FORT SAM HOUSTON

INSTALLATION DESIGN GUIDE

JULY 2006

ESSEX

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FORT SAM HOUSTON & CAMP BULLIS

INSTALLATION DESIGN GUIDE (IDG)

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Users of the IDG are presented with a hyperlinked table of contents. Each name is hyperlinked directly to the beginning of the document that it indicates. The table of contents is expandable and hyperlinked to each section and subsection.

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EXECUTIVE SUMMARY

Authority: The *Commander's Guide Army Installation Standards* published 1 October 2002, gave initial senior Army leadership direction. *The Army Installation Design Standards* establishes the Army standards for installation design as directed by the Secretary of the Army and the Chief of Staff, Army.

ES.1 PURPOSE

The purpose of the *Army Installation Design Standards* is to provide Army standards and serve as a tool for implementing those standards (Fig. ES.1).

- The design standards for site planning, buildings, vehicular and pedestrian circulation, landscaping, site elements (i.e. signage, utilities), force protection, and Sustainable Design are provided for incorporation into each Army installation.

- The framework for implementation is the Army Installation Design Guide (IDG). Each installation will imitate the IDG processes in the *Army Installation Design Standards* in the development of their installation specific IDG.

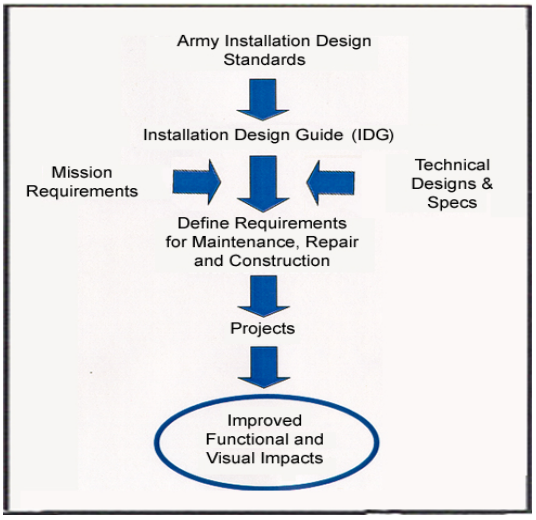


Fig. ES.1 - The Army Installation Design Guide is a Tool to Implement Army Standards

ES.2 BACKGROUND

ES.2.1 The *Army Installation Design Standards* follows the concept established in the Joint Service *Unified Facilities Criteria Installation Design* manual.

ES.2.2 Research was conducted to incorporate into Army standards the best practices from other organizations such as the Air Force, Navy, AAFES, GSA, National Park Service, Federal Highway Administration, and various city and county governments, and associations.

ES.2.3 Existing Army Installation Design Guide were also reviewed for their application of procedures, examples, and benchmarks for IDG implementation Army-wide.

ES.3 IDG METHODOLOGY

ES.3.1 In effect, Fort Sam Houston is like a small town with its own employment base, community services, and functional requirements. The IDG provides standards and guidelines to installation decision makers, contracted and in-house planning and design professionals, installation maintenance personnel, and others. The IDG sets interior and exterior standards and planning criteria to be integrated into all proposals, design and construction contracts, renovation, maintenance, or repair projects performed on the installation or its properties.

ES.3.2 The following paragraphs present an overview of the steps involved in developing an installation specific IDG. The IDG promotes a sense of arrival, functional compatibility, visual order, enhances site assets, relates the natural and man-made environment, and achieves consistent architectural themes throughout the installation and where applicable its sub-installations.

Step 1. Installation Profile

Initially an installation profile is created in which the installation setting, existing land use, and proposed land use are detailed to include all applicable sub-installations.

Step 2. Visual Surveys

The first survey establishes the visual zones and themes of the installation. The second survey documents the liabilities and assets within each visual zone.

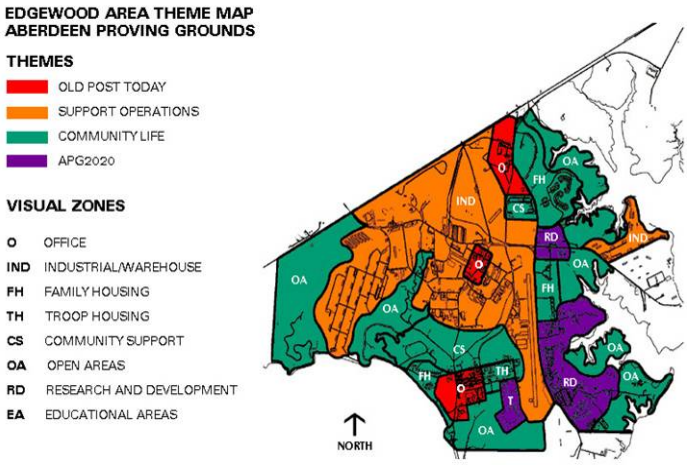


Fig. ES.2 - Example of Themes and Visual Zones

Step 3. Visual Zones and Themes

Information gathered is recorded and used to delineate visual zones. Zones with similar visual characteristics are grouped together to form a broader category called themes. Visual characteristics define a "look and feel" of an area together with the dominant features that define its image. Typical visual characteristics include unique buildings, vehicular and pedestrian corridors, functional use, natural features, and spatial relationships (Fig. ES.2).

Step 4. Assets and Liabilities

Each visual zone is then defined for its assets and liabilities. Subsequently, a functional analysis is prepared. For instance, increased density reduces infrastructure

costs, encourages pedestrian activity, reduces fuel consumption and has a positive environmental impact. Without elaboration, this principle alienates many personnel who picture high-rise buildings and overcrowded streets. The reality is that planners can find a balance between a density that supports pedestrian activity and several alternatives. This can translate into compact development with two and three-story facilities set closely in mixed-use districts. Compact development requires some concentration of employment, some clustering of housing, and some mixing of land usages.

Step 5. Recommendations

Recommendations are developed to address the liabilities identified and to enhance the assets noted in accordance with Army standards and the IDG goals and objectives. Recommendations are in the form of specific projects that are utilized to prepare a prioritized projects list for approval by the installation Real Property Planning Board.

ES.4 RESPONSIBILITIES

ES.4.1 Assistant Chief of Staff for Installation Management (ACSIM):

- Establish Army facility standards and approve deviations from the standards.
- Approve Army Installation Design Standards Implementation Plan.
- Approve Army Installation Design Standards Investment Strategy.

ES.4.2 Director Installation Management Agency (IMA):

- Develop and implement the Army Installation Design Standards Implementation Plan.
- Develop and implement the Army Installation Design Standards Investment Strategy.
- Ensure compliance with the Army Installation Design Standards.
- Maintain electronic newsletter for communicating changes in standards.

ES.4.3 **Garrison Commander:**

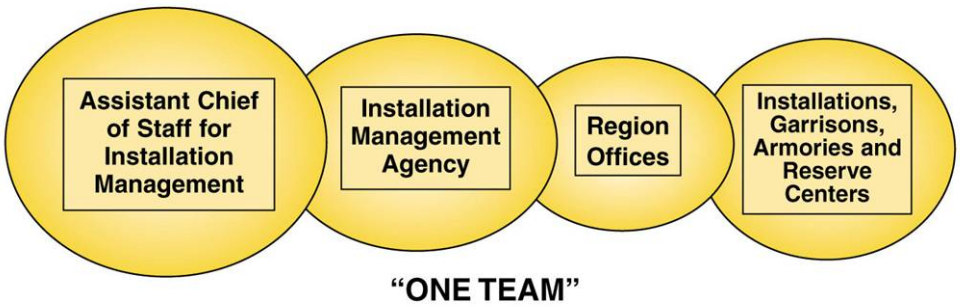
- Develop the installation's IDG.
- Chair installation Real Property Planning Board to review and approve projects established on the Prioritized Improvement Projects List to meet Army standards.
- Submit Prioritized Improvement Projects List for approval and funding IAW Director, IMA instructions after review and approval by Senior Mission Commander.
- Enforce IDG standards.

ES.4.4 **Senior Mission Commander:**

- Review and approve IDG.
- Review and approve RPPB prioritized improvement projects list recommendations to meet Army standards prior to submission to IMA Region Director.

ES.4.5 **Major Army Command/Tenant:**

- Participate in installation Real Property Planning Board.
- Participate in design and planning charrettes.
- Determine project functional requirements.
- Participate in design reviews.
- Participate in development of Prioritization Projects List.



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SECTION 1
INTRODUCTION

1.1 PURPOSE

1.1.1 A military installation conveys a visual image established by its architectural and historical character, arrangement of facilities, circulation patterns, and features in the landscape. This image can be clear, orderly, logical and attractive; or cluttered, confused, and unattractive.

1.1.2 The purpose of the Army Installation Design Guide (IDG) is to provide the Garrison Commander and other Real Property Asset decision-makers with an understanding of the character and structure of Fort Sam Houston. It is a concise, stand-alone document, summarizing information from a variety of sources. It serves as a guide for site specific future development and provides general background information in land use growth patterns. The development of the IDG is a participatory process involving key personnel at the installation. This plan reflects the goals and objectives for future development established by key decision-makers at Fort Sam Houston. This includes not only the visual impact of features on the installation and but also the impact of projects on the total built and natural environment. The improvement of the quality of visual design and development and use of sustainable design and development practices have a direct and future impact on the quality of life for those who live, work, or visit the installation.

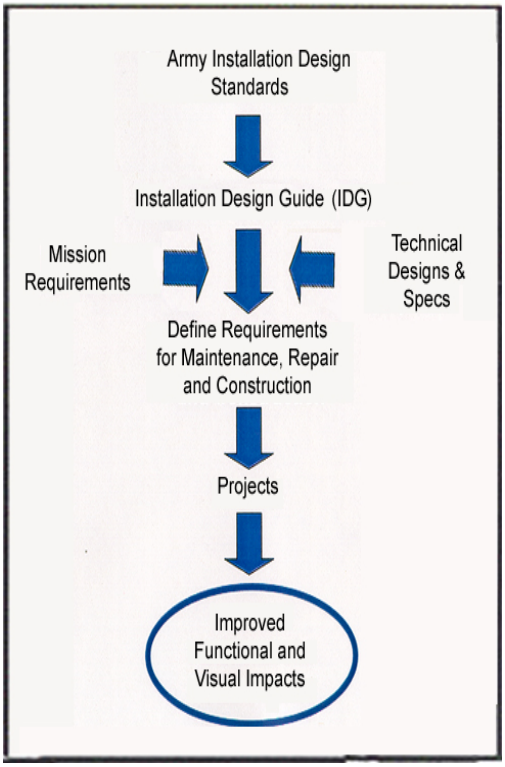

Fig. 1.1 - The Army Installation Design Guide is a Tool to Implement Army Standards.

1.1.3 The IDG includes standards and general guidelines for the design issues of site planning; architectural character, colors and materials; vehicular and pedestrian circulation; and landscape elements, including plant material, seating, signage, lighting, and utilities. The design guidelines incorporate sustainable design, quality of

design, anti-terrorism, low maintenance, historical and cultural considerations, durability, safety, and compatibility.

1.2 GOAL

The overall goal of the IDG is to provide a clear, comprehensive approach to establish and maintain a positive visual imagery throughout the installation and implement appropriate standards. This is accomplished by providing a systematic development process that is defined through description, analysis, synthesis, and implementation; and by applying the appropriate Real Property Master Planning Guiding Principles:

F--ull and appropriate facility utilization;

O--perational sustainment through life-cycle best practices;

R--eliable infrastructure for our customers' satisfaction, safety, health and security;

T--imely programming for facility disposal and replacement;

S--upport for assigned missions and strategic goals;

A--ccuracy of data for decision makers;

M--easured performance and benchmarking;

1.3 OBJECTIVES

The IDG objectives are:

1.3.1 To provide a set of general design standards and guidelines that define color, materials, style, signage, and other aspects of design for all visual elements surveyed.

1.3.2 To provide standards and guidelines for the selection of materials for new construction, renovation, maintenance and repair projects.

