatre, dining hall, and club. Adjacent recreational spaces

additionally enhance these layer of boundary and can buffer other non-desired areas or functions. Site planning and community planning should define an edge to the dormitory campus, while considering the importance of adjacent community and common public areas.

## 2. Circulation

### Vehicular Access

Provide access to the dormitory from secondary (collector) streets to minimize the congestion associated with main arterial streets. Where possible, divide main entrances with landscaped traffic medians between entry and exit lanes. Because of the high volume of traffic using the entrances, the recommended minimum width of non-divided entry roads should be 7.32 m (24 feet). Consider passenger loading and/or drop off areas near the dormitory entrances, providing convenience to residents and their guests. Consider moving vans and delivery trucks, and required easement areas. Follow force protection construction standards in all vehicle access design, critical in determining allowable set-backs and adjacencies.

### Fire Department/Emergency Service

Reference the International Building Code (IBC) for a minimum separation required between dormitories and the closest adjacent building. This separation is for fire protection purposes but may also be dictated by force protection requirements and local fire protection policies. Provide access to fire protection vehicles from three sides. Obtain width, weight, and turning radii of fire fighting vehicles from the base fire department.

### Service Vehicles

Access streets and parking areas should be designed to accommodate service vehicles. Where interior court areas are proposed between adjoining dormitories, consider designing the main pedestrian walks to accommodate such vehicles. As an example, these walkways must be a minimum of 2.4 meters (8 feet) wide and constructed using reinforced concrete to accommodate medium weight vehicles. Consider treating the walkways with a patterned concrete system to minimize the negative visual impact of the wider access route. Consider materials such as concrete grass road type pavers to provide access to infrequent service vehicles. Consider installing removable bollards as needed to restrict unauthorized vehicle access.

### Bus Route Access

Where possible and appropriate, access to public transportation systems should be considered in project design. If the base provides bus service, designers should consider developing shelters and walks to serve enlisted personnel needs. Bus shelters must be compatible with the architectural style of existing buildings and other bus shelters on base.

### Pedestrian Circulation Systems

Walkways to building entrances should be 2.4 meters (8 feet) wide. All other sidewalks should be 1.8 meters (6 feet) wide. Design and grade sidewalks to provide barrier-free access to the first floor of all dormitories and to any outdoor use areas associated with the dormitories. Provide connections to other functional areas of the base with pedestrian circulation systems.

Consider including links to jogging/biking trails as part of the site development process. In northern tier locations, consider the use of sidewalks above steam heat tunnels to free walkways free of ice in the winter, or consider heated or covered walks in lieu of open corridors.

### Outdoor Areas

Include outdoor passive and/or active use areas in all dormitory facility development plans. Where appropriate, design pavilions to become an integral part of the dormitory complex. The pavilions must complement the architectural style and materials of the dormitories. Plan for and provide additional amenities such as barbecue grills, tables, benches, lighting, and landscape plant materials. Outdoor activity areas must be carefully coordinated with indoor social activity areas.

### Service Entrances

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

## 3. Parking

### Resident Parking

Provide one parking space per dormitory resident. Parking areas in overseas locations should be sized to local conditions and may be reduced. Additional visitor parking is not required, but may be an option based on local requirements. This results in a significant area of paving which, if not planned properly, will have a negative impact. This parking ratio applies to most dormitories, but may be reduced based on the parking needs of the specific project. Paving increases storm water runoff, results in increased reflected and absorbed radiation, and raises the ambient air temperature of the surrounding area. Parking areas also result in reflected sun glare off vehicles, increased air pollution, and concentrated contamination of runoff from leaking oil and antifreeze.

Grading can help to create a transition zone within parking areas, between parking and dormitories, and between multiple groups of dormitory facilities. For instance, terraced parking areas can break up the expanse of parking and reduce the visual impact.

Many of the negative impacts of parking areas can be mitigated or lessened by improved design techniques. Trees planted in parking lot islands will intercept reflected radiation, visually break up the mass of paved surface, and provide shade for vehicles. Properly located, the traffic islands can also provide safer pedestrian circulation. Where topography allows, design parking areas in multiple levels with transition zones. This may reduce grading requirements and allow the designer to balance the volume of cut and fill. Design these transitions as landscape buffers much like traffic islands to soften the visual impacts.

Consider sustainable alternatives to solid pavement.

### Parking for the Persons with Disabilities

The parking requirement for dormitory facilities assumes all occupants are able-bodied enlisted personnel and does not provide for visitors with disabilities or temporarily disabled enlisted personnel. Provide accessible parking spaces in accordance with the Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act (ADA) Accessibility Guidelines. Locate these parking spaces to provide the most convenient access to the building entry.

### Motorcycle Parking

Designated motorcycle parking areas should be included in the site plan. These areas should be constructed of reinforced concrete to prevent motorcycle stands from sinking into the asphaltic concrete parking areas. Recommend the installation of concrete embedded lockdown eyebolts for securing motorcycles from theft.

### Bicycle Parking

Dormitory residents frequently use bicycles, particularly in milder climates. Provide bicycle parking facilities within the dormitory complex area. Provide all bicycle parking on concrete surfaces adjacent to sidewalks or first floor building corridors. Parking areas must be covered and screened from view of the general public. Consider covered bicycle parking enclosed on a minimum of 3 sides, or lockable bicycle lockers in northern tier or highly corrosive environments, which maximize security and minimize visual clutter. Such lockers can be purchased with equipment funds.

## 4. Site Considerations

### Establishing the Finished Floor Elevation (FFE)

Establishing the finished floor elevation of Permanent Party Enlisted Dormitories is one of the more important aspects of site planning. The FFE affects grading, cut and fill, 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 often are catastrophic, resulting in barren sites lacking visual interest. The landscape architect, architect, and civil engineer must work closely together to achieve optimal design results.

### Grading

Grade the site to achieve an orderly transition from the point where enlisted personnel enter the site by automobile or on foot to the point where they are at the first floor entrance. Site grading must consider the impacts of the parking area, the dormitory, bus-stop shelters, sidewalks, outdoor passive use areas, mechanical equipment, and trash dumpsters. Where appropriate, use grading to control the negative visual impacts these man-made facilities have on the visual environment. See the discussion of landforms below.

Dormitories tend to be linear and relatively narrow in configuration and therefore lend themselves to an orientation paralleling existing contours. Determine if local building codes require storm water retention. Where on-site storm water retention is required, the location of retention areas must be carefully thought out in terms of function as well as visual impact. Use large retention sites for outdoor recreation areas.

### Landforms

The landscape architect and the civil engineer must work together to use landforms to soften the impact of parking on the landscape and to positively enhance force protection of the dormitory campus. 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.

### Storm Drainage

The successes and failures of site planning rely heavily on the designer's ability to facilitate drainage. Depending on the geographic location and the availability of nearby subsurface storm drains, provide underground storm drainage for each enlisted dormitory complex. All site water must 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 dormitory project. As a minimum, divert surface water to an underground system to a point where it is discharged into aboveground storm drains. The project should provide for appropriate surface water retention and erosion prevention, and should provide for drop inlets as necessary to intercept surface runoff and prevent walkways from being flooded. Refer to the *USAF Landscape Design Guide* for further guidance.

### Utility Corridors

The site planner should develop underground utility corridors (easements) in coordination with the base community planner, electrical, mechanical, communication and civil engineers. Size corridors to accommodate future expansion. Place utility corridors no closer than one and one-half times the crown width of nearby mature trees or 10.7 meters (35 feet), whichever is greater. Locate utility corridors to allow for future street-tree plantings. Consider using pipe tunnels and trenches.

## 5. Site Amenities

### Site Furniture

The selection of site furniture is similar to putting icing on the cake. Along with the landscape development and signage, this element gives the project a finished appearance. Site furniture that is in harmony with the architectural style of the dormitory facilities complements the building, and makes the outdoor spaces more usable and appear more organized. Poorly selected and/or placed site furniture can result in major disharmony, drawing attention away from

otherwise superbly designed site and building features. The landscape architect must coordinate the selections with the architect and interior designer to ensure smooth transitions are made from within the building to the outdoors and vice versa. Effective transitions are achieved when building materials, colors, and design details from the building are incorporated into and reinforced by the paving materials, signage and site furnishings.

### Site Lighting

Site lighting is an integral part of any dormitory project. Provide lighting to ensure occupants have a means of safely moving between outdoor spaces. Consider the base's design standards, if available, in the selection of luminaries and poles. All signage and lighting must be in compliance with the installation's standards. The selection of materials and locations must be a joint decision between the landscape architect and the electrical engineer. Energy-efficient lamps such as high-pressure sodium with color correction ensuring optimum visual acuity are recommended for energy-conscious site lighting. Consider life-cycle costs of lamp replacement, though, when specifying fixture and lamp types. Provide adequate site lighting at any point where there is a change in grade requiring steps, near accessible and motorcycle parking areas under stairwells, and near main entrances to buildings. A lighted sign may be appropriate for night visitors. Use the recommendations of the *Illuminating Engineering Society (IES) Lighting Handbook* to establish illumination levels. In particular, do not exceed IES of North America (IESNA) foot-candle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments. Design exterior lighting such that zero direct-beam illumination leaves the building site.

Consider motion detection and photo sensitive sensors to achieve energy efficient lighting design.

### Sustainability

Incorporate sustainable design concepts into the dormitory campus. Consider recycling centers and containers and other refuse issues when developing site design and landscaping. Coordinate locations of recycling and refuse containers with site furnishings and landscape to complement the campus and building design, while provide ease of use and service ability.

### Signage

Follow the guidance contained in *AF Pamphlet 32-1097, Sign Standards Pamphlet*, and as supplemented in the base's design standards, if applicable.

### Visual Screening

Trash dumpsters must have balance convenience to the residents with access by large trash handling trucks, but must be located away from main entrances and comply with Antiterrorism/Force Protection requirements Screen trash dumpster locations with any combination of hard wall materials, earth forms and landscaping to reduce adverse visual impact. Where hard wall materials are used, the materials must complement the materials used in the dormitories and other outdoor facilities. Screen mechanical equipment such as chillers, evaporating condensers, switchgear, and electrical transformers. Architectural screening materials must complement the dormitory's architectural style and materials. Use landforms to screen objects in the landscape that do not require enclosures.

## 6. Landscape Architecture

Landscape plans developed for the Air Force require the services of a professional landscape architect working in conjunction with the other disciplines to achieve the total design intent for the project. The landscape architect must have an intimate knowledge of the plant materials for the region. Refer to the *USAF Landscape Design Guide* for further guidance. In addition, the landscape architect must conform with DoD force protection guidance referencing maximum height and location of plant materials adjacent to a dormitory building.

The design intent should include creating an aesthetically pleasing landscape minimizing resource and maintenance requirements. The fundamentals of good landscape design include: proper planning and design, plant selection, plant installation, use of turf alternatives, use of mulch materials, zoning of plants as per water requirements, soil improvements, efficient irrigation, and appropriate maintenance considerations.

Structure the landscape design program to satisfy the architectural, engineering, aesthetic, and environmental requirements of each project while minimizing maintenance needs. The following factors must be evaluated when performing a site analysis:

- Visual elements
- Climatic data
- Existing vegetation
- Soil quality
- Hydrology
- Topography
- Spatial and program analysis
- Circulation patterns
- Security requirements
- Maintenance requirements

### Enframement

Identify appropriate external views of the dormitory during the site analysis process. Using landscape design elements, focus attention to important features of the building by manipulating and placing tree masses and screening undesirable features.

### Visual Enhancement

Landscape plant materials used for utilitarian purposes, such as screening service areas or providing shade, will also enhance the attractiveness and livability of an area. The oppressive feeling of monumental scale can be relieved by the careful selection of proper plant materials. Visually separate multiple buildings into several pleasantly framed units, and enhance individual buildings within a group. Shrubs and small trees arranged in strategic groups around a building improve the appearance by softening structural lines. This also helps to integrate the building with its site and diverts attention from unattractive structural features.

### Spatial Articulation

Use plant materials to create outdoor enclosed spaces and to separate such spaces one from another. Also use plant material 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 plant material used. Keep in mind that the effects of deciduous plants vary with the season, whereas evergreens remain constant year-round.

### Visual Screening

Unattractive views or objects identified by the site analysis should be screened with appropriate plant materials to minimize negative visual impacts. Trash dumpster areas, pad mounted electrical transformers, parking areas, and mechanical yards are examples of such views or objects. 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.

### Wind Control

Wind is either a pleasant or unpleasant climatic factor depending on ambient air temperature, relative humidity, and velocity. Use plants as wind control devices to slow, guide, deflect or filter the wind. Knowledge of the direction and speed of prevailing winds at different seasons of the year is necessary. When plants are used as a wind barrier, wind is generally affected for a distance of 2 to 5 times the height of the barrier to the windward side and 10 to 15 times the height of the barrier to the leeward side. Plants are better screens than fences or walls for windbreaks because they permit some degree of wind penetration. Irregular forms provide a more effective windbreak than evenly spaced plants. A variety of plant species and sizes also provide a better windbreak than one consisting of a single species. For climates where occasional to frequent snows occur, consideration must be given to the effects of snowdrifts.

### Sun Control

The 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 dormitory project. By intercepting the direct and reflected radiation, plant materials control the absorption of heat energy by the building and parking areas, thus reducing energy costs.

### Landscape Maintenance

Include landscape establishment and maintenance within the initial contract for installation of plant materials. The duration of the establishment period should be for a period of one year and should not be included as a contract option. The establishment period requirements should include:

- Irrigation
- Mowing and edging
- Replacing mulch
- Inspection/control of pests and weed control
- Tightening staking/guying materials
- Pruning
- Fertilization
- Maintaining watering saucers

### Landscape Irrigation

Landscape with indigenous materials and plants to minimize irrigation needs. Include irrigation systems in dormitory projects sited in arid and semi-arid climatic regions. Use bubbler or drip irrigation systems adjacent to building facades to minimize impact of overspray. Provide all irrigation systems with solid-state automatic multi-station controllers, state-of-the-art control valves, and backflow preventers in accordance with 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 all irrigation systems. Water conservation is a high-priority factor in development of the irrigation design. Take advantage of non-potable water if possible.

## B. Building Design

### 1. General Considerations

The following basic functional activities must be addressed in permanent party enlisted dormitories. These three basic functional categories are interactive, and designers must fully understand the relationships between these categories. The designer must take an overall approach to creating a fully integrated facility. The three basic functional categories are:

#### Residential Activities

- Sleeping
- Personal hygiene
- Personal study
- Personal storage
- Indoor relaxation
- Personal cooking and dining
- Laundry

#### Recreation and Community Activities

- Television viewing
- Fitness/workout rooms
- Room games
- Outdoor sports
- Outdoor relaxation areas

#### Service Activities

- Mail delivery
- Vending
- Bulk storage
- Administrative support

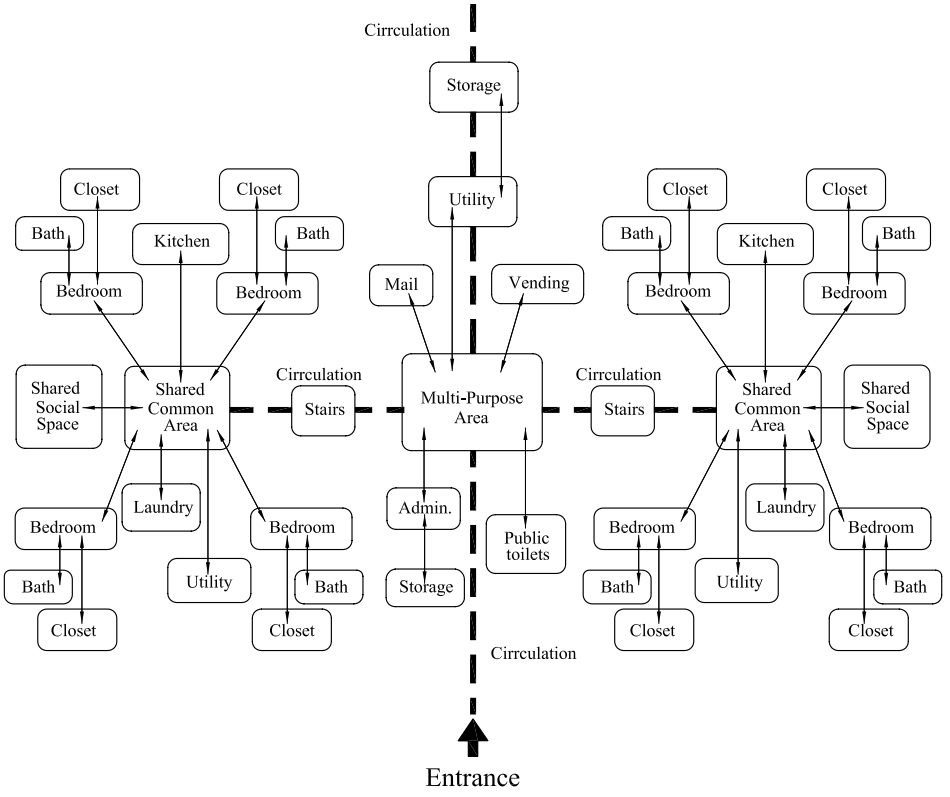
Successful dormitory designs require well-designed outdoor spaces integrated with the dormitory building. There are two basic categories for outdoor spaces:

### Sports Areas

- Football and soccer fields
- Ball diamonds
- Basketball courts
- Tennis courts
- Open space for informal sports activities

### Other Recreational Areas

- Outdoor seating areas
- Barbecue grills
- Gazebos
- Picnic tables
- Patios and decks




Dormitory Functional Relationship Diagram figure 9

## 2. Building Configuration

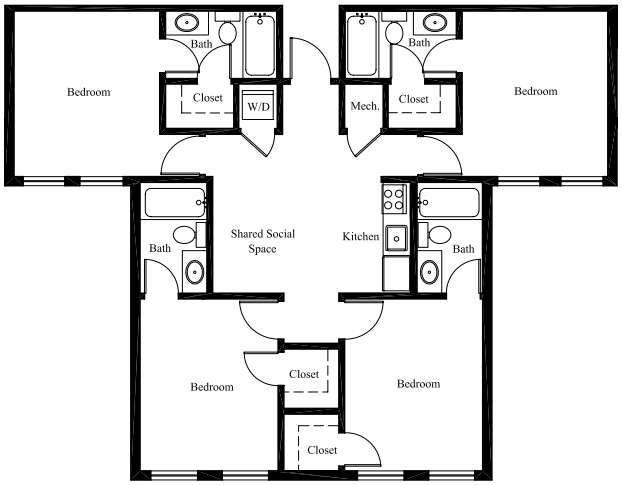
The three basic functions are linked together by circulation spaces, and the functions are typically arranged in one of three configurations:

- Undistinguishable within a major architectural form
- Configured as connected components
- Contained in separate structures

Additionally, there are three types of circulation to dormitory rooms that apply to Permanent Party Enlisted Dormitories:

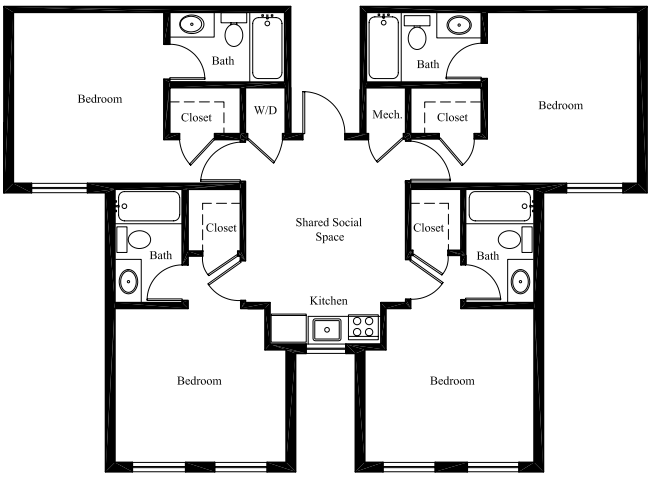
- **Corridor Access:** access from interior double-loaded corridors
- **Balcony Access:** access from exterior balconies or sidewalks
- **Breezeway Access:** access from breezeways in a garden apartment arrangement

Figures 9a – 9j show typical module plans and building configurations for each type of facility. These are the basic building blocks from which permanent party enlisted Dormitory programs are developed. These designs are not mandatory standards, but are provided to serve as examples and to illustrate critical design issues. The module layout may vary provided that the required Net Living Area, minimum dimensional clearances, and maximum gross building area conform to established criteria.



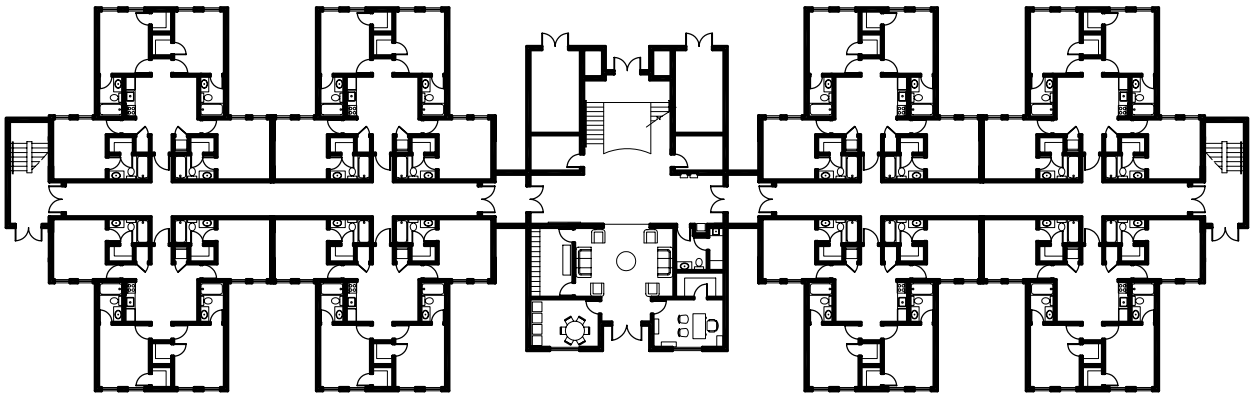

Net Living Area 12.0 $m^2$

Corridor Access Floor Plan Figure 10a

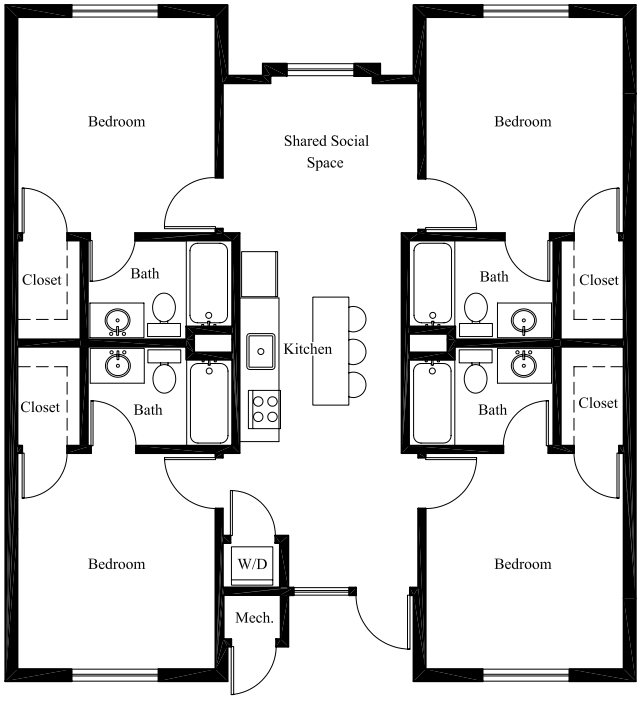



Net Living Area 12.0 $m^2$

Corridor Access Floor Plan Option Figure 10b

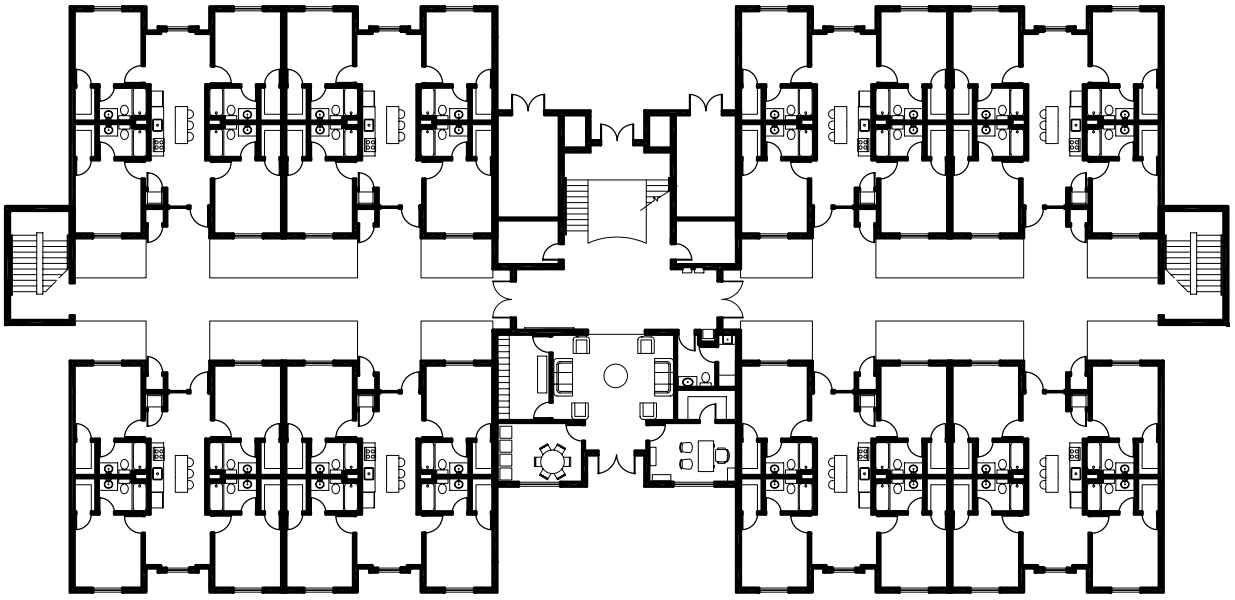


Corridor Access Building Plan Figure 10c

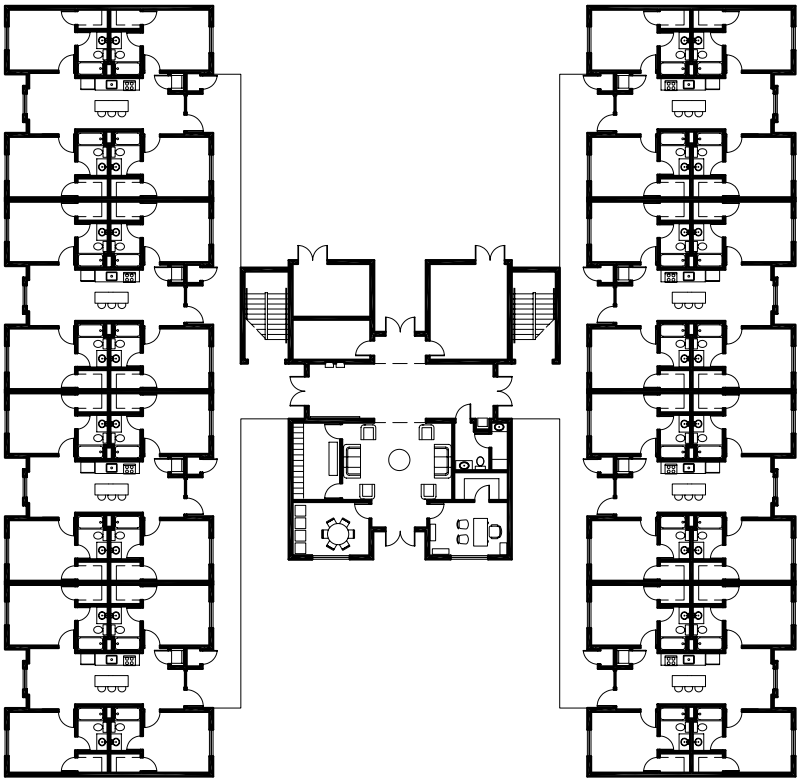



Net Living Area 12.2 $m^2$

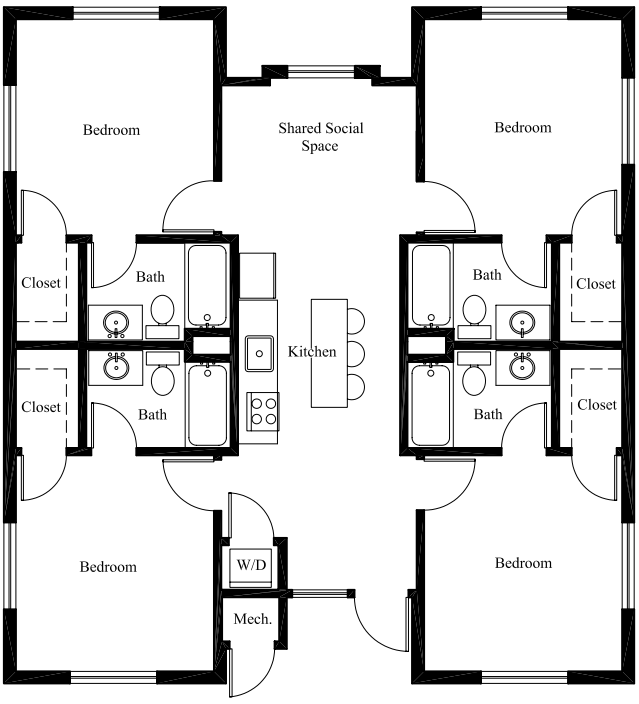
Balcony Access Floor Plan Figure 10d



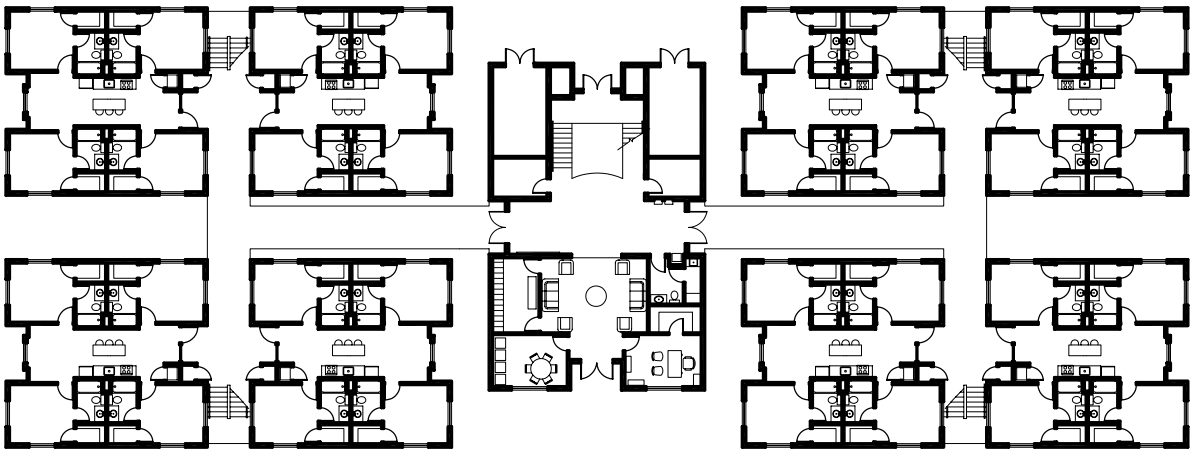
Balcony Access Building Plan Figure 10E



Balcony Access Building Plan Option Figure 10F




Breezeway Access Floor Figure 10g



Breezeway Access Building Plan Figure 10h

Balcony Access dormitories with private access to individual living units from exterior balconies or sidewalks may give the perception of increased privacy. They convey a feeling of an individual apartment rather than the hotel-like feeling presented by a Corridor Access dormitory with interior double-loaded corridors. Balcony Access dormitories can benefit aesthetically from the articulated facades created by balconies. Corridor Access dormitories usually present a greater challenge to the architect due to their typically flat facades. It is important to note, however, that residents in Balcony Access dormitories tend to close their window coverings to gain privacy from outside walkways. This results in less use of natural light. Balcony Access dormitories have the advantage of more centrally located plumbing systems where toilets are grouped back-to-back down the center of the building without being interrupted by a corridor. In Corridor Access dormitories, the view from living unit windows can be directly to the exterior without having to look across a balcony. Corridor Access configurations generally support interior socialization, while Balcony Access configurations support outside social interaction and interior separation. Breezeway Access style dormitories offer the greatest degree of privacy, since stairways access a limited number of modules. In most configurations, Breezeway Access dormitories have only two modules per floor accessed by each stairway.