1.3.3 To provide guidance for accomplishing sustainable development. See Appendix D.

1.3.4 To provide a structured methodology for establishing projects to improve the visual imagery of the installation.

1.3.5 To provide guidance to integrate ATFP standards.

1.4 AUDIENCE

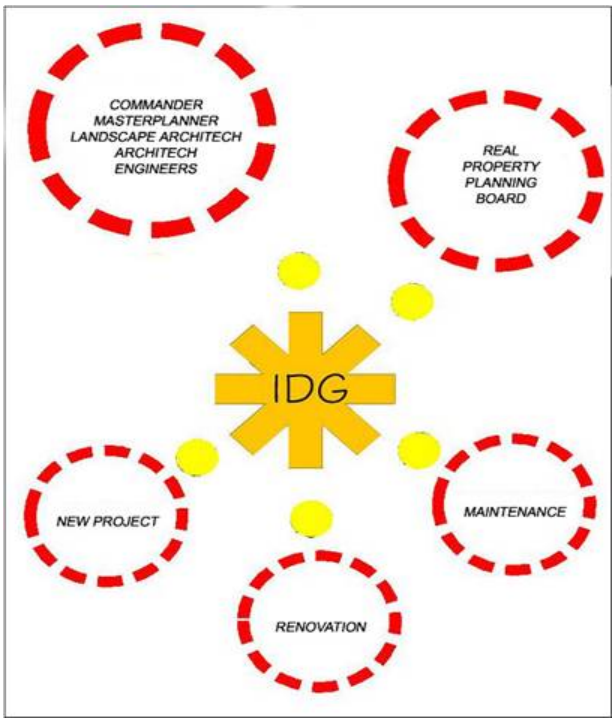

Fig. 1.2 - Design Guide Audience

1.4.1 The IDG is to be used by all individuals involved in decision-making, design, construction, and maintenance of facilities (Fig.1.2). The primary users include the following:

1.4.1.1 Senior Mission Commander

1.4.1.2 Garrison Commanders and Staff

1.4.1.3 Installation facility planning and design personnel

1.4.1.4 Installation facility maintenance personnel

1.4.1.5 Installation Management Agency and Region

1.4.1.6 U.S. Army Corps of Engineers project managers, design, and construction staff

1.4.1.7 Consulting Planners, Architects, Engineers, Interior Designers, and Landscape Architects

1.4.1.8 Supporting agencies such as AAFES, DeCA, DoDDS, MEDCOM, tenants, etc.

1.4.1.9 National Guard

1.4.2 The ultimate success of the IDG is dependent upon the commitment of the above individuals and organizations working as a team to apply the Army standards.

1.5 0RGANIZATION

1.5.1 This Army Installation Design Guide is organized to facilitate the preparation and execution of projects to improve the visual image on the installation and ensure design conforms to Army standards to include sustainability.

1.5.2 Sections 2 and 3 discuss the process, use, and implementation of the IDG.

1.5.3 Section 4 establishes the installation profile. The installation setting, existing land use, and future land use are detailed.

1.5.4 Section 5 addresses the development of installation visual themes and zones. It lists visual themes and zones, specifies assets and liabilities of each zone, and offers recommendations.

1.5.5 Section 6 provides a list of prioritized improvement projects. All projects are addressed in terms of existing conditions; design concept, cost estimate, funding and maintenance impact, and site plan where applicable.

1.5.6 Sections 7 through 12 discuss the six design components that provide the categories used for review and analysis during the visual inventory of the installation. The visual impressions of each zone are categorized according to these six design components.

1.6 WHEN TO USE THE ARMY INSTALLATION DESIGN GUIDE

1.6.1 This IDG provides installation-specific design data. The general design concepts, recommendations, and standards addressed herein are applicable to all Army installations. This document will be used as a reference to acquire recommendations and Army standards on the design of all facilities, new roads, road widening, parking, sidewalks and other pedestrian paths, bicycle paths, Access Control Points (ACP), site furnishing selection and placement, signage selection and placement, lighting selection and placement, utility corridor selection, and utilities. Clearing of plant materials and planting of new plant materials will be based upon the guidance herein.

1.7 MAINTAINING THE ARMY INSTALLATION DESIGN GUIDE

1.7.1 Since the IDG is a "living document", keeping it up-to-date and accurate will ensure its continued usefulness. Therefore, it will become necessary to revise it as mission, budget, standards, and other conditions generate new planning and design requirements and in response to facility user feedback.

1.7.2 In accordance with AR 210-20, Master Planning for Army Installations, the installation Real Property Planning Board (RPPB) is the adjudicating body for the Army Installation Design Guide at the installation level. Violations and variances from standards will be reviewed and adjudicated by the RPPB. The Senior Mission Commander will chair an Installation Planning Board (IPB) to review and approve the RPPB's actions.

1.7.3 The Fort Sam Houston and Camp Bullis Real Property Planning Board (RPPB) will review and approve the IDG and all major changes to it and other components of the Real Property Master Plan (Master Plan). Once reviewed and approved by the Installation Planning Board (IPB), its use is mandatory for all maintenance, repair,

minor construction/alteration, and major construction/post-acquisition improvements projects (regardless of size, fund source, or method of execution). The review and approval process will coincide with the regularly scheduled, semi-annual planning board meeting

1.8 RESPONSIBILITIES

1.8.1 As directed by the Secretary of the Army and the Chief of Staff, Army and approved by the Army Installation Management Board of Directors the following responsibilities are established:

1.8.1.1 Assistant Chief of Staff for Installation Management (ACSIM):

Establish Army facility standards and approve deviations from the standards.

Approve Army Installation Design Standards Implementation Plan.

Approve Army Installation Design Standards Investment Strategy.

1.8.1.2 Director Installation Management Agency (Dir IMA):

Develop and implement the Army Installation Design Standards Implementation Plan.

Develop and implement the Army Installation Design Standards Investment Strategy.

Ensure compliance with the Army Installation Design Standards.

Maintain electronic newsletter for communicating changes in standards.

1.8.1.3 Garrison Commander:

Develop the installation's IDG.

Chair Real Property Planning Board (RPPB) to review and approve projects established on the Prioritized Improvement Projects List (Appendix G) to meet Army standards.

Submit Prioritized Improvements Projects List for approval and funding IAW Director, IMA instructions after review and approval by Senior Mission Commander.

Enforce IDG standards.

1.8.1.4 Senior Mission Commander:

Review and approve IDG.

Review and approve RPPB prioritized improvement projects list recommendations to meet Army standards prior to submission to IMA Region Director.

1.8.1.5 Major Army Command/Tenant:

Participate in installation Real Property Planning Board.

Participate in design and planning charrettes.

Determine project functional requirements.

Participate in design reviews.

Participate in development of Prioritization Projects List.

1.9 SUSTAINABLE DESIGN AND DEVELOPMENT

1.9.1 Practicing the principles of sustainable design in the planning, design, construction, and operation of infrastructure and facilities is a smart business practice. Protecting our natural resources and reducing our impact on the natural environment is achievable when we create high-performance, healthy (Fig. 1.3), energy efficient (Fig. 1.4), and safe buildings.

Fig. 1.3 - CO2 Measurements Measure Indoor Air Quality Assisting in Creating a Healthv Environment

1.9.2 The Integrated Design Process. Critical to the success of sustainable design and development is the organization and commitment of the team to engage in the Integrated Design Process. To effect change in building design and operation, the project delivery process itself must become a collaborative effort to integrate design strategies among all disciplines and all players in the project delivery process. Integrated design demands a more inclusive team, working closer together than is traditionally the case. Future building users and facility managers must be invited to join architects, engineers, and planners in developing the vision and goals for new facilities.

(Adapted from the HOK Guidebook to Sustainable Design)

1.4a - Energy Efficient Lighting Contributes to Sustainability

1.9.3 Appendix D, Sustainable Design, discusses the sustainable design concept and its application to Army projects. Paragraph D.3 discusses the Sustainable Project Rating Tool (SPiRiT) developed by the U.S. Army Corps of Engineers (USACE). Per the Assistant Secretary of the Army (Installation & Environment) Sustainable Design and Development Memorandum and the Assistant Chief of Staff for Installation Management (ACSIM) endorsement of Sustainable Design and Development initiative, the SPiRiT rating system will be used by design professionals in all new construction, additions, or renovation of Army facilities for rating sustainability.

1.4b - Efficient Water Usage contributes to a High Performance

1.9.3.1 The SPiRiT document (Appendix E) was derived from the U.S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System. **FY08 uses LEED-NC "Silver".**

1.9.3.2 Army Rating Standard.

1.9.3.2.1 The SPiRiT rating of "Silver" is the standard for all FY06 MILCON vertical construction projects currently under design (as of March 18, 2003). For all other FY06 and future-year MILCON projects, the minimum SPiRiT rating requirement is "Gold". See Assistant Secretary of the Army memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003.

1.9.4 Further information on sustainable design can be obtained at the following websites:

Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website This site provides information on the following topics: documentation and references; sustainable process, tools, products and materials; Sustainable Design and Development Training; and links to various sustainable design and development informational website . Also see USGBC LEED ratings.

U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website.

Whole Building Design Guide (WBDG) This site provides comprehensive and current information on sustainable design strategies and technologies.

1.10 ARMY STANDARDS

1.10.1 Army Standards and References are included in the last two paragraphs of the following sections and appendices: Section 7, Site Planning Design Component; Section 8, Buildings Design Component; Section 9, Circulation Design Component; Section 10, Landscape Design Component; Section 11, Site Element Design Component; Section 12, Force Protection Design Component; Appendix D, Sustainable Design; and Appendix M, Historic Preservation Guidelines.

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SECTION 2
IDG PROCESS AND IMPLEMENTATION

2.1 INTRODUCTION

Military installations are hometowns for many of our military families, resources for many veterans and retirees, and an integral part of the surrounding communities. The Army Installation Design Guide (IDG) provides direction for achieving a sense of community, order, tradition, and pride on our installations. This section provides a brief overview of the IDG developmental process and methodology detailed in Unified Facilities Criteria (UFC) 2-600-01, Installation Design.

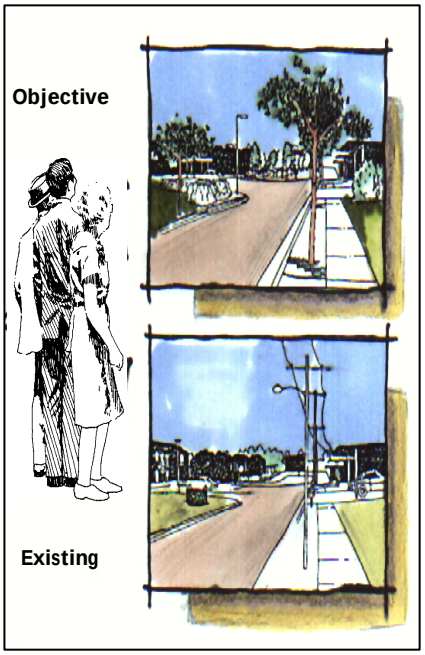

Fig. 2.1 – Include Positive Visual Elements

2.2 THE DESIGN GUIDE PROCESS

2.2.1 The IDG includes a process for analysis, planning, design, and implementation. This process includes the following steps:

2.2.1.1 **Setting Goals and Objectives.** The installation develops a set of goals and objectives that address the visual requirements of the installation. The goals and objectives provide a pre-determined image that helps create a visually pleasing and optimally functional environment.

2.2.1.2 **Conduct Visual and Spatial Surveys.** Two visual surveys are preformed in the preparation of the IDG. The first survey establishes the visual zones and themes of the installation. The second survey documents the assets and liabilities within each visual

zone. Chapter 5 of UFC 2-600-01 details the method for conducting the installation visual survey.

2.2.1.2.1 **Establish Visual Zones and Themes**

2.2.1.2.1.1 The Information gathered during the first survey is used to establish the visual zones of the installation. The visual zones are delineated by the visual characteristics of an area defined as the "look and feel" of an area together with the dominant features that help define its image. A functional analysis of each zone organizes the visual impressions and assesses their functional relationships to determine the visual character and unifying motif. Typical visual characteristics include unique buildings, vehicular and pedestrian corridors, functional use, natural features, and spatial relationships.

2.2.1.2.1.2 Visual zones with similar characteristics are then grouped together to form a broader category called themes. Example themes include, community life theme, operations support theme, buffer/open space theme, and industrial theme.

2.2.1.2.2 **Determine Assets and Liabilities.** The second survey a visual zone inventory is conducted. During the survey each visual zone is analyzed for specific visual impacts. The objective of the inventory is to define the visual assets and liabilities within the visual zone.

2.2.1.2.2.1 **Assets.** Assets are positive visual elements, design elements, or features that enhance the surroundings, either visually or functionally.

2.2.1.2.2.2 **Liabilities.** Liabilities are negative visual elements, design elements, or features that detract from the visual image or functionality of the surroundings. Liabilities should be corrected through appropriate design measures and are the basis for recommendations for improvement.

2.2.1.3 **Recommendations and Implementation Plan**

The assessment of each visual zone includes recommendations to correct liabilities and where desired to enhance assets. The recommendations are in the form of specific projects and are described in detail Section 6, Improvement Projects of the IDG.