Designers should recognize the importance of minimizing the exterior wall area of the dormitory. This practice not only reduces construction costs, but also reduces life-cycle energy costs. The proportions of dormitory buildings are a direct product of the proportions of the dormitory's modules, therefore deeper modules have less exterior wall surface and result in more efficient building footprints that can be constructed on smaller sites.

### 3. Interior/Exterior Relationships

A holistic approach to dormitories is vital to insure that the site and the building relate properly to each other. Site circulation must directly interface with the building circulation, exterior social spaces should be designed where possible to be extensions of interior social spaces, and main building entrances should be carefully coordinated with sidewalk, parking, and roadway configurations.

Force Protection construction standards referencing building set back distances from parking and roadways must be incorporated during this coordination process.

### 4. Privacy/Social Interaction

Privacy for residents is an important design factor, but must be tempered with the concept of "buddy care." Dormitories serve as homes for the residents, and should be designed in as much as practical to avoid an "institutional" appearance or feeling. Corridor Access dormitories offer a moderate degree of privacy since the living/bedroom areas are typically somewhat buffered from the central hallway by kitchens, baths, and closets. Balcony Access dormitories with direct exterior access for each resident have the perception of offering a greater sense of privacy, but must consider the circulation on the balcony that is directed past the resident's only window. Breezeway Access garden apartment style dormitories offer a greater degree of privacy by limiting the number of modules accessed by a single stair, reducing noise and pedestrian traffic. Shared social space

within the 4-person module is a functional requirement for Air Force Permanent Party Enlisted Dormitories, but designers should strive to achieve a balance between the social space and the privacy of each bedroom.

## 5. Noise Considerations

Give attention to the separation of noisy areas (game rooms, television rooms, outdoor recreation areas, and laundry rooms) from quieter spaces (residential rooms and study rooms). Design non-public support areas (utility spaces, trash collection and mail service access) to avoid conflict with public residential functions.

## 6. Architecture

Andrews Air Force Base

### Mass and Scale

Architectural scale is defined as the comparative relationship of a structure or space to the human form. People perceive a sense of personal comfort based on influences from the physical environment. Environments that enable a person to feel comfortable and accepted as a part of the environment are considered to possess a human scale. The relative proportions, height, form and volume of a building or space, as well as its formal relationship to other buildings or spaces, contribute to achieving this sense of scale. Dormitories should provide a residential environment with an architectural scale that imparts a clear sense of relative comfort, ease, and satisfaction. This can be achieved by using standard residential ceiling and windowsill heights, avoiding oversized entrance canopies, structural elements, and other artificially oversized building elements.

Building mass is defined as the overall bulk or total volume of space a building occupies. Large buildings such as dormitories, aircraft hangars, and maintenance facilities often have a greater 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 enables a blending of facilities in terms of form, proportion, and perceived size. The size, shape, proportion, repetition, and placement of design features such as fenestrations, roofs, and columns, etc., are elements that combine to project the architectural character and mass of a building.

### Architectural Compatibility

The architectural character of the facility must be in context with its surroundings. The facility must 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 base architectural compatibility standards available at most installations. 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 a respect for local and regional design and architectural characteristics. The following elements are part of a successful design solution:

Well-designed dormitories respect the characteristics of the built environment in the local region through compatible architectural style, choice of construction techniques and materials, and form. Some of the local influences that affect regional character fall in these categories:

- Historic
- Cultural/Traditional
- Topographic
- Climatic

Architectural compatibility and appropriate proportions can be achieved by integrating a vocabulary of scales, forms, color palettes, and materials that blend with and respect the built and natural environments. The result is a combination of facilities that complement 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.

### Windows

All living areas and places of assembly must have operable windows to provide natural ventilation. Use tight-fitting, insulated, commercial-grade windows for dormitories. Light-duty residential grade windows are not acceptable. Windows and glazing shall meet force protection construction standards minimum requirements. Low emissivity (Low E) double pane glazing is recommended for increased thermal performance, ultraviolet retardation, and maximum light transmission. Install heavy-duty insect screens on all operable windows. Size windows at between 10 and 15 % of the floor area they serve. Windows serving residential units must be operable and sized for emergency egress. All windows must be compatible with the type of window coverings to be used, and shall allow ease of maintenance, such as tilt-out features.

### Doors

All exterior doors shall meet force protection construction standards minimum requirements. For privacy and force protection, dormitory entrance doors should be locked with access by residents only, keyed to match module locks also. Doors must be fully weather-stripped, include a heavy-duty metal threshold and minimum ½" grade change to prevent drafts, dirt, water, and insect entry, and must be thermally insulated. Entry doors for dormitory modules should be sound-insulated and must have a peephole for viewing visitors. Consider keyless (credit card type) locksets for all module entry doors. Consider a doorbell and/or intercom/buzzer access at module entrances. Entry doors should be 900 mm (3'-0") wide, closet and bath doors

should be a minimum of 600 mm (2'-0") wide, and doors between living/sleeping areas and common areas should be a minimum of 750 mm (2'-10") wide. Do not use hollow core wood doors, bi-fold doors, or pocket doors in dormitory construction. Provide doorstops throughout and provide blocking in walls as required.

### Moisture Control

Special construction considerations, not limited to HVAC systems, are required for dormitories in humid areas. Refer to *Engineering Technical Letter (ETL) 93-2, Dormitory Criteria for Humid Areas* for specific guidance.

Buckley Air Force Base

### Exterior Finish Materials and Systems

Select reliable, conventional building systems for dormitories, and use building materials and finishes that are durable and easy to maintain. Architectural systems must be selected based on their aesthetics, simplicity, economic characteristics, and compliance with installation architectural guidelines. Designers must consider durability, functionality, economy, low maintenance requirements, and architectural compatibility when selecting exterior finish materials. Many dormitories are constructed of load-bearing CMU exterior walls with a brick veneer finish. Other dormitories are built with single-wythe split faced or ribbed CMU. In both cases, the CMU wall is furred with gypsum board on the interior of the modules. Some dormitories have successfully utilized exterior insulation finish systems (EIFS) as the primary exterior wall finish. While this is a good system in terms of thermal performance, integral color, and moisture penetration, designers must specify heavy-duty reinforcing mesh at all areas subject to impact damage. Exterior insulation finish systems require tightly written specifications to ensure proper installation, materials, and details, including provisions to limit exposure to finished grade.

### Roofing

Unless the installation's architectural compatibility standards state otherwise, all dormitories should have sloped roofs. Sloped roofs not only ensure positive drainage, but also impart a more residential image than do flat roofs. Standing seam metal roof systems have excellent performance characteristics, but must be in context with the installation's architectural compatibility standards. Restrict the use of concealed gutters on standing seam metal roofs because of problems with water shedding. Consider ice and snow hazards when locating sloped roofs over building entrances. Composition shingles and clay tile roofing may also be appropriate. Avoid using tapered roof insulation to achieve slope.

## 7. Functional Area Requirements

This section presents criteria applicable to the design of each functional area of an enlisted dormitory. These include:

- Private Living/Bedroom Area (4 per module)
- Private Bathroom (4 per module)
- Private Vanity & Sink (usually located in bathroom)
- Private Closet (4 per module)
- Shared Common Area (one per module, shared by 4 persons)
    - Shared kitchen (one per module, shared by 4 persons)
    - Laundry Facilities (in module)
    - Shared social space (one per module, shared by 4 persons)
- Utility Space (mechanical, electrical, data, communications and plumbing)
- Mail Service (can be located outside if appropriate and as coordinated with force protection requirements—required where USPS delivers to base housing)
- Vending (optional)
- Circulation Space (amount depends on building design)
- Janitor's Closet with Housekeeping Storage
- Public Restrooms
- Administration Area/Space (not required where Dorm Managers are located elsewhere)
- Multi-Purpose Space(s)

Primary design considerations are presented for each functional area indicating the anticipated use, performance, organization, character, and relationships of specific areas. Criteria are included herein for size and critical dimensions, storage requirements, furnishings and equipment, and other technical requirements.

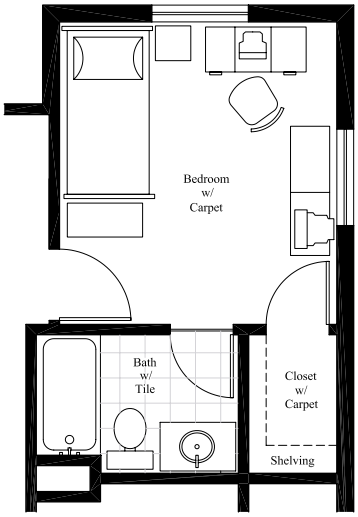
### Living/Bedroom Area

This area is the net living space for one E1 through E4, and is shown graphically by the shaded areas in Figures 5a and 5b. Consider the following:

Typical Bedroom

- Ceiling height must be at least 2440 mm (8'-0"). Do not use lay-in acoustical tile ceiling systems.
- If CMU construction is used for exterior walls or interior partitions, it must be furred with 13mm ($^1/_2$") or thicker gypsum wallboard, or plaster/lath veneer.
- Provide wide-angle peepholes and deadbolts on all module entrance doors.
- Provide automatic door closers on entrance doors for Corridor Access dormitories. Balcony Access and Breezeway Access entrance doors do not require automatic closers.

- Provide an entry door lockset with an integral deadbolt and master entry capability (either by key or card, at local option). Corridor Access dormitory entrance doors require sound insulation. Exterior doors require thermal insulation.
    - The minimum dimension of the living/bedroom area should not be less than 3048 mm (10'-0"). Minimize doorways or openings in perimeter walls of the living/bedroom area in order to enhance flexibility in furniture arrangement. See Figure 10 for typical living/bedroom layouts.
    - Ceiling fans with integral light kits may be provided in each living/bedroom area.



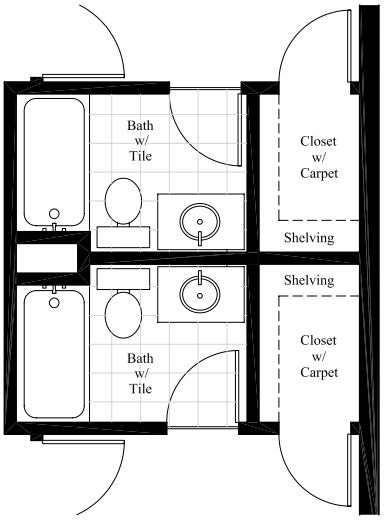

Typical Living/Bedroom Area Figure 11

### Vanity Area and Bathroom

Each resident shall have a private vanity, located within the bathroom (preferable), in the living/bedroom area, or in its own dedicated alcove. Plan this area to make the most efficient use of very limited space. Include the following:

- Provide a full-length mirror on the vanity side of the door leading to the closet if within the bathroom, on the inside of the bathroom door if the vanity occurs within the bathroom, or on the inside of the closet door if within the bedroom.
- The vanity must be at least 762 mm (30") wide and must have an integral bowl, countertop, and integral backsplash. The vanity counter top should be 787 mm to 914 mm (31" to 36") above the floor.
- Where space permits, vanity base cabinets should contain a minimum of two 200 mm wide by 75 mm high (8" x 3") drawers with the remaining area under the vanity given to storage accessed by cabinet doors. Where the lavatory bowl prevents providing drawers, provide access under the sink by cabinet doors.
- Provide a full width mirror above the vanity, with top of mirror a minimum of 1829 mm (72") above the floor finish. The bottom of the mirror should extend to the top of the backsplash. Provide a residential incandescent light fixture providing at least 75 foot-candles illumination above the mirror This fixture may have single or multiple lamps.

- Install one medicine cabinet with at least 10,618 $cm^3$ (648 cubic inches; nominally 12"W x 18"H x 3"D) of interior area adjacent to the vanity, hinged next to mirror. At least three adjustable interior shelves are required. The medicine cabinet doors should be finished to match the vanity base.
- Provide a duplex GFI convenience outlet near the mirror. Size circuits to accommodate 1600-watt hair dryers, etc.
- Provide a single-lever ceramic cartridge washerless faucet at each lavatory.
- A shower/tub combination is preferred in all private bathrooms. Major Commands may elect to specify showers only, but must consider the height of the curb to avoid leakage problems. Use enameled cast iron or steel tubs. Glass fiber reinforced tubs are not allowed. Glass shower doors mounted on tubs are not encouraged due to increased maintenance and cleaning requirements. Provide a heavy-duty shower curtain rod.
- Provide a showerhead with mounting hardware that allows height adjustment over a wide range. Consider heavy-duty hand-held showerheads connected to a flexible hose that fits into an adjustable-height holder mounted on a vertical rod.
- Provide two towel bars, each at least 600 mm (24") long. One should be located convenient to the vanity, the other convenient to the shower/tub combination. Placement should avoid door swing area.
- Provide one robe hook on the bathroom side of the bathroom door.
- If practical, provide a wall mounted storage cabinet with doors and at least one adjustable shelf above the wainscot over the water closet. The finish of this cabinet must match the vanity.
- Provide a heavy-duty, recessed ceramic, wall mounted toilet tissue holder near the toilet.
- Allow space beside the toilet for a plastic trashcan, 7-liter (7.4 quart) minimum capacity.




Typical Bathroom Plan Figure 12

### In-Room Storage

Each living/bedroom area must have a minimum of 2.3 $m^2$ (20 SF) of net closet space. This requirement is met with a single walk-in closet measuring approximately 1500 mm by 1500 mm (4'0" x 5'0"). Access from the closet should typically be from the bedroom. In renovations where pre-existing conditions limit closet configurations and/or new construction has limited design constraints, access may be provided from within the bathroom. Allow for adequate ventilation of both rooms and properly seal around the closet door. Where ceiling height allows, consider raising closet ceilings to maximize storage volume.

Closets must have minimum interior dimensions of 600 mm deep by 1050 mm wide by 2250 mm tall (24" x 42" x 90"). Provide solid core wood doors with heavy-duty builder's hardware, lockset keyed to match bedroom entrance door lockset. Provide at least one clothes rod with a shelf above in each closet. The total length of hanging space must not be less than 2400 mm (8'0"). Provide heavy duty closet organizers, braced into wall studs. Closet organizer systems that have double clothes rods and shelves are highly recommended to maximize the efficiency of closets. Space may be provided in the lower part of the closet for movable drawer units that are moved out of the closet into the living area at the resident's option. Designers may consider increasing the in-room storage closet size to accommodate the dormitory's bulk storage requirements, therefore eliminating dedicated bulk storage areas.

## Shared Common Area

### Kitchen

The kitchen provides residents with a quality of life amenity similar to enlisted personnel occupying military family housing or living off base. Four E-1 through E-4s will share the kitchen. All built-in equipment must be purchased with MILCON funds. Freestanding equipment is purchased from other appropriations. As a general rule of thumb, appliances that are simply set in place and plugged in are purchased with equipment funds, whereas "built-in" appliances are purchased as part of the construction with MILCON funds. Appliances may be gas or electric as determined by local requirements. See Figure 13 A – I for a typical shared kitchen.

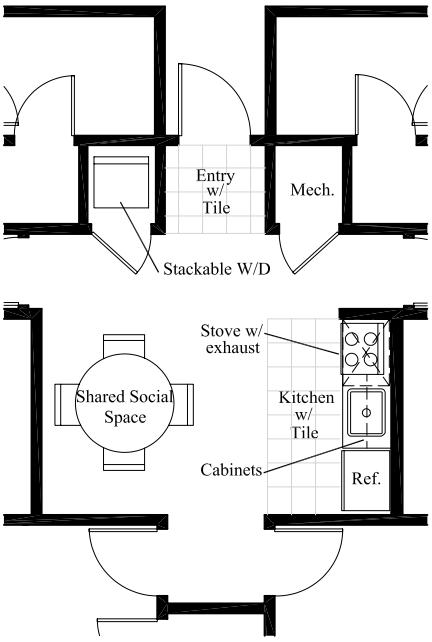
The following requirements must be met in the design of the kitchen:

- Provide a frost-free energy saver refrigerator with a separate freezer compartment and ice maker. Recommended size is 25 cubic foot.
- Provide a double-bowl stainless steel sink. Consider using a "sink-and-a-half" design having one large bowl with a smaller bowl connected to a disposer. A disposer is required except in locations where they are illegal. Provide a gooseneck single lever faucet.
- Dishwashers are not recommended but are optional if funding allows.
- Provide at least two duplex outlets above the backsplash. These outlets must be GFI if they occur within the specified distance from the sink as defined in the latest addition of the National Electric Code. These outlets are in addition to those required for the range, refrigerator, range hood, oven, microwave/convection oven, or disposer.

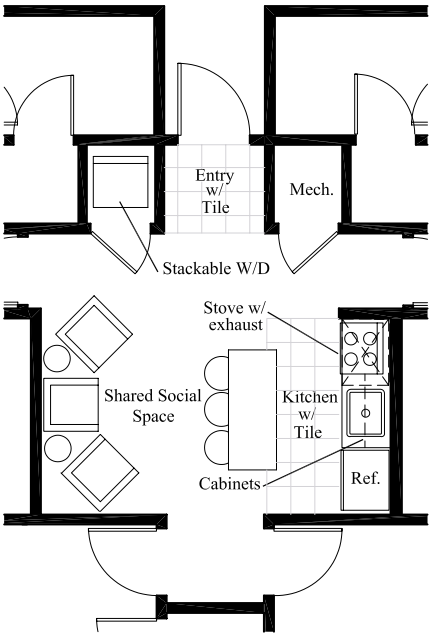
- Provide a built-in or shelf-mounted combination microwave/convection oven. Conventional ovens are not required due to the functionality of the microwave/convection oven, but are optional, based on local requirements.
- Provide an electric cook top, 2-burners minimum, based on local requirements.
- Provide a range hood with a light and fan. Positive ventilation to the exterior is required for all newly constructed Enlisted Dormitories. Ducted exhaust hoods are recommended for renovation projects as well, but ductless fans with re-circulating fans and proper filters are acceptable when warranted by existing building conditions, and when allowed by local building or fire protection codes.
- An operable window is desirable but not mandatory in kitchens.
- The following cabinet and countertop dimensions are recommended, but may be reduced where space is at a premium:
    - Provide at least 900 mm (3'0") of wall cabinets in the kitchen. Also provide 900 mm (3'0") of base cabinets.
    - Provide at least 600 mm (2'0") of counter space adjacent to the sink. The countertop should have an integral backsplash.
    - Provide fluorescent task lighting of at least 75 foot-candles under wall cabinets, and provide either an incandescent or fluorescent ceiling light fixture(s) on the ceiling of the kitchen area, providing between 50 and 100 foot-candles ambient illumination.
- Designers should consider the use of pre-manufactured "Compact Kitchens" to maximize kitchen efficiency and make best use of limited space. Each component should be independent, though, to allow for replacement or repair.
- Provide a fire extinguisher, mounted in an easily accessible location to the cooking area.

## Shared Social Space

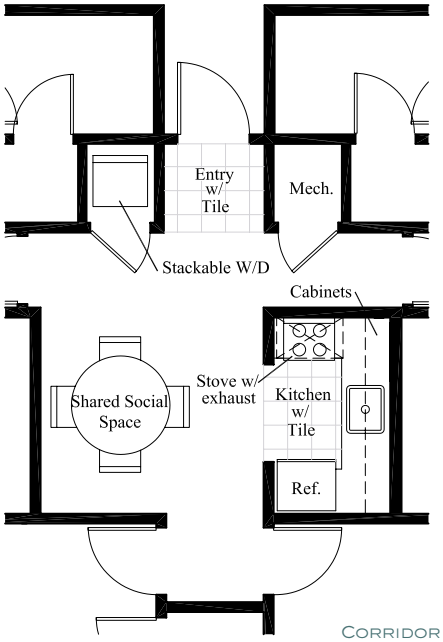
The shared social space provides residents with a common living area to relax together and watch television, eat meals, study and/or play games. This area is located adjacent to the kitchen and laundry areas, enhancing quality of life for the residents, while provide an apartment type setting encouraging interaction and relaxation.