2.2.2 **Design Components**

The following six design components, described in sections 7 through 12, provide guidelines and standards from which to conduct the visual zone review and analysis.

Section 7, Site Planning

Section 8, Buildings

Section 9, Circulation

Section 10, Landscape

Section 11, Site Elements

Section 12, Force Protection

2.2.3 **Design Principles.** The visual inventory and analysis requires an understanding of basic design principles. These design principles are discussed in Section 3, paragraph 3.4.

2.2.4 **Visual Elements.** The basic design principles are used to define the visual elements described in Section 3, paragraph 3.5. The assessment and classification of visual elements follows basic design principles describing "good" (positive visuals elements) and "not so good" (negative visual elements) design.

2.3 USING THE DESIGN GUIDE

2.3.1 Use this IDG in determining the general design and construction considerations inherent in the preparation of project plans. The IDG provides design guidelines and Army-wide design standards intended to be used in all maintenance, repair, renovation, and new construction projects. The IDG applies to all projects, regardless of the funding source.

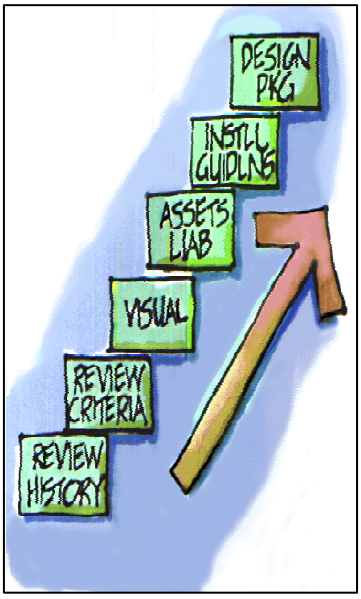

Fig. 2.2 – Using the Design Guide

2.3.2 The following steps illustrate how the design guide is used for the preparation of plans for new construction, renovation, maintenance and repair projects on the installation (Fig. 2.2):

2.3.2.1 Step 1: Review the Installation Profile information included in this IDG (Section 4).

2.3.2.2 Step 2: Review the IDG analysis criteria information (Section 3) including design goals and objectives, visual elements, and design principles.

2.3.2.3 Step 3: Review the applicable references, guidelines, and standards of the design components. These include site planning, buildings, circulation, landscaping, site elements, and force protection and are discussed in Sections 7 through 12 respectively.

2.3.2.4 Step 4: Review the information and description of the installation themes in Section 5, paragraph 5.2.

2.3.2.5 Step 5: Select the zone where the project will be located from Section 5, Visual Themes and Zones. Review the assets, liabilities, and recommendations for that zone.

2.3.2.6 Step 6: Select the appropriate guidelines or standards from the design components addressed in Sections 7 through 12.

2.3.2.7 Step 7: Assemble all materials gathered in steps 1 through 5 above.

2.4 IMPLEMENTATION

2.4.1 IDG Review and Approval

The Fort Sam Houston and Camp Bullis Real Property Planning Board (RPPB) will review and recommend approval for the IDG and all major changes to it and other components of the Real Property Master Plan (Master Plan). The review and approval process will coincide with the regularly scheduled, semi-annual planning board meetings. The Garrison Commander is the final approval authority for the IDG

2.4.2 Compliance

2.4.2.1 For the IDG to work optimally as a management tool, it is essential that the Master Planner or designated representative establish an understanding of the IDG among the parties concerned with its use. This can best be established at the RPPB level where all installation principles are represented. The Directorate of Public Works (DPW) staff Master Planner or designated representative shall insure that the guidelines and requirements of the IDG are readily available to, and understood by, all parties involved in the design of new facilities, design of additions or alterations to existing facilities, or maintenance.

2.4.2.2 The Master Planner or designee, acting in support of the RPPB, is the first level reviewer of projects (SRM, MCA, and NAF to include Design Build) and other requests for actions that involve compliance with IDG guidelines and standards.

2.4.2.3 The Garrison Commander, supported and advised by the RPPB, is the final authority in enforcement of the IDG guidelines and standards.

2.4.2.4 The Installation Planning Board chaired by the Senior Mission Commander, will monitor development of the installation planning process and provide guidance to other installation boards and the Garrison Command for areas such as:

Strategic Planning,

Real Property Planning,

Range Planning, and

Communications Planning.

2.4.3 **Project Approval**

2.4.3.1 Project requests in the form of a DA Form 4283 shall be submitted to the DPW or equivalent and will include the required Design Team IDG Checklist discussed below.

2.4.3.2 Design Team IDG Checklist.

2.4.3.2.1 The Design Team IDG Checklist is to be completed by the design team to assure the guidelines and standards have been considered in the design process. The Design Team IDG Checklist is provided in Appendix A.

2.4.3.2.2 The Designer of Record or Design Agent shall provide a copy of the completed checklist to the Master Planner, together with a signed certification statement with each design submittal. The checklist along with concept site plans and elevations for each design submittal shall be provided to the Master Planner for review. If the Master Planner or designated representative concurs, the plan and the signed checklist are forwarded to the RPPB for final approval.

2.4.3.2.3 The accepted checklist shall become a part of the project record files.

2.4.4 **Customer Funded Projects.**

2.4.4.1 Self-help projects and occupant purchased and installed furnishings and site feature projects must be reviewed for conformance with the IDG.

2.4.4.2 The DPW is responsible to insure that the purchase and installation of furnishings and features by building occupants or land tenants is reviewed. A work request (DA Form 4283) will be submitted requesting proprietary approval for the work the customer wants to accomplish. This process is normally limited to the purchase and installation of systems furniture, floor covering

replacement and limited exterior structures like park benches, smoking shelters and picnic pavilions.

2.4.5 **Request for Waiver**

2.4.5.1 A request of waiver from the Design Guide Checklist (Appendix A) will be submitted to the Master Planning office for approval by the RPPB.

2.4.5.2 A request for waiver from the Army standards shall be submitted to the Assistant Chief of Staff for Installation Management for approval.

2.4.6 **Checklists (optional)**

2.4.6.1 Projects Requirements Checklist (Optional)

It is recommended that this checklist be used as a pre-design planning tool for initiating projects and to present a functional description of the project at MILCON Planning Charrettes and Design Charrettes. The checklist can assist participants of the charrettes in project formulation and documentation. By the nature of the planning process all the data on the forms will not be completed, however, the form should be completed to the greatest extent possible prior to the charrettes. The checklist can also be used to document the results of the planning or design charrettes. The Projects Requirement Checklist is provided at Appendix B.

2.4.6.2 Interior Design Review Checklist (Optional)

It is recommended that the Interior Design Review Checklist be used during review of a Request for Proposal (RFP) submission or an AE or in-house design prior to solicitations. The Interior Design Review Checklist is provided at Appendix C.

2.4.7 The requirement to use the IDG as a design tool in all facility planning, design, and construction should be included in the Request for Proposals on new projects, Scopes of Work for new projects, and maintenance agreements.

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SECTION 3
DESIGN GUIDE
ANALYSIS CRITERIA

3.1 INTRODUCTION

3.1.1 The Army Installation Design Guide process depends upon the development of visual goals and objectives and the identification of visual elements. Goals and objectives provide the desired visual context of the installation.

3.1.2 Basic design principles are used to assess, define, and classify visual elements. This assessment becomes the design criteria used to determine the visual character of the installation. These design criteria are used for design decisions in the review of existing visual context and determination of project recommendation.

3.2 GOALS, OBJECTIVES, AND RECOMMENDATIONS

3.2.1 The goals and objectives for the Fort Sam Houston Installation Design Guide are:

Improve the visual image of the installation by assuring that proposed designs are compatible with existing development standards throughout the installation.

Improve the visual environment by eliminating those areas that create or communicate negative images of the installation.

Provide an environment that is sensitive to natural elements such as topography, vegetation, light, water and views, while supporting the landscape theme and enhancing the visual impact of the installation.

3.2.2 Specific objectives and recommendations are addressed as part of the visual inventory and analysis and will be incorporated into the Installation Master Plan. The appropriate Real Property Master Planning Guiding Principles:

Full and appropriate facility utilization;

Operational sustainment through life-cycle best practices;

Reliable infrastructure for our customers' satisfaction, safety, health and security;

Timely programming for facility disposal and replacement;

Support for assigned missions and strategic goals;

Accuracy of data for decision makers;

Measured performance and benchmarking;

and the concepts from Chapter 4 of the UFC 2-600-01 will be considered when developing specific recommendations for improvements on the installation.

Fig 3.1 – Master Planning Steps

3.3 IDENTIFICATION AND CLASSIFICATION OF VISUAL ELEMENTS

3.3.1 Basic design principles define visual elements and assess their character.

3.3.2 The assessment and classification of visual elements follows basic design principles describing "good" and "not so good" design. Their assessment becomes the design criteria used to determine the visual character of the installation.

3.4 DESIGN PRINCIPLES

The visual inventory and analysis requires an understanding of basic design principles. The primary principles are:

Scale - The proportional relationship of humans to their spatial environment. The scale should result in a

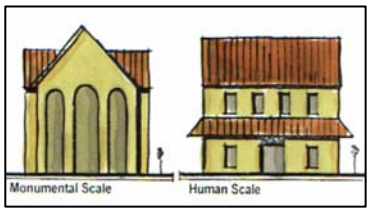

Fig 3.2 – Monumental & Human Scale

comfortable relationship for the user and will vary as space, size and activities vary (Fig. 3.2).

Form - The size and shape of mass. Individual forms should be designed to complement one another and the environment.

Function – The use of a space or an area. Function is gauged by the degree to which the space works for its intended purpose.

Color – All elements of the visual environment have color. The use and arrangement of colors greatly determine the visual impact of all elements.

Texture – All elements of the visual environment have texture. The use and blending of textures greatly impact the visual environment.

Unity – All elements of the visual environment should blend to complement one another. Repetition of scale, form, color, and texture results in a unified visual impression.

Framing – All views include a ground plane, side planes, and overhead plane. The relationship of planes changes as the individual moves through the environment (Fig. 3.3).

Fig 3.3 – Parade Ground Axis with Building as

Axis – An axis is a linear progression of space connecting two or more dominant features.

Terminus – A terminus is the end of an axis and is typically defined by a dominant feature such as a building.

Balance – Visual elements are composed to be symmetrical or asymmetrical. In either case, visual elements should be sized and located to provide visual balance (Fig. 3.4).

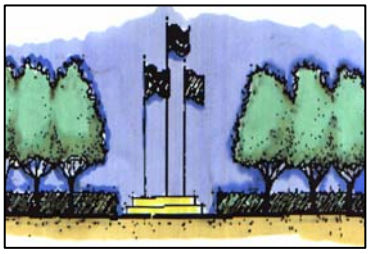

Figure 3.4 – Symmetrical Elements

Sustainability - Practicing the principles of sustainable design in the planning, design, construction, and operation of infrastructure and facilities is a smart business practice (See Appendix D).

3.5 VISUAL ELEMENTS

The visual elements, described below, elements include manmade and natural features and their inter-relationship. This Army Installation Design Guide provides

guidance on how to recognize the visual impacts of the installation and how to improve upon them if warranted.

Natural Characteristics - Regional and site characteristics that have been preserved and enhanced as a part of the installation.

Edges and Boundaries - Linear elements such as walls, fences, or trees create separation of use and activities.

Buildings and Structures - Typically the most dominant features of an installation. Their location and design characteristics determine the primary visual image.

Fig. 3.5 - Buildings Are Typically the Dominate Feature on an Installation

Activity Nodes - Centers of activity that attract people on a daily basis.

Landmarks - Visually or historically prominent features such as towers, statues, static displays, or buildings that provide identity and orientation of place.

Fig. 3.6 - Landmarks Provide Orientation of Place

Entrances and Gates - Provide the first and last impression of the installation.

Circulation System - Includes streets, railroad tracks, trails, sidewalks, parking lots, driveways, delivery areas, and bicycle paths. The circulation system utilizes a large amount of space and creates significant visual impact.

Trees and Other Vegetation - Trees and other vegetation frame views, provide visual screens, shade, color, and interest in the installation.

Street Trees - Street trees soften, complement, and define the road hierarchy, and improve the overall visual quality of the installation.

Fig. 3.7 - Street Trees Improve the Overall Visual Quality of the Installation

Views and Vistas - Scenic and attractive views and vistas should be enhanced. Unattractive views should be screened.

Open Spaces - Open space areas create visual impact and can be designed to either separate or integrate adjacent uses.