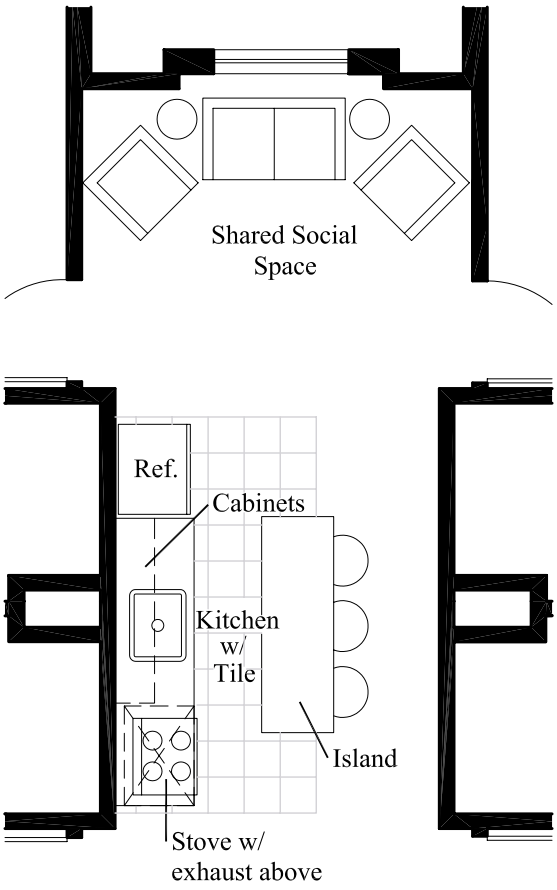

Corridor Access Shared Common Area
Plan option Figure 13a



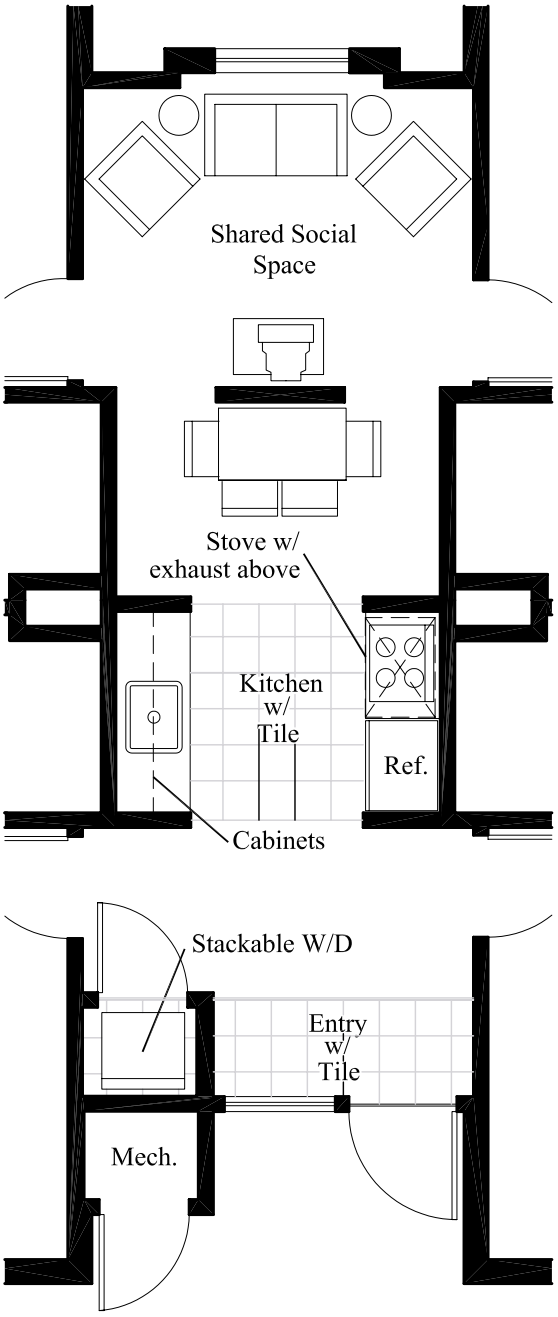

Corridor Access Shared Common Area
Plan option Figure 13b



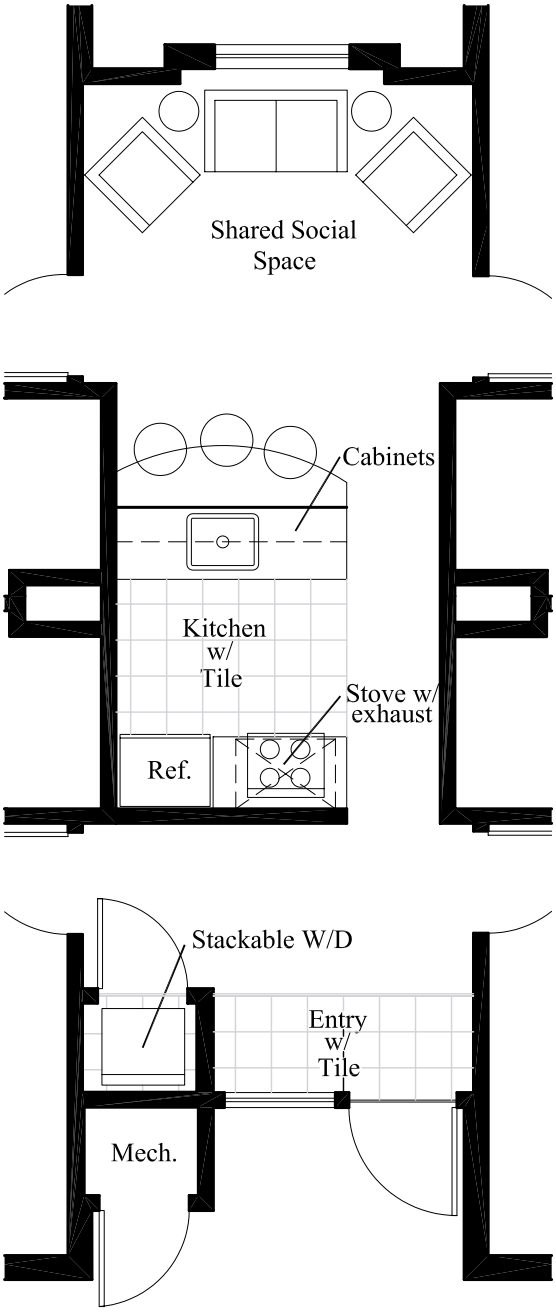

Corridor Access Shared Common Area
Plan option Figure 13c



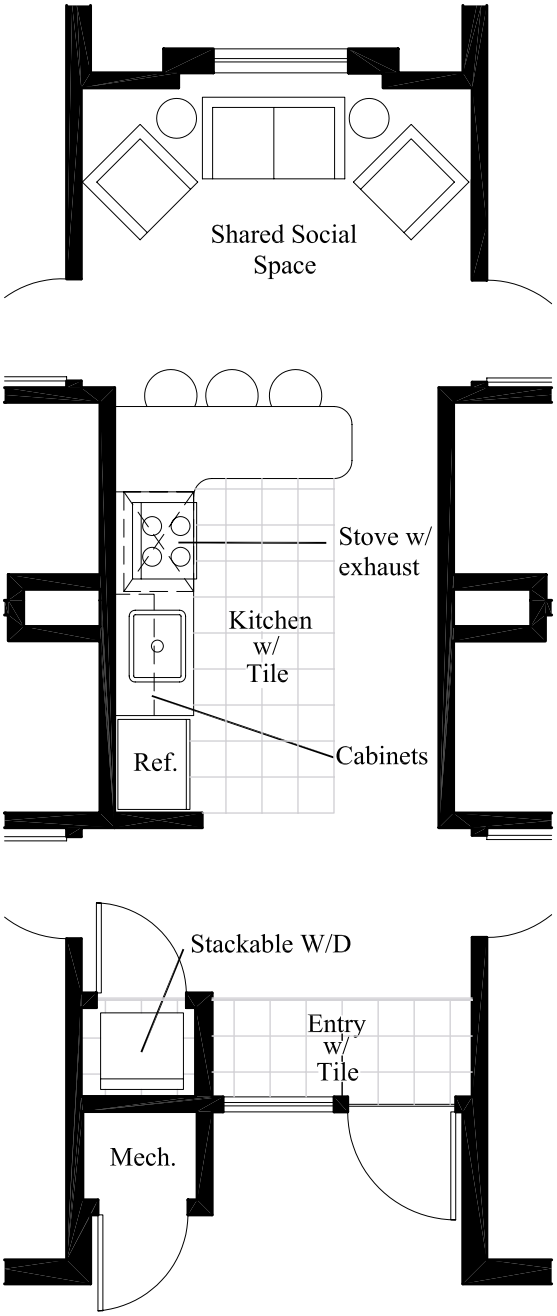

Corridor Access Shared Common Area Plan
Option Figure 13d



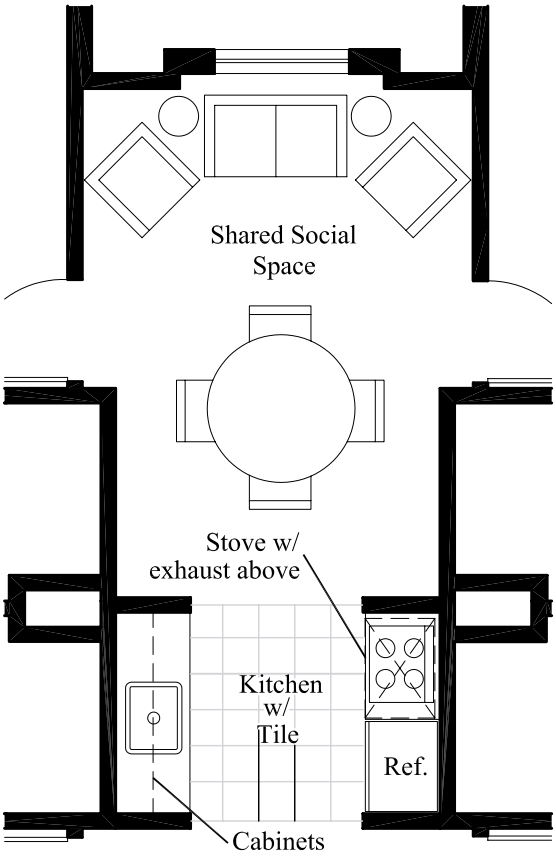

Corridor Access Shared Common Area Plan
option Figure 13e



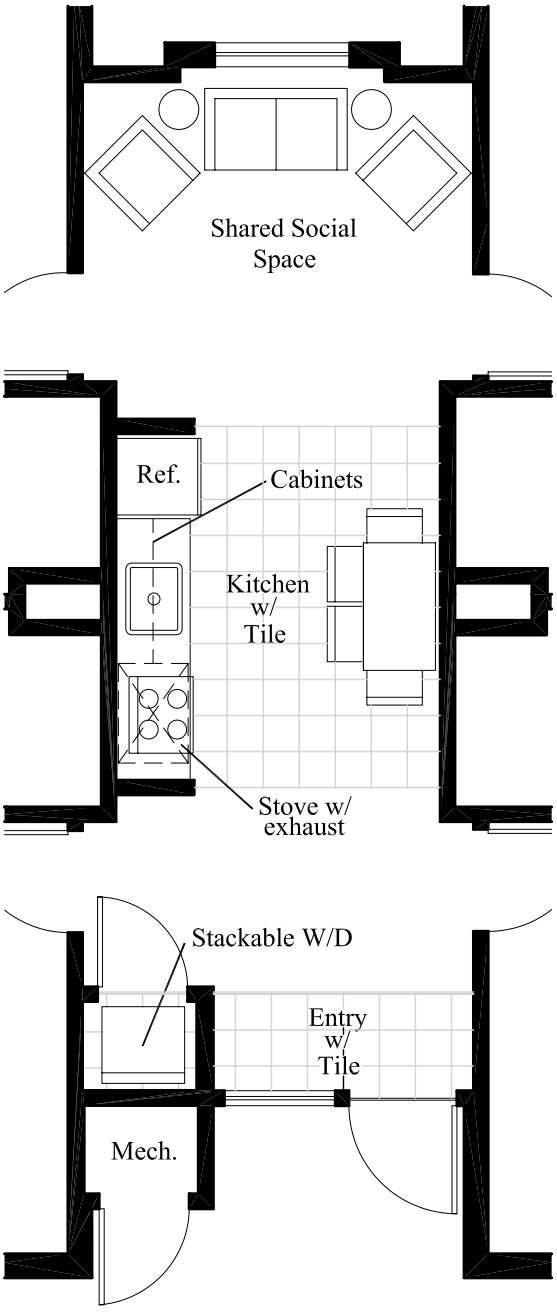

Balcony Access Shared Common Area Plan
Option Figure 13f




Breezeway Access Shared Common Area Plan
Option Figure 13g




Breezeway Access Shared Common Area Plan
Option Figure 13h




Breezeway Access Shared Common Area Plan
Option Figure 13i

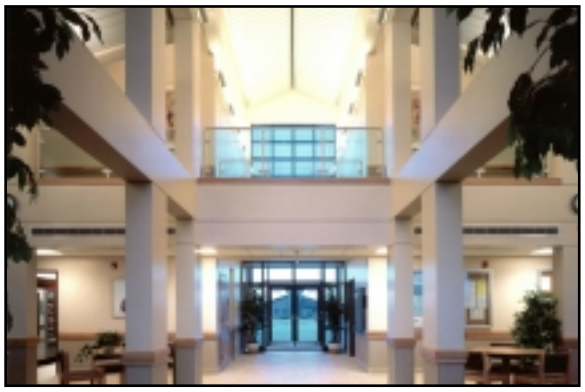
### Laundry Areas

Provide 1 washer-dryer set inside the common area of each module, side-by-side or stacked. While in-module laundry is preferred, centralized laundry facilities are optional. Washer/dryer ratios in centralized laundry rooms shall be 1 washer/8 residents and 1 dryer/6 residents.

Designers must carefully address noise isolation, acoustics, humidity, ventilation, and temperature control.

Other laundry area considerations:

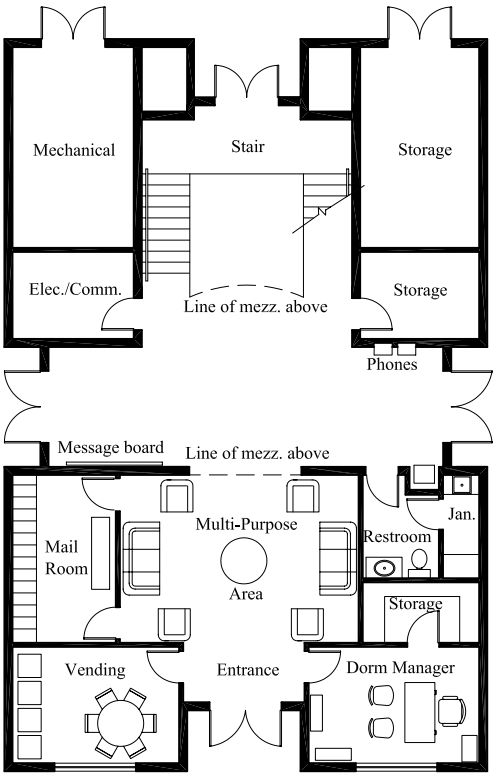
- Conceal all utilities from view, yet provide easy access. Mount utility connections 900 mm (36 inches) above the floor. Design straight-run venting of dryers to avoid lint clogs.
- Provide floor drains for each washer, in addition to the drain in the wall-mounted box.
- Consider providing one recessed, cabinet-mounted fold-down ironing board in the common area of each module, convenient to the laundry area.
- Consider providing a wall-mounted storage cabinet above side-by-side washers and dryers, to match quality and finish of kitchen cabinets.



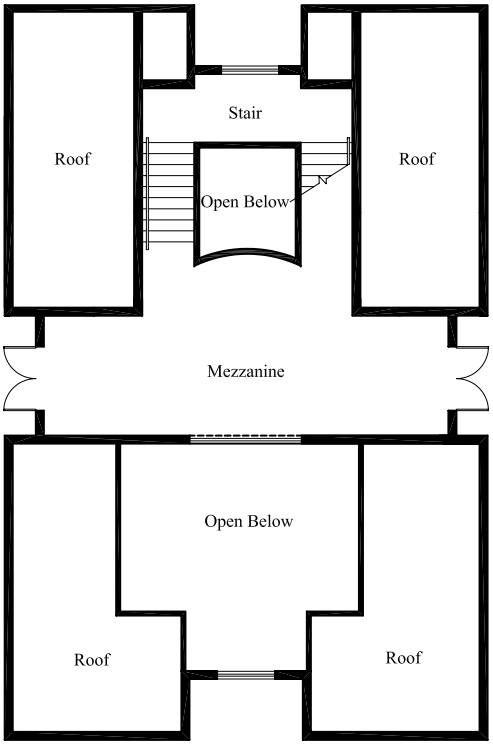
Buckley Air Force Base

### Consolidated Support Facilities

See Figure 14 for a typical support facility containing multi-purposes space, including vending area, administration office, game room, television room, and public toilets. It is very important that these centralized spaces be designed as an integral part of the dormitory even though they may be configured as a separate structure. Designers should encourage social interaction by ensuring circulation patterns pass through the consolidated support facility such that residents routinely are exposed to these common areas as they go to and from their rooms. Consider and coordinate the use and location of recycling centers throughout the common areas to compliment the interior design while supporting sustainability guidance.




Typical consolidated Support Facility
Ground Floor figure 14




Typical consolidated Support Facility
Second Floor figure 14

## Multi-Purpose Space

Multi-purpose space includes study/meeting rooms, game rooms, television rooms, workout rooms, public toilets, administration area, mail, vending and utility areas. Distribute multi-purpose spaces throughout the dormitory, or consolidate them into one larger space on the first floor that allows for several uses. Consideration must be given to the location of the area to avoid undesirable noise and traffic, while providing the ability to secure the area and/or electronics and equipment as necessary. It is important to locate these spaces to encourage social interaction between the residents. Plan acoustics, lighting, and furnishings to create an environment conducive to the intended activity. Many residents own televisions; therefore, the need for a television room must be evaluated on a case-by-case basis. Provide dimmable lighting and window treatments to control glare in television rooms.

Anticipate the type of activities provided in the design of game rooms. Most game rooms are designed to accommodate pool tables and/or Ping-Pong tables. Acoustically isolate game rooms from television rooms, as well as residential and study areas because of the typically high noise level. Locate the game room and television room near the public phone alcove and or the vending area to encourage use and social interaction. Provide drinking fountains adjacent to multi-purpose spaces as required.

Television, workout and game rooms are often subject to hard use. Select finish materials accordingly. Provide durable wall finishes such as sisal wall covering, natural stone, brick or integrally colored split face block, or wood on the walls of these rooms. Avoid the use of suspended acoustical ceiling systems in game rooms as they have a tendency to be damaged by pool cues.

Buckley Air Force Base

Buckley Air Force Base

Typical Mail Room

## Mail Service

Where mail is delivered to the dormitory, provide one United States Postal Service approved tamper-resistant mailbox per resident. Each mailbox must have minimum dimensions of 150 mm wide by 125 mm tall by 390 mm deep (6" x 5" x 15-½") and must be key lockable or combination lock as coordinated with the postal service. Consider the likelihood of vandalism in proposed mailbox locations and design accordingly. Do not provide mail slots in individual dormitory rooms. Where space and dormitory size permits, group the mailboxes together into one consolidated unit. The mail service may be located indoors on the first floor of a dormitory building or in an outdoor covered area, gazebo, or where quantity warrants, even a separate enclosed building. The location and configuration of mail service areas must be closely coordinated with force protection requirements, which may preclude location within the dormitory building, or will require the mail room to be located on an exterior building wall.

Coordinate the proposed location for mailboxes with base information managers, who, in turn, should coordinate with the local United States Postal Service and/or mail delivery contractors. The location of mailboxes may be driven by traffic flow, building configuration,

security requirements, and agreements with the USPS and/or contracted delivery services. Landscaping considerations are required for mailboxes located outside of a building.

While mail service must be relatively convenient to the residents, major emphasis must be placed on providing convenient and efficient delivery and pick up. Avoid locating boxes where residents retrieving their mail will become an annoyance to other residents. In large dormitory complexes, it may be desirable to locate several groupings of mailboxes in a number of locations. Provide overhead protection for boxes located outdoors, and consider the impact of adverse weather on mail delivery and pick up. Parcel lockers are not required. Residents will pick up large packages at the Base Post Office.

Mailboxes added to an existing dormitory should be well integrated into the design to appear as an original feature rather than an afterthought. Programmers and designers should refer to HQ USAF letter, 13 October 1995, *Mail Delivery Service for Unaccompanied Personnel Housing*, for more information.

### Vending Area

Provide a vending area near the multi-purpose spaces on the first floor of the dormitory building or in the consolidated support facility as required. This space is optional based on local requirements. Provide space and utility connections for ice and vending machines, number to be determined by individual base requirements. Where provided, icemakers should be sized based on 136 kg (300 pounds) for each 200 residents. For larger dormitories, vending areas may be distributed throughout the facility.

### Administration Area

For most Permanent Party Enlisted Dormitories, the administration area consists of a single office for the facility manager. Locate this office on the first floor for the convenience of residents and visitors. They are typically located near the main entrance to the building. Provide a recessed, wall mounted, lockable key storage box in this office (if required) for storage of spare room keys for each room. Some bases collocate their dormitory managers with their housing managers in a location separate from the dormitories. To account for this situation, the space for the administration area has been included in the total area programmed as "Multi-purpose" space.

### Utility Space

Utility spaces include mechanical rooms, electrical and telephone closets, janitor closets, storage closets, outside storage, and supply storage rooms. Address the following:

- Locate mechanical rooms to control noise and vibration and allow for efficient utility distribution. Mechanical rooms are generally best located adjacent to laundry facilities. Give special attention to the reduction of noise and vibration transfer.
- Electrical and communications rooms introduce little conflict with living units and should be located as required throughout the dormitory for efficient utility distribution.

- Plan access to mechanical, electrical, and communications rooms so that minimal disruption of residents occurs when these spaces require service and access is restricted by residents. Provide access from the exterior of the dormitory whenever possible.
- Locate a janitor closet on the first floor of all dormitory buildings and on each floor of Corridor Access dormitories. Balcony Access and Breezeway Access dormitories require janitor closets on each floor only if public areas such as laundry rooms or television/game rooms are provided on that floor. Provide each janitor closet with a deep service sink, a mop strip, a floor drain, and wall-mounted shelves for storage of cleaning supplies.
- Provide storage closets where needed. These are most often required near public spaces such as television and game rooms for storage of game equipment, etc.
- An outside storage room is recommended for each dormitory building for storage of grounds and building maintenance equipment and supplies, such as lawn mowers, snow removal equipment, garden tools, gasoline, and paint. Determine the types of materials to be stored and design accordingly for the associated fire hazard classification and ventilation requirements.
- A supply storage room is recommended for storage of vacuum cleaners, supplies, etc. Ideally, locate this room on first floor and adjacent to the administration area. The recommended size for this room is about 23.22 $m^2$ (250 SF).

### Bulk Storage

Provide bulk storage per dormitory based on local conditions. Designers may consider increasing the in-room storage closet size to accommodate the dormitory's bulk storage requirements, or provide a separate storage room per module, thus eliminating dedicated and centralized bulk storage areas. Recommend 1 storage cubicle/area per 4 person module, quantity to vary based on local requirements. Each storage cubicle or area should be a minimum of 2 $m^3$ (70.6 CF), and should be lockable, keyed to match module entrance lockset.

### Public Toilets

Where public spaces occur on the first floor of a dormitory, provide accessible toilet facilities for use by visitors and residents. Provide convenient access to these toilets from multi-purpose areas. Design these toilets to accommodate the needs of persons with disabilities. Provide one lavatory and one toilet in each visitor toilet. In smaller dormitories, this requirement is met by one room with a privacy lock on the door to allow use by both males and females. Use separate men's and women's toilets in larger facilities where higher use is anticipated. Provide commercial quality toilet accessories in the visitor toilets. These include a recessed paper towel dispenser/trash receptacle, toilet tissue holder, soap dispenser, grab bars, and soap dish.

### Circulation Space and Entryways

- Avoid an institutional appearance for interior corridors in Corridor Access dormitories. This is accomplished by using wall-mounted light fixtures and wall and ceiling articulation to help alleviate the "tunnel effect" of a long corridor. Recess all wall-mounted accessories other than the light fixtures, such as fire extinguisher cabinets. Except for emergency pull boxes, ensure that all fire extinguisher cabinets, hose boxes, electrical boxes, plumbing chase covers, etc. are finished to match, or at least coordinate with the surrounding surface.
- Introduce natural light into interior circulation spaces where possible.
- Provide convenience outlets each 7620 mm (25 feet) on center in interior corridors.
- Exposed ductwork, conduit, etc., is not allowed. Provide utility access doors as required.
- Freight elevators may be provided if the construction budget allows, and are encouraged to facilitate moving of furniture and appliances. Provide a stainless steel interior finish to provide durability and ease of maintenance. Combination freight/passenger elevators are required for dormitories four stories or more in height.

## 8. Interior Design

See Table 4 later in this section for the Suggested Surface Finish Schedule. For further guidance on interior design standards and criteria, see the *Air Force Interior Design Guidelines*.

### Comprehensive Interior Design

The goal of the designer is to provide a total quality residential facility. This residence will be occupied by either gender and by a diverse age group.

The interior design and architectural design of the facility must be integral and related. All dormitory design projects shall include Comprehensive Interior Design (CID) services. CID services may be provided as part of the dormitory A – E's design package, by a professional commercial interior design service, or by in-house Air Force interior designers. CIDs should reference the base quarters improvement plan (QIP) for base-specific information on furniture styles, color schemes, and project-specific guidance.

### Quality-of-Life

The interior design has a direct impact on the quality of life for the occupants. Interview typical dormitory residents for invaluable feedback. Consider including the residents in design reviews.

Allow flexibility for the facility occupants to personalize their units. This includes freedom in furniture arrangement and display of artwork and hobbies. Give increased attention to the high-tech personal environment that characterizes today's life-styles (computers, audio-visual equipment, cable television, etc).

## Interior Finish Materials and Colors

Select neutral colors for surfaces that will have a long life, such as ceramic tile, laminates, window blinds, solid surface counters, etc., to facilitate future finish material upgrades. Provide a pleasing color scheme in durable finish materials. Use color in non-permanent finishes to add interest and vitality, but do not allow color to dominate the interior environment. Coordinate materials, finishes, color, and texture selection to complement the overall building design and image.

### Recommended Finish Schedule

| Space | Floor | Wall | Ceiling |
|---|---|---|---|
| **LIVING UNITS** | | | |
| Living/Bedroom | CPT | PT, WC | PT |
| Bathroom/Vanity | CT, PT | CT, PT | PT |
| Entrance | PT, QT | PT, WC | PT |
| Common Social Space | CPT, PT | PT, WC | PT |
| Kitchen | PT, QT | PT, WC | PT |
| Laundry Rooms | PT, QT, CT | PT | PT |
| **COMMON AREAS** | | | |
| Entrance | PT, QT | PT, WC | PT |
| Corridors, Stairs | PT, QT | PT, WC | PT |
| Multi-Purpose Area (game rooms, tv rooms, admin, mail) | CPT, PT | PT, WC | ACT, PT |
| Vending | PT, QT | PT | ACT, PT |
| Storage Rooms | SC, QT | PT | PT |
| Toilets | CT, PT | CT, PT, WC | PT |

**LEGEND**

**Floors**

| | |
|---|---|
| CPT | Carpet or Carpet Tile |
| CT | Ceramic Tile |
| QT | Quarry Tile |
| SC | Sealed Concrete |
| PT | Porcelain Paver Tile |

**Walls**

| | |
|---|---|
| CT | Ceramic Tile |
| PT | Painted Drywall or Plaster |
| WC | Vinyl Wall Covering |

**Ceiling**

| | |
|---|---|
| ACT | Suspended Acoustical Tile |
| PT | Painted |

### Carpet

For the latest guidance on carpet, reference *ETL 00-6, Air Force Carpet Standards and the USAF Interior Design Guide.* Carpet with a small pattern, a tweed or random design is required for its appearance retention and durability. A commercial grade level loop carpet or carpet tile with rubber slab carpet is recommended for the living units and public areas. Consider new products with additional wearability and maintenance abilities, and consider recyclable goods. Carpet over cushion should be applied with the double-stick method. If available, factory attached cushion is preferred. Living/bedroom areas have a heavy wear classification for carpet, and public areas have a severe wear classification

### Hard Surface Flooring

Use tile with sealed or epoxy grout in walk-off entrance areas, module bathroom/vanity areas, kitchens and laundry, and other heavier traffic areas of dormitory common areas including corridors, stairs and multi-purpose areas. Quarry tile, ceramic tile and porcelain paver tiles are good alternatives based on location and use. Grout should be sealed immediately following installation and use of epoxy grout should be considered in heavy traffic areas. Grout color should be neutral and medium tone to match color of tile. Avoid white as a predominant color. The option to use commercial grade sheet vinyl is allowable in Pipeline Student Housing only, primarily for main corridors and laundry areas.

### Walls

Exposed concrete masonry units (CMU) are unacceptable as an interior wall finish. The use of natural materials such as stone, brick and wood on the interior can provide a durable finish and provide warmth and texture to the space. Additionally, sisal and other heavier duty materials can be considered in the appropriate areas, such as the Multi-Purpose Area. The use of vinyl wall covering over smooth walls in areas as recommended above is optional. If vinyl wall covering is provided on exterior walls, ensure that the wall is properly designed to avoid moisture problems such as mold and mildew. Accent colors can be used in textiles such as draperies and upholstery fabrics. When walls are painted, a washable, non-glossy product such as an eggshell enamel must be used. Bathrooms, kitchens, laundry area, vending areas, doors and trim work, and services areas should receive a semi-gloss enamel finish. Consider an orange-peel or medium sand finish as appropriate to provide texture. Provide blocking in walls throughout for all wall mounted accessories, including doorstops, bathroom accessories, accessibility requirements, bulletin boards, cue racks, etc.

### Ceilings

Paint ceilings white. Avoid heavily textured acoustical treatments, including a sprayed popcorn ceiling application which is difficult to patch. Do not use suspended acoustical tile ceilings in the living units, as this treatment conveys a non-residential quality and tiles are easily damaged. Coordinate ceiling treatment with lighting selections—consider recessed lighting and soffits. In longer corridors or large areas, such as the Multi-Purpose Area, consider introducing soffits, coves, headers, and varying ceiling heights to provide interest. Emphasize natural light as possible.

### Cabinets and Millwork

Built-in cabinets must be well constructed with sturdy hardware and shall meet the requirements of the Kitchen Cabinet Manufacturer's Association (KCMA) standards. Particleboard may not be used in kitchens, bathrooms or vanities. Cabinet faces shall be solid wood and use a raised panel surface. Recessed pulls are preferred, but may not comply with accessibility requirements applicable to some overseas locations where civilians occupy dormitories. Finishes must be able to withstand frequent cleaning and must coordinate with the other finish materials. Neutral colors are required for cabinets and millwork to facilitate future color scheme changes.

Recommend the use of a non-porous solid surfacing material for countertops and back splashes as possible based on durability and ease of maintenance. Provide full height back splash in kitchen to run from countertop to underside of cabinets above.

### Bathrooms

Use 154.2 $mm^2$ (8 inch square) or 304.8 $mm^2$ (12 inch square) slip resistant ceramic floor tiles or porcelain paver tiles in bathrooms/vanity areas with matching base. Specify a mottled or shaded tile to hide discoloration from detergents, etc. Use ceramic wall tile or non-porous solid surfacing material from floor to ceiling around bathtubs and showers. Grout should be sealed immediately following installation and use of epoxy grout should be considered in heavy traffic areas. Grout color should be neutral and medium tone to match color of tile for ease of maintenance and good appearance retention. Other areas may be covered to wainscot height as possible.

Recommend the use of a non-porous solid surfacing material for countertops and back splashes as possible based on durability and ease of maintenance.

Provide blocking in walls throughout for all wall mounted accessories, including doorstops, bathroom accessories and accessibility requirements.

### Lighting

Dormitories have historically suffered from poor lighting levels, thus designers shall provide a much higher quality light source, light level and fixture selection to enhance new dormitory spaces and their use. Provide a combination of task and ambient lighting in living units. Recommend incandescent lamps as the primary source of illumination, and as used in recessed, table and floor lamps, and wall sconces. Limit fluorescent lighting to utility areas and use color-corrected lamps to provide a warm residential appearance. The designer must be cognizant of lighting for both day and night situations and should emphasize natural light as possible. Consider dimmable lighting in living/sleeping rooms. Coordinate lighting selections with ceiling treatments and consider recessed lighting, light coves, indirect lighting and soffit lighting as alternatives. Provide blocking in walls throughout for all wall mounted accessories including wall mounted lighting fixtures.

### Window Treatment

Mini blinds, vertical blinds, draperies or a combination are authorized. Consider solar conditions when selecting a window treatment. All window treatments must pass *NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. Fabrics for draperies and bedspreads will be inherently flame-retardant. For ease of cleaning, drapery pleats that are either stack pleated, roll pleated, or accordion-type pleated are preferred instead of pinch pleated. The drapery lining must hang independently from the finished drapery treatment. Installation of blackout linings is recommended but optional for all dormitories. Traverse rods and blinds must be of commercial quality. Provide blocking in walls throughout for all wall mounted accessories. Bedspreads must complement the window treatments and carpet color, but need not match exactly since bedspreads are laundered more frequently. Consider installing European style rolladens (roll-up shutters) to provide additional privacy, security, and noise and light reduction.

### Furniture Considerations

Reference the USAF Interior Design Guides for guidance on appropriate Air Force requirements, specifications and recommended manufacturers. All furniture shall match in style and finish per dormitory project, and shall constructed of solid hardwoods and veneers, with steel frames where necessary. Storage shall be maximized, as well as flexibility in furniture arrangement. Beds shall be a minimum 2030 mm (80 inches) long and 990 mm (39 inches) wide, 1372mm (54 inches) wide where space permits. Consider providing under-bed storage. Furniture in the shared common area of each module shall be sturdy, but shall include a combination of dining and/or seating for relaxation, reading, watching television, eating and/or studying. Use individual lounge chairs and love seats instead of sofas to maximize placement flexibility. Furniture in the building public areas shall also be well planned and specified, to allow maximum flexibility and comfort, while encouraging social interaction and use.

Scale and proportion of dormitory furniture is critical based on the gross building and module area constraints. Although durability is critical, traditional large scale dormitory furnishings are not appropriate. The interior designer must coordinate the Comprehensive Interior Design (CID) package during the design process, and should make recommendations on appropriate scale and type of required furnishings based on individual project requirements. Furniture considerations and layout are integral to the success of the room and module designs, and must be included.

Reference *AFI 32-6044, Furnishings Management, Furnishings Standards*.

### Signage, Artwork and Accessories

Provide artwork for all public areas. Graphics and signage must be well designed and coordinated with the architectural style and finish materials. Follow the guidance contained in *AF Pamphlet 32-1097, Sign Standards Pamphlet*.

Fire-resistant silk plants are authorized for public areas. Install chair rails where needed. Provide wall protection for recreational games such as dartboards and billiards. Provide nameplate signage with removable inserts to identify the occupants of each dormitory room or module, and provide an insert to allow a sign that indicates "day sleeper."

## C. Building Systems

Considerable detailed analyses have been conducted in the preparation of this design guide to consider alternative construction types, materials and methods, and cost impacts.

Based on construction type cost comparisons between Type II and Type V, force protection requirements, size and height limitations, and varying climatic issues, analysis shows that Type V construction for Air Force dormitory facilities is not a cost effective option without compromising safety, quality, and durability provided with current Type II construction standards. Thus, dormitory facilities will continue to be constructed as Type II.

Alternative Type II materials and methods are considerations, though, based on new technologies, as well as materials and methods more common in commercial construction, and may be a viable way to lower either initial or long term operational and maintenance costs, reduce construction time and cost, and yet, continue to provide quality construction and enhanced quality of life for the airmen.

Various structural systems and exterior finish systems were compared, roof systems and supporting structures were considered, mechanical systems were researched and lighting systems identified. These recommended alternatives are viable options for new and renovated dormitory construction and are included below.

### 1. Structural

Select an economical structural system based on:

- Antiterrorism/Force Protection requirements
- Facility size
- Projected load requirements
- Subsoil conditions
- Local availability of materials and labor
- Feasibility of prefabrication
- Local construction practices
- Resistance to fire, and wind, snow, seismic, geologic, and permafrost conditions

Antiterrorism/Force Protection requirements applicable to the structural design of dormitories include those found in the *Interim Department of Defense Antiterrorism/Force Protection Construction Standards*. Standard 4, Superstructure of this document calls for design of the structural support system to minimize progressive collapse, attaching all interior ceiling, electrical, and mechanical components to the building structure, and using annealed laminated glass on windows and doors.

Recognize that dormitories are modular and repetitive in nature; therefore, decisions concerning the structural system have substantial impact on construction costs. Coordinate column spacing and layout with the building's floor plan so that columns occur within or in alignment with walls. Keep columns within living spaces to a minimum, and limit them to larger public spaces.

CMU with steel frame construction or systems using bearing walls should be considered as past designs validate their economic advantages, durability and climate resistance. Analyze the proposed structural system to determine if it is the "best value" method to realize the architectural design intent. Larger projects (multi-dormitory campus) or fast track design-build projects should consider the use of precast module units or architectural concrete tilt-up wall systems. Based on new technology and required expertise needed to construct/maintain, these systems are not recommended for single dormitory building application.

Roof systems and supporting structure should consider life cycle costs as well as long term durability and ease of maintenance. Concrete tile roofing systems and metal roofing systems are recommended for typical dormitory construction.

Reference the *Uniform Building Code (UBC)* and the *International Building Code (IBC)* for design load criteria for dormitiories.

## 2. Acoustics

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

- Adjacent living units
- Units on a floor level above or below
- Hallways and balconies
- Mechanical rooms and systems
- Exterior-generated sound, such as aircraft and automobile noise

Walls between living units and between living units and corridors, and exterior walls of living units must have a Sound Transmission Class (STC) of at least 50. Floor and ceiling assemblies must have an STC of at least 55 and an Impact Insulation Class (IIC) of at least 60.

Telephone, cable television, convenience outlets, and mechanical ducts must not compromise the acoustical integrity of wall, floor, or ceiling assemblies. Where fluorescent lamps are used, specify fluorescent lamp ballasts with a sound level rating 'A'.

## 3. Heating, Ventilation and Air Conditioning (HVAC)

### Antiterrorism/Force Protection

Mechanical and utility systems should comply with the *Antiterrorism/Force Protection considerations contained in Standard 6, Mechanical and Utility Systems:* locate air intakes on roofs or above first story, and restrict access to intakes; control access to facility roofs; install emergency shutoff switches for HVAC systems; avoid positioning redundant utilities in the same location or chase; and provide secured access to all supporting facilities and infrastructure systems.