Signage - A coordinated installation signage plan, addressing both exterior and interior signage, should be developed to facilitate circulation and provide useful information.

Utility Corridors - Utilities should be in corridors and unsightly above ground utilities minimized.

Other Elements - Visual elements other than those above may occur within an installation and should be noted.

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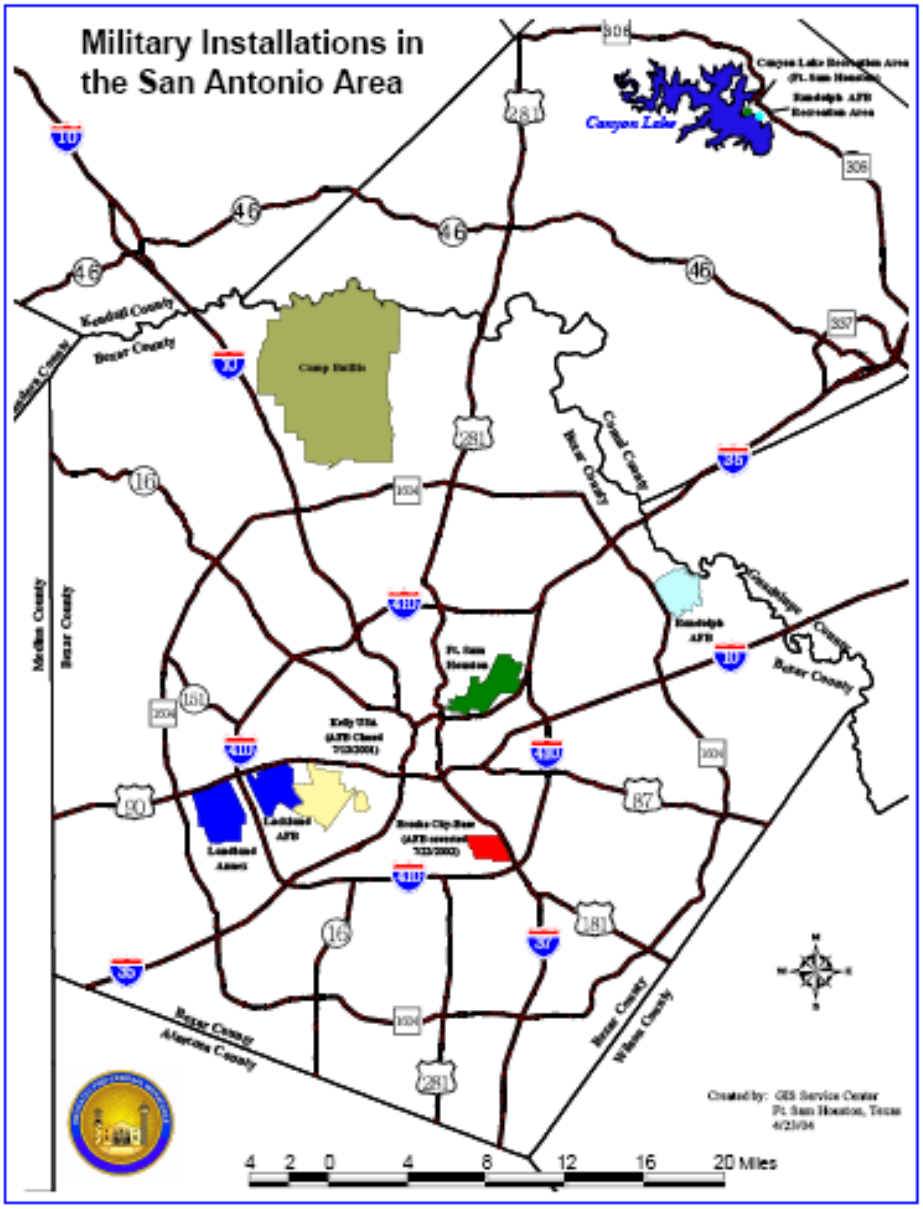
SECTION 4 INSTALLATION PROFILE

4.1 Setting



4.1.1 Regional Setting

Fort Sam Houston (FSH) is located within the City of San Antonio. Much of the surrounding area is established, with only residual in-fill likely to occur in the future. The southwest and west is mostly built up with older single- and multi-family residential areas interspersed with neighborhood and strip commercial uses at intersections and along primary roadways. To the northwest are the San Antonio Botanical Center, the San Antonio Country Club, single-family residential areas in the City of Terrell Hills, and limited office-type commercial along adjacent arterials. Areas to the north are medium density single-family residential. The eastern boundary is largely open with rural land and sporadic houses. Some industrial use is interspersed, but floodplains constrain development. To the southeast and south, open land along the boundaries and highways is mostly zoned for industry and is being developed as such. The city's John James Park and the FSH National Cemetery (owned and administered by the Veterans Administration [VA]) are contiguous with FSH property on the northeast end of the post.

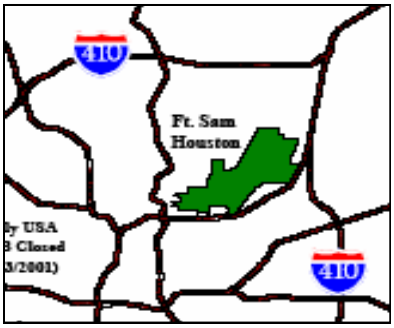


Figure 4.1 Fort Sam Houston Vicinity Map

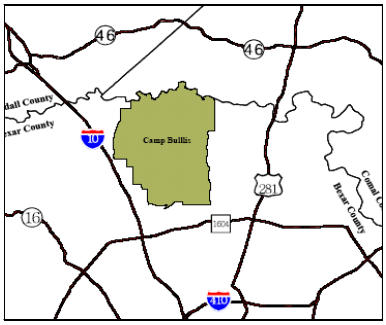


Figure 4.2 Camp Bullis Vicinity Map

Camp Bullis, located in north Bexar County, is surrounded by a combination of rural agricultural land, scattered houses and new residential development (primarily on the west and east sides). To the southwest is Eisenhower Park, a large City of San Antonio owned park. Some industry and commercial use is occurring along the major roadways. Several active quarries are located on the south and east sides of Camp Bullis. Camp Stanley Storage Activity, a 4,000-acre facility and sub-installation of the U.S. Army Material Command's Red River Army Depot, is adjacent to the western boundary of Camp Bullis. It is used for ammunition storage and weapons maintenance.

Figure 4.3 San Antonio Depot Construction 1876 (The Quadrangle)

Figure 4.4 Drawing of Original Camp Bullis Site

4.1.2 History of the Installation

Fort Sam Houston is unique among Army posts. On one hand it is a major, active military installation that plays a vital role in the defense of the United States. On the other hand, it contains some of the oldest structures on any of the Army's installations. This blend of old and new gives today's soldiers a share in the history of this post, which goes back almost a century and a half. The

fort first occupied rented land in 1845 and grew into a major garrison starting with the construction of the Quadrangle in 1876. Since then, it has developed into a large modern military installation. Its mission began to shift toward a medical emphasis after World War II as a result of the presence of Brooke General Hospital and relocations of other medical missions to FSH

Camp Bullis (about 28,000 acres) is located about 18 miles northwest of FSH, on a site about 10 miles long (north to south) and 4 miles wide, in Bexar County. The area surrounding Camp Bullis was primarily rural until the mid-1900s, but since then has become increasingly urbanized through residential development and expansion. Approximately 17,000 acres were originally purchased for Camp Bullis in 1906 (known until 1917 as Leon Springs Military Reservation), to provide adequate space for field training and weapons ranges to support units at FSH. During World War II, the role of Camp Bullis as a major processing and training center for U.S. troops expanded. As the role of FSH shifted to medical training, Camp Bullis provided the larger area required for field training of troops going into combat. In 1983, construction of a combat assault landing strip in the northeast part of the reservation expanded training capabilities. With the establishment of the US Air Force's Air Base Ground Defense School in 1992 the Camp Bullis mission increased significantly as it became a preferred site for joint military field training in south Texas.

Figure 4.5 Camp Bullis during 1900's Mobilization Training

A detailed history of the development of Fort Sam Houston and Camp Bullis is included in historic landscape inventory reports. – Fort Sam Houston Landscape Inventory - Camp Bullis Landscape Inventory.

4.1.3 Environmental Setting

Topography

The Fort Sam Houston topography is characterized by smooth hills rising up from the Gulf Coastal Plain with elevations ranging from 600 feet above mean sea level in the San Antonio River and Salado Creek flood plains to 800 feet above sea level at the north central part of the installation. The Balcones Escarpment, a broad area of faulted limestone forming the southern and eastern edge of the Edwards Plateau, dominates the regional physiography. This escarpment rises approximately 1,000 feet above the Gulf Coastal Plain and trends northeast to southwest through the San Antonio area. Fort Sam Houston is located in the Blackland Prairie physiographic region, a hilly area along the base of the escarpment. Much of this region is covered with gravelly terrace deposits with some valleys cut by stream erosion. To the northwest of the escarpment lies the Edwards Plateau, a rugged, hilly region dissected by many small streams.

The Camp Bullis topography is characterized by valleys, buttes and mesas, with elevations ranging from 1000 to 1450 feet above mean sea level. Located in the Texas "Hill and Lake Country" the land sits on the Edwards Plateau, a rugged, hilly region dissected by many small streams. A majority of the land is undeveloped with rough limestone hills covered by areas of

vegetation intermixed with grasslands and prairies with oak/juniper savannas and oak/juniper/mesquite thickets. The highest hills are in the center of the installation where firing ranges and maneuvers areas are while the cantonment area is built in the valley at the southern end of the installation.

Geology

The bedrock that underlies FSH has been mapped by Barnes (1974) as the Navarro Group and Marlbrook Marl overlain with Quaternary (recent) stream deposits. This formation is composed of marl, clay, sandstone, and siltstone, with concentrations of siderite and siliceous limestone. The stream deposits along Salado Creek form terraces consisting largely of gravel, sand, and silt up to 45 feet thick. These stream terraces were formed during the Pleistocene age with recent alluvium forming the deposits in the present Salado Creek floodplain. The major structural feature in the San Antonio region is the band of faulting associated with the Balcones Fault Zone, which separates the Edwards Plateau from the coastal Plain area. This fault scarp has been eroded by numerous small streams and has left a number of alluvial terrace deposits at the base of the escarpment. The Balcones Fault Zone is approximately 15 to 20 miles wide and runs southwest to northeast through the San Antonio region.

Camp Bullis is located on the Edwards Plateau on the upthrown side of the Balcones Escarpment. The Balcones Escarpment separates the Edwards Plateau from the low-lying Gulf Coastal Plain. Geologic formations occurring on the surface include the Upper and Lower Glen Rose Formation and Edwards Limestone. The Lower Glen Rose Formation consists of massive limestone, whereas the Upper portion consists of thin-bedded soft limestone. Outcroppings of Edwards Limestone occur in the southeastern portion of Camp Bullis. The boundary between these geologic formations is a northeast-trending fault where younger Edwards Limestone was down-dropped to the southeast. The rise over the fault zone from its lower side to the upper is about 1,500 feet.

The dominant geological features on Camp Bullis are regional vertical fractures, a regional dip, and Balcones Fault Zone. Fractures are weak areas in geologic formations where rupturing occurs without displacement, while faults are locations of vertical or near-vertical movement. Two sets of fracture patterns are present across Camp Bullis, one northwest to southeast and the other northeast to southwest. The regional dip in the formations tends to the east and southeast at a rate of about 100 feet per mile near the fault zone (Bexar and Comal Counties) and decreases to 10 to 15 feet per mile northwest of the area (Kerr and Gillespie Counties). Detailed geotechnical data is in Supplement O.

Soils

The soils at FSH are characteristically fertile and generally maintained with grasses and trees to prevent erosion. The western, upland portion of the installation consists primarily of the Houston Black Soil Series. These soils consist of clayey particles that are dark gray to black and calcareous. Houston Black soils have slow to high surface drainage and poor to nonexistent internal drainage. Runoff from the Houston Black soils can be fairly rapid where slopes greater than 1 percent and erosion problems can be severe. These soils are fairly productive, and in rural areas they are cultivated for grains and fiber crops (cotton). Soils of the Lewisville series, found in the northwestern and south-central region of FSH, are

moderately deep soils consisting of silty clay formed over the higher terrace deposits. These are some of the more productive soils in Bexar County and can be easily tilled and worked. If left unprotected, however, the Lewisville soils are susceptible to severe erosion. Tarrant soils, which comprise an undulating chalk substratum, occur in patches in the western portion of the installation. The soils in the eastern portion of the installation are derived from various stream terrace deposits. The Trinity and Frio soils occupy the bottomlands and low terraces along Salado Creek. These soils, which form over recent alluvium, frequently flood. A detailed FSH soils map is shown in Supplement O, Geotechnical Data.