### System Design

The design of the HVAC system must comply with the criteria set forth in *MIL-HDBK-1190, Facility Planning and Design Guide (Sept. 1987), Chapter 10, Air Conditioning, Dehumidification, Evaporative Cooling, Heating, Mechanical Ventilation, and Refrigeration*. The following is provided in addition to, and in cases of conflict takes precedence over, the above guidance.

In humid areas special design and construction considerations are required. These considerations are not limited to HVAC systems. Refer to *Engineering Technical Letter (ETL) 93-2, Dormitory Criteria for Humid Areas*, for specific guidance. Humid areas are defined as having over 3,000 hours of 19°C (67°F) or higher wet bulb temperatures in combination with an outside design condition of 50% relative humidity or higher, or over 1,500 hours of 23°C (73°F) or higher wet bulb temperature in combination with an outside design condition of 50% relative humidity or higher, based on 2.5% dry bulb and 5% wet bulb temperatures.

### System Selection

The selection of the HVAC system is to be based upon the lowest total life cycle costs: include initial costs, operating costs, energy costs, system maintenance and repair costs, and component replacement costs, if not expected to achieve the same life cycle of the systems under considerations. The HVAC system must be designed to ensure that building energy consumption does not exceed DoD energy budget figures. Use of a central plant should be considered for dormitory complexes. A central plant with heating and cooling equipment reduces maintenance and capitalizes on the higher efficiency of larger capacity commercial equipment. Ground-mounted and through-the-wall AC systems may also be considered, as appropriate. Consider the use of renewable energy technologies as part of the selection of the HVAC system or as a supplemental energy source. Reference ETL 94-4 Energy Usage Criteria for Facilities in the Military Construction Program for further guidance. Consider the requirement and/or selection of DDC controls or other types of EMCS systems with base personnel.

### Maintenance

Maintainability of the system is critical to the continued quality of life of the occupants. Access to the systems must minimize disruption to the occupants and maximize servicing efficiency. The mechanical systems must comply with ETL 88-4, Reliability and Maintainability (R&M) Design Checklist. HVAC units will be located within the mechanical closet/space to ensure that filters, controls, drain pans, and condensate piping, control valves and coils are easily accessible for servicing and cleaning. Condensate piping will be equipped with traps and threaded clean outs at the unit. Design drawings must detail these features including minimum clearances for maintenance. In the selection of chilled water systems, the design of HVAC enclosures must take into account the space needed for chillers to receive air to cool condenser coils and room for service. Enclosure design should also consider screening that will prevent large amounts of pollen and vegetation from clogging condenser coils, enclosure placement on the site, and compatibility with surrounding architecture and exterior design elements.

### Ventilation Air

Provide a central ventilation system to supply conditioned outside air to each room or each module's HVAC unit. Equip all branch ducts with accessible volume control dampers. Each module will be supplied continuously with conditioned outside air to meet the current *ASHRAE Standard 62* or as required for building pressurization, whichever is larger. If provided to each module's HVAC unit, the module's HVAC unit's fan must run continuously.

### Bathroom Exhaust

Bathrooms may be equipped with a central exhaust system or individual, directly vented, and switched exhaust fans. System selection shall be based upon a life cycle cost analysis. If a central ducted bath exhaust system is utilized, the exhaust system shall:

- Run continuously and be interlocked with the building supply air system.
- Have a manual volume damper accessible from the space for proper balancing.
- Be evaluated for utilizing heat recovery from the exhaust system to precondition ventilation air.

### Module HVAC Units

When room modules are equipped with individual HVAC units, they should be ducted vertical fan units placed within designated mechanical closets or mechanical rooms equipped with lockable doors. Through-the-wall units and units located in the ceiling space are discouraged for maintenance reasons. Individual HVAC units should be carefully designed or avoided in humid areas to avoid mold and mildew. Special construction considerations, not limited to HVAC systems, are required for dormitories in humid areas. Refer to Engineering Technical Letter (ETL) 93-2, Dormitory Criteria for Humid Areas for specific guidance.

- Supply air: Supply air shall be ducted to the sleeping rooms and common area. Branch ducts shall be equipped with balancing dampers.
- Control: Individual climate control must be provided for each of the 4 living/bedrooms, plus a separate control for the common shared social space.

- Return Air: Provide ducted return or transfer, do not use ceiling space as return air plenums. Evaluate need for transfer/return air sound attenuation between the sleeping room and common area.
- Constant exhaust in bathroom; central fan tied to fire protection system.
- Consider alternative systems that balance cost, maintainability and control.

### Piping System

Where air conditioning is authorized and centralized hot and chilled water utilized, recommend that individual HVAC units be connected to a centralized mechanical system by a 4-pipe hot water and chilled water distribution system to provide positive space control.

### Perimeter Fin Tube Heating

In areas where perimeter fin tube heating is utilized, provide temperature control for each zone.

### Kitchen and Laundry Areas

Provide kitchen area with a minimum of 2.54 L/s per $m^2$ (0.5 cfm/SF) of supply or transfer air continuously. For all new or renovated kitchens , provide a range hood above cooktops or ranges that exhausts directly to the outdoors. Recirculating exhaust hoods are not allowed for new dormitories, but are allowed for major renovation projects where running ductwork from the kitchen to the outside of the building is difficult. Where practicable, use direct exhaust systems for renovation projects as well. Dryer venting must be additionally be well-designed, especially with the inclusion of laundry units per module, to prevent lint clogs and significant maintenance issues. Design straight-run venting of dryers to avoid lint clogs. Both kitchen exhaust and dryer venting must be exhausted away from windows and exterior balcony areas.

## 4. Plumbing

Reference the Uniform Plumbing Code (UPC) for plumbing requirements. Provide the following as required:

- Domestic hot and cold water
- Sanitary and storm drainage
- Propane or natural gas
- Steam or hot water
- Chilled water

Provide hot and cold water to all public toilets, bathrooms, kitchens, sinks, janitor closets, drinking fountains and laundry rooms. Provide shut-off valves at all fixtures. Tank type, low water volume toilets are required in all bathrooms. Provide elongated bowl toilets with a closed-front seat and a lid. Toilets and bath fixtures must match and be neutral in color. Drinking fountains shall be located in the multi-purpose areas of each dormitory building, and shall meet accessibility requirements and UPC requirements for number, size and height.

Provide drinking fountains in multipurpose spaces as required.

Provide hose bibbs on all exterior walls of each building at 30.48 m (100 foot) intervals; freeze proof as dictated by climatic conditions. Provide floor drains in all toilets, bathrooms, janitor closets, and laundry rooms.

Provide metering for water per building and as per Air Force requirements.

Plan plumbing systems for dormitories to take advantage of stacking bathrooms and placing fixtures back-to-back. Mechanical engineers, architects, and structural engineers must work together to carefully plan the size and location of plumbing chases with minimal impact on usable living space. Consider collocating plumbing chases with vertical vents serving each room.

## 5. Energy Performance

Sustainable energy efficient performance in dormitories cannot be achieved solely by individual building systems, but must be supplemented by other design factors as well. Reference ETL 94-4 Energy Usage Criteria for Facilities in the Military Construction Program for further guidance

These design factors include:

- Mechanical system and management controls selection
- Thermal insulation characteristics
- Building orientation
- Solar shading
- Landscaping
- Electrical system design
- Appliance selection
- Dormitory type (Corridor Access, Balcony Access, or Breezeway Access)

There are many other factors designers must consider, but they should keep in mind the importance of life-cycle cost analysis for dormitories. The Air Force keeps its facilities for a longer period of time than most buildings in the private sector. Therefore, considerable attention should be given to energy-efficient design in the initial planning process.

## 6. Electrical/Communications

Provide the following as required:

- Distribution equipment
- Electric, telephone, and local area network wiring
- Receptacles and grounding
- Interior and exterior lighting
- Emergency lighting
- Fire detection and annunciation
- Cable television
- Personnel Alerting system

Electrical system design calculations should be based on multi-family occupancy rather than hotel occupancy since the dormitory is the full-time home for the residents, and therefore has a higher demand factor. Provide individual circuits per room.

Force protection requirements include the installation of a Personnel Alerting system. Coordinate with base security forces personnel for guidance and additional requirements.

Provide metering for electric power per building and as per Air Force requirements.

Provide one quadraplex outlet on each wall of the living/bedroom area, 5 per room, minimum, mounting height per code. Provide ground fault interrupters (GFI) at all wet locations including exterior locations as required.

Provide ground fault interrupters at all wet locations.

Prewire and provide two cable television outlets on opposite walls in each living/bedroom area, as well as 2 each two-line telephone jacks located as far apart as practical. Provide a wall mounted public pay telephone per each 12 modules, to be located adjacent to the multi-purpose room in the consolidated support facility. Provide 1 LAN phone line adjacent.

Provide local area network (LAN) and/or FAX/modem connections in each living/bedroom area. Rough-in with empty J-box; provide conduit (minimum 19 mm diameter) with pull-wire for LAN adjacent to each telephone outlet. Location of outlets should allow for maximum flexibility in furniture arrangement. Consider the installation of cable modem infrastructure. All designs should consider latest technology available, but actual requirements will vary per location. Due to wide variances, this guide will only suggest the installation of conduit for future communication systems. The use of cable trays is encouraged.

Provide overall ambient and task lighting in each dormitory room. Incandescent fixtures with dimmer switches are recommended for the living/bedroom area. Fluorescent fixtures on the underside of kitchen wall cabinets are recommended to provide task lighting and supplement ambient lighting. Consider recessed downlights and indirect lighting. The use of fluorescent fixtures in dormitory rooms is allowed, but must be carefully selected to fit into the residential environment. Fixtures in dormitory rooms must not appear “institutional”. Do not rely solely on table lamps for room lighting. Ambient light level at desk height must average 50 foot-candles in each dormitory room. Conceal all wiring; exposed wire mold or conduit is not allowed.

Halogen lamps and compact fluorescent lighting are good alternatives over traditional lighting systems based on long term energy efficiencies, improved illuminance, and long lamp life spans. Halogen lamps blend well with traditional incandescent lamps and produce a residential warmth to a space. Compact fluorescent fixtures can retrofit standard fixtures and provide a long lamp life. These advantages balance higher initial costs, and should be considered for dormitory construction.

Electric or gas is acceptable for appliances based on local requirements. Allow 120v, 208v and gas dryer connections.

Provide exterior lighting of parking areas, building entrances, and walkways. See Chapter 2 for more information concerning exterior lighting. Use the latest edition of the National Electrical Code, the IES Lighting Handbook, and NFPA 101 Life Safety Code for lighting calculations, or host nation code as applicable. Provide one exterior light fixture outside each room entrance door for Balcony Access and Breezeway Access dormitories.

### 7. Fire Protection/Life Safety

In line with *Antiterrorism/Force Protection Standard 6, Mechanical and Utility Systems*, fire protection systems for dormitories must include seismic detailing.

Fire protection systems must conform to *MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design and Construction*, and to National Fire Protection Association (NFPA) fire codes. Based on the Uniform Building Code, a dormitory module is classified as an efficiency apartment with an R-1 occupancy. Based on the Life Safety Code, this occupancy is classified as an apartment building. Facilities will be of Type II, noncombustible construction as defined by the Uniform Building Code (UBC).

All new dormitories and major dormitory renovation projects must be protected throughout by an approved supervised automatic sprinkler system installed in accordance with the requirements specified in *NFPA 13, Installation of Sprinkler Systems*, or *13R, Sprinkler Systems in Residential Occupancies Up To and Including Four Stories in Height*, as appropriate and other fire codes referenced therein. Sprinkler water supplies for systems designed in accordance with NFPA 13 shall comply with Military Handbook 1008. Ensure adequate space is included in the mechanical room for the sprinkler riser or, if no mechanical room is in the project, a sprinkler riser closet with adequate space to service the riser. Fire sprinkler heads shall be recessed as standard design, with an exposed head with protective cage acceptable in utility or service locations.

Fire detection/internal alarm and reporting system shall conform to the latest edition of NFPA 72, National Fire Alarm Code. Each dormitory living/bedroom area and shared social space must be provided with an approved single station smoke/heat detector powered from the building electrical system. All living areas and modules shall be clearly identified on an addressable panel, based on local requirements.

Ensure that audible notification devices are easily heard within the living units, and allow all devices within each bedroom and common area of each module to sound concurrently. This may require additional, louder, or individual (in each room) notification devices because of the sound attenuating construction found in dormitories. Fire alarm notification devices used within modules will be the "private mode" type.

Provide a Class I standpipe system in stairwell enclosures of dormitories 4 stories or greater in height in accordance with *NFPA 14, Installation of Standpipe, Private Hydrants and Hose Systems*. Standpipes consist of a 63mm (2.5 inch) outlet at the first floor and one 63mm (2.5 inch) outlet to be located at each intermediate landing between floors to prevent congestion at doorways. Where there are multiple intermediate landings between floors, hose connections should be

located at the landing approximately midway between floors. These outlets must have American National Fire Hose Connection Screw Threads (NH), also sometimes known by the abbreviations NST and NS.

Provisions for life safety must conform to the requirements found in the latest edition of *NFPA 101, Life Safety Code*.

Travel distance to exits is of particular concern in designing dormitories. The placement of stair towers or stairwells must be part of the preliminary building planning process. Minimizing the number of stairs required can be achieved by maximizing allowable travel distance in the design. This requires determining the maximum number of living units that can be served by one stair while still conforming to the maximum allowable travel distance. The elimination of stairs must be tempered with the need for privacy. Fewer stairs can result in more traffic being funneled past module entrances in Balcony Access dormitories. In this case, balcony widths must be sized to allow required egress width plus clearance required with outswinging entrance doors.

Requirements for the fire resistance of wall, ceiling and floor assemblies shall be in accordance with the International Building Code (IBC) In addition, the minimum fire separation between egress paths, hazard areas, and exits shall comply with *NFPA 101, Life Safety Code*. Construction of such assemblies must be closely coordinated with the sound attenuating techniques used. Exits such as stair enclosures shall be separated by not less than 1-hour fire resistive construction. All fire exits should be alarmed and sound when opened. Note there is no minimum fire separation requirement between modules or with modules in a fully sprinklered facility.

Provide carbon monoxide detection as required throughout.

**APPENDIX B2**

**FUNCTIONAL REQUIREMENTS – SITE AMENITIES/STRUCTURES**

**DUMPSTER ENCLOSURE**
**DESCRIPTION:** Concrete pad for trash. Dumpster enclosures shall have brick exterior wall and SW 2035 Chicory metal gates. Dumpster enclosure shall have a concrete access apron in front of enclosure doors. Enclosure to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Quantity and locations as shown on plans.

**BIKE RACK**
**DESCRIPTION:** 1 (13 station) bike rack. Bike Rack to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Preferred location is adjacent to dormitory in a covered structure with low screen walls.

**COMPLEX IDENTIFICATION SIGN**
**DESCRIPTION:** Complex Identification Sign shall be provided for this complex. Complex Identification Sign shall meet the Pope AFB Architectural Compatibility Plan. Location of Complex Identification Sign shall be coordinated with Pope AFB Contracting Officer.

*5 ~~**BENCHES**~~
~~**DESCRIPTION:** See locations on plans and match adjacent bench style. Factory finished metal benches. Benches to meet Pope AFB Architectural Compatibility Plan~~
~~**ADJANCENY REQUIREMENTS:** Incorporate seats at locations where short term seating is required, such as formal building entries or plazas (courtyards).~~

*5 ~~**LITTER/ASH RECEPTACLES**~~
~~**DESCRIPTION:** Factory finished metal litter and ash receptacles combination. See plans for locations. Litter/Ash Receptacles to meet Pope AFB Architectural Compatibility Plan~~
~~**ADJACENCY REQUIREMENTS:** Locate litter/ash receptacles at building entrances, shelters and other areas of public concentration (benches and seats).~~

**PICNIC TABLES**
**DESCRIPTION:** Metal factory finished, picnic tables with metal frames. See plans for number and location. Picnic Tables to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Shall be located at the shelter next to the commons building.

**PICNIC SHELTER**
**DESCRIPTION:** 24’ x 24’ with hipped metal roof and structure to match architecture of buildings. Shelter shall be set in the middle of a 28’ x 28’ concrete pad. Picnic Shelter to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Close proximity to the commons building.

**GRILLS**
**DESCRIPTION:** Steel plate grill with ½” diameter steel bar cooking surfaces and coiled steel grips to adjust cooking surface. Grill shall be permanently embedded and supported by a steel pipe. Concrete pad around base of grill to extend 18” around steel pipe. See plans for number and location. Grills to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Near picnic shelter and commons building – see plans for locations.

**BIKE RACK SHELTER**
**DESCRIPTION:** 10’ X 8’ shelter with hipped metal roof and structure to match architecture of buildings. Shelter shall be set within a 10’ x 12’ concrete pad. Bike Rack Shelter to meet Pope AFB Architectural Compatibility Plan
**ADJACENCY REQUIREMENTS:** Close proximity to courtyard.

**MECHANICAL YARD ENCLOSURE**

**DESCRIPTION:** Solid brick wall attached to rear of commons building that will extend beyond the height of any mechanical unit located within enclosure. Enclosure shall also have solid metal gates with locks to prevent unauthorized entry. Top enclosure shall have metal grate installed to allow for maximum airflow and supported by a metal frame work to prevent sagging. Enclosure to meet Pope AFB Architectural Compatibility Plan

**ADJACENCY REQUIREMENTS:** Location shown on plans.

**APPENDIX B3**

**FUNCTIONAL ROOM REQUIREMENTS – DORMITORY BUILDING**

# APPENDIX B3
# FUNCTIONAL ROOM REQUIREMENTS – DORMITORY BUILDING

## TYPICAL LIVING UNIT (MODULE)

| ROOM NAME | DESCRIPTION | ROOM OCCUPANCY | ROOM SIZE/AREA (AREA IN SQUARE FEET) |
|---|---|---|---|
| **Private Living/Bedroom** | Private bedroom and living space for one enlisted person | 1 Person | 10'-1" x 11'-0"<br>110.9<br>(area includes vestibule) |
| Room Requirements: | A minimum of one exterior operable window with insect screen is required. Window shall meet egress requirements of NFPA 101 and UBC. 8'-0" minimum ceiling height. Partitions around laundry rooms to have a minum STC of 55. Small refrigerator required in each living/bedroom. Provide Ceiling Fans. Provide 2 cable TV connections per Private Living/Bedroom | | |
| Hours of Operation: | | | |
| **Bedroom Vestibule** | Entry to Bedroom | | 3'-6" x 5'-8"<br>19.8 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Prviate Bathrooms** | Bathing and toilet facilites for one enlisted person | 1 Person | 7'-8" X 4'-10"<br>37.1 |
| Room Requirements: | 1 combination tub/shower, 1 lavatory and 1 vanity. HVAC system shall exhaust bathroom air. | | |
| Hours of Operation: | | | |
| **Walk-in Closet** | Walk-in Closet for clothing and storage of boxes | 1 per Private Living Area | 4'-5" X 5'-8"<br>25.0 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Shared Compact Kitchen** | Food Preperation space and seating/dining area | 1 per Module (shared by 4 persons) | 9'-7" X 13'-4"<br>96.9 |
| Room Requirements: | Double bowl sink, 4 burner cook top and fullsize oven, microwave, range hood with exhaust fan, storage cabinets, 21 cubic foot refrigerator | | |
| Hours of Operation: | | | |
| **Multi-Purpose Space** | Circulation and small group gathering space | 1 per Module (shared by 4 persons) | 9'-6" X 9'-7"<br>99.7 |
| Room Requirements: | Provide 1 Cable TV connection | | |
| **Laundry Facilities*** | Facility for washing and drying within Living Module | 1 per Module (shared by 4 persons) | 2'-6" X 9'-7"<br>8.5 |
| Room Requirements: | Partitions around laundry rooms shall have minimum STC of 55 and shall extend to underside of floor above. | | |
| **Balcony/Porch **** | Exterior Space | 1 per module (shared by 4 persons) | 3'-6" X 8'-4"<br>14.6 |

# APPENDIX B3
# FUNCTIONAL ROOM REQUIREMENTS – DORMITORY BUILDING

| | |
|---|---|
| **TYPICAL LIVING UNIT (MODULE) - NET AREA** | 990.9 |
| (Includes: 4 Living areas, 4 bathrooms, 4 closets, 1 kitchen, 1 multi-purpose, 1 laundry facility) | |
| **TYPICAL LIVING UNIT (MODULE) - GROSS AREA** | 1,211.8 |

# APPENDIX B3
# FUNCTIONAL ROOM REQUIREMENTS – DORMITORY BUILDING

## ADDITIONAL SPACES

| ROOM NAME | DESCRIPTION | ROOM OCCUPANCY | ROOM SIZE/AREA (AREA IN SQUARE FEET) |
|---|---|---|---|
| **Stairs (x2) ** (x4 floors)** | Circulation between floors and emergency egress | N/A | 756.0 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Ext. Corridor ** (x4 floors)** | Circulation to entrance of Typical Living Unit and egress | N/A | 3,751.2 |
| Room Requirements: | Minimum width - 4'-0" | | |
| Hours of Operation: | | | |
| **Electrical Room (x4 floors)** | Electrical support spaces | N/A | 179.2 |
| Room Requirements: | One per floor required. | | |
| Hours of Operation: | | | |
| **Comm. Room (x4 floors)** | Telephone and data network support spaces | N/A | 179.2 |
| Room Requirements: | 7'-0" x 10'-0" minimum room size. One per floor required. | | |
| Hours of Operation: | | | |
| **Elevator (x4 floors) **** | Vertical Transport between floors | N/A | 103.6 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Elevator Equipment Room** | Equipment room for elevator equipment | N/A | 54.0 |
| Room Requirements: | Adjacent to Elevator. | | |
| Hours of Operation: | | | |
| **ADDITIONAL SPACE - NET AREA** | | | 5,023.2 |
| **ADDITIONAL SPACE - GROSS AREA** | | | 6,210.7 |

## DORMITORY TOTAL (GROSS AREA)

| | |
|---|---|
| **TYP. LIVING UNIT (x28)** | 33,929.8 |
| **ADDITIONAL SPACES** | 6,210.7 |

# APPENDIX B3
# FUNCTIONAL ROOM REQUIREMENTS – DORMITORY BUILDING

| | |
|---|---|
| **DORMITORY TOTAL FOR 112 SOLDIERS** | **40,140.5** |
| (SQUARE FEET) | |
| **AREA OF OPTION** | 5,257.6 |
| **DORMITORY TOTAL (INCLUDING OPTION) F0R 128 SOLDIERS** | **45,398.1** |

* Area includes space for stacked washer/dryer
** Area for both stairs, corridors, elevator shown as half scope

**APPENDIX B4**

**FUNCTIONAL ROOM REQUIREMENTS – COMMONS BUILDING**

# APPENDIX B4
# FUNCTIONAL ROOM REQUIREMENTS – COMMONS BUILDING

## COMMONS BUILDING

| ROOM NAME | DESCRIPTION | ROOM OCCUPANCY | ROOM SIZE/AREA (AREA IN SQUARE FEET) |
|---|---|---|---|
| **Lobby/Circulation** | Primary entry point and waiting area for visitors. | | N/A<br>422.0 |
| Room Requirements: | Handicap accessible. Enclosed Bulletin Board | | |
| Hours of Operation: | 24 Hours | | |
| **Office *** | Reception area for visitors and duty desk for dormitory manager | 1 Person | 12'-4" x 10'-0"<br>148.2 |
| Room Requirements: | Provide Voice, Data, and Cable TV connection | | |
| Hours of Operation: | 24 Hours | | |
| **Activity** | Activity room for personel | 1 Person | 10'-0" x 14'-0"<br>140.0 |
| Room Requirements: | Provide insulated glass storefront or sidelights at door to allow views into room from corridor. Handicap Accessible. Provide Voice and Cable TV connection | | |
| Hours of Operation: | 24 Hours | | |
| **Multi-Purpose ***** | Activity room for personel | | 15'-4" x 16'-0"<br>259.6 |
| Room Requirements: | Provide insulated glass storefront or sidelights at door to allow views into room from corridor. Handicap Accessible. Provide Voice and Cable TV connection | | |
| Hours of Operation: | 24 Hours | | |
| **Vending** | Space for soft drink, snack vending machines and ice maker. | | 3'-4" x 16'-0"<br>53.3 |
| Room Requirements: | Handicap accessible. Provide floor drain near ice machine. | | |
| Hours of Operation: | | | |
| **Storage** | Storage room for vacuum cleaners, linens, etc. | | 10'-0" x 4'-0"<br>93.3 |
| Room Requirements: | | | |
| Hours of Operation: | | | |

# APPENDIX B4
# FUNCTIONAL ROOM REQUIREMENTS – COMMONS BUILDING

**COMMONS BUILDING (continued)**

| ROOM NAME | DESCRIPTION | ROOM OCCUPANCY | ROOM SIZE/AREA |
|---|---|---|---|
| | | | (AREA IN SQUARE FEET) |
| **Storage** | Storage room for office supplies | | 6'-4" x 4'-0"<br>25.3 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Janitor** | Storage of cleaning supplies. | 1 Person | 6'-0" x 4'-0"<br>24.0 |
| Room Requirements: | Provide floor mop sink, mop rack and wall mounted shelving. | | |
| Hours of Operation: | | | |
| **Guest Toilet** | Handicap accessible toilet for use by visitors. | 1 Person | 6'-4" x 6'-0"<br>38.0 |
| Room Requirements: | Handicap Accessible. | | |
| Hours of Operation: | | | |
| **Mechanical** | Mechanical Support spaces | | 16'-8" x 24'-4"<br>589.3 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Electrical** | Electrical support spaces | | 9'-4" x 9'-0"<br>84.0 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **Communication** | Telephone and data network support spaces | | 7'-0" x 9'-4"<br>65.3 |
| Room Requirements: | 7'-0" x 10'-0" minimum room size. | | |
| Hours of Operation: | | | |
| **Covered Entry** | Covered protection from weather at front door | | 8'-0" x 29'-0"<br>119.3 |
| Room Requirements: | | | |
| Hours of Operation: | | | |
| **COMMONS BUILDING - NET AREA** | | | 2061.6 |

# APPENDIX B4
# FUNCTIONAL ROOM REQUIREMENTS – COMMONS BUILDING

**COMMONS BUILDING TOTAL (GROSS AREA)**

| | | |
|---|---|---|
| **COMMONS BUILDING TOTAL** | | **2491.3** |

* Area includes office entry vestbule
** Area for both covered porch and breezeway shown as half scope
*** Area includes TV vestibule

**APPENDIX C**
**FIRE PROTECTION ANALYSIS/LIFE SAFETY CODE ANALYSIS**
**OF BUILDINGS IN THIS PROJECT**

(Dormitory Building and Commons Building are treated as one Building for the purpose of Code Analysis)

**********

**NOTE TO DESIGNER: This document is a preliminary analysis used for concept development. It does not contain all requirements and does not relieve the designer of complete code and criteria review, compliance and documentation responsibilities during proposal preparation and final design development.**

REFERENCES:
Military Handbook MIL HDBK 1008c, Fire Protection for Facilities Engineering, Design and Construction, 10 June 1997
Engineering Circular EC 1110-1-94, Classification of Type of Construction, 21 July 2001
Uniform Building Code, 1997
NFPA 101, Life Safety Code, 2000
NFPA 10, Standard for Portable Fire Extinguishers, 1998

**********

**FIRE PROTECTION ANALYSIS/LIFE SAFETY CODE ANALYSIS**
**DORMITORY BUILDING (BASE BID PLUS OPTIONS)**

BUILDING DESCRIPTION:
Four (4) Story Building, Approximately 45,063.6 Square Feet

1. Type of Occupancy Classification
   UBC
   Paragraph 310.1
   Group R-1

2. Type of Occupancy Classification
   NFPA 101
   Chapter 30 - New Apartment Buildings

3. Occupancy Separation
   UBC
   Table 3-B
   Single occupancy/None required

4. Minimum Construction Type
   UBC
   Chapter 6
   Type II 1 hour Buildings

   NOTE: The UBC fire resistance requirements for permanent partitions shall not apply to non-bearing partitions in Type I or II construction (MIL HDBK 1008C, Paragraph 2.1.2).

5. Basic Allowable Building Height
   UBC

Table 5-B
Type II, 1-Hour Buildings
65 Feet

6. Actual Building Height
54 Feet, 2 inches

7. Allowable Number of Stories
UBC
Table 5-B
Four (4) (Group R-1)

8. Basic Allowable Floor Area
UBC
Table 5-B (Group R-1)
**13,500 Square Feet**
Allowable Area Increases:
Section 504 – Allowable Floor Areas
Paragraph 504.2 Areas of Buildings over One Story **(13,500 s.f. X 2 = 27,000 square feet)**
Section 505 – Allowable Area Increases
Paragraph 505.1.2 Separation on three sides **(min. separation = 50 feet – 50'-20' X 2.5% = 75%**
**27,000 s.f. X1.75% = 47,250 square feet)**
Paragraph 505.3 Automatic Sprinkler Systems **(47,250 s.f. x 2 = 94,500 square feet)**
**94,500 square feet**

9. Actual Floor Area as Designed
**44,985.6 Square Feet (Actual Area with Commons Building 48,028.4 Square Feet)**

10. Automatic Sprinkler System
MIL HDBK 1008C
Paragraph 4.1.5, and 6.1.2a
NFPA 101
Chapter 30 – New Apartment Buildings
Paragraph 30.3.5.1 and 30.3.5.2
The entire facility shall have automatic sprinkler system protection. A commercial sprinkler system is required in the building.

11. Fire-Resistive Requirements
UBC
Table 6-A
Type II, One-Hour Buildings

| | |
|---|---|
| Bearing Walls: Exterior | 1HR |
| Bearing Walls: Interior | 1HR |
| Nonbearing Walls: Exterior | NR, N/C ≥ 40' per 603.3.1 and Table 5A |
| Structural Frame | 1HR |
| Partitions/Permanent | 1HR |
| Shaft Enclosures | 1HR |
| Floors and Floor/Ceilings | 1HR |
| Roofs and Roof/Ceilings | 1HR |
| Exterior Doors and Windows | Openings not permitted less than five feet from property line |
| Stairway Construction | Section 603.4, shall be of non-combustible construction |

12. Number of Exits Required
NFPA 101
Chapter 30 – New Apartment Buildings

Paragraph 30.2.4
Number of Exits Required: 2
Number of Exits Provided: 2

13. Maximum Common Path of Travel
NFPA 101
Chapter 30 - New Apartment Buildings
Paragraph 30.2.5.2
35 Feet
Exception: In buildings protected throughout by an approved, supervised automatic sprinkler system, common path of travel shall not exceed 50 feet.

14. Maximum Dead-End Corridor
NFPA 101
Chapter 30 - New Apartment Buildings
Paragraph 30.2.5.3
35 Feet
Exception: In buildings protected throughout by an approved, supervised automatic sprinkler system, dead-end corridors shall not exceed 125 feet.

15. Maximum Travel Distance to Exits
NFPA 101
Chapter 30 – New Apartment Buildings
Paragraph 30.2.6.1
Travel distance within a dwelling unit (apartment) to a corridor door shall not exceed 75 feet.
Exception: In buildings protected throughout by an approved, supervised automatic sprinkler system, the travel distance shall not exceed 125 feet.
Paragraph 30.2.6.2
The travel distance from a dwelling unit (apartment) entrance door to the nearest exit shall not exceed 100 feet.
Exception No. 1: In buildings protected throughout by an approved, supervised automatic sprinkler system, the travel distance shall not exceed 200 feet.
Exception No. 2: Travel distance to exits shall not exceed 200 feet for exterior ways of exit access.

16. Travel Distance to Fire Extinguisher
NFPA 10
75 Feet, Maximum

17. Fire Extinguisher Cabinets
NFPA 10
Cabinets for portable fire extinguishers shall be provided.

18. Fire Alarms and Detection Systems
MIL HDBK 1008C
NFPA 101
A fire alarm/reporting system will be provided as required by MIL HDBK 1008C. The fire alarm system is designed in accordance with the applicable publications of NFPA. The system shall include a fire alarm control panel with battery back up, manual pull stations, automatic smoke/thermal detectors and audio/visual indicating devices. The system shall include local alarms as well as annunciation to the existing central fire alarm system.

**FIRE PROTECTION ANALYSIS/LIFE SAFETY CODE ANALYSIS**
**COMMONS BUILDING**

BUILDING DESCRIPTION:
One (1) Story Building, Approximately 3,128.4 Square Feet

1. Type of Occupancy Classification
   UBC
   Paragraph 304.1
   Group B

2. Type of Occupancy Classification
   NFPA 101
   Chapter 38 - New Business Occupancies

3. Occupancy Separation:
   UBC
   Table 3-B
   Single occupancy/None required

4. Minimum Construction Type
   UBC
   Chapter 6
   Type II 1 hour Buildings

   NOTE: The UBC fire resistance requirements for permanent partitions shall not apply to non-bearing partitions in Type I or II construction (MIL HDBK 1008C, Paragraph 2.1.2).

5. Basic Allowable Building Height
   UBC
   Table 5-B
   Type II, 1-Hour Buildings
   65 Feet

6. Actual Building Height
   22 Feet

7. Allowable Number of Stories
   UBC
   Table 5-B
   Two (4) (Group B)

8. Basic Allowable Floor Area
   UBC
   Table 5-B (Group B)
   **18,000 Square Feet**
   Allowable Area Increases:
   Section 504 – Allowable Floor Areas
   Paragraph 504.2 Areas of Buildings over One Story **(18,000 sf. X 2 = 36,000 square feet)**
   Section 505 – Allowable Area Increases
   Paragraph 505.1.2 Separation on three sides **(min. separation = 50 feet – 50'-20' X 2.5% = 75%**
   **36,000 s.f. X1.75% = 63,000 square feet)**
   Paragraph 505.3 Automatic Sprinkler Systems **(63,000 s.f. x 2 = 126,000 square feet)**
   **126,000 square feet**

9. Actual Floor Area as designed
**3,128.4 Square Feet**

10. Automatic Sprinkler System
MIL HDBK 1008C
Paragraph 6.1.2a
NFPA 13
The Commons Building shall be provided with a complete automatic sprinkler system.

11. Fire-Resistive Requirements
UBC
Table 6-A
Type II, 1hour Buildings

| | |
|---|---|
| Bearing Walls: Exterior | 1HR |
| Bearing Walls: Interior | 1HR |
| Nonbearing Walls: Exterior | NR, N/C ≥ 40' per 603.3.1 and Table 5A |
| Structural Frame | 1HR |
| Partitions/Permanent | 1HR |
| Shaft Enclosures | 1HR |
| Floors and Floor/Ceilings | 1HR |
| Roofs and Roof/Ceilings | 1HR |
| Exterior Doors and Windows | Openings not permitted less than five feet from property line |
| Stairway Construction | Section 603.4, shall be of non-combustible construction |

12. Number of Exits Required
NFPA 101
Chapter 7 Means of Egress
Paragraph 7.4.1.1
The number of means of egress shall not be less than two (2).
Number of exits provided is three (3).

13. Maximum Dead End Corridor
NFPA 101
Chapter 38 – New Business Occupancies
Paragraph 38.2.5.2
Dead-end corridors shall not exceed 20 feet.
Exception: In buildings protected throughout by an approved, supervised automatic sprinkler system, dead end corridors shall not exceed 50 feet.

14. Maximum Common Path of Travel
NFPA 101
Chapter 38 – New Business Occupancies
Paragraph 38.2.5.3
Common paths of travel shall not exceed 75 feet.
Exception: A common path of travel shall be permitted for the first 100 feet in a building protected throughout by an approved, supervised automatic sprinkler system.

15. Maximum Travel Distance to Exit
NFPA 101
Chapter 38 – New Business Occupancies
Paragraph 38.2.6
Travel distance to exits shall not exceed 200 feet.
Exception: Travel distance shall not exceed 300 feet in buildings protected throughout by an approved, supervised automatic sprinkler system.

16. Emergency Lighting and Exit Signs
NFPA 101
Furnish self-contained battery units to provide a reasonable degree of public safety within the building and for safe evacuation of the building.

17. Fire Extinguisher Cabinets
NFPA 10
Cabinets for portable fire extinguishers shall be provided.

18. Fire Alarms and Detection Systems
MIL HDBK 1008C
NFPA 101
A fire alarm/reporting system will be provided as required by MIL HDBK 1008C. The fire alarm system is designed in accordance with the applicable publications of NFPA. The system shall include a fire alarm control panel with battery back up, manual pull stations, automatic smoke/thermal detectors and audio/visual indicating devices. The system shall include local alarms as well as annunciation to the existing central fire alarm system.

# APPENDIX D

## POPE AIR FORCE BASE FIRE ALARM REQUIREMENTS

# SECTION 16721

# SMART FIRE DETECTION, ALARM AND RADIO-TYPE REPORTING SYSTEM

REFERENCE PART I

## 1.0 REFERENCES

1.1 The publications listed below form a part of this specification to the extent referenced. The Publications are referred to in the text by basic designation only. All publications shall be referred to in their **LATEST EDITION**, including any revisions thereof at the time contract is awarded. The specification in this section supersede the drawing and if the design of the fire alarm system is not IAW NFPA codes the contractor will notify in writing the Contracting Officer or the Corps of Engineer for corrective action before starting work on fire alarm system. The contractor will forward one copy of the report to the 43 CES CEF Technical Services Branch.

1.2 American National Standards Institute (ANSI)

ANSI C62.41 Recommended Practice for Surge Voltage in Low-Voltage AC Power Circuits

1.3 Factory Mutual System (FM)

FM 7825 Supplement Approval Guide

1.4 National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

NFPA 72 National Fire Alarm Code

NFPA 78 Lightning Protection Code

NFPA 90A Installation of Air Conditioning and Ventilating Systems

1.5 Underwriters Laboratories, Inc. (UL)

UL Directory Fire Protection Equipment Directory

UL 66 Rigid Metal Conduit

UL 38 Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems

UL 228 Door Closures-Holders, with or without Integral Smoke Detectors

UL 268 Smoke Detectors For Fire Protective Signaling Systems

UL 268A Smoke Detectors for Duct Application

UL 464 Audible Signal Appliances

UL 467 Grounding and Bonding Equipment

UL 521 Heat Detectors for Fire Protective Signaling Systems

UL 797 Electrical Metallic Tubing

UL 868 Control Units for Fire Protective Signaling Systems

Military Handbook 1008C Facility Planing and Design Guide

Current ETLs-Engineer Technical Letters

ADA-American Disability Act Standard

## GENERAL INFORMATION OF FIRE ALARM PANEL

## Part II

2.0. The Contractor shall provide a low voltage; automatic, integrated Narrowband Radio Transceiver/Fire Alarm Control Panel designed for use in local and auxiliary systems with latest in solid-state addressable technology and expertise in radio transmission-based systems. It includes the transmitter to meet the requirement of Proprietary Protective Signaling Systems and Public Fire Service Communication Systems. Combines the Narrowband Radio and Addressable Fire Alarm Control Panel in one modular, compact unit: No interconnection wiring or interfacing needed. Capable of adding zones through expansion modules located in the control panel. The panel shall provides easy programmability of zone, bell circuit and auxiliary function options so it can be tailored to the individual customer's needs

2.1. The microprocessor-controlled, combination addressable fire alarm control panel and transceiver incorporates the latest solid state technology in radio transmission based systems. The panel shall be connected to existing Monaco D 500 Radio Alarm System operating in VHF frequency range.

2.2. Features of the addressable integrated Radio Transceiver and Fire Alarm Control Panel: Provides up to eight Analog Driver Cards (ADC) that may be configured as Style 4, Style 6or

Style 7 Signaling Line Circuits (SLC). Each ADC has a capacity for up to 99 analog addressable smoke and heat sensors and 99 addressable monitor or control modules for a total system capacity of up to 792 analog addressable smoke and heat sensors and 792 addressable monitor or control modules.

b. Provides two Class A (Style Z) or four Class B (Style Y) Notification Appliance Circuit (NAC)

c. Provide two Class A (Style Z) or four Class B (Style Y) indicating devices circuit. Expandable through installation of an Expansion Backplane and expansion cards.

d. Automatically detects and configures new devices

e. Plain English display (LCD) identifies specific points of alarm or trouble; multiple alarms scroll across the LCD

f. LEDs indicated the operational status of the addressable control panel.

g. Addressable detectors support: Advanced maintenance features (such as detector sensitivity adjustment and maintenance alerts).

h. Supports grouping of multiple devices to a common zone number for transmission to the D-500 Central Receiving System.

i. Nuisance alarm reduced by alarm verification, auto drift compensation and pre-alarm levels.

j. Includes lamp test, drill test, walk test, and transmitter disable for all or individual zones and devices.

k. Internal clock calendar.

l. 48 character display for device identification and description

m. RS-232 and EIA 422 communication ports.

n. Addressable Control Panel configuration can be transferred to/from PC compatible computers using the Monaco Window-based Addressable Planner software

o. Up to 3.5 amps of power available for NACs.

p. Battery back up with automatic battery backup for 60 hours of standard operation in the event of an ac power failure.

q. Provides 24 Vdc filtered power.

r. 4 watts RF output power; 2 watts for 450-470 Mhz .

s. Operates on 120 60 Hz.

t. Radio is FCC certified for narrowband operation and meets the requirements of the NTIA (National Telecommunications and Information Administration) Manual of Regulation and Procedures for Federal Frequency Management.

2.3. Description of the addressable fire alarm/ radio transceiver

a. A total of four amps of filtered current at 24 Vdc is provided by the fire alarm panel for operating external alarm system equipment. From this five amp supply, one amp is supplied to the auxiliary output circuit, one amp to the auxiliary power circuit and up to two amps is supplied to and shared by the bell circuits (one amp for each Class A/ two Class B bell circuits). Filtered power (24 Vdc) is also provided to the initiation (detection) zones for loop powered device operation: each of these circuits is current limited to 50 milliamps in alarm. The auxiliary power circuit can be used to supply power for non-loop powered alarm initiating devices. All circuits are internally protected with polyswitches or fuses. Batteries are provided with the unit for continued operation in the event of an ac power failure: battery charging circuitry is built into the Power Supply PCB Assembly.

b. All configuration programming for the fire alarm panel shall be input through the onboard keypad, a terminal connected to the panel, or Addressable planner software. The planner will allow you to save the configuration information on disk. The software shall be provided to Technical Services at the final acceptance test.

c. An alarm condition on a circuit shall automatically deactivate the air-handling units throughout the building.

d. Evacuation alarm silencing witch or switches which, when activated, will silence alarm devices, and trouble conditions, but will not affect the zone indicating lamp nor the operation of the transmitter. This switch (es) shall be overridden upon activation of a subsequent alarm from an unalarmed zone and the alarm devices will be activated.

e. Status conditions for the fire alarm panel are indicated by LED's (Light Emitting Diodes): AC POWER BATTERY FAULT, ALM (all troubles), XMT (transmitting), RCV (receiving), CD (RF carrier detection), and XMTR DISC (transmitter is disconnected).

f. Each Switch on the fire alarm shall perform a separate function, Switches on the Display/ Keyboard PCB Assembly are used to turn off evacuation signaling devices, reset the panel, silence the panel audible alert, repower the transmitter, and test LED and signaling device operation. The Class A/B selector switches on the CPU PCB Assembly is used to set the class for the zone and evacuation signaling circuits: the board-mounted hardware RESET switch is used to reinitialize the microprocessor.

g. Transmitter shall have disconnect to allow testing and maintenance of the system with out activating the transmitter.

h. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect all opens shorts, and grounds.

2.4. The fire alarm panel shall perform four basic functions: detection, evacuation signaling, reporting and supervision.

a. The fire alarm panel shall provide a supervised, polarity reversing auxiliary output circuit and two Form C relay contacts which may be used for auxiliary alarm output functions. The auxiliary output is a nonsilenceable alarm-activated output circuit which operates whenever an alarm occur on a zone designated as type waterflow Alarm

b. Form C relay contacts may be used for alarm signal output. Relay # can be programmed to operate for all alarms or for all trouble conditions. Relay # 2 can be programmed to activate on RSA commands from the D-500, to reset four wire smoke detectors on Panel Reset, for specific zone alarm or for all alarms. These relays can be used as an output for HVAC (heating, ventilating and air conditioning) equipment door and elevator controls, etc.

c. All initiating (detection) and indicating (evacuation signaling) circuits on the panel and connected expansion assemblies are supervised for open, short and ground fault conditions. A short including a double ground fault on a detection circuit, signals an alarm condition. An open, a wire-to-wire short, or a single ground fault on an indicating appliance circuit signals a trouble condition. The system shall be capabilities and have ability of a circuit to process alarm and trouble signal during an abnormal condition

d. The panel, transceiver, and zones shall be continuously monitoring for alarm and trouble conditions. The current status shall be stored in a replaceable EEPROM (nonvolatile memory) and update as new conditions occur or alarms and troubles are removed. Reports shall be sent the central receiving equipment and placed in a message buffer and prioritized for transmission: all alarms will be sent before any troubles.

e. Alarm Operation: The panel indicates alarms with a red LED and a message in LCD that identifies the zone input or the specific addressable device and description.

f. Troubles Operation: The panel indicates zone and panel troubles with an onboard audible alert, a yellow LED< and a message in the LCD that identifies the zone input the specific addressable device, or the specific panel trouble. The panel maintains a list of the last 500 alarms and troubles are maintained in panel history.

g. Panel Supervision: The panel shall supervise for the following trouble conditions:

- Disconnected Expansion Backplane or ZEC Assembly.
- AC brownout condition
- Open fuse connections
- Abnormal radio (transceiver) power (shut down due to a fault)
- High or low unregulated dc voltage
- high or low panel voltage

- high panel current
- configuration error
- ground fault conditions
- one or more disable zones
- one or more zones, which have transmissions, inhibited
- An open, short or ground fault condition on a bell or auxiliary output circuit
- The fire alarm panel shall supervise Annunicator

h. All panel trouble occurs the TBLLED lights shall steady yellow and the LCD displays the specific condition of trouble. The panel encodes a trouble transmission using the Panel Trouble AID number and sends the message to the central receiving equipment where it is decoded, displayed and logged.

i. The fire alarm panel shall de-magnetize the Electromagnetic Fire Door Devices.

j. The fire alarm panel shall transmit a general alarm and general trouble

k. The addressable devices shall be rouped to form virtual zones. The message transmitted to the D-500 Central Receiving System identifies the zone group. The panel LCD identifies the individual addressable device that has generated the alarm or trouble.

2.5. The Panel shall have a nameplate with the following information: major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating and catalog number on a noncorrosive and nonheat sensitive plate, which is securely attached to the equipment. Information of ZID numbers and location in the building will be posted on the inside door of the panel.

2.6. PROGRAMING of the Fire Alarm panel/transmitter and D-500 (located in building 250): The installer is required to obtain available ZID numbers from the Fire Alarm Communication Center. The installer shall fully program the transceiver and the D-500 to communicate by zone and remote test.

2.7. Keys and locks: The panel shall have lock and key. The key will be keyed to existing lock systems in other buildings on base. Six copies of the Keys will be forwarded to the Technical Service Branch of the Fire Department through the Contracting Officer or US Army Corps of Engineers at the Acceptance test.

2.8. Environmental Requirement: The fire alarm panel/radio transmitter shall be designed for reliable outside operation in an ambient temperature range of -22 degrees F to +140 degrees F. Fire alarm/radio transmitter shall be corrosion resistant and designed for reliable operation under adverse climatic conditions including 130 mph winds, ice, rain, and snow storms.

2.9. Mounting of the fire alarm panel/radio transmitter housing shall be designed for universal mounting on walls, poles, or pedestals. Mounting shall utilize either lag bolt, anchor bolts, stainless steel banding, mounting brackets, or a shackle/bolt combination, as applicable to the manufactory's recommendation. The height of the panel and clearance around panel shall be IAW NFPA 72.

a. No holes will be cut in top of fire alarm cabinet.

2.10. Radio Fire Alarm Transceiver shall be compatible with the radio fire alarm base station located at the base fire department. The Transceiver is an integrated with the fire alarm panel. The panel and radio transceiver be one unit

a. Frequency: The transmitter shall operate on a frequency of 138.125 MHz

2.11. Primary Power for the fire alarm panel/radio transmitter system: Primary power shall be electrically supervised and is a single dedicated branch-circuit taken from the building electric services. The fire alarm panel/radio transmitter shall be powered by 120 Vac. Power filtering shall be provided in accordance with fire alarm panel/radio transmitter manufacturer's recommendations. Circuit breaker panel shall be provided with key lock. Transfer from primary to emergency power or restoration from emergency to primary power shall be fully automatic and not cause transmission of a false alarm. Loss of ac power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit. If the main circuit breaker panel is in sight of the fire alarm panel a circuit breaker in circuit breaker panel shall be used for the fire alarm electrical disconnect. The fire alarm circuit breaker will be red in color and locked in the open position and marked FIRE ALARM CIRCUIT. If the main circuit breaker panel is not in sight of the fire alarm panel, the power disconnect shall be a type that can be locked in the on or off position and marked FIRE ALARM CIRCUIT and painted RED and located in sight of the fire alarm panel. Circuit conductors entering or leaving the fire alarm panel shall be connected to screq-type terminal with each terminal marked for identification.

2.12. Emergency power for the fire alarm panel/radio transmitter: shall be a battery back power. Batteries shall provided and be sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity to operate the fire alarm system for a period for 60 plus operate all components of the system for a period of 15 minutes. Batteries shall be stored IAW NFPA and manufacturer's recommendations. Trouble message shall be automatically transmitted in event of a failure in excess of on (1) minute of the primary power of the fire alarm pane/radio transmitter.

a. Battery Charger: Battery charger shall be completely automatic, with high/low charging rate, and switch and contained in fire alarm panel/radio transmitter cabinet, capable of restoring the batteries from full discharge to full charge within 8 hours. A separate ammeter shall be provided for indicating rate of charge. A separate voltmeter shall be provided to indicate the rate of the battery charge. Pilot light shall indicate when batteries are manually placed on a high rate of charge as part of the unit assembly.

b. Power Line Surge Protection: All equipment connected to alternating current circuits shall be protected from power line surges. The surge protector shall have the following specifications:

| | |
|---|---|
| Type of design | Silicon Oxide Varistor |
| Maximum current | 60,000 amps |
| Maximum energy | 1,500 joules |
| Maximum number of surges | Unlimited |
| Response time on milliamp test | 5 nanoseconds |
| Response time to clamp 10,000 amps | 10 nanoseconds |
| Response time to clamp 50,000 | 25 nanoseconds |

| | |
|---|---|
| Leads | 36” # 12 THHN |
| Case material | PVC |

c. The surge/lighting Arrestor shall be installed IAW manufactory’s and fire alarm panel/radio transmitter recommendation

2.13. Antenna: The antenna system shall utilize vertical polarization antennas, communication links between transmitters/ receivers and antennas, and matching networks as needed for the proper coverage. The antenna system shall be either omni directional or shaped-coverage. The selected y the contractor based on topography. The antenna system and cabling shall be furnished to provide adequate system gain. The antenna shall be capable of withstanding the environmental conditions of 130 mph wind and 1 inch radial ice without failure. The antenna shall be mounted three (3) above roof Lighting protection shall be install IAW manufactory’s recommendation.

a. The contractor shall provide and install an antenna assembly, antenna wall-mount bracket, lighting arrestor kit, coaxial cable and connector. Coordinate with Contracting Officer for exact location of installation

b. The light arrestor box shall be fitted with strain relief fittings. The light kit shall be silicone wear wires connect to the lighting arrestor

2.14. Wiring for Fire Alarm System: Wiring or system shall be copper STYLE D (CLASS A) installed in ¾ inch minimum diameter conduit (conduit shall be IAW UL 06 and UL 797) (conduit that penetrates fire walls shall be sleeved and fire stopped IAW NFPA 70). No more than on conductor shall be installed under any screw terminal. All circuits conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to terminals with each terminal marked in accordance with the wiring diagram for identification. All junction boxes will be painted red and have a sticker that states “Fire Alarm System”. Connections shall be made with either crimp-on terminal spade lugs or with approved pressure type terminal blocks. The use of wire nut type connectors is prohibited in the system. All wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer’s representative shall be present for the connection of wiring to the control panel. Wiring for strobe light circuits shall be shielded solid copper No. 12 AWG minimum. Wiring for 120v ac power shall be No. 12 AWG minimum. Wiring for power limited circuits shall be No. 14 AWG minimum power wiring and control wiring shall be isolated. All wiring shall conform to NFPA 70. All conductors shall be color-coded. Wiring color code shall remain uniform throughout the circuit. Pigtail or T-tap connections are unacceptable. Grounding of fire alarm system shall be provided to building ground. No solder connections will be allowed. If conduit and wiring runs from different environments seal-off connects shall be used. All wiring will be inspected by the Contracting Manager and Technical Services Branch before walls and ceiling are enclosed. All wiring termination shall be labeled with heat shrink labels indicating zone and number sequence and information on the As Build drawing.

2.15.Detectors: Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 12 inches from any part of lighting fixtures. Detectors shall be located at least 3 feet from diffusers of air handing system. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors, which mount in free space, shall be mounted directly to the end of stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway.

Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided. Detector devices shall comply with the applicable requirements of NFPA 72 NFPA, 90A, UL 268, and UL Detector base shall have terminal for making connections. Detectors shall be connected into alarm initiating circuits. The detectors shall be provided as indicated IAW NFPA standards or codes. Facility that requires detectors: All areas of a facility shall be covered with detectors, this supersedes the drawing. All detectors that are in concealed (above false ceiling, etc.) locations shall be provided with a remote visible indicator lamp, this supersedes the drawing. No more than 10 detector devices will be on one zone (circuit) with ZID # and description. Dormitory shall have no more than 6 (six) devices on one zone (circuit) with ZID # and description. Detector (either smoke or heat depending on climate) shall be install over fire alarm panel IAW NFPA 72.

a. Heat Detectors Description: The addressable electronic heat detectors shall be state-of the – art dual electronic thermistor sensing circuits for fast response. The detectors shall provide open area protection with 50 foot spacing capability. Shall have two LED on each detector light to provide 360 degrees visibility of detector function. The LEDs are latched ON by the addressable control panel for an alarm indication. The detector will alarm at 135 degrees or for a temperature increase in excess of 15 degrees per minute. This enables the heat detector to communicate an alarm to the addressable control panel prior to reaching the static set point, which provides a timely response to rapid temperature increase.

Features of the addressable Heat Detector:

- Low profile
- Integral tamper proof feature
- Sensitivity tested at the device and from the addressable control panel
- Shall interconnected with addressable fire alarm control panel without any monitoring device added

b. Smoke Detectors Description: The smoke detector shall be an addressable low-profile plug type. Detector sensitivity shall be programmed at the addressable control panel. The sensitivity is continuously monitored and reported to the addressable control panel. Each detector's address shall be easily set with decade address switches. The detector can add a thermal sensor that will alarm at a fixed temperature of 135 degrees. The power for the smoke detector shall be supplied by the fire alarm panel 24 VDC. Features of the addressable Smoke Detector:

- addressable-analog communication
- stable communication technique with noise immunity
- Communicates individual identity, sensitivity and status to the addressable control panel
- Low standby current
- Remote sensitivity adjustment
- Versatile plug in design
- Dual LEDs for 360 degrees visibility
- Rotary decade address switches
- Removable cover and insect screen for easy cleaning
- Reed switch for local magnet test
- Field sensitivity metering to meet NFPA 72 requirements
- Optional remote LED accessory

- For use with integrated radio transceiver and addressable fire alarm control panels

e. Ducting Smoke Detectors: Detectors shall have duct housing, mounted exterior to the duct, and with factory perforated sampling tubes. Interchangeable detector heads, streamlined housing with clear cover, high temperature duct smoke detector, 32 degrees F to 158 degrees F, remote test capability, a powered outputs for remote LED, and UL268A listed. Activation of a duct detector shall cause shutdown of all air-handling units. Activation of the fire alarm system in the alarm mode shall cause shutdown of all air-handling units. Detectors shall be rated for the air velocity from 500to 4000FPM. Detectors shall be mounted in readily accessible location. Detectors shall be connected to remote indicating lamp. The detector shall communicate and continuously monitored through the Signaling Line Circuit (SLC). Detector will report to panel any changes in sensitivity caused by dirt, temperature or humidity.

f. Addressable Detector Bases Description: The detector bases shall be used to add functions to the addressable detectors as (sounders, isolator, and relay). Isolator base shall prevent an entire Signaling Line Circuit (SLC) from being disabled when a short circuit occurs by isolating the shorted portion of the SLC from the remainder of the SLC. Relay bases shall contain a relay that is activated by the detector's LED. When the LED has been on for ten seconds, the relay activates. This relay shall be used to control a variety of devices, such as a fire-door release or elevator recall.

2.16. Manual Fire Alarm Stations: Manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into alarm initiating circuits of the fire alarm panel ZID # and description, no more than 5 pull station on one zone (circuit). Stations shall be single action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contracts shall be rated for the voltage and current upon which they shall operate. Stations shall have a separate screw terminal for each conductor. Where boxes must be surface mounted, boxes shall be painted the same color as the fire alarm manual stations.

2.17. Manual Foam Discharge Stations: will be distinctly in shape and color from the fire alarm stations and will have distinct signage at each device stating "Start FOAM Nozzles in red lettering not less than 3 inches in height on a lime yellow background. Manual foam discharge stations will be housed within a clear plastic tamper cover that must be lifted prior to activating the station. Actuation of any manual foam discharge stations will cause the system to activate all nozzles, activate the facility fire evacuation alarm and the foam system annunciation signal, cause the fire alarm panel/radio transmitter to signal to the fire department. Manual Foam Discharge Station shall be on dedicated zone (circuit) with ZID #and description.

a. Foam System Signal provide audio-visual (blue visual signals, strobe or rotating beacon and audio signal different than fire evacuation signals) within the aircraft servicing area to indicate foam system activation. Foam System Signal shall be connected to the fire alarm panel/radio transmitter.

2.18. Water flow Detecting Devices: Shall provide water flow detection on all fire protection risers and connected to the fire alarm panel/radio transmitter. Water-flow detecting devices shall be detected by

pressure-type switches with a built-in adjustable (not less than 0-90 seconds) retard on all sprinkler systems. Water-flow shall cause the activation of the facility fire evacuation alarm system and send alarm signal to the fire department. Water-flow switch (es) shall be connected to the fire alarm system and on dedicated zone (circuit) with ZID # and description.

a. A mini-monitor module shall be used with the manual fire alarm station to make the manual station an addressable device.

b. It shall be capable of style B supervised wiring to the load devices. The supervised state of the monitored device is transmitted back to the addressable control panel.

c. Min-monitor module features: Full supervision of input circuit. Monitors dr contact closure for a single device. Must be able to operate with addressable integrated radio transceiver and fire alarm control panel

2.19. Supervisory Devices (Tamper Switches): Shall transmit a signal to the fire department, zone by trouble on activation of any supervisory device. Each supervisory device shall be connected to the fire alarm panel/radio transmitter, on a dedicated zone (circuit) with ZID # and description.

2.20. Notification Appliances: Combination Audible/Visual notification appliances shall be heavy duty and conform to the applicable requirements of UL464. Devices shall be connected into alarm indicating circuits and no more than 10 appliances per circuits. The color of the appliances will be off white with red letter (fire signal). Appliances shall be factory assembled. Units shall be suitable for use in an electrically supervised circuit and shall have a sound output rating of at least 85 dBA at 10 feet. Visual indication shall be accomplished by high intensity optic lens strobes (minimum of 15 candela). At least one-audible/ visual notification appliances shall be installed on the exterior of the facility street side. Exterior appliance shall be installed for exterior use IAW NFPA 70 and recommend by manufactory for Exterior Use. Appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height then six (6) inches from the top of ceiling or otherwise indicated.

a. Combination Visual/Chimes notification appliances shall have same specification as the Audible/Visual notification appliances. These appliances shall only be used in school, Child Development Center.

2.21. Electromagnetic Door Hold-Open Devices: Any door with a fire rating (fire door) shall have electromagnetic door hold-open devices. Devices shall be attached to the walls unless otherwise indicated. Devices shall comply with the appropriate requirements of UL 228. Devices shall operate on power from the fire alarm control panel. Compatible magnetic component shall be attached to the door. Under normal condition, the magnets shall attract and hold the doors open. When fire alarm panel/radio transmitter is activated in alarm mode the magnets are de-energized, and shall release the doors. Magnets shall have a holding force of approximately 25 pounds. Devices shall be UL or FM-01 approved. Housing finish for device shall match door hardware. Operation shall be fail-safe with no moving parts. Door operated manually will not activate the fire alarm system.

2.22. Delivery and Storage of Equipment: All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust and any other

contaminants. If the installer is contacting to existing system the above protection will be provide to existing system by the contractor. Both systems will be secure to prevent any damage or thief of new and existing equipment. Prior to disconnecting, connecting, or moving to any existing system the Technical Services Branch, Pope AFB fire alarm maintenance contractor, Contracting Manager and the construction contractor will certificate that the existing system is operation. This test will be conducted after the completion by same personnel and ensure the existing system is operational after connection.