The dominant soils on Camp Bullis are Tarrant and Bracket Series. These thin clay soils formed in association with stream deposits or from erosion and weathering of underlying limestone. Tarrant soils occur on gently undulating slopes (1 to 5 percent), while Bracket soils are on steeper side slopes (12 to 30 percent). Tarrant Series consists of stony soils that are very shallow, dark-colored, and gently undulating to steep. These soils occur on limestone prairies. The surface layer is a very dark grayish-brown, calcareous clay loam approximately 10 inches thick. The subsurface layer is an 8-inch-thick hard fractured limestone. Bracket Series consists of shallow, light-colored soils that developed over soft limestone inter-bedded with hard limestone. These soils occur as moderately sloping to steep, convex, cone-shaped hills. Alternate layers of hard and soft limestone give the slopes a “stair step” appearance. The surface layers are grayish-brown gravelly clay loam approximately 4 inches thick over a light brownish-gray clay loam to silty clay. These soil layers exhibit a weak to moderate, fine, granular structure that is friable when moist. Other soil mapping units on Camp Bullis include Krum, Trinity and Frio, Lewisville, Crawford, Crawford and Bexar, Patrick, and Venus. These soils are located on lower hills and in streambeds. Trinity and Frio soils are found in the Salado Creek drainage and are listed as frequently flooded. A detailed Camp Bullis soils discussion is also in Supplement O, Geotechnical Data.

Climate

Fort Sam Houston and Camp Bullis are located on the edge of the Gulf Coastal Plains, which results in a modified subtropical climate, predominantly continental during the winter months and marine during the summer months. Normal mean temperatures range from 50.7°F in January to 84.7°F in July. The summer is hot, with daily temperatures above 90°F more than 80 percent of the time. Extremely high temperatures are rare; the highest on record is 108°F in August 1986. Mild weather prevails during much of the winter months, with below-freezing temperatures occurring, on average, about 20 days each year.

The area is situated between a semi-arid area to the west and the coastal area of heavy precipitation to the southeast. The average rainfall of 27.54 inches is sufficient for normal production of most crops; however, rainfall is highly variable from year to year in this region. Rainfall averages approximately 28 inches annually, but may range from less than 20 inches to 40 inches, with some years having none at all.

Northerly winds prevail during most of the winter, while southeasterly winds from the Gulf of Mexico prevail during the summertime and near the ground surface for long periods during the winter.

Hydrology

Fort Sam Houston is drained primarily by Salado Creek, which flows from north to south through the eastern portion of the reservation. The headwaters of Salado Creek are located in the northwestern part of the Camp Bullis area and on Camp Stanley. The stream is intermittent and derives principally from precipitation in the area. Base flow for Salado Creek entering FSH is primarily from runoff. A small tributary of the San Antonio River known as the Alamo Ditch drains the western part of FSH. The southern and central portions of the installation are drained by San Antonio's storm drainage system. Camp Bullis is drained by six intermittent streams. Salado Creek, largest of these streams, drains the western portion of Camp Bullis. Lewis Creek drains the central portion of the installation and flows into Salado Creek to the southwest. Panther Springs Creek, including an unnamed tributary, drains the southeast portion of Camp Bullis and flows into Salado Creek several miles south of the installation boundary. Cibolo Creek drains northern portions of Camp Bullis. Meusebach Creek drains east, entering Cibolo Creek approximately 2 miles northeast of Camp Bullis. All streams on Camp Bullis eventually flow into the San Antonio River to the south. Each of the streams and drainages are intermittent, fed primarily by precipitation from storms; however, springs along Panther Springs Creek and Lewis Creek periodically produce surface flow for several hundred feet before disappearing into fractures, caves and sinkholes located in the stream beds.

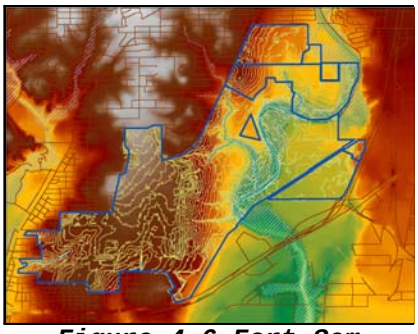


Figure 4.6 Fort Sam Houston Digital Elevation Model & Flood Plain

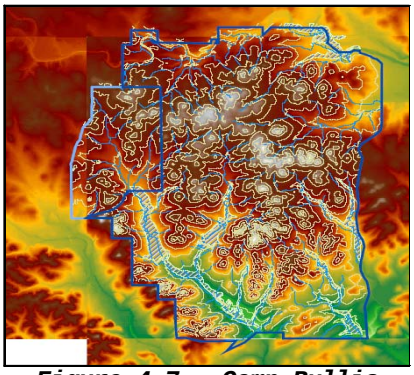


Figure 4.7 Camp Bullis Topography and Flood Zone

Vegetation

The land that is now FSH originally was part of the Blackland Prairie Biome, The area is located where three distinctly different soil associations meet, and because of this edge setting it is likely that the original vegetation was quite diverse and abundant. Little bluestem grasses are considered the dominant climax species, while other grasses such as big bluestem, Indian grass, switch grass, Texas winter-grass, and side-oats. Grama would also be found. Along the waterways, the grassland yielded to woodlands consisting of cedar elm, netleaf hackberry, cottonwood, and pecan trees. Some spiny shrubs of the South Texas chaparral may have been present on the southern portion of the installation.

With over 100 years of building and development the only remaining undisturbed habitat is the wooded and grassy area along the floodplain of Salado Creek (approximately 30 percent of the post). The remainder of the installation is planted with landscape ornamentals and lawns. The trees now found on the installation are ash live oak, pecan, cedar elm, netleaf hackberry, honey locust, palms, and crepe myrtle. Mesquite is found in the Salado Creek bottomlands in association with hackberry and cedar elm. Lawns predominantly consist of Bermuda or St. Augustine grasses

Camp Bullis is also near the junction of three major vegetation zones: the Blackland Prairie, South Texas Plains, and Edwards Plateau. The combination of these three vegetation zones

produces a diversity of plant communities including open grasslands and prairies intermixed with oak/juniper savannas and oak/juniper/mesquite thickets. Historical reports and experimental data suggest that, prior to settlement, fire likely maintained many areas as open grasslands or savannas. Since settlement fire has been suppressed in these areas and they are wooded today. Currently Camp Bullis vegetation is dominated by oaks and ash juniper thickets interspersed with oak savannas. Oak and juniper mixed with grasses dominate the lower elevations, while juniper and live oak cover the undisturbed hillsides.

4.1.3.7 Wetlands

Wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The United States Fish and Wildlife Service (USFWS) 1999 National Wetlands Inventory (NWI) identified approximately 120 acres of wetlands on Fort Sam Houston. These wetlands are associated with the floodplain of Salado Creek or are hydrologically connected to the creek.

On Camp Bullis the 1999 USFWS NWI indicated there are approximately 112 wetland systems that include 88.7 acres of wetlands and 41.7 acres of deep-water habitat. Using the USFWS classification system, the two types of wetland systems on Camp Bullis are palustrine and lacustrine. Major subsystems under the palustrine systems are unconsolidated bottom, unconsolidated shore, and emergent. The only subsystem under lacustrine is unconsolidated shore. Most of the palustrine systems are excavated or diked impoundments that are inundated briefly following large storms. Lacustrine systems are also intermittently flooded and only contain water following large storms. Pond No. 22 is the only semi-permanent to permanent water body on Camp Bullis

4.1.3.8 Wildlife

The wildlife found on FSH can be divided into two regimes: species tolerant of built-up areas and those that occur in the Salado Creek floodplain. Species typical of the built-up areas include urban-tolerant species such as fox, squirrels, skunks sparrows, mockingbirds, robins and grackles. Wildlife observed along Salado Creek includes white winged doves, cardinals, horned owls, mourning doves, woodpeckers and Carolina chickadees. Mammals include beavers, armadillos, skunks, cottontail rabbits, and opossums. Fish species include black bullheads, mosquito fish, sailfin molly, and bluegill, largemouth bass and Rio Grande perch

Although the diversity of habitat on Camp Bullis is low, the relatively high quality habitat supports a variety of wildlife. Approximately 57 species of mammals are known or presumed to occur on the Edwards Plateau. Some of the intermediate to larger mammals include coyote, gray fox, white-tailed deer, and axis deer. The axis deer is an exotic species from India and Ceylon that escaped from private ranches and has adapted to conditions on Camp Bullis. There are 358 species of birds known or presumed to exist in or around Camp Bullis. The lack of habitat diversity on Camp Bullis limits the number of bird species expected on the installation. An unofficial list of bird sightings on Camp Bullis includes approximately 203 species. Approximately 92 species of reptiles and amphibians have been reported in the vicinity of Camp Bullis, including 6 species of salamanders, 19 species of toads and frogs, 7

species of turtles, 21 species of lizards, 38 species of snakes and 1 alligator species. There is very little permanent surface water on Camp Bullis so fish populations are very limited.

4.1.3.9 Environmentally Sensitive Habitat

Camp Bullis has endangered species. The black-capped vireo nests in dense thickets and areas with heavy shrubs and few trees. The golden-checked warbler nests in the old growth Ashe junipers (cedar) and oak stands along the banks of streams and some creeks. Ashe juniper (cedar) can be distinguished by its shaggy gray bark. Branches of this tree cannot be cut. Training activities are limited in the habitats of these birds. Level 1 Restrictions are in effect during the non-breeding seasons (16 August to 28 February). Under Level 1 training units may occur and utilize "core" habitat for training. Use of existing roads and trails, and parking equipment in open areas is allowed. No vegetation may be removed. The are no restrictions within 100-meter buffer areas around "core" habitat under Level 1. Level 2 Restrictions are in effect during the breeding season (1 March to 15 August). The following apply within "Core" habitat:

- Training units may pass through area using only existing roads and trails or emergency stop only. Parking equipment is limited to two hours or less in duration.
- No bivouacs or other static positions can be established, including temporary fueling areas, decontamination areas and field medical operations.
- No vegetation removal, including brush/ juniper removal.
- No use of pyrotechnics or controlled burns for brush management.
- No off-road vehicle use for maintenance of military maneuver.
- No use of obscurant smoke, other chemical agents, or lighted nighttime activities.

Under Level 2 Restrictions the following apply to within the 100-meter buffer areas around the "Core" habitat:

- No long-term use of noise producing equipment (e.g., generators)
- No use of obscurant smoke or other chemical agents.
- Vegetation removal, including brush/ juniper removal, only by hand and must be approved by the Environmental Office at Camp Bullis.

4.1.4 Man-Made Environment

The Department of the Army policy is that the achievement of environmental objectives as an integral part of the Army mission. The IDG requires the environmental consequences of any proposed action be considered during the planning process and be evaluated along with the technical and economic factors in the decision making process. A detailed environmental impact statement will be prepared and processed in accordance with the National Environmental Policy Act. Proper use of the IDG conveys an understanding of the urgent need to preserve and restore the natural environment and to conserve material resources and an appreciation of the Army's support of the environmental protection effort fostered throughout the Army. Initiative, leadership, and cooperation in achieving these environmental objectives are encouraged of all personnel.

4.1.4.1 Contaminated Areas

Figure 4.8 contains environmental conditions at Fort Sam Houston. The seven condition codes include:

1- Areas where no release or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas).

2- Areas where only a release or disposal of petroleum products and/or their derivatives has occurred.

3- Areas where a release, disposal and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial action.

4- Areas where a release, disposal and/or migration of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.

5- Areas where a release, disposal and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet taken place.

6- Areas where a release, disposal and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.

7- Areas that are not evaluated or require evaluation.