2.23. SUBMITALS: PRIOR TO STARTING INSTALLATION OF SYSTEM

a. Six copies of Installer Qualification and Shop drawing shall be forwarded to the Contracting Officer or The US Army Corps of Engineers and two copies to the 43d Civil Engineer Squadron, Fire Protection Flight, Technical Services Branch prior to performance of any work on the fire alarm system.

b. Installer is the person(s) who installs the fire alarm system

c. Fire Alarm System: A group of interacting, interrelated elements forming a complete fire alarm system to include but not limited to fire alarm panel/radio transmitter, detection devices, supervisory signal, notification appliances, wiring, and conduit

d. Installer Qualification: Installer must have three years experience in the installation of fire alarm systems, certified by manufactory, possess a minimum LEVEL II certificate from the National Institute for Certification in Engineering Technologies (NICET) in the subfield Fire Protection Engineering Technology (Fire Alarm Systems), and certified by Monaco Inc.

e. Certified installer shall be at the construction site during the installation of the entire fire alarm system, programming, pre-final, correction of system, and acceptance test.

f. Shop Drawing: Shop drawing shall be submitted and shall consist of a complete set of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Detail drawing shall also contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawing shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation

2.24. SUBMITTALS PRIOR TO PERFORMANCE AND ACCEPTANCE TESTING:

Six copies shall be forwarded to the Contracting Officer or The US Army Corps of Engineers and two copies to the 43d Civil Engineers Squadron, Fire Protection Flight, Technical Services Branch of the following submittals, 30 days prior to performance or acceptance testing of the fire alarm system.

a. Complete copies of operating instructions outlining step-by-step procedures required for system start up, operation, and shut down. Maintenance instructions listing routine maintenance procedures, possible breakdowns, repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.

b. Spare Parts Data: Contractor shall furnish spare parts data for each different item of materials and equipment specified, with current unit prices and source of the supplier, and a list of the parts recommended by the manufacturer to be replaced after 3 years of services.

c. Special Tools and Spare Parts: Special tools necessary for the maintenance of the equipment shall be furnished. Two spare sets of fuses of each type, five spare lamps, and two expansion cards shall be furnished to the 43 CES/CEF Technical Services Branch. Two percent of the total number of each type detector, notification appliances Manual Stations, and supervisory devices, but not less than two each, shall be furnished to the Technical Services Branch.

d. As Built Drawing: The contractor shall submit two legible copies, one copy placard and two 3.5 dish copies in auto CAD format to the 43 CES/CEF Technical Services Branch, of all fire alarm drawing showing the as-built system. The Installer of the fire alarm system (NECIT Level II) shall sign the detailed drawing of the fire detection system. The drawings shall consist of a complete list of equipment and material, including manufacturer's descriptive and technical literature and catalog cuts. The drawing shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. The detailed point-to-point wiring diagram showing all points of connection shall include connections between system devices, appliances, control, panels, supervised devices, and all equipment that is activated by the control panel.

e. Certificate of Transceiver Inspection Report: A Certificate of Transceiver Inspection Report see attachment I shall be given to the Contracting Officer, and 43 CES/CEF Technical Services Branch. The installer certifying the fire alarm system is installed IAW specification of the contract, NFPA, NEC, UL, manufacturer specifications, and Air Force Publications signs this Certificate. The Certificate also certifies the installer will maintain the fire alarm system IAW warranty and NFPA standards and codes during warranty period.

f. Training of Fire Fighters: The Fire Alarm Contractor (installer) shall schedule two 4 hours of training with the Pope AFB Fire Department Training Officer two weeks in advance of completion of fire alarm system. This training will include but not limited to the operating procedures, and restoring the system to normal operation after a trouble or fire alarm activation of system.

g. Programming the D-500 at the Fire Station: The contractor will ensure that correct information of zones identification are programmed in the D-500 at the Fire Station (building # 250) and information is posted on the inside of the fire alarm panel and copy of information is forwarded to the Fire Alarm Communication Center (building # 250) and the Technical Services Branch.

h. The battery calculation for the fire alarm system and schedule battery sixty-hour emergency power test 30 days prior to acceptance test

2.25. Pre-final Acceptance Test. The contractor requests the pre-final acceptance test, the test shall be schedule 30 days prior to test date with Contracting Manager, Technical Services and Fire Alarm installer.

2.26. The contractor shall furnish all instruments equipment and personnel required for this test. The correction action required of the pre-final acceptance test shall be forwarded on a written report to Contracting Manager and 43 CES/CEF Technical Services Branch two days after Pre-final test. All correction actions will be completed prior to the final acceptance test.

2.27. Performance and Acceptance Test of the Fire Alarm System: The contractor shall schedule the Contracting Officer, Contracting Manager, and the Technical Services Branch thirty (30) days prior to date pre final and final acceptance tests are to be conducted. The Acceptance test shall be performed in the presence of the Contracting Manager, Contracting Officer, Technical Branch, installer, Government Technical Advisor, and fire alarm system manufacturer qualified representative. The contractor shall furnish all instruments, equipment and personnel required for the test. .

a. Acceptance Test: The test shall be in accordance with NFPA 72 and specification of contract. The Fire Alarm Installer Contractor Contracting Officer, Contracting Manager, and Technical Services shall verify that all previous deficiencies of the Pre-final test have been corrected. The acceptance test shall include the following:

- Test of each function of the control panel
- Test of each circuit in both trouble and normal modes
- Test of alarm initiating devices (100%) devices in alarm, trouble, and normal conditions
- Test of each control circuit and device
- Test each alarm notification appliance. The visual and audible shall be measured by meters and met the specification of the contract, NFPA 72 and ADA standard (if applicable).
- Test each supervisory device in trouble and normal conditions
- Ensure the battery emergency power test was completed and test the battery charger
- Visual inspection all wiring connections (test shall be done prior to enclosing walls and ceiling)
- Opening the circuit at each alarm initiating and indicating device to the wiring supervisory feature.
- Test the as-built drawing to insure that they are correct.
- Perform a calibrated test to ensure smoke detectors are with in listed marked sensitivity.
- Duct smoke detector shall be tested with a manometer for proper readings.

b. Acceptance Test Report: Upon completion of test on the fire alarm system a written record of completion report (report shall be IAW NFPA 72) shall be submitted in booklet form showing all field test performed to prove the system is in compliance with the specification of the contract. Two copies shall be forwarded to each of the following: Contracting Officer, Contracting Manager, and 43 CES/CEF Technical Services Branch within two working day of acceptance test.

2.28. Once the Air Force takes ownership of the building the inspection, testing, and maintenance of the Fire Alarm System shall be perform by government technical alarm maintenance personnel except for warranty items (one year period)

a. Perform Quarterly Inspection with report forwarded to Technical Services Branch

b. Perform Semi-Quarterly cleaning of detectors

c. IAW with the base fire alarm maintenance contract.

2.29. Emergency Warranty Calls: Provide 24-hr emergency phone number to Contracting Officer or US Army Corps of Engineers.

a. Warranty Calls: The Contractor's Fire Alarm maintenance personnel shall responded around the clock, seven days per week to trouble services calls within four (4) from the time of notification from Contracting Officer or US Army Corps of Engineers of a trouble call. The maintenance personnel shall report to building # 250 (265 Boxcar St. Fire Department) to discuss the problem with the fire alarm system. The maintenance personnel shall complete warranty call within five working days of notification. Non-availability of parts shall not be considered a valid excuse for non-compliance.

b. Written report of corrective action (s) taken to correct the trouble with the fire alarm system shall be forwarded to the Contracting Officer, US Army Corps of Engineers, and the Technical Services Branch within two days of completion of repairs.

c. The Contractor's Fire Alarm Maintenance Personnel Qualification: Maintenance Personnel must have three years experience in the installation of fire alarm systems, certified by manufactory, and possess a minimum LEVEL II certificate from the National Institute for Certification in Engineering Technologies (NICET) in the subfield Fire Protection Engineering Technology (Fire Alarm Systems).

2.30. OTHER REQUIREMENT: Contractor shall:

a. All areas of the building will have 100% coverage with detection devices to include but not limited to the closet, bathrooms regardless of size.

b. The system equipment shall be UL or FM approved or approved listed by a nationally recognized testing laboratory in accordance with applicable NFPA Standards.

c. All conduits shall be ¾ inch and will be run in loop system. No fire alarm circuit will be run parallel, and wiring in same conduit.

d. The proper UL listed and fire rated recess extinguisher cabinets shall be mounted no more than five (5) feet to top of cabinet from the finished floor, painted to match interior finish, located in accordance with NFPA 10 and furnish 10lb ABC extinguishers.

e. All wiring and conduit will meet all requirements of NEC 70 Articles.

f. Contractor shall request from the Fire Department, in writing, the ZID numbers for the Fire Alarm Panel.

g. Contractor shall give two- (2) week notice to Fire Dept for programming the D-500.

h. Contractor shall give two- (2) week notice to Fire Department of all tests.

i. All Fire alarm wiring entering fire alarm panel shall be labeled with the zones using heat shrink labels.

2.31. Americans with disabilities Act (ADA) of 1990

a. Horn and strobe or strobe shall be in handicap bathrooms.

b. Pull stations for handicap if building is designed for handicapped personnel.

c. All exits, office doors will accommodate the handicap and hallways IAW ADA standards (if applicable).

2.32. Add lock box in mechanical room, connected to the fire alarm panel for supervision. The box will require two keys to open. One key by fire department and other key by Security Forces.

a. Specification of the lock box

- Recessed mount
- UL listed. Double-action rotating tumblers and hardened steel pins , accessed by a biased cut key
- Housing will be ¼ inch steel plate and ½ inch thick steel door with interior gasket seal .
- Lock shall have 1/8 inch steel dust cover with tamper seal mounting capability
- Dual Switch
- Tamper switch on door and box connected to the fire alarm panel as it own supervisory zone.
- Keys for the lock box will be turned over to the fire department and Security Forces
- Installed and mounted in accordance with manufactory specification

2.33 The 43 CES/CEF Technical Services Branch of the 43rd Civil Engineer Squadron shall remove the old fire alarm panel(s) and all devices of the fire alarm system before building is turned over to contractor. The Contracting Officer or the Corps of Engineers will insure they notify the Technical Services Branch one-week before building is turned over to the contractor to insure the fire alarm system has been removed. The contractor will ensure that the fire alarm system has been removed before starting any work on the building.

# CERTIFICATION OF TRANSCEIVER INSPECTION
## Attachment I

| **BUILDING TRANSCEIVER INSPECTION** | | | | **DATE:** | | | | **BASE NAME:** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING #** | | | **BT2-#** | | | | | **# ACTIVE ZONES** | | | |
| **TRANSCEIVER TYPE : BT2-** | | | | **S/N** | | | | **DATE:** | | | |
| **ZID # (1=NUMBER CHECKED: 2= ALARM ZMTD/REVD: 3= TROUBLE XMTD/RCVD** | | | | | | | | | | | |
| **ZID #** | **1** | **2** | **3** | **ZID #** | **1** | **2** | **3** | **ZID #** | **1** | **2** | **3** |
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| **TRANSCEIVER SETUP/TEST and ANTENNA INSTALLATION** | | | |
|---|---|---|---|
| Interrogation & Reply: | Y N | Master or Slave | Forward Xmtd Power Watts |
| Tamper Xmtd/Rcvd: | Y N | 4 Tone 5 Tone | Reflected Power: Watts |
| A/C Fail Xmtd/Rcvd: | Y N | A/C Fail Active or Inhibited | VSWR: |
| Low Battery Xmtd/Rcvd: | Y N | Coazial Cable Continues in Length | Y N |
| ANTENA TYPE: | | | |
| Lighting Arrestor: | Y N | Coaxial Cable Drip Loop: | Y N |
| Mast Grounded | Y N | Weather Seal Used | Y N |
| Arrestor Grounded: | Y N | Installed Correctly: | Y N |
| Ground Point: Rod Other | | Antenna Ground Connected to Building Ground | Y N |

| **TRANSCEIVER ENCLOSURE INSTALLATION** | | | |
|---|---|---|---|
| Alone wiring and antenna coax cable less than seven feet from the floor run in conduit or equivalent protection: Y N | | Zone wiring and antenna coax cable run in conduit or equivalent when passing through walls and anywhere damage is likely to occur? Y N | |
| Conduits or raceways through which moisture may contact live parts sealed at both ends? Y N | | EOL resistors on active zones placed electrically furthest away from BT2 zone input? Y N | |
| Installation wiring color-coded or marked for identification? Y N | | Wiring as-builds for BT2 to fire alarm control panel interfacing provided? Y N | |
| BT2 enclosure information tables completed? Y N | | Enclosure clean and free of metal shavings? Y N | |
| A/C Power (3 wire) Y N | Fuses Correct: Y N | Voltage Sw: 115 or 230 | Tamper Sw: Y N |

| FIRE ALARM SYSTEM INFORMATION | |
|---|---|
| Panel Manufacturer: | Panel Model Number: |
| Active Zones: | Transmitted Zones |
| Number of Heat Detectors | Number of Manual Pull Stations |
| Number of Smoke Detectors | Number of Smoke Duct Detectors |
| Number of Batteries | Number of Horn/Strobe |
| Number of Tamper Switches | Number of Flow Switches |

I _____ certify that the above fire alarm panel and components are installed and operational to the specification of contract, the manufacturer, and NFPA Codes.

SIGNATURE _____

DATE: _____

| **DISCREPANCIES** |
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Dated 13 Jun 02

# APPENDIX E

# SUBSURFACE EXPLORATION
# AND
# GEOTECHNICAL ENGINEERING REPORT
# (PRELIMINARY)

Dormitory Complex
L.I. 033002, FY-03
Pope Air Force Base, North Carolina

By
Soils Section
Geotechnical & HTRW Branch
U.S. Army Engineer District, Savannah

15 January 2003

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SUBSURFACE EXPLORATION AND
GEOTECHNICAL ENGINEERING REPORT
(PRELIMINARY)

Dormitory Complex
L.I. 033002, FY-03
Pope Air Force Base, North Carolina

15 January 2003

**1. PURPOSE.** The Government has conducted a preliminary geotechnical investigation for the proposed project. This report provides an overview of the site conditions, including subsurface soil and groundwater conditions, and preliminary recommendations pertaining to the geotechnical design and construction of the project.

**2. QUALIFICATION OF REPORT**. The field explorations performed for this report were made to determine the general subsurface soil and groundwater conditions and were not intended to serve as an assessment of site environmental conditions. No effort was made to define, delineate, or designate any areas of environmental concern or of contamination. Any recommendations regarding drainage and earthwork construction are made on the basis that such work can be performed in accordance with applicable laws pertaining to environmental contamination.

**3. PROJECT DESCRIPTION**. The proposed project consists of the design, site preparation and construction of 128 person, four-story dormitory(ies), a single Commons building and two (optional) asphalt parking lots. The project requires extensive earthwork, new sidewalks, curbs and gutters, a dumpster enclosure with a concrete pad, and landscaping. Work required for supporting utilities include; 1) tying into existing and installing new underground water and storm drainage systems, 2) relocating and tying into existing underground sanitary sewer and gas lines, and 3) installing new underground chilled water, electrical and communications systems. Demolition of the existing parking lot will be required in the vicinity of the dormitory(ies) and Commons building.

Drawings and specifications for the design and construction of the Dormitory Complex project are included in the RFP. The plans and specifications are provided to convey to the proposers the functional intent and requirements and the quality requirements of the project facilities and are to be used as a basis for design.

Since the project will be constructed under a design/build contract, detailed structural information for the proposed facilities is unavailable.

**4. EXPLORATION PROCEDURES**.

**a. Site Reconnaissance**. Prior to the field exploration, the site and surrounding areas were visually inspected by a geotechnical engineer. The observations were used in planning the exploration,

in determining areas of special interest, and in relating site conditions to known geologic conditions in the area.

**b. Field Exploration.**

(1) Subsurface conditions at the project site were explored by thirteen soil test borings drilled at the approximate locations shown on the Grading Plans included in the drawings with this RFP. Depths of the borings for the proposed project ranged from five to thirty feet below the existing ground surface.

(2) Boring locations were established in the field by an engineer by measuring distances and estimating right angles from existing buildings, roads, sidewalks, and other features. The ground surface elevation at each boring location was determined by interpolation from the site topography survey. Since the measurements were not precise, the locations shown on the Grading Plans and the elevations on the boring logs should be considered approximate.

(3) Froehling & Robertson, Inc. (F&R), under contract to the Savannah District, drilled the borings utilizing the Standard Penetration Test (SPT). The borings were drilled with an ATV-mounted CME 550 drill rig; a 2¼ inch I.D. hollow-stem auger was used to advance the boreholes. Split-barrel sampling with Standard Penetration Tests (SPT) were performed at intervals shown on the boring logs. Standard Penetration Tests were in substantial accordance with ASTM D 1586. In the standard penetration test (SPT), a soil sample is obtained with a standard 1½ inch I.D. by 2 inch O.D. split-barrel sampler. The sampler is first seated 6 inches and then driven an additional 12 inches with blows from a 140 pound hammer falling a distance of 30 inches. The number of blows required to drive the sampler the final 12 inches is recorded and is termed the "standard penetration resistance", or the "N-value". Penetration resistance, when properly evaluated, is an index of the soil's strength, density, and foundation support capability.

(4) Representative portions of the soil samples taken in the field were sealed in airtight containers and transported to the driller's laboratory were they were examined by an engineer to confirm the driller's field classification. Classification of the soil samples were performed in general accordance with ASTM D 2488 (Visual-Manual Procedure for Description of Soils). The soil classifications include the use of the Unified Soil Classification System described in ASTM D 2487 (Classification of Soils for Engineering Purposes). Since the soil descriptions and classifications are based on visual examination, they should be considered approximate, except where the samples were subjected to laboratory testing, as described below.

(5) Soil boring logs graphically depicting soil descriptions, standard penetration resistances, and observed groundwater levels are shown on the drawings with this RFP.

**c. Laboratory Soils Testing**. Twenty-six of the soil samples from the soil test borings were selected and tested for grain-size distribution, moisture content and Atterberg limits. Three undisturbed samples were obtained adjacent to selected SPT borings to obtain samples of clayey soils for consolidation testing. The purpose of the laboratory testing was to aid in our evaluation of the subsurface soils and in confirming the field classifications. The laboratory tests were performed in substantial accordance with applicable ASTM standards. Results of the laboratory testing are shown on the drawings included with this RFP.

## 5. SITE AND SUBSURFACE CONDITIONS.

**a. Site Description**. The site is generally bounded by Reilly Street to the east, Ethridge Street to the south and Interceptor Street to the west. The proposed dormitory(ies) and Commons building will be constructed on the north side of an existing parking lot located between existing buildings 288 and 291. The area is flat, sloping about two percent from the south to the north from elevation 205 feet (mean sea level) to 198 feet. The area is approximately 1.6 acres. The parking lot in Option 2 is about 0.9 acre and is located just to the northwest of the intersection of Reilly Street and Ethridge Street. The area is grassed and generally flat, having once been occupied by a dormitory. The southern end of this lot rises steeply from elevation 214 feet to about 222 feet over a distance of 80 feet, for a slope of ten percent. The parking lot in Option 1 is about 1.3 acres; it is located between Reilly Street and Interceptor Street, just south of Ethridge Street. The long narrow site slopes to the west from a peak elevation of about 232 feet to a low of 220 feet. The slope in this lot averages about six to seven percent. Many mature pine and oak trees will likely have to be removed to make room for the parking lots.

**b. Area and Site Geology**. Pope Air Force Base is situated in the Sand Hills area of the Coastal Plain physiographic province of North Carolina. The Coastal Plain extends westward from the Atlantic Ocean to the Fall Line, a distance of about 130 miles. The Fall Line is the boundary between the Coastal Plain and the Piedmont physiographic provinces.

Geologic units in the Pope AFB area, ranging from oldest to youngest, include the Carolina Slate Belt rocks, which comprise the basement rock, the Cape Fear Formation, and the Middendorf Formation. The Cape Fear and Middendorf Formations overlie the basement rock and are part of the generally southeastward-dipping and thickening wedge of sediments that constitute the Atlantic Coastal Plain deposits.

The Middendorf Formation is exposed at land surface throughout the Pope AFB area. The formation is composed of tan, cross-bedded, medium- and fine-grained, micaceous quartz sand and clayey sand interbedded with clay or sandy clay lenses or layers. Layers of hematite-cemented sandstone occur locally throughout the Middendorf Formation as do thin layers of hard kaolin and kaolin-cemented sandstone. Below the water table, these units are generally friable or plastic. In places, the Middendorf Formation is a mottled orange, gray, and tan color with streaks and laminae of red and purple hematite and manganese oxide stains.

**c. Subsurface Conditions**

(1) Dormitory Complex. Borings B-1 through B-5 (30-foot depth) were drilled at an existing parking lot and generally evenly spaced over the 1.6 acre area. The borings encountered two inches of asphalt underlain by a two-foot layer of medium dense, reddish-brown , gray or brown, fine silty sand fill, which in turn was underlain by about two more feet of loose silty sand fill. The exception being B-3, which had two feet of medium dense, silty sand underlain with three feet of stiff clayey sand fill. Below the fill material in all of these borings, the soil varied considerably in soil type, density, consistency and thickness.

Borings B-1 and B-4 had from three to six feet of loose to medium density silty sand below the fill. Beneath the first layer of in situ material in boring B-1 was a seven-foot layer of medium dense,

poorly graded sand underlain by a ten-foot layer of loose to very loose silty sand, terminating with about seven feet of very soft clayey sand. Beneath the first layer of in situ material in boring B-4 was a sandy clay layer with consistencies ranging from very soft at the top of this layer to very stiff in the lower portion of the layer.

Borings B-2, B-3 and B-5 had from 2.5 to 9.5-foot layers of sandy clay beneath the fill. The clay ranged from fat to lean with consistencies of very soft to stiff. Below the clay in boring B-2 was a 6.5-foot layer of medium dense, poorly graded sand, underlain by a five-foot layer of loose silty sand. Below these sands was a 11.5-foot layer of lean sandy clay with consistencies ranging from very soft for most of the layer to very stiff for the last drive sample of the boring. Below the clay in boring B-3 was a 4.5- foot layer of very soft clayey sand, underlain by 10 feet of medium density silty sand and terminating in 1.5 feet of very stiff sandy clay. Below the clay in boring B-5 was a thin layer (about one-foot) of silty sand underlain by 9-foot layer of very soft clayey sand, terminating in 6.5 feet of very stiff, very sandy clay.

The differences between the material types and variable thicknesses described above are seen in the boring logs. It is important to note the differences between the field and laboratory soil classifications, the wide variability in the sand and moisture contents and the frequency with which very soft clayey sand and sandy clay was encountered.

(2) Parking lots. Borings B-6 through B-10 were performed for the parking lot in Option 1. Borings B-11 through B-13 were performed for the parking lot in Option 2. With the exception of boring B-11, which was located on a steep slope, all of the borings encountered a one to two inch layer of silty or sandy topsoil. Fill material was encountered in borings B-6, -7, -9, -11 and B-12. The fill material, ranging from 2.0 to 4.7 feet in thickness, consisted of medium dense, fine silty sand, often with a trace of gravel or clay. In borings B-6, B-7 and B-9, the fill was underlain by silty sand of loose to very loose density. The fill in borings B-11 and B-12 was underlain by either clayey sand or sandy clay of firm consistency. Below the topsoil in borings B-8 and B-10 was a layer of loose, fine, silty sand 2.0 and 3.5 feet thick, respectively, underlain by a 1.5 to 3.0 foot layer of either clayey sand or sandy clay of stiff consistency. Boring B-13 consisted of 4.9 feet of stiff to very stiff clayey sand.

(3) The above subsurface descriptions are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs together with the laboratory test data shown on the drawings should be reviewed for specific information at individual boring locations. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between the subsurface materials; the actual transition may be gradual.

**d. Groundwater Conditions**.

(1) Water levels were generally measured at completion of the borings and again at 24 hours after completion of the borings. Several of the deeper borings received piezometers in which groundwater levels were measured. Groundwater was encountered from about nine to sixteen feet below the ground surface in several of the borings. Many of the borings caved prior to a 24 –hour

groundwater observation; therefore, long term stabilized water levels were not obtained for all of the borings. The variability in the groundwater readings over the limited horizontal and vertical distances between borings along with the soil moisture descriptions implies a perched groundwater condition may be present. Perched groundwater is common in and around Pope Air Force Base.

(2) Groundwater depths or elevations shown on the boring logs represent groundwater encountered on the dates shown. Absence of groundwater data for certain borings implies that no data is available, but does not necessarily mean that groundwater will not be encountered at the locations of those borings. Groundwater levels will fluctuate with seasonal and climatic variations, variations in subsurface soil conditions, and construction operations. Therefore, groundwater conditions in the future, and at other locations on the site, may differ from the conditions encountered at the boring locations, on the dates the borings were performed.

## 6. ENGINEERING EVALUATIONS AND RECOMMENDATIONS.

**a. General**. The following conclusions and recommendations are based on the information available on the proposed structures, observations made at the project site, interpretation of the data obtained from the soil test borings, and our experience with soils and subsurface conditions similar to those encountered at the site. Since the test borings represent a very small statistical sampling of the subsurface conditions, it is possible that subsurface conditions substantially different from those indicated by the test borings could be encountered during the construction. In such instances, adjustments to the design and construction of the proposed structures might be necessary, depending on the actual conditions.

### b. General Site Preparation.

(1) The demolition and removal of a number of utilities and pavements will be required to prepare the site for construction. Following demolition and removal, the construction area should be grubbed and stripped of all vegetation, topsoil, organics, remnants of foundations and other deleterious materials. Clean topsoil can be stockpiled and reused later in landscaped areas. It is recommended that the zone of stripping extend a minimum of ten feet beyond the outer edges of the structures and pavement. Any existing utilities in construction areas should be located and rerouted, as necessary.

(2) The density of the fill material encountered in the borings, which consisted of sands, ranged from loose to medium dense. Existing fill soils can be highly variable in composition and compaction. Usually fill soils that were not controlled during placement are erratic with respect to slab/pavement support. Some of the near surface soils may need to be undercut in order to achieve sufficient subgrade stability for compaction operations and/or direct support of slab/pavement structures. The fill material consisted of primarily silty and clayey sands; these soils can generally be densified to some depth under the compaction of a vibratory roller. After stripping or excavation, we recommend that all proposed fill areas or areas at design grade beneath proposed buildings and road/parking areas containing sands be densified using a vibratory roller weighing at least 10 tons. We recommend that at least 8 passes be made over the areas, with half the passes perpendicular to the other half. After the densification of near surface sands, the exposed subgrade of all areas beneath buildings and road/parking areas should be proofrolled in the presence of the geotechnical engineer or his representative to evaluate subgrade stability. Proofrolling with a fully loaded tri-axle dump truck, 20-ton roller, or similar equipment in a perpendicular overlapping pattern is recommended.

Proofrolling not only helps to reveal the presence of any unstable or otherwise unsuitable surface materials, but will densify the exposed subgrade for new fill placement and structure/pavement support. If unsuitable conditions are encountered at the subgrade level, recommendations for dealing with the conditions should be provided by the geotechnical engineer. Generally, any areas which are observed to rut, pump or deflect excessively during the proofrolling process and cannot be densified by continued rolling are undercut to firm bearing soils and replaced with structural fill. In general, soils encountered in the borings should be suitable for reuse as structural fill following discing and air drying to achieve the proper moisture level. Proofrolling should be performed only after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade.

**c. Foundation Design and Construction.**

(1) Given the proposed structures and the subsurface soil conditions at the project site as revealed by the "preliminary" explorations, it is anticipated that the soils at the project site are not suitable for support of the proposed structures on conventional shallow foundations, especially the dormitory buildings. Using the results of the soil test borings and laboratory test data provided in the RFP and assumed column loads of about 115 kips (since this is a design-build project, detailed structural information for the proposed structures is unavailable), we calculated maximum settlements of 1 to 3 inches. It is anticipated that some form of ground modification, foundation improvement system, conventional deep foundations, or a combination of these will be required for support of the proposed buildings.

(2) Conventional shallow footings should be supported on approved natural or existing fill soils or on properly compacted structural fill. Column footings and load-bearing wall footings should have minimum dimensions of 30 inches and 24 inches, respectively, and should be located at a minimum depth of two feet below finish floor or finish grade, as appropriate. Non load-bearing wall footings should have a minimum width of 18 inches and should be located at a depth of 18 inches below finish floor or finish grade, as appropriate.

(3) Foundation excavations should be concreted as soon as practical following excavation. Exposure to the environment could weaken the soils at the footing bearing level should the foundation excavations remain open for an extended period of time. Bottoms of foundation excavations should be inspected immediately prior to placement of reinforcing steel and concrete to verify that adequate bearing soils are present and that all debris, mud, and loose, frozen or water softened soils are removed. If the bearing surface soils have been softened by surface water intrusion or by exposure, the softened soils must be removed to firm bearing, and replaced with additional concrete during the concreting, or replaced to design subgrade with No. 57 or No. 67 stone, compacted to a non-yielding condition. To minimize exposure, the final excavation (4 to 6 inches) to design subgrade could be delayed until just prior to placement of reinforcing steel and concreting. Foundation excavations must be maintained in a drained/dewatered condition throughout the foundation construction process.

**d. Site Classification for Seismic Design.** The project site should be classified as Site Class D for the purpose of determining maximum considered earth spectral response accelerations $S_{MS}$ and $S_{M1}$ in accordance with "NEHRP" Recommended Provisions for Seismic Regulations for New Buildings and Other Structures," 1997 Edition.

**e. Concrete Slabs-On-Grade.**

(1) We recommend that all concrete slabs-on-grade in inhabitable areas, including storage areas, be underlain by a minimum of four inches of open graded, washed pea gravel, or stone, often termed "capillary water barrier," to prevent the capillary rise of groundwater. Nos. 57, 67, 78, or 89 stone could be used. We also recommend that a moisture vapor barrier consisting of lapped polyethylene sheeting having a minimum thickness of 6 mils be provided beneath the building floor slabs to reduce the potential for slab dampness from soil moisture. Concrete slabs used in conjunction with conventional shallow foundations should be jointed around columns and along supported walls to minimize cracking due to possible differential movement.

(2) Construction activities and exposure to the environment often cause deterioration of the prepared slab-on-grade subgrade. Therefore, we recommend that the slab subgrade soil be inspected and evaluated immediately prior to floor slab construction. The evaluation might include a combination of visual observations, hand rod probing and field density tests to verify that the subgrade has been properly prepared. If unstable soil is revealed, the affected soil should be removed to firm bearing, and replaced to design subgrade with suitable structural fill soil placed and compacted as recommended, or replaced with additional capillary water barrier material.

**f. Pavement Design.** If fat clays are encountered in the subgrades for pavements, the material should be undercut a minimum of 15 inches and replaced with a sand-clay or clay-sand soil having a liquid limit less than 50 and a plastic index less than 30.

**g. Groundwater Considerations.** Water should not be allowed to collect near the foundation or on floor slab areas of the building either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs.

**h. Structural Fill**. In order to achieve high density structural fill, the following evaluations and recommendations are offered:

(1) Based on the soil test borings, excavated on-site soils (excluding any organics and debris) can be used as structural fill. Some moisture content adjustment will probably be necessary to achieve proper compaction. Due to the high plasticity of some of the clays (CL and CH), increase and decrease of the moisture content in these soils may require considerable effort. Furthermore, excavation of these in situ soils produces chunks and clods. Considerable manipulation and working with disc harrows might be required to produce uniform moisture content and fill material of uniform texture free of chunks and clods. We recommend that these soils be used only in the lower portions of the fills.

(2) We recommend that the contractor have appropriate disc harrows on site during earthwork for both drying and wetting the soils.

(3) Materials selected for use as structural fill should be free from roots and other organic matter, trash, debris, and frozen soil, and stones larger than 3 inches in any dimension. The following soils represented by their Unified Soil Classification System (ASTM D 2487) group symbols will be

suitable for use as structural fill: GC, GM, SP, SW, SC, SM, ML, MH, CL and CH (on-site). The following soil types are considered unsuitable: Pt, OH, OL, GP, GW, and CH (borrow).

(4) Suitable fill soils should be placed in lifts of maximum 8 inches loose measurement. The soil should be compacted by mechanical means such as steel drum, sheepsfoot, tamping, or rubber-tired rollers. Compaction of clays is best accomplished with a sheepsfoot or tamping roller. Periodically rolling with heavily loaded, rubber-tired equipment may be desirable to seal the surface of the compacted fill, thus reducing the potential for absorption of surface water from rain. This sealing operation is particularly important at the end of the workday and at the end of the week. Within confined areas or foundation excavations, we recommend the use of manually operated, internal combustion activated compactors ("wacker packers" or sled tamps). The compactors should have sufficient weight and striking power to produce the same degree of compaction that is obtained on the other portions of the fill by the rolling equipment as specified. Where hand operated equipment is used, the soils should be placed in lifts of maximum 4 inches loose measurement.

(5) We recommend the structural fill and subgrades be compacted to the following minimum percents of the modified Proctor maximum dry density (ASTM D 1557):

| | |
|---|---|
| Beneath structures and building slabs, to 5 feet beyond building and structure line, around footings and in trenches | 90 percent |
| Beneath paved areas, except top 12 inches | 90 percent |
| Beneath paved areas, top 12 inches | 95 percent |
| Beneath sidewalks and grassed areas | 85 percent |

**i. Construction Quality Control Testing**.

(1) Prior to initiating any structural fill placement and/or compaction operations, we recommend that representative samples of the soils which will be used as structural fill or subgrade, both suitable on-site soils and off-site soils (borrow), be obtained and tested to determine their classification and compaction characteristics. The samples should be carefully selected to represent the full range of soil types to be used. The moisture content, maximum dry density, optimum moisture content, grain-size and plasticity characteristics should be determined. These tests are required to determine if the fill and subgrade soils are acceptable and for compaction quality control of the subgrades and structural fill. Tests for the above soil properties should be in accordance with the following:

| | |
|---|---|
| Moisture Content | ASTM D 2216 |
| Maximum Dry Density and Optimum Moisture | ASTM D 1557 |
| Grain-Size (Wash No. 200, less hydrometer) | ASTM D 422 and D 1140 |
| Plasticity | ASTM D 4318 |

(2) A representative number of in-place field density tests should be performed in the subgrade of compacted on-site soils and in the structural fill and backfill to confirm that the required degree of compaction has been obtained. In-place density tests should be performed in accordance with the sand cone method prescribed in ASTM D 1556; the use of nuclear gauges for density testing should not be permitted. We recommend that at least one density test be performed for each 5000 square feet, or portion thereof, of compacted existing on-site soils, subgrades, and in **each** lift of compacted structural fill beneath structures; one for each 7500 square feet beneath paved areas. At least one density test should be performed for each 100 linear feet in the bearing level soils of continuous footings. Density tests should be performed at 100-foot intervals in the subgrade of roads. In addition, a density test should be performed for each 150 linear feet of backfill placed per foot of depth in trenches for utilities systems. Where other areas are compacted separately by manually operated compactors, a minimum of one density test should be performed for every 250 square feet, or portion thereof, of fill placed per foot of depth.

(3) Compaction control of soils requires the comparison of fill water content and dry density values obtained in the field density tests with optimum water content and maximum dry density. The performance of a laboratory compaction test on material from each field density test would provide the most accurate relation of the in-place material to optimum water content and maximum density, but it is not feasible to do this as the testing could not keep pace with fill construction. We recommend that compaction control of the earthwork construction be performed using a "family" of compaction curves and the one-point or two-point compaction methods. Excerpts from construction specifications, which describe the approach and its use, are included in the Appendix.

(4) Any area that does not meet the required compaction criteria should be reworked, and retested. If the moisture content of the soil is within the recommended range, additional compaction may be all that is necessary to increase the density. If the moisture content is not within the recommended range, then, the moisture content should be adjusted to within the range, and the area recompacted.

(5) All laboratory and field density testing should be performed by an approved commercial testing laboratory which has been validated by the Engineer Research and Development Center Materials Testing Center (MTC) under the Corps of Engineers laboratory inspection and validation program. The laboratory shall be listed on the list of Corps of Engineers Validated Laboratories.

# APPENDIX

## One-Point and Two-Point Compaction Methods

## Compaction Control

For fine grained (clayey and silty) soils and for sands with appreciable fines such that normal shaped compaction curves are obtained, results of all compaction tests shall be plotted on a common plot as a family of curves. For each field density test performed, a one-point compaction test, with additional points as needed, shall be performed on the same material on which the field density test was conducted. The one-point compaction test shall be performed on the dry side of the optimum moisture content. For comparison of field density data to the proper laboratory compaction test results, the procedures for the one-point and/or two-point compaction control methods as described in paragraph Compaction Procedure, shall be used. Compaction curves plotted on the family of curves shall be of such a scale that the optimum moisture content can be interpreted to the nearest 0.1 percent and the maximum dry density can be interpreted to the nearest 0.1 pcf(or 2 $kg/m^3$). When a one-point test plots outside the range of the family of curves, an additional five-point compaction test shall be performed.

## Compaction Procedure

### General

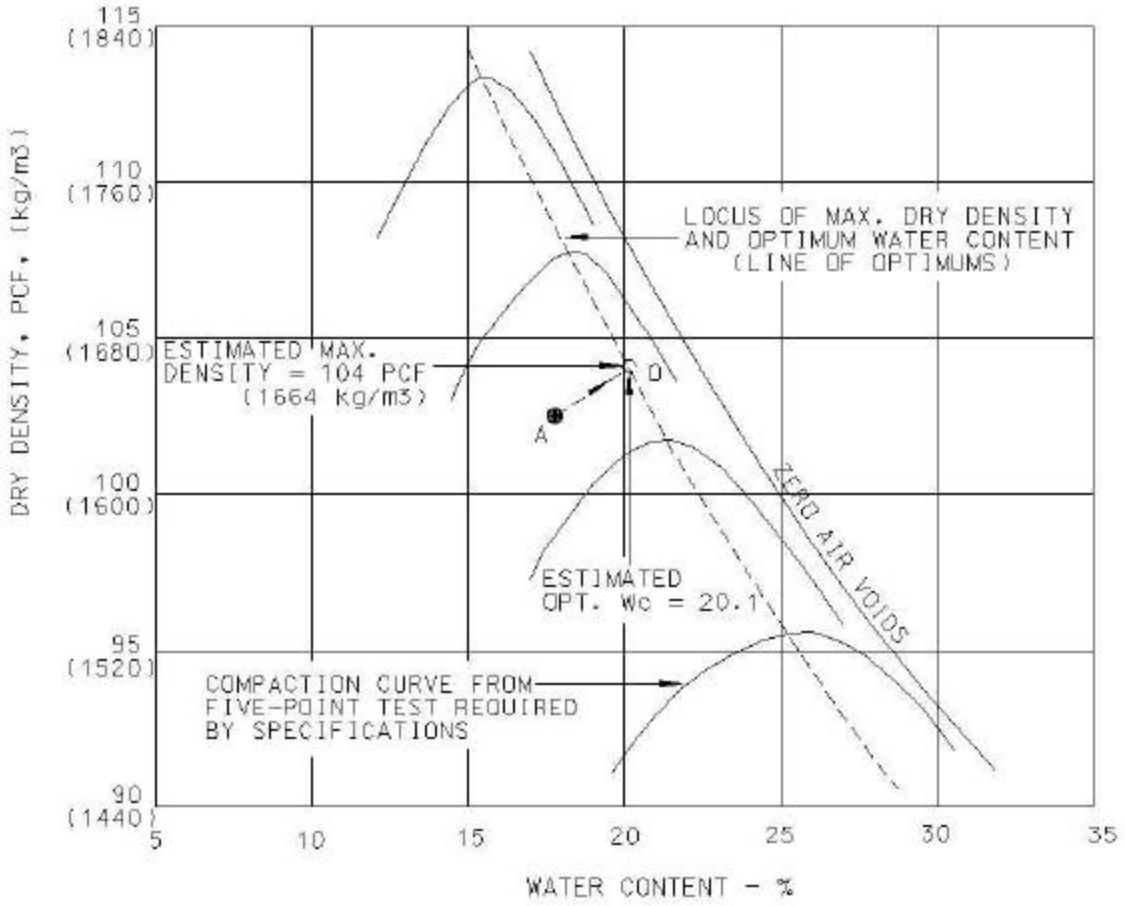
The following paragraphs describe methods of relating field density data to desired or specified values. Compaction control of soils requires comparison of fill water content and/or dry density values obtained in field density tests with optimum water content and/or maximum dry density. At a minimum, control shall be in accordance with the One-Point Compaction Method. Where conditions require, the Two-Point Compaction Method shall be used.

### One-Point Compaction Method

The material from the field density test is allowed to dry to a water content on the dry side of estimated optimum, and then compacted using the same equipment and procedures used in the five-point compaction test. Thorough mixing is required to obtain uniform drying; otherwise, results obtained may be erroneous. The water content and dry density of the compacted sample are determined and then used to estimate its optimum water content and maximum dry density as illustrated in Figure 1 at the end of this section. In Figure 1, the line of optimums is well defined and the compaction curves are approximately parallel to each other, consequently, the one-point compaction method could be used with a relatively high degree of confidence. However, in Figure 2 at the end of this section, the curves are not parallel to each other and in several instances will cross if extended on the dry side. Consequently, the correct curve cannot be determined from the one-point method; therefore, the two-point compaction method should be used. The one-point method should be used only when the data define a relatively good line of optimums.

Two-Point Compaction Method

In the two-point test, one sample of material from the location of the field density test is compacted at the fill water content if thought to be at or on the dry side of optimum water content (otherwise, reduced by drying to this condition) using the same equipment and procedures used in the five-point compaction test. A second sample of material is allowed to dry back about 2 to 3 percentage points dry of the water content of the first sample and then compacted in the same manner. At least one point shall fall within 3 percent of the line of optimums. After compaction, the water contents and dry densities for the two samples are determined. The results are used to identify the appropriate compaction curve for the material being tested as shown in Figure 2 at the end of this section. The data shown in Figure 2 warrant the use of the two-point compaction test because the five-point compaction curves are not parallel. Using point A only, as in the one-point test method, would result in appreciable error as the shape of the curve would not be defined. The estimated compaction curve can be more accurately defined by two compaction points.



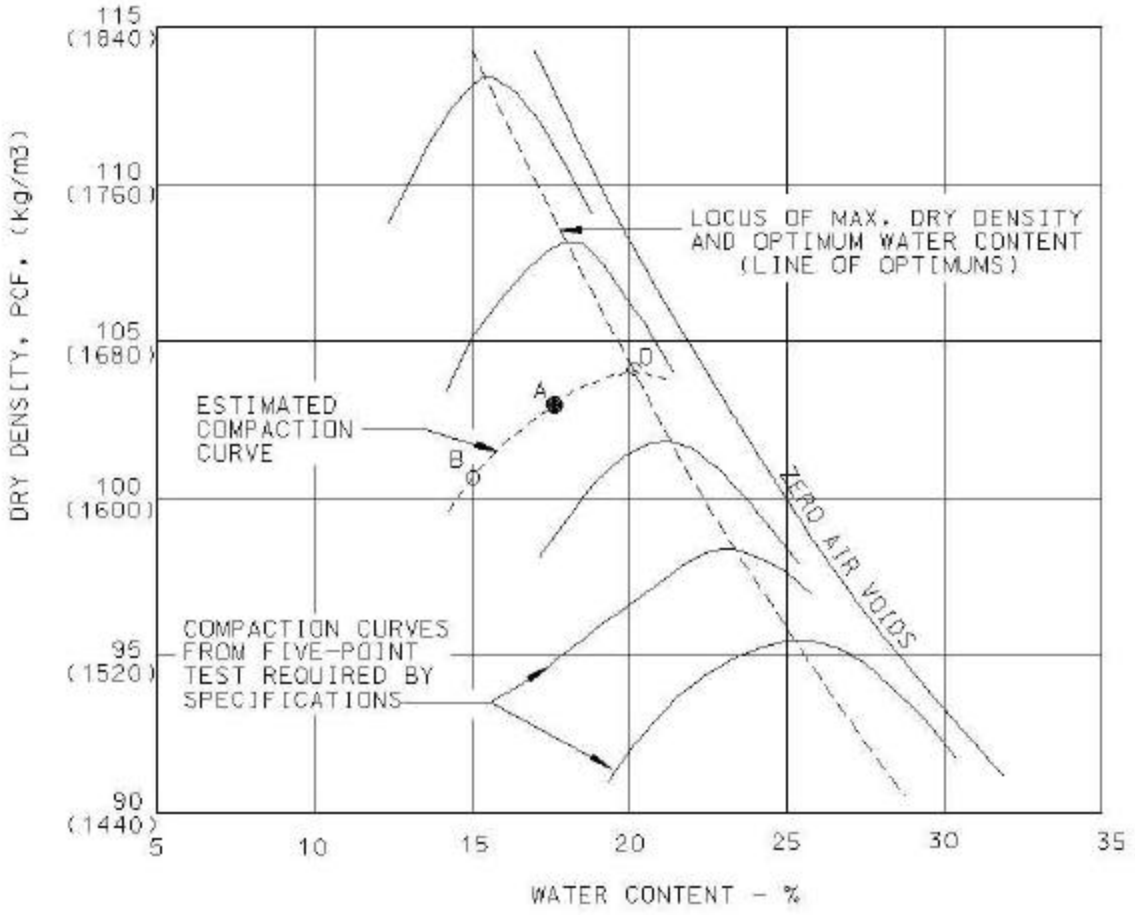

PROCEDURE:

1. Point A is the result of a one-point compaction test on material from field density test. This point must be on the dry side of optimum water content.

2. Point O is the estimated optimum water content and maximum density of the fill material based on a projection of point A approximately parallel to the adjacent compaction curves.

3. Point A must plot within 3 percent of the line of optimums.

**Figure 1. Illustration of one-point compaction method.**




PROCEDURE:

1. Points A and B are results of a two-point compaction test on material from field density test. Points A and B must be on the dry side of optimum water content.

2. The estimated compaction curve based on Points A and B establishes Point O on the locus, which is the estimated maximum dry density and optimum water content of the fill material.

3. One point must plot within 3 percent of the line of optimums.

**Figure 2. Illustration of two-point compaction method.**

**APPENDIX F**

**HYDRANT FLOW TEST RESULTS (ATTACHED)**

# HYDRANT FLOW TEST REPORT

PROJECT FY-03 Dormitory

LOCATION Pope AFB

JOB NUMBER 02124

TEST NO. 1

DATE 04/30/02

TIME. 1400

GAGE READINGS

RESIDUAL HYDRANT

STATIC 94 psi

RESIDUAL 67 psi

HYDRANT DATA

RESID. HYDRANT NO. 215

FLOW HYDRANT NO. 216

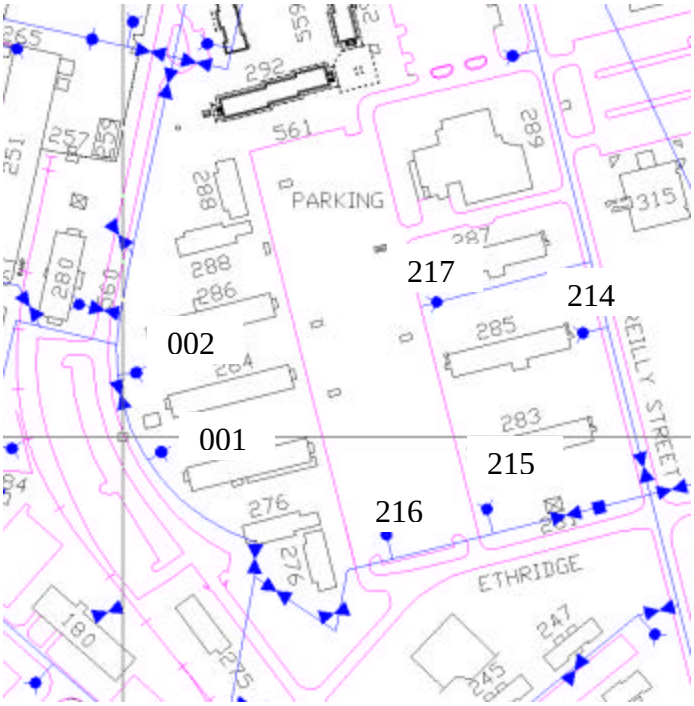
FLOW HYDRANT COEFF. 0.90

FLOW HYDRANT

PRESSURE 58 psi

FLOW 1,308 GPM

## SKETCH




## REMARKS

$Q_{20}$ = 2,255 GPM

# HYDRANT FLOW TEST REPORT

PROJECT FY-03 Dormitory

LOCATION Pope AFB

JOB NUMBER 02124

TEST NO. 2

DATE 04/30/02

TIME. 1420

GAGE READINGS

RESIDUAL HYDRANT

STATIC 104 psi

RESIDUAL 75 psi

HYDRANT DATA

RESID. HYDRANT NO. 214

FLOW HYDRANT NO. 217

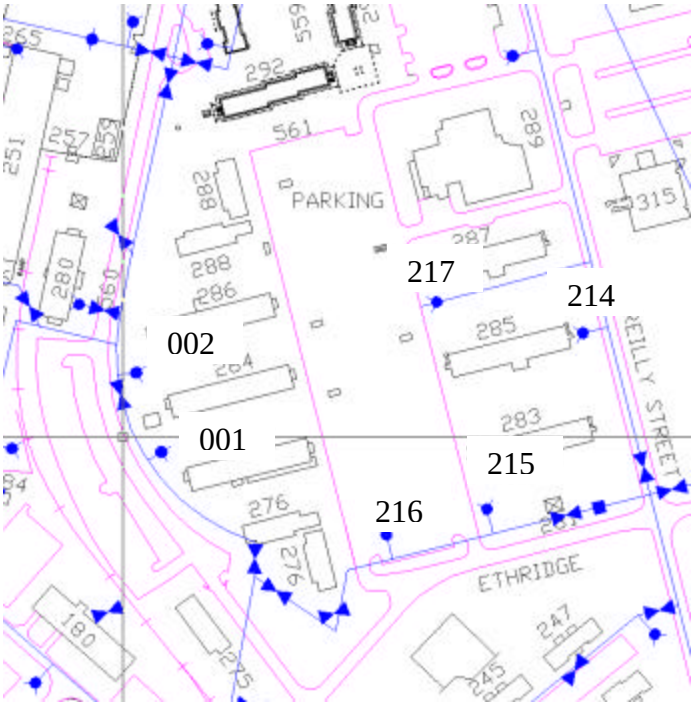
FLOW HYDRANT COEFF. 0.90

FLOW HYDRANT

PRESSURE 42 psi

FLOW 1,171 GPM

## SKETCH




## REMARKS

$Q_{20}$ = 2,080 GPM

# HYDRANT FLOW TEST REPORT

PROJECT FY-03 Dormitory

LOCATION Pope AFB

JOB NUMBER 02124

TEST NO. 3

DATE 04/30/02

TIME. 1450

GAGE READINGS

RESIDUAL HYDRANT

STATIC 100 psi

RESIDUAL 76 psi

HYDRANT DATA

RESID. HYDRANT NO. 001

FLOW HYDRANT NO. 002

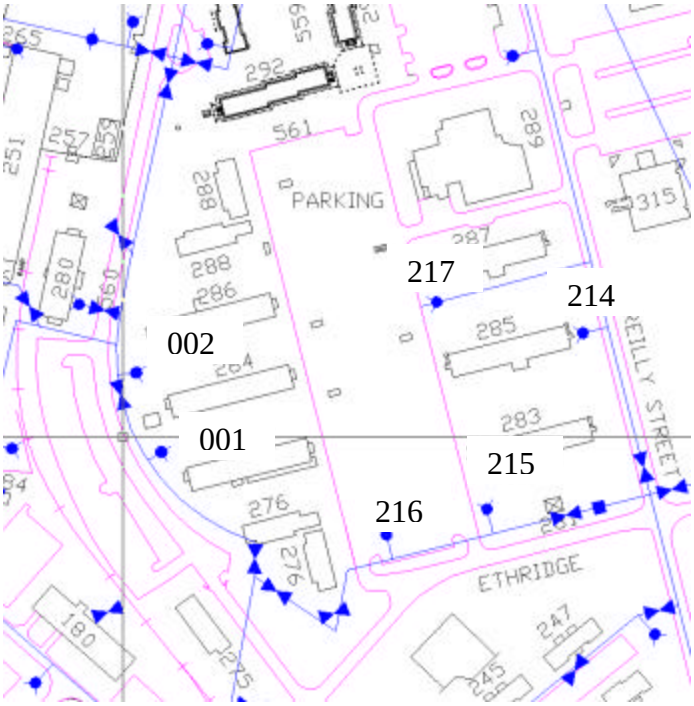
FLOW HYDRANT COEFF. 0.90

FLOW HYDRANT

PRESSURE 48 psi

FLOW 1,220 GPM

## SKETCH




## REMARKS

$Q_{20}$ = 2,337 GPM

**APPENDIX G**

**SECTION 01564 – ENVIRONMENTAL PROTECTION DURING CONSTRUCTION**

# SECTION 01564 – ENVIRONMENTAL PROTECTION DURING CONSTRUCTION

## PART 1 – GENERAL

### 1.1 INTRODUCTION

This section covers requirements for environmental pollution prevention and damage to the environment as the result of construction, demolition, and renovation operations under this contract and for those measures set forth in other technical provisions of these specifications. Environmental pollution and damage to the environment is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare, and unfavorably impacting ecosystems or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes. The control of environmental pollution and impacts requires consideration of the potential effects of an action upon air, water, and land resources, and includes management of visual aesthetics, natural and cultural resources, noise levels, solid waste, dust, hazardous waste, toxic waste, and radioactive materials, as well as other pollutants.

### 1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record on daily reports any problems in complying with laws, regulations, permit requirements, ordinances, and corrective action taken. The Contractor shall immediately inform the Contracting Office (CO) and the 43d Civil Engineer Environmental Office (43 CES/CEV) of any environmental problem.

### 1.3. KNOWLEDGE OF ENVIRONMENTAL REQUIREMENTS

The Contractor is responsible for being knowledgeable of and complying with all applicable federal, state, and local laws, regulations, permit requirements, and Air Force policy. Whenever there is a conflict among federal, state, and local laws, regulations, and permit requirements, the more restrictive provision shall apply.

### 1.4. CONTRACTOR COMPLIANCE

#### A. Permits

The Contractor shall comply with all requirements under the terms and conditions set forth in any and all permits issued for work under this project by any local, state or federal agency. (e.g., NCDENR Erosion and Sedimentation Control Permit, NCDENR Asbestos Abatement Permit, 401 Water Quality Permit, NCDENR Air Quality Permit, NCDENR Sanitary Sewer Permit, NCDENR Solid Waste Landfill Permit, U.S. Environmental Protection Agency Permit, etc.). Any changes to permits must be justified and coordinated with 43 CES/CEV and the appropriate regulatory agency.

#### B. Contacts with Regulators and Fines

The Contractor shall inform the 43 CES/CEV of any contact with regulators, including copies of correspondence, site visits and inspections. If a permit requires mitigation, that mitigation shall be

coordinated with the 43 CES/CEV. The Contractor shall be liable for any costs, assessments, fines, legal fees, etc., that the Air Force may incur resulting from actions or responsibilities of the Contractor.

C. Subcontractors

Assurance that subcontractors comply with the environmental protection requirements of this section will be the responsibility of the prime Contractor.

## PART 2 – PRODUCTS (NOT APPLICABLE)

## PART 3 - EXECUTION

3.1 SUBMITTALS

The following shall be submitted in accordance with Sections SUBMITTAL DESCRIPTIONS and/or SUBMITTAL PROCEDURES. Within 10 calendar days after the date of Notice of Award, the Contractor shall submit in writing an Environmental Protection Plan that must be approved by the Contracting Office with input from the 43 CES/CEV prior to starting construction. The Contractor shall submit monthly environmental reports by the 5$^{th}$ day of each month throughout the length of the contract. These monthly reports will include information on contractor chemical use; recycling; disposal of chemicals and disposal of discarded materials; erosion control activities and dates including species seeded/planted and nursery/manufacturer source; hydro-seeding or mulch projects; installed erosion control products; spills, abatement and reporting; and landscaping activities to include dates, species, type and nursery sources. Sample forms to provide Contractors guidance are included at the end of this section of these specifications.

3.2 ENVIRONMENTAL PROTECTION PLAN

The Contractor's Environmental Protection Plan shall include, but is not limited to, the following:

A. Legal Requirements

A list of federal, state, and local laws, regulations, and permits concerning environmental protection and pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits shall be included. Whenever there is a conflict between federal, state, or local laws, regulations, and permit requirements, the more restrictive provision shall apply. This submittal is for the Air Force's information only and does not absolve the Contractor from procuring and implementing all necessary permits and complying with all environmental regulations.

B. Protection of Features

The Contractor shall prepare a listing of methods to protect resources needing preservation within and near authorized work areas. These include, but are not limited to, natural vegetation such as trees,

shrubs, vines, grasses, and ground cover; landscape features; air and water quality; fish and wildlife; habitat; sensitive species; soil; and historical, archaeological, and cultural resources.

C. Environmental Protection Procedures

Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations shall be included. The Contractor establish procedures to be followed to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures set forth in the Environmental Protection Plan.

D. Erosion and Sedimentation Control Plan and National Pollutant Discharge Elimination System (NPDES) Permit

(1) When the total area of land disturbed is 1 acre or more in size, the Contractor shall apply for coverage under the North Carolina "General NPDES Stormwater Discharge Permit for Construction Activities" from the Division of Water Quality of the North Carolina Department of Environment and Natural Resources (NCDENR) by submitting a completed Notice of Intent for their approval. This General Permit is tied to an approved "Erosion and Sedimentation Control Plan" issued by the North Carolina Division of Land Resources. The contractor must comply with the conditions of the permit issued by NCDENR and implement the requirements of the SWPPP in accordance with North Carolina Administration Code, Title 15, Department of Natural and Economic Resources, Chapter 4, Sedimentation Control. The Contractor shall be responsible for taking all actions necessary to comply with the erosion control laws and implementing the permit. When the area to be disturbed is less than 1 acre, a formal plan is not required; however, erosion and sedimentation control measures will be implemented as needed to minimize pollution of water resources.

(2) If the project is already covered by such Permits and Plans, the Contractor shall abide by such IAW section 1.4. The Contractor shall coordinate such applications, plans, and permits with the CO and 43 CES/CEV.

(3) Ground cover must be reestablished early in the project rather than being reserved as the last item of work. Over 85% of the final ground cover must be established by the time the Contractor demobilizes. Final retainage will not be released until 100% of the final ground cover is established by the Contractor.

E. Oil and Hazardous Materials Spill Prevention and Contingency Plan

The contractor shall develop a plan to prevent releases/spills of oil or hazardous materials to be used on the project. The plan shall indicate methods the contractor will use to restore any damage to the environment caused by any release of oil or hazardous material on the project site. Revegetation of the site shall be done as appropriate for the proximity of the spill near to the airfield. The plan will also contain an inventory of the type, amount and location of hazardous chemicals the contractor will have on the job site at any time.

(1) IAW POPEI32-102, paragraph 5.1.6, "The contractor is responsible for the proper use, storage, and disposal of contractor-caused oil spillage in accordance with Pope AFB Facility Response Plan, 'Person/s discovering the emergency will take all step possible to immediately alert others in the area, shut down all fuel operations (if appropriate), notify the base Fire Department by dialing 911 from a

base telephone or (910) 394-0911 from a cellular phone, and safely initiate steps to control the emergency and reduce the hazard.'"

(2) IAW POPEI32-102, paragraph 5.1.7, "Any used oil spillage caused by the contractor while performing services under this contract shall be cleaned up immediately by the contractor according to the State of North Carolina guidance document: Disposal of Solid Residue from Petroleum Discharge Clean-ups. All contractor vehicles shall have spill control equipment and materials such as shovels, absorbents, and plastic bags. If the spill occurs on a concrete or asphalt surface, the contractor shall use an oil absorbent material on the spill and clean up the area until only a stain remains. Disposal of the contaminated material shall be as directed by the CO. The area will be returned to its natural state. Used oil spillage shall be contained and stored in contractor-furnished, aboveground, approved containers. The contractor shall provide a written report to the COR of any spills within one working day of the occurrence. The contractor shall take every precaution to prevent oil spillage from entering into the storm drains, sewers, creeks, or other water sources."

F. Affirmative Procurement Program

Describe in the Environmental Protection Plan how the Contractor will comply with Pope Air Force Base's latest version of the Affirmative Procurement Program Plan that provides guidance on environmentally preferable purchasing.