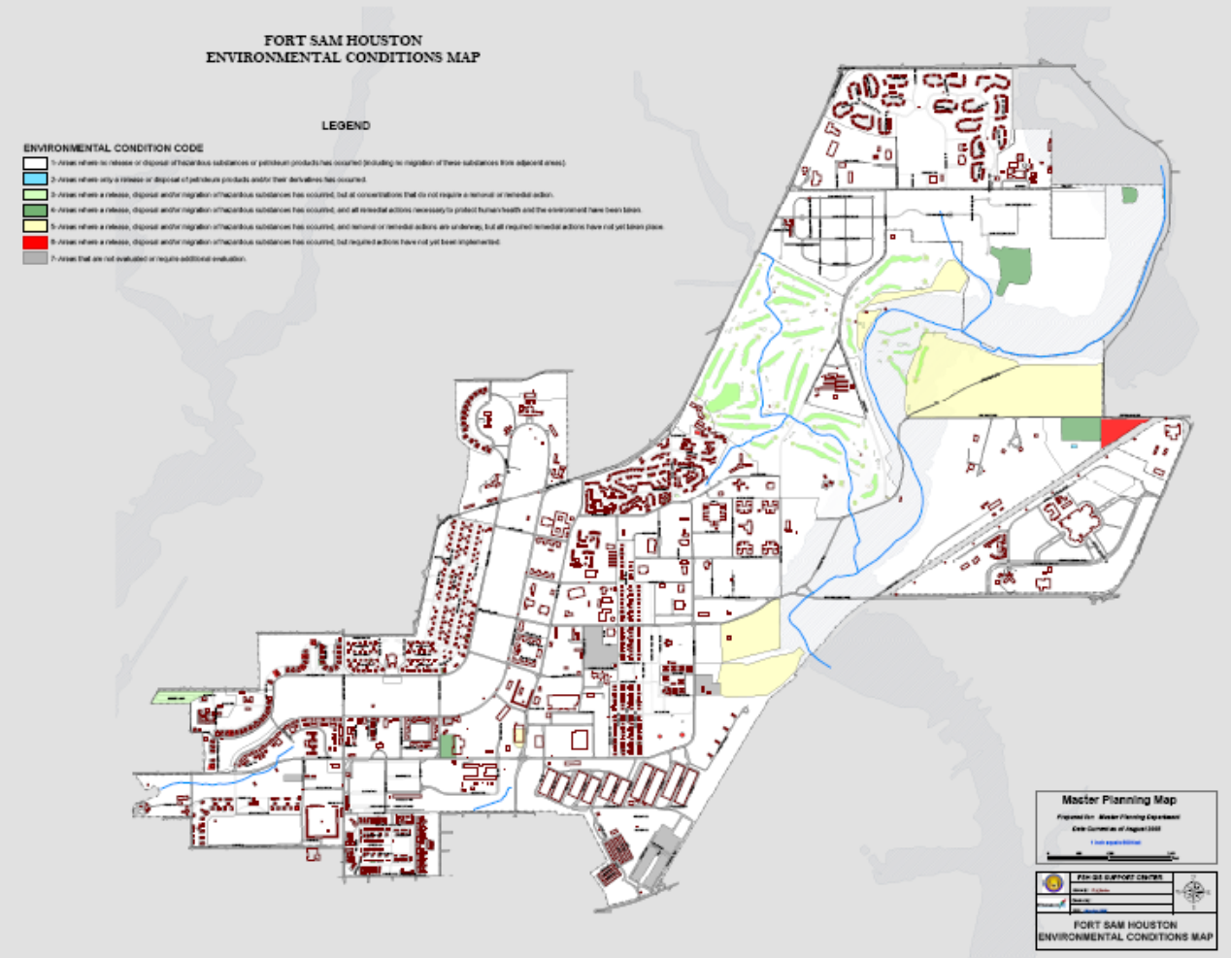


Figure 4.8 Environmental Conditions - Fort Sam Houston

4.1.4.2 Solid Waste Management

Historical Overview

In 1993, the Texas Legislature passed House Bill 2537, that required the Regional Councils of Governments to include an inventory of closed municipal solid waste landfills in their regional plans for solid waste management. The requirements are referenced in the Texas Health and Safety Code, Chapter 363.064. Texas Commission on Environmental Quality (TCEQ) contracted with Southwest Texas State University (SWTSU, now Texas State University) to do a preliminary inventory of the landfills in the 24 regional councils in Texas. This effort resulted in the location of approximately 4,200 closed and abandoned municipal solid waste landfills throughout Texas. In 1999, Senate Bill (SB) 1447 was passed and required to the COGs to further develop the Closed Inventory. The COGs were mandated to take the SWTSU point location inventory and database and develop maps showing exact or approximate boundaries of the closed landfills. The full requirements of SB 1447 may be found in the Texas Health and Safety Code, Chapter 363.064. Fort Sam Houston fully complies with these requirements.

4.1.4.3 Noise Level Descriptions

- Noise Zone III consists of the area around the source of the noise in which the level is greater than 70 decibels (dB), C-weighted day-night sound level (CDNL) for large caliber weapons, greater than 104 PK 15(met) for small arms and greater than 75 dB, A-weighted day night sound level (ADNL) for aircraft activity. The noise level within NZ III is considered so severe that noise-sensitive land uses will not be considered therein.

- Noise Zone II consists of an area where the day-night sound level is between 62 and 70 dB CDNL for large caliber weapons, 87 and 104 PK 15(met) for small arms and 65 and 75 dB ADNL for aircraft activity. Exposure to noise within this area is considered significant, and use of land within NZ II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in NZ II areas must be used for residential purposes, then noise level reduction (NLR) features of 25 to 30 decibels should be incorporated into the design and construction of the buildings.

- Noise Zone I include all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons, less than 87 PK 15(met) for small arms and 65 dB ADNL for aircraft activity. This area is usually acceptable for all types of land use activities.

- Land Use Planning Zone (LUPZ) DNL noise contours, 57 dB CDNL and 60 dB ADNL, represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states “Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.” For residential land uses, depending on attitudes and other factors, a 57 CDNL or 60 ADNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps. See Figure 4-x and Figure 4-y.

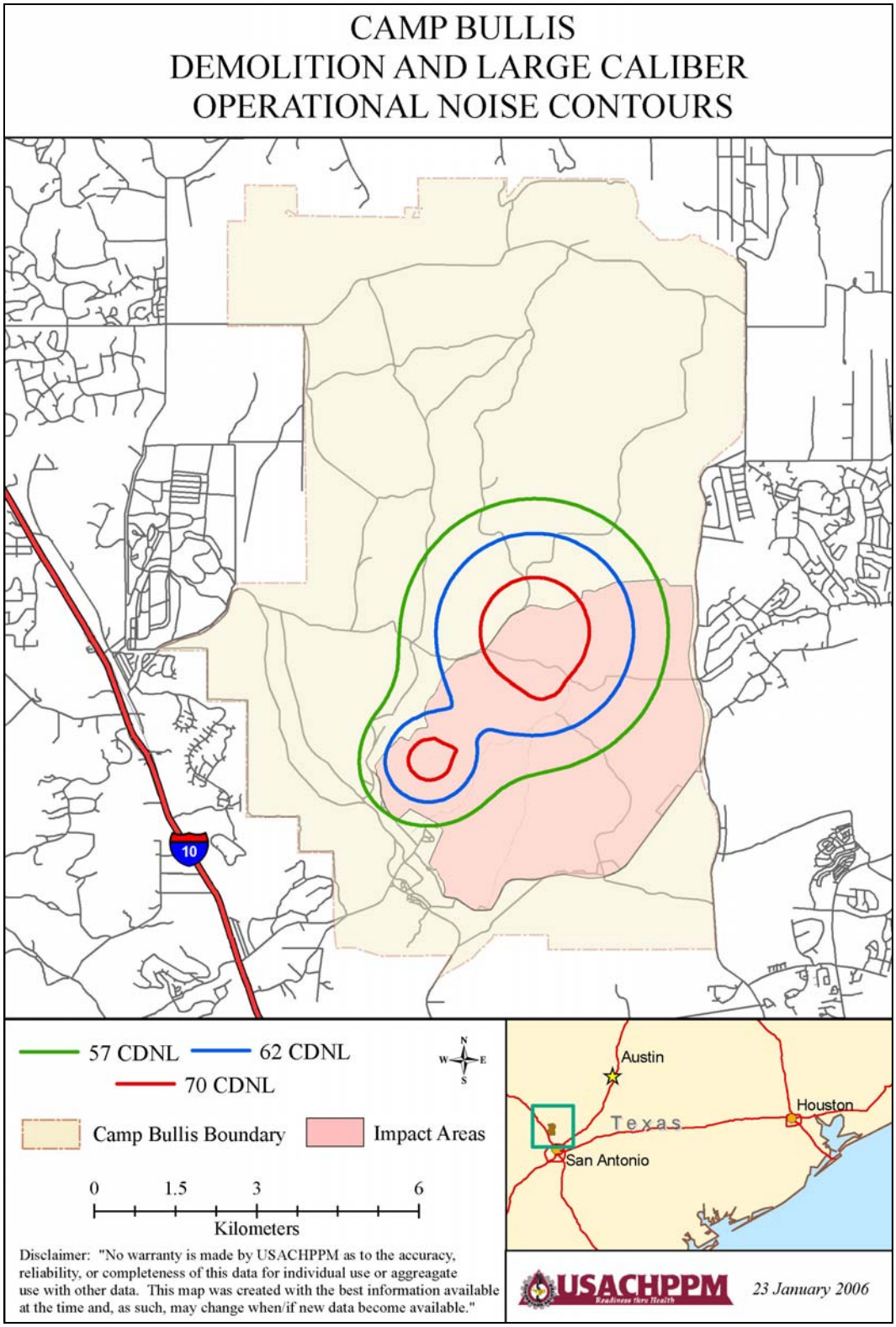


Figure 4-9 – Camp Bullis Noise Level Study

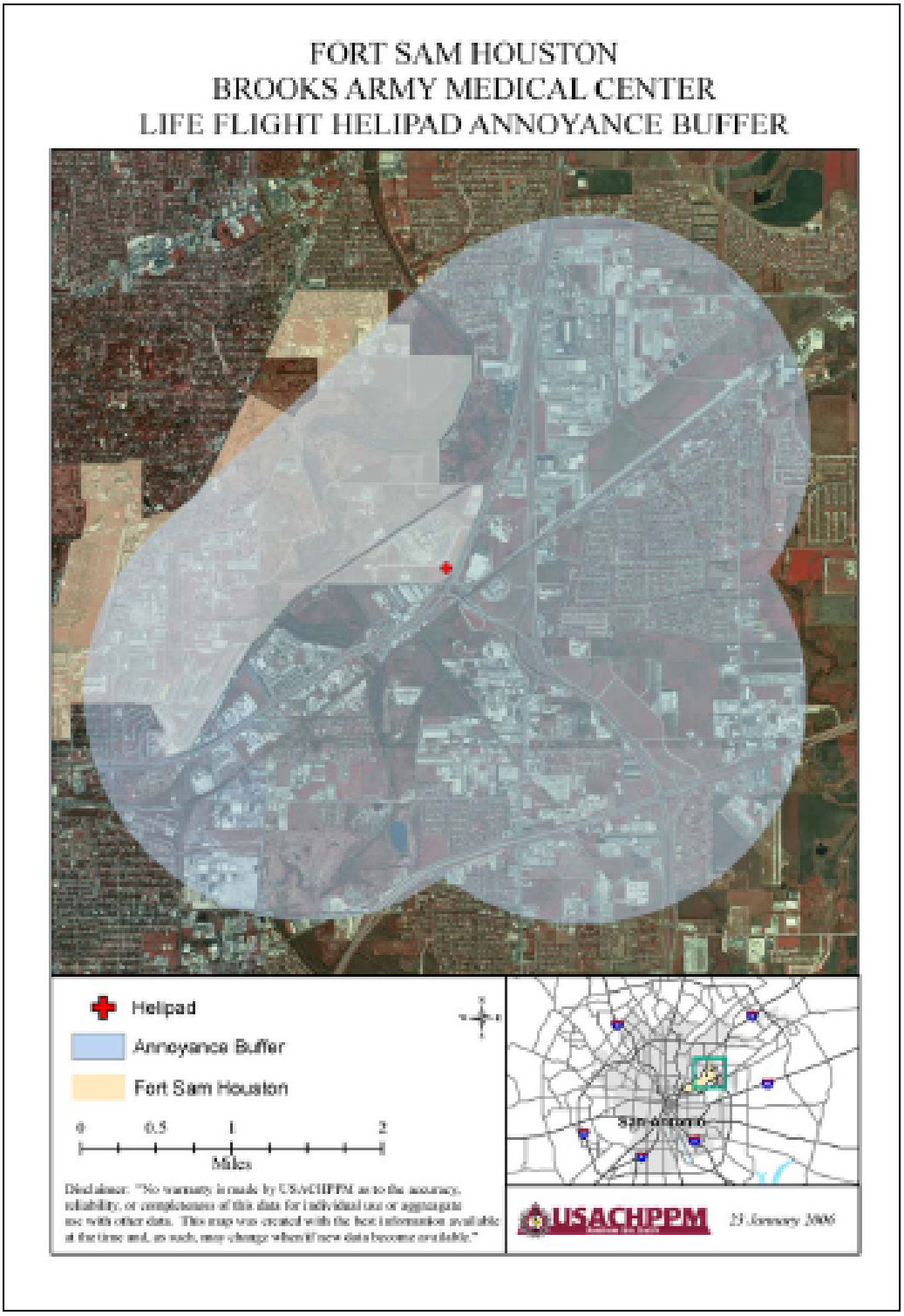


Figure 4-10 – Fort Sam Houston Noise Buffer Study

4.1.4.4 Air Quality

There are many places in the local San Antonio region where instruments and equipment have been established to sample our air quality. Some of these sites have equipment for monitoring ozone levels; of these sites, some of the sites have equipment that is *situated or located* and *maintained* according to federal specifications so that the ozone concentrations they record can be used to determine the region's compliance with federal standards for ozone. These special monitor are *regulatory* monitors. There are four regulatory monitoring sites for ozone in our local region. They are called "CAMS" sites, which stands for "Continuous Air Monitoring Station." One such site is located at Camp Bullis and is known as CAM 58.

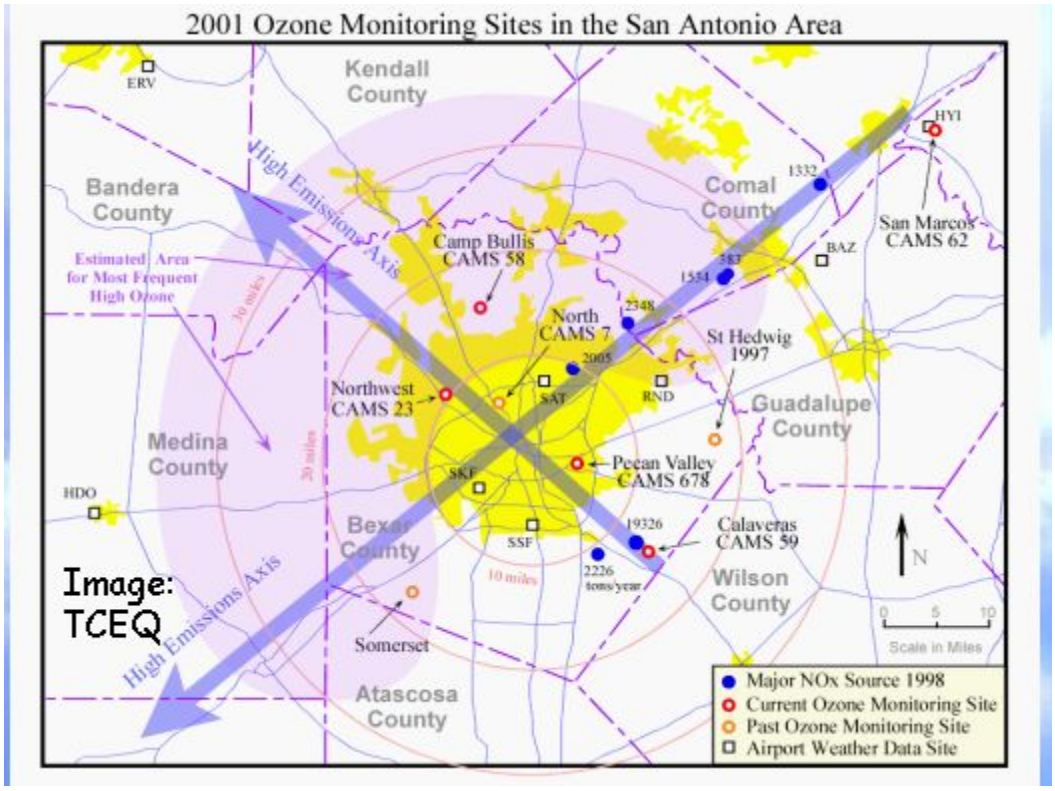


Figure 4-11 – Ozone Monitoring Sites in San Antonio

This graphic was prepared by the Texas Commission on Environmental Quality. The arrows show important emissions sources, notably the IH 35 highway, the urban core of the city of San Antonio; several cement plants, and the City Public Service power stations, as well as several monitoring stations. The arrows show the alignment of these emission sources, labeled "High Emission Axis." When the wind carries along these axes, the air carries emissions from these sources. The purple kidney-shaped lobe along the western and northern edges of the city core reflects that the wind patterns typical during ozone season (April 1 to October 31 of each year) will blow towards the west and north of the city. The purple region is labeled, "Estimated Area for Most Frequent High Ozone" in our region.

4.2 EXISTING LAND USE

4.2.1 Fort Sam Houston

Fig 4.12 shows existing land use at FSH.

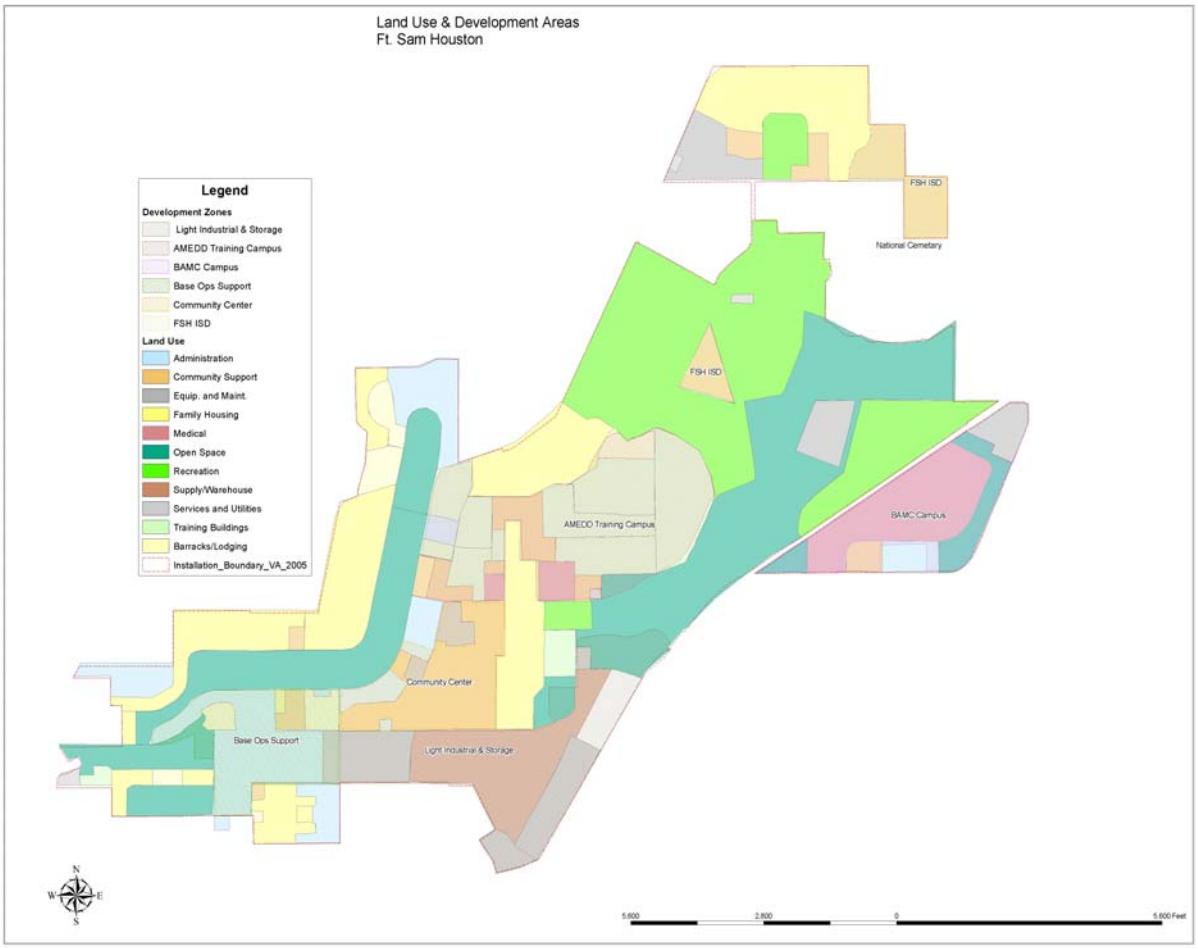


Figure 4.12 Fort Sam Houston Land Use

4.2.2 Camp Bullis

Fig 4.13 shows existing land use at Camp Bullis, showing the typical types of facilities found in each Land Use category.

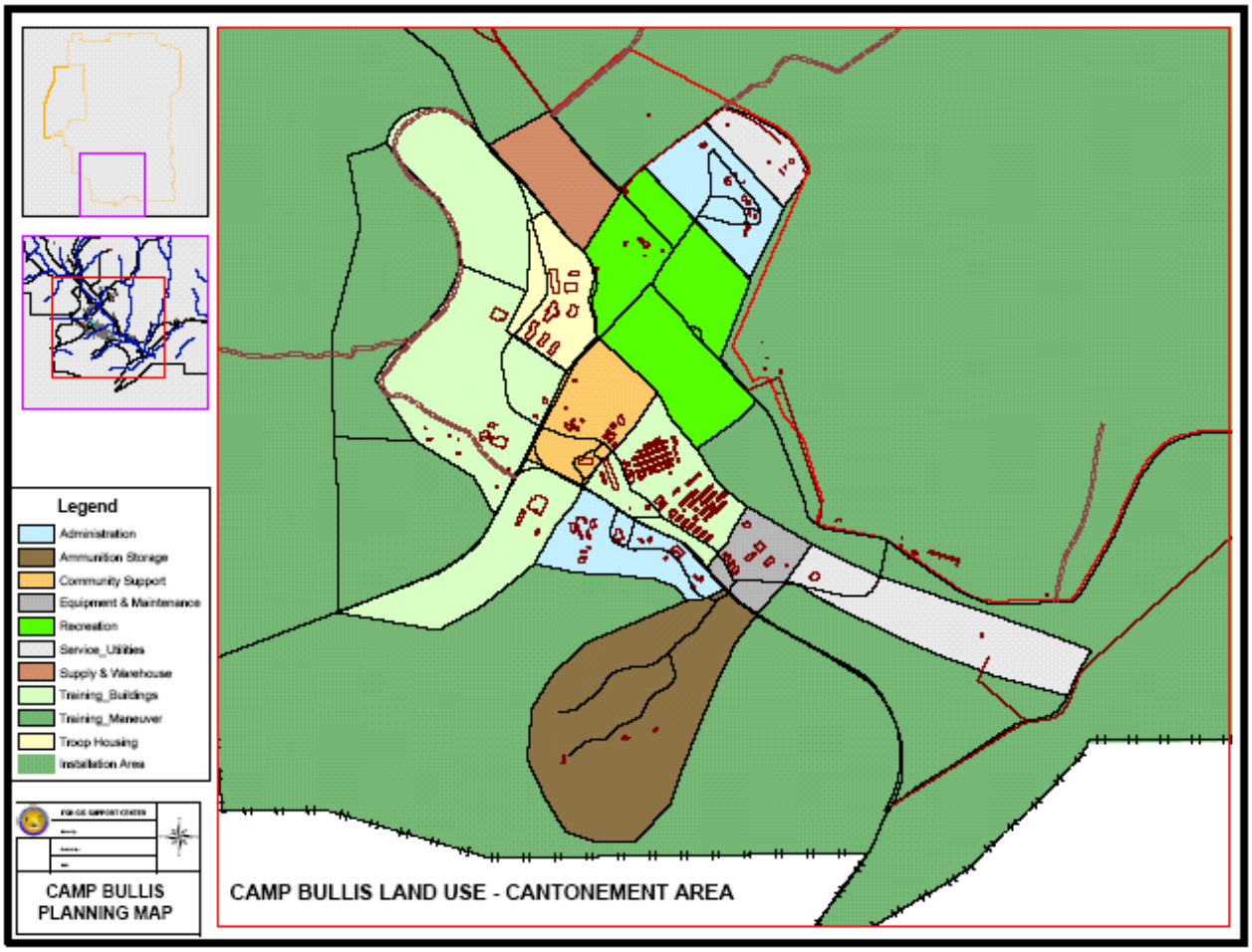


Figure 4.13 Camp Bullis Land Use

4.3 PROPOSED LAND USE

4.3.1 Future Land Use – Fort Sam Houston

There are no changes to the future land use for Fort Sam Houston.