G. Drawings

(1) Drawings showing locations of any proposed temporary excavations or embankments of haul roads, stream crossings, material storage areas, temporary fuel tanks, sanitary facilities, and stockpiles of excess or spoil materials shall be included.

(2) The drawings shall include a work area plan showing the proposed activity for each portion of the area and identifying the areas of limited use or no use. The plan should include measures for marking the limits of use areas.

(3) As-builts shall include electronic ArcView shapefiles and CADD data-layer files in the format being used by 43 CES. These will be used to update Pope AFBs GIS and CADD database.

H. Environmental Monitoring Plan and Log

The Environmental Protection Plan shall include plans for monitoring environmental compliance for the job site, including land, wildlife, habitat, water, air, noise, hazardous and toxic wastes, hazardous materials and solid waste disposal. The monitoring log shall be available for inspection by the CO and 43 CES/CEV.

I. Foreign Object Damage Prevention

All contractors are responsible to comply with Pope AFB Instruction 21-111 (OPR is 43 WW/CVF). Specific areas of interest include the following: "A foreign object (FO) is any object that is alien to an area or system. Foreign object damage (FOD) is damage to aircraft, drones, space systems, support equipment, engines, components, or missiles (except ICBM's), caused by debris. Some examples of FOD are engine damage caused by ingestion of loose hardware, rocks,

etc….and tires damaged by debris on the ramp or taxiway. The flight-line includes access roads, the paved areas around all hangars and nose docks, aircraft parking areas, the runway (including the overrun), all taxiways, the assault strip, compass row, wash rack, trim pad, test cell, end-of-runway, gun berm, and hush house. Maintenance areas include all hangars and nose docks, backshops, areas where aircraft parts are repaired, and where equipment is maintained that will be used on or around aircraft. The Program Objective is to eliminate potential FOD hazards. The Wing FOD Prevention Program is based on awareness and training with continuous individual and supervisory involvement. Professionalism is the key to any successful program. The overall program objective is ZERO FOD**.**

J. Implementation and Responsible Party

Include a statement identifying the Contractor's personnel responsible for ensuring the Environmental Protection Plan is implemented. This person(s) must have the authority to act for the Contractor in all environmental protection matters.

3.3 IMPLEMENTATION

The Contracting Office shall forward the Contractor's Environmental Protection Plan to the 43rd Civil Engineer Environmental Office (43 CES/CEV) for approval. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures in accordance with local, state and federal laws and regulations and Air Force policy.

3.4 NOTIFICATION

The Contracting Officer or his representative (Quality Assurance Evaluator) will notify the Contractor of any observed noncompliance with federal, state or local laws or regulations, permits, and other elements of the contractor's Environmental Protection Plan. This verbal notification shall be followed by a written notification of noncompliance. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and
implement such action as approved. If the Contractor fails to immediately correct the noncompliance problem, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No contract period extensions or cost/damage recuperation shall be granted to the Contractor for any such suspension.

3.5 PROTECTION OF ENVIRONMENTAL RESOURCES

A. The environmental resources within the project boundaries and those affected outside the limits of work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications. The Contractor's Environmental Protection Plan shall include proposed methods of work to comply with the following subparagraphs:

B. Protection of Land Resources

(1) Prior to any construction, the Contractor shall clearly mark the areas required to accomplish all work to be performed under this contract. Isolated areas within the general work area, which are to be

saved and protected, shall also be clearly marked and/or fenced. The Contractor shall provide effective protection for land and vegetation resources at all times. The Contractor shall not remove, cut, deface, injure, or destroy land resources, including trees, shrubs, vines, grasses, topsoil except as indicated on the drawings or in the specifications without written permission from the Contracting Officer. No ropes, cables, or guy wires shall be fastened or attached to any trees for anchorage unless specifically authorized by the CO. Protect the rootzone of adjacent trees and shrubs by using protective orange fencing or similar protection to mark the outside of the dripline of protected trees/shrubs. Trees trunks, roots and vegetation outside the designated area shall not be impacted by construction, including piling supplies against trees, scraping trunks of trees, grading next to tree trunks, or parking vehicles within the rootzone. Monuments and markers shall be protected before construction operations begin. Where construction operations are to be conducted during darkness, the markers shall be made of appropriate reflective material to remain visible. The Contractor shall inform his personnel of the purpose of marking and/or protection of all necessary objects. Damage to protected areas and objects shall be repaired immediately by the Contractor at no additional cost to the Government.

(2) Reduction of Exposure of Unprotected Erodible Soils: Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas as approved by the Contracting Officer.

(3) Temporary Protection of Disturbed Areas: Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation at all times including, but not limited to, the following:

(a) Control of Runoff: Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and silt basins; by check dams and berms constructed to reduce the velocity and divert runoff to protected drainage courses; and by any measures required by the area wide plans approved under paragraph 208 of the Clean Water Act.

(b) Sediment Basins: Sediment from construction areas shall be trapped in temporary or permanent sediment basin in accordance with basin plans shown on the drawings. They shall be constructed as indicated in the approved erosion control plan and permit to prevent sedimentation downstream or areas down-slope.

(c) Borrow areas on Government property shall be managed to minimize erosion and to prevent sediment from entering nearby watercourses or lakes.

(d) Spoil areas on Government property shall be managed and controlled to limit spoil to areas designed on the drawings and prevent erosion of soil or sediment from entering nearby waters.

(4) Forest Resources

Merchantable timber and pine straw shall neither be cut nor removed from the construction site until it has been assessed by the Savannah District Timber Harvest Office in conjunction with 43rd Civil

Engineer Environmental Office (43 CES/CEV) and the Ft. Bragg Natural Resources Division. The Savannah District Timber Harvest Office will be given adequate time to arrange for the sale and removal of timber and pine straw if it is deemed necessary. In the event the Savannah District, Civil Engineer Environmental Office (43 CES/CEV) and Ft Bragg Natural Resources Division determine the amount or quality of timber or pine straw is not merchantable, they will inform the Contracting Officer. The CO will then authorize the Contractor to remove these forest resources that are within the construction area.

(5) Handling of Hazardous Materials

(a) Shall be in accordance with POPEI 32-113, Hazardous Materials Management Process dated 13 March 2001. IAW paragraph 3.8, "The Pope AFB Contracting Office (43 AW/LGC) or other office executing the contract will ensure contractors report all planned use of hazardous materials on Pope AFB. HM used on Pope AFB, regardless of the source, contributes to the environmental reporting requirements of the base. The Contracting Office will ensure contractors prepare a Hazardous Materials Worksheet (attached) for each hazardous material proposed for use on Pope AFB. The Contracting Office will provide a copy of the worksheets to the HAZMART and CE HMCC thirty (30) days prior to beginning work on Pope AFB. A MSDA for each HM must be attached to each worksheet."

(b) IAW POPEI32-113, paragraph 3.8.4, "The Contractor will process all HM through the HAZMART or CE HMCC (as appropriate) as soon as the material is brought on base. The HM will be bar-coded and the contractor will report barcodes of material consumed to the HAZMART or CE HMCC on a quarterly basis and at the conclusion of the contract."

(6) Disposal of Waste and Listing of Chemicals

The Contractor is responsible for proper use, storage, and disposal of chemical wastes in accordance with (IAW) the latest Pope AFB Hazardous Waste Management Plan (HWMP), latest Pope AFB Solid Waste Management Plan, and current Department of Transportation (DOT) Regulations, State of North Carolina and federal environmental laws. In addition to complying with these regulations, the contractor must provide the base HAZMART a listing of chemicals (including estimated quantities) and a material safety data sheet (MSDS) for each chemical to be used during the execution of the contract. The contractor must also coordinate with the base Fire Department and the Wing Safety Office for proper storage of flammables, corrosives and other hazardous chemicals. These requirements must be met prior to bringing chemicals on base.

(a) Compatible Containers: Contractor must ensure that all chemical waste is stored in containers that meet the DOT specifications for performance-oriented packaging. Hazardous wastes shall not be stored underground. Any release or spill to the environment will be immediately reported to the base Fire Department at 911 from a base telephone or 394-0911 from a cellular phone; Base Contracting Office, and to the 43 CES/CEV at (910) 394-4195.

(b) Recycling: The Contractor shall implement a recycling program (with an emphasis on recycling at the construction site) that includes separate collection of waste and recyclable materials. Based upon contract plans and drawings, the contractor shall estimate the quantities of available materials for recycling. The contractor shall provide a material dismantling sequence plan, a schedule of removal, and the estimated quantity of recyclable materials to the Environmental Flight, 43 CES/CEV, when the pre-

construction meeting is held. The contractor shall provide necessary equipment for the temporary storage and handling of C&D debris. Recyclable materials to be recovered shall include as a minimum the following items:

(i) Asphalt
(ii) Concrete and concrete blocks (masonry units)
(iii)Metal, ferrous and non-ferrous
(iv)Green wastes (i.e. trees, bush, grass trimmings)
(v) Miscellaneous construction wastes (i.e. red clay brick, corrugated cardboard)
Contractor shall coordinate his recycling efforts with the 43 CES/CEV Solid Waste Manager. Contractor is responsible for arranging collection by or delivery to the permitted Ft Bragg C&D Landfill and Transfer Station that accepts construction and demolition waste for the purpose of recycling. Prior to delivering materials, contractor shall familiarize itself with the specifications for acceptance of construction and demolition materials at recycling facilities or transfer stations. Contractor shall provide recycled materials data in pounds to the Solid Waste Program Manager by the 5th day of each month throughout the length of the contract in the monthly environmental report.

(c) Chemical Analysis: The Contractor is responsible for complying with 40 CFR Part 261 to determine which waste generated under this contract is regulated as hazardous waste.
The Contractor is responsible for all sampling and analysis required to make this determination. All sampling and testing shall be done by state certified personnel in an EPA and state approved laboratory and IAW EPA approved methods for hazardous waste characterization. Contractor must coordinate confirmatory sampling with 43 CES/CEV 48 hours prior to any sampling events. After samples are taken, Contractor shall mark containers with the following information: the container identification number; contents of the container; contractors name/ phone number; the project name and number; "Awaiting Analysis", and "Date Sampled _____".

(d) Non-hazardous Waste: Waste that has been certified as non-hazardous by the Contractor may be removed from project site. This waste shall be disposed of in accordance with all applicable State of North Carolina requirements and guidance. The Contractor shall address the disposal method and location of the disposal site for each chemical waste in the Environmental Protection Plan for the project.

(e) Hazardous Waste: Contractor will follow the Requirements for Contractors as set forth in the PAFB Hazardous Waste Management Plan, Section 5.6.3. Removal shall be performed by a licensed hazardous waste hauler and transferred only to a licensed Treatment, Storage or Disposal Facility (TSD). The contractor will dispose of Hazardous Waste generated from this project unless it is specifically stated in the contract that the disposal will be the responsibility of the government. The Contractor shall address the disposal method and location of the disposal site for each chemical waste in the Environmental Protection Plan for the project. Unless otherwise specified, disposal is the responsibility of the contractor who shall provide the following:

(i) Provide a copy of each proposed transporter and/or facility permit prior to start-up of any work that may generate hazardous waste.
(ii) Develop and provide a copy of each manifest to 43 CES/CEV ten working days prior to any proposed shipment of waste from the base.

(iii) Coordinate with 43 CES/CEV for load inspection and signature on all manifests at least two workdays prior to a proposed shipment date.
(iv) Ensure that signed manifests are returned to 43 CES/CEV, 560 Interceptor Road, Pope AFB, NC no later than twenty days after the shipment is removed from Pope AFB.

(f) When disposal of Hazardous Waste is the responsibility of the government, the contractor shall provide the following:

(i) Properly complete and provide CES/CEV a copy of the waste profile sheet IAW the base Hazardous Waste Management Plan (HWMP).
(ii) Coordinate with the hazardous waste Centralized Accumulation Site (CAS) manager (910-394-1900) for transfer of wastes. The contractor shall be responsible to delivering the waste to the CAS in properly labeled and marked DOT approved containers.

(g) Labeling: Each container of hazardous waste shall be immediately labeled with a hazardous waste label and marked with the contractors name and phone number, the container contents and the project name. Contractor shall immediately annotate the accumulation start date on each container of hazardous waste whenever the total volume of hazardous waste at the job site exceeds 55 gallons.

(h) Container Management: The Contractor will maintain containers in accordance with Section 5.4 of the PAFB HWMP and inspect the containers weekly for signs of rust or deterioration. Inspection results shall be documented. Additionally, the U.S. Department of Transportation's proper shipping description shall be marked on each container before it is removed from Pope AFB. There will be no more than 55 gallons (or its equivalent) of hazardous waste at the project site for a period longer than 72 hours. Whenever the amount of hazardous waste at the project site exceeds 55 gallons, each container must be marked with an accumulation start date and the contractor must move the amount in excess of 55 gallons to the CAS for temporary storage. Contractor must make arrangements to ensure all waste stored at the CAS is shipped to an approved TSD facility no later than 60 days after the container(s) are placed at the CAS. During this 60 day time period, the contractor shall ensure all required profiles, sampling and analyses, manifests, etc. are properly completed in time to make the shipment.

(i) Training: The Contractor shall ensure that all of his employees who handle hazardous waste are trained in the management requirements for hazardous waste. Each contractor employee who physically handles or manages hazardous waste shall receive Pope AFB specific training prior to beginning any project, which involves the management of hazardous waste. This training may involve up to 8 hours of classroom instruction and testing and/or computerized self-study/testing. Contractor must contact 43 CES/CEV, 910-394-4195 to arrange for Pope AFB specific training.

(7) Disposal of Discarded Materials

(a) Discarded materials, other than those that can be included in the solid waste category, will be handled as directed by the Contracting Officer. Demolition debris shall be disposed of at the Fort Bragg demolition landfill on Lamont Road unless directed otherwise by the Contracting Officer. Materials contaminated by asbestos shall be placed in proper containers and disposed of in the asbestos section of the Ft Bragg sanitary landfill on Longstreet Road unless otherwise directed by the Contracting Officer. Contractor shall coordinate with the 43rd Civil Engineer Environmental

Office and obtain a permit from the Ft Bragg Environmental/Natural Resources Division to dispose of materials in the landfills on Ft Bragg.

(b) Monthly Reports of Disposal of Discarded Materials: Contractor shall document type and amount (in pounds) of materials discarded as a result of construction activities. Contractor shall organize this information by the following types: yard waste, construction/demolition material debris, regular refuse/trash, regulated hazardous waste, toxic waste (asbestos, PCBs) and non-regulated chemical waste. Contractor shall provide this information to the Solid Waste Manager by the 5th day of each month throughout the length of the contract in the monthly environmental report.

(8) Disposal of Solid Wastes

Contractor shall comply fully with NC Solid Waste Management Rules and Regulations. Solid wastes (excluding clearing debris) shall be placed in containers, which are emptied on a regular schedule (at least weekly). Contractor shall not place any hazardous materials or hazardous wastes in containers with solid waste. Yard debris is also prohibited from being placed in solid waste containers.

(9) Recyclable Materials

Contractors are reminded that NC Solid Waste Management Rules and Regulations prohibit the disposal of aluminum cans. In addition to North Carolina State law G.S. 130A-309.10(f), refer to paragraph 3.5.B.(6)(b) for additional requirements.

C. Preservation and Recovery of Historical, Archaeological, and Cultural Resources

(1) Artifacts Discovered During Construction: If any historical or archaeological artifacts are encountered during Contractor operations, the Contractor shall cease all activity in the affected area and protect the artifact(s). The Contractor shall promptly notify the Contracting Officer and the Environmental Flight Cultural Resources Manager. An archaeologist may be employed to determine the significance of the findings and to consult with the State Historic Preservation Officer. The significance of the findings shall be determined prior to authorizing the Contractor to resume operations in that area.

(2) Cultural Resources Protected by Law: Cultural resources on federal property are protected and managed by the Archaeological Resources Protection Act of 1979, and other applicable laws. Collection for personal use is not authorized. Violations could subject contractor personnel to civil and criminal penalties.

D. Protection of Water Resources

(1) The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Special management techniques shall be implemented to control water pollution by any construction activities that are included in the performance of this contract.

(2) Monitoring of Water Resources: Monitoring of water resources and wetlands affected by construction activities shall be the responsibility of the Contractor. During construction, action will be

required to maintain buffer areas and soil erosion control measures near water areas/wetlands that could be adversely affected by construction activities. Wetlands shall not be disturbed/impacted without obtaining a permit from the U.S. Army Corps of Engineers, Wilmington District Wetlands Enforcement Office.

(3) Washing and Curing Water: Wastewater directly derived from construction activities shall not be allowed to enter water areas. This wastewater shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates so that pollutants are separated from the water. These pollutants will be removed and the area restored to pre-construction conditions.

(4) Cofferdam and Diversion Operations: The contractor shall plan his operations and perform all work necessary to minimize adverse impact or violation of the water quality standard for receiving streams (e.g., Tank Creek). Construction operations for de-watering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use.

(5) Stream crossings shall be controlled during construction. Crossings shall provide movement of materials of equipment, which do not violate water pollution control standards of the Federal, State or local agencies.

(6) Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. The Contractor shall monitor all water areas affected by construction activities.

E. Protection of Wildlife, Fish, Sensitive Plants and Habitat

(1) The Contractor shall keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of wildlife, fish, sensitive plants and habitat. In addition, the Endangered Species Act requires that federally-listed species and their habitats be protected; similar state acts require conservation and protection of state-listed species; and Air Force Instruction 32-7064 requires conservation and protection of certain species and habitats. Information concerning any Pope AFB species or habitat that requires specific attention, along with measures for their protection, shall be obtained from the 43rd Civil Engineer Environmental Flight.

(2) Various haul routes and roads on Fort Bragg are adjacent to rare, threatened, or endangered plant and animal species as well as other sensitive habitats. The red-cockaded woodpecker (RCW) (*Picoides borealisis*) is an endangered bird that is often of concern to construction activities. Other protected plant and animal sites may be located near contractor-used roads. The contractor should be aware of posted signs denoting protected sites as well as trees with painted with white bands. Parking, digging, storage of construction materials and other habitat impacts are not permitted in protected areas. Molesting a protected species or damaging their habitat is a violation of law or regulation. For more information about protected species on Fort Bragg, contact the Fort Bragg Endangered Species Branch.

F. Protection of Air Resources

(1) The Contractor shall keep construction activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with State of North Carolina and federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency (EPA) shall be maintained for all construction operations and activities. The Contractor shall have sufficient functional equipment available to accomplish the task.

(2) Particulates: Dust particles, aerosols, and gaseous by-products from all construction activities and the processing and preparing of materials, such as from asphalt batch plants, shall be controlled at all times.

(3) Odors: Odors shall be controlled at all times from all construction activities, processing, and preparation of materials.

(4) Air Quality: Monitoring of air quality shall be the responsibility of the Contractor. The Contractor as directed by the Contracting Officer shall monitor all air areas affected by the construction activities.

(5) Air Permits: Any new construction project which involve the installation of parts degreasers, paint booths, bead blasters, wood cyclones, boilers or like equipment must be coordinated through the 43 CES/CEV, Air Program Manager. An air permit may be required. If so, the permit must be obtained prior to the start of construction. The 43 CES/CEV is the base's office of primary responsibility for air permits (910-394-4195).

(6) Asbestos Containing Material (ACM): The contractor shall ensure that all areas requiring demolition, cutting, breaking or other alterations has been identified as either containing asbestos or no asbestos present. Should asbestos be present, the abatement of such materials will be removed and disposed of by persons accredited by the North Carolina Department of Environment and Natural Resources (NCDENR) and in accordance with NCDENR publication NC Asbestos Requirements, Procedures. Obtaining an asbestos removal permit is the responsibility of the contractor. A copy of the state approved asbestos removal permit and any revision will be provided to 43 CES/CEV prior to the removal activity starting.
Additionally, a completed copy of all asbestos manifests for disposal of asbestos materials will be provided to 43 CES/CEV. Asbestos bags will be clearly marked with the generators name and location. The asbestos material must be taken to a landfill that is state permitted for acceptance of asbestos waste. Prior to removing asbestos waste from Pope AFB, the contractor shall provide a copy of the approved manifest to 43rd Civil Engineer Environmental Office (43 CES/CEV) and shall make the shipment available for inspection by the government. The contractor shall ensure a copy of the manifest signed by the accepting facility (landfill) is returned to 43 CES/ CEV no later than 20 days after the asbestos waste is removed from Pope AFB. In the event the removal schedule changes, the Contractor shall inform the CES/CEV Asbestos Program Manager with details of those changes as soon as possible.

(7) Lead Based Paint (LBP): Contracts to prepare previously painted surfaces for repainting must address LBP through sampling and analysis. Particular attention and paint analysis is required for exterior facility surfaces that are flaking and peeling. Where LBP is identified for removal or refinishing,

the contractor must ensure this work is done in accordance with the OSHA Interim Final Lead in Construction Standard (29 CFR 1926.62) and state approved abatement procedures (Whenever the final rule is implemented the contractor shall comply with it). This includes, but is not limited to, providing hazard communication training and ensuring that protective equipment is appropriate for the type of LBP removal/encapsulation specified in the contract.
Measures shall be employed by the contractor to capture/containerize all debris from interior and exterior work which results in the disturbance of surfaces containing LBP. Hazardous waste generated from such projects must be managed in accordance with section 3.5.B.(6)(e) of this specification, the Pope AFB Hazardous Waste Management Plan and 40 CFR part 260-268.

(8) Ozone Depleting Substances (ODS): The base Contracting Officer must verify that contracts do not include a requirement to use ODSs or any requirement that can be met only through the use of ODSs, without approval of the waiver approval authority (e.g. AF/LG, AF/CE, or SAF/AQ). The purging of ODS equipment (e.g. air conditioner, refrigerant units, fire protection systems etc.) is required prior to repair, removal, or demolition. The ODSs remain the property of Pope AFB. If purging the equipment is not included in the contract, the 43 Civil Engineer Operations Flight must be contacted to accomplish this task.

G. Reduction of Sound Intrusions and Noise

The Contractor shall keep construction activities under surveillance and control to minimize disturbances caused by excessive noise. Equipment shall have properly operating noise-muffling devices for the entire length of the contract.

H. Application of Pesticides

(1) The Contractor shall apply all pesticides in accordance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act, using pesticides approved by the EPA and by following the manufacturers' instructions on the label. Contractor shall coordinate application of pesticides during construction with the 43rd Civil Engineer Operations Flight Entomologist.

(2) Licensing and Certification: All pesticide applications shall be performed by a Contractor certified in the EPA category or categories that cover the work to be performed and shall hold a valid business license. For work on Pope AFB, the Contractor shall be certified and licensed by the State of North Carolina. The Contractor shall present evidence of such licensing and certification to the Contracting Officer for approval prior to beginning work under this contract.

4. POST-CONSTRUCTION CLEANUP

The Contractor shall be responsible for cleaning up all areas affected by the construction and restoring them to at least their original condition to include landscaping; planting of trees, sod, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass, sheet metal, bricks, and waste concrete. Backfilled areas shall be machine-compacted and replanted with Bermuda grass as long as the work does not cause a flight-line operational concern. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract

5. RESTORATION OF DAMAGED LANDSCAPE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the Environmental Protection Plan submitted for approval to the Contracting Officer. This work will be accomplished at the Contractor's expense.

6. MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract of for the length of time construction activities produce the particular pollutant.

A. Containment Berms: Contractor shall provide a secondary containment berm around temporary above ground fuel storage tanks. The bermed area shall be large enough to contain 125 percent of the volume of the storage tanks. The Contractor shall ensure containment areas are kept free of rainwater or any other substance that will reduce its containment capacity throughout the duration of the contract. The Contractor shall not install any temporary underground storage tanks.

B. Erosion Control Devices: The Contractor shall immediately repair any damaged erosion control structures, such as silt fences, and remove accumulated sediment.

C. Storm Drains: The Contractor shall ensure sediment does not block storm drains. The Contractor shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area or from off site sources during the duration of the contract.

7. TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

A. The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers and instruments required for monitoring purposes) to ensure adequate and continuous environmental pollution control. Such training shall be completed and documented in the Environmental Protection Plan before contract work begins.

B. The Contractor is encouraged to complete a comprehensive site survey to develop a baseline of existing environmental conditions at the construction site as an integral part of the required pollution control training. Any concerns identified during the survey by the Contractor should be reported to CES/CEV. This survey can also be used to guide the Contractor’s staff in the manner and method of work to be used during the project. Training of Contractor personnel is required on the requirements of all environmental permits and programs including, but not limited to, the Environmental Monitoring Plan; Oil and Hazardous Materials Spill Prevention and Contingency Plan; Storm Water Pollution Prevention Plan; recycling and Pollution Prevention goals; management of hazardous and non-hazardous materials and waste; protection of wildlife, fish, habitat, sensitive plants; air resources; asbestos containing materials; lead based paint; ozone depleting substances; cleanup and restoration.

----------end of specifications: Attachments 1, 2 & 3 follow----------

**Attachment 1**
**CONTRACTOR HAZMAT WORKSHEET**
**(adapted from POPEI32-113, 13 March 2001)**
*(In Addition to Filling in the Form Below, Attach a MSDS for Product)*

Date _____

Project/Contract Number _____

Project Name _____

Contractor's Name _____

Contractor's Representative _____

Contractor's Telephone Number _____

HM Product Name _____

Product Manufacturer_____

Individual Container Size: _____ Total Quantity Needed Over Contract_____
(5 gal pail, 50 lb bag, etc.) (100 pails, 20 bags, etc.)

Product Use (describe with details):

_____
_____
_____
_____
_____

Waste Generated by Material Use and How Waste Disposed:

_____
_____
_____
_____
_____

**Add the appropriate MSDS as an attachment**

**Attachment 2**
**Recurring Reports and Selected Environmental Submittal Requirements**

1. 30 days prior to beginning work, submit CONTRACTOR HAZMAT WORKSHEET w/MSDS (see Attachment 1) per each Hazardous Material.

2. Within 10 calendar days after the date of Notice of Award, the Contractor shall submit in writing an Environmental Protection Plan IAW paragraphs 3.1, 3.2.J and 3.5.

3. At the pre-construction meeting, the Contractor shall provide a material dismantling sequence plan, a schedule of removal, and the estimated quantity of recyclable materials to the Environmental Flight, 43 CES/CEV IAW paragraph 3.5.B.(6)(b).

4. Submit an Oil and Hazardous Materials Spill Prevention and Contingency Plan IAW paragraph 3.2.E.

5. By the 5th day of each month and throughout the length of the contract, Contractor shall provide recycled materials data in pounds to the Solid Waste Program Manager in CES/CEV IAW paragraph 3.5.B.(6)(b)(v).

6. By the 5th day of each month throughout the length of the contract (for Discarded Materials), "Contractor shall document type and amount (in pounds) of materials discarded as a result of construction activities. Contractor shall organize this information by the following types: yard waste, construction/demolition material debris, regular refuse/trash, regulated hazardous waste, toxic waste (asbestos, PCBs) and non-regulated chemical waste" IAW 3.5.B.(7)(b).

7. By the 5th of the first month after the end of each quarter, the Contractor will report barcodes of material consumed to the HAZMART or CE HMCC and at the conclusion of the contract IAW paragraph 3.5.B.(5)(b).

8. Ten (10) working days prior to proposed shipment of Hazardous Waste, the Contractor shall "Develop and provide a copy of each manifest to 43 CES/CEV prior to any proposed shipment of HW from the base IAW paragraph 3.5.B.(6)(e)(ii). In addition, "Coordinate with 43 CES/CEV for load inspection and signature on all manifests at least two workdays prior to proposed shipment date." "Ensure that signed manifests are returned to 43 CES/CEV, 560 Interceptor Road, Pope AFB, NC no later than 20 days after the shipment is removed from Pope AFB."

9. As a function of Container Management, "There will be no more than 55 gallons (or its equivalent) of hazardous waste at the project site for a period longer than 72 hours" IAW paragraph 3.5.B.(6)(h). In addition, "Contractor must make arrangements to ensure all waste stored at the CAS is shipped to an approved TSD facility no later than sixty (60) days after the container(s) are placed at the CAS.

10. "Prior to removing asbestos waste (ACM) from POPE AFB, the contractor shall provide a copy of the approved manifest to 43rd Civil Engineer Environmental Office (43 CES/CEV) and shall make the shipment available for inspection by the government" IAW paragraph 3.5.G.(6). Furthermore, "The Contractor shall ensure a copy of the manifest signed by the accepting facility (landfill) is returned to 43 CES/CEV no later than 20 days after the asbestos waste is removed from Pope AFB."

## Attachment 3
## Environmental Points of Contacts (area code 910)

| | |
|---|---|
| Administrative Assistant: | Ms. Carol Kirk, 394-4195 |
| Air Quality: | Mr. Jerome Watson, 394-1628 |
| Asbestos: | Mr. Jerome Watson, 394-1628 |
| Chief of Compliance: | Mr. Paul Humphrey, 394-2584 |
| Chief of Planning: | Ms. Omega Weeks, 394-1639 |
| Entomology: | TSgt Henry Astudillo, 394-5500 |
| Environmental Assessments | 2Lt Lisa Gmaz, 394-1638 |
| Flight Chief: | Mr. Wendell Williams, Sr., 394-1647 |
| Fort Bragg Natural Resource Division: | Mr. Terry Myers, 396-2510 |
| Fort Bragg Endangered Species Branch: | Ms. Jackie Britcher, 396-2544. |
| Hazardous Materials: | Mr. Garland Evans, 394-1635 |
| Hazardous Waste: | Mr. Phillip Weaver, 394-4397 |
| Hazardous Waste CAS: | Mr. Mike Lamm, 394-1900<br>Mr. Bruce Langston, 394-1900<br>Mr. Jeff Sloop, 394-1900 |
| Installation Restoration: | Mr. Bob Byrd, 394-4194 |
| Natural and Cultural Resources: | Ms. Viola Walker, 394-1633 |
| Project Management: | Mr. Charles Rimbach, 394-2582 |
| Solid Waste & Recycling: | Mr. Garland Evans, 394-1635 |
| UST/POL: | 1Lt Brian Littlejohn, 394-1636 |
| Water Quality: | Mr. Alberto Marquez, 394-1637 |

CIVIL ENGINEER OPERATIONS

| | |
|---|---|
| Flight Chief: | Maj Steven Keller, 394-1366 |
| HVAC: | Mr. Robert Logan, 394-1365 |
| Liquid Fuels: | Mr. Lonnie Maiden, 394-6692 |

FIRE PROTECTION FLIGHT

| | |
|---|---|
| Fire Chief: | Mr. Scott Logue, 394-1693 |
| Ass't Fire Chief: | Mr. Marion Garvin, 394-4778 |