4.3.2 Future Land Use - Camp Bullis

Master Planning intent is to encourage effective use of the land available and maintain installation buffer areas.

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Links
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SECTION 5 VISUAL THEMES AND ZONES

5.1 INTRODUCTION

5.1.1 Visual themes and zones are determined after performing surveys mentioned in paragraph 2.2. These surveys were conducted using existing installation maps, visual inspection, interviews, questionnaires, and photographs to record impressions of visual and spatial impacts. The data captured was used to define the visual themes and zones of the installation. Figure 5.1 presents a graphical portrayal of the FSH installation's visual zones.

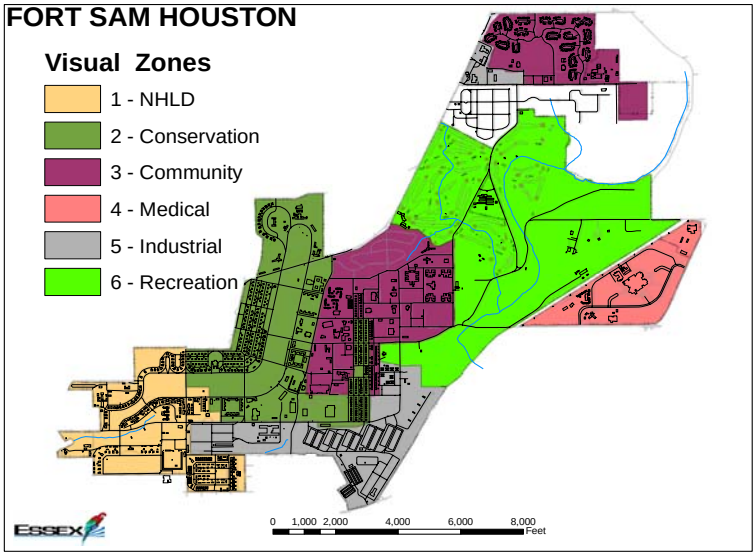


Figure 5.1 Visual Zones

5.1.2 Because of its long history and the pride the Army has always had for this installation, to this day it retains the physical evidence of almost every era of military planning. Fort Sam Houston is a variable course book on the Army planning traditions and the design concepts predominant at the time it was built. Since its earliest European settlement, San Antonio has been recognized as a prime strategic location; first by the Spanish government, then by the Mexican government and since 1845, by the government of the United States. Because of its strategic location, FSH has played a major part in the training and supplying of the U.S. military since the 1870's.

5.2 VISUAL THEMES

5.2.1 Visual themes create a perception of unification within the installation. These themes create design consistency that provides orientation and a "sense of place".

5.2.2 Visual themes are generalized groupings of visual features that provide the same general use and visual characteristics. Visual themes include broad scale activities that occur on the installation. These activities typically include similar design and layout characteristics. Table 5-1 and Table 5.2 show the theme/visual zone relationship for Fort Sam Houston and Camp Bullis.

VISUAL THEME 1 Historic	**VISUAL THEME 2 Community**	**VISUAL THEME 3 Mission**	**VISUAL THEME 4 Recreation**
VISUAL ZONE **1 – National Historic Landmark District**	VISUAL ZONE **3 - Community**	VISUAL ZONE **4 – Medical**	VISUAL ZONE **6 - Recreation**
VISUAL ZONE **2 - New Post His. Conservation District**		VISUAL ZONE **5 - Industrial**	

TABLE 5- 1 FORT SAM HOUSTON
VISUAL THEME and ZONE RELATIONSHIP.

VISUAL THEME
Training
VISUAL ZONE
Training Areas

TABLE 5- 2 CAMP BULLIS
VISUAL THEME and ZONE RELATIONSHIP

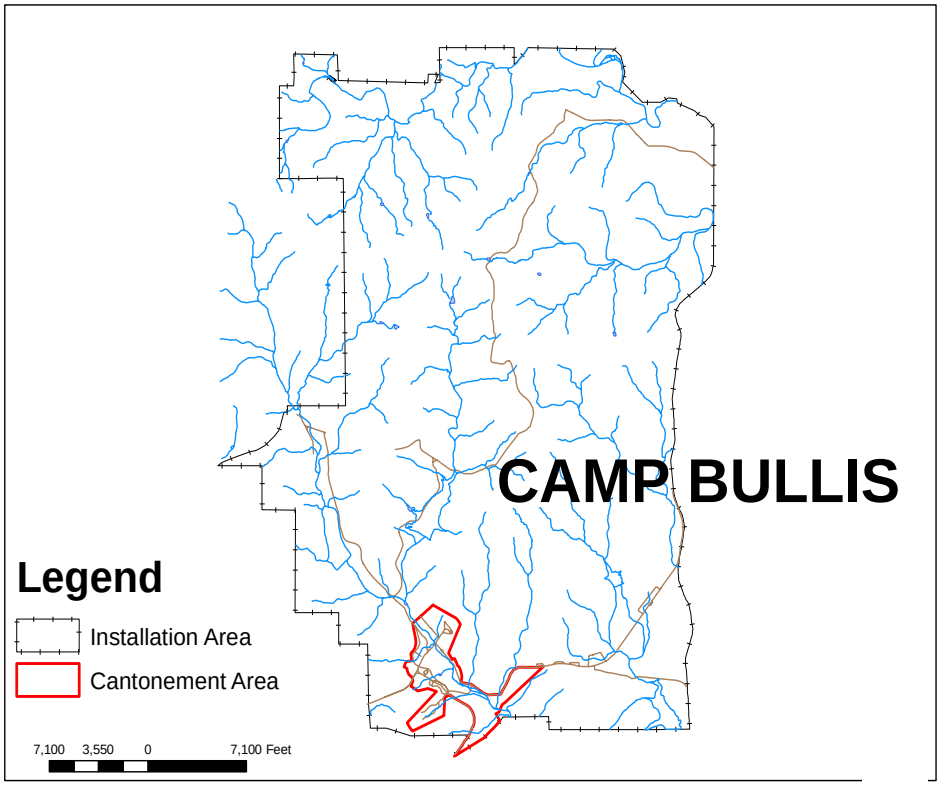


Figure 5.2
Camp Bullis

5.3 VISUAL ZONES

5.3.1 Visual zones are areas within the installation that include similar visual characteristics. Visual characteristics define a "look and feel" of an area together with the dominant features that define its image. Typical visual characteristics include unique buildings, vehicular and pedestrian corridors, natural features, and spatial relationships.

5.3.2 The following paragraphs present a functional analysis of each of the visual zones. This analysis includes a description of the visual character, a visual analysis map, assets, liabilities, and recommendations for each zone.

5.3.3 The visual analysis maps graphically illustrate the features and constraints that affect the visual character of the zone.

5.3.4 Assets and liabilities are determined according to the following criteria: installation visual goals and objectives (Section 3, para 3.2), design principles (Section 3, para 3.3) and visual elements (Section 3, para 3.4) in relationship to the six design components described in Sections 7 through 12 of this Army Installation Design Guide.

5.3.5 Recommendations are made to correct the liabilities or enhance the assets. These recommendations are used to generate projects that are listed in Section 6, Improvement Projects.

5.4 NATIONAL HISTORIC LANDMARK DISTRICT VISUAL ZONE 1

5.4.1 The Quadrangle Visual Character

The Quadrangle - 1876 - 1879. In 1870 the City of San Antonio presented the Federal Government with 40 acres to the north and east of downtown for the construction of a permanent Army post. Construction did not actually begin until 1876, due partly to the intense interest shown by such national officials as President Grant and Quartermaster General M. C. Meigs in the final decision of its placement and design. From all available documentation, this facility owes much of the design inspiration to the classical Military education of Quartermaster General M. C. Meigs, as West Point graduate. This complex has become a well-known San Antonio landmark over the years. Its heavy limestone walls form a real contrast with the tranquil green of its interior courtyard. The square -topped Clock Tower is perhaps the most widely known image of FSH. From its earliest days, the acreage to the north and west of the Quadrangle housed temporary barracks and quarters (often in tents) for units stationed at the depot, until eventually permanent stables were constructed. Completed in 1879, the Quadrangle buildings became the new Quartermaster Depot for the Department of Texas. From this depot the western frontier forts were supplied, by pack—horse, with provisions and all equipment and materials necessary for existence, until World War I. Today it serves as headquarters for Fifth U.S. Army

Figure 5.3
Quadrangle Entrance

Figure 5.4
The Clock Tower

5.4.1.1 Visual Analysis Map

Main Entrance and Circulation

The Quadrangle complex is sited along New Braunfels Avenue, which was at one time the main entrance to the post from the south. Interior access is controlled by guards stationed at the sally port entrance and at the pedestrian gate at the perimeter fence along Grayson Street. The interior courtyard is limited to pedestrian traffic so vehicle parking is provided in the parking lots outside of the complex.

Focal Points

The sally port entrance and the distinct 90-foot tall clock tower centered in the courtyard are the focal points for the Quadrangle. The courtyards quiet, park-like setting with green grass, mature oak trees and free roaming wildlife (deer, rabbit, and peacocks) make this facility a truly unique Army Headquarters.

Open Space & Buffer

With the exception of the southern side of the area, which borders City of San Antonio property, significant open space has been maintained around the Quadrangle that helps retain the historic western frontier fort look.

Historical and/or Architecturally Significant Features

The significance of the Quadrangle lies not only in the design influenced by a distinguished Quartermaster General, but also in the many historic events and personalities with which it has been associated.

Figure 5.5
The Quadrangle Courtyard

As the second permanent facility constructed by the U.S. Army in San Antonio and the oldest Army facility still in Army hands, it is the progenitor of the close relationship the city has had with the military ever since. Architecturally, heavy gray limestone walls with dressed buff-colored limestone detailing that includes large round arches along second floor loggias and around warehouse bay openings on the interior, segmental arch window surrounds with a modified keystone over exterior windows, flat limestone lintels on rear wall openings, and a broad segmental arch made up of graduated limestone voussoirs with "San Antonio Depot 1876" carved into its keystone make the Quadrangle a one-of-a-kind facility.

5.4.1.2 Assets

5.4.1.2.1 Site Planning – The entire complex has a strong sense of identity, is highly visible and is easily accessible.

5.4.1.2.2 Buildings – The historic limestone masonry detailing make the clock tower (B40) and the main building (B16) unique.

5.4.1.2.3 Circulation – Keeping motor vehicles out of the courtyard reinforces the historic western frontier fort atmosphere.

5.4.1.2.4 Landscape – Lush grass and fine, mature oak trees within the courtyard provide a very pleasant environment for both employees and visitors.

5.4.1.2.5 Site Elements - Quiet, park-like courtyard.

5.4.1.3 Liabilities

5.4.1.3.1 Ste Planning - Surface parking along the New Braunfels side of the Quadrangle.

5.4.1.3.2 Buildings- Windows, doors and second floor loggia have been severely altered.

5.4.1.3.3 Circulation - Parking around courtyard an intrusion in an otherwise pedestrian space.

5.4.1.3.4 Landscape - Highly visible placement of mechanical equipment.

5.4.1.4 Recommendations

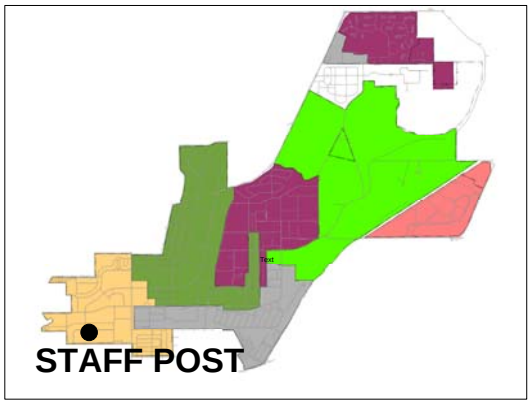
5.4.1.4.1 Site Planning - Restoration and development as military archives for FSH. Easy exterior access from the north off New Braunfels Avenue. Interior access controlled at the sally port entrance.

5.4.1.4.2 Buildings – Continue to maintain, restore, and preserve characteristics and features. East and west wings originally served as warehouse space for supplies, while administrative offices occupied the south wing. The entire complex houses the offices of Fifth Army.

5.4.1.4.3 Circulation – Improve ease of exterior access from the north off New Braunfels Avenue. Interior access controlled at the sally port entrance.

5.4.1.4.4 Landscape - While most trees and landscape are in good condition, maintenance levels can vary greatly. Landscape should not be allowed to deteriorate; or inappropriate beds and plantings be introduced. The landscape plan should be followed for the site to complement the period of the buildings and enhance the special nature of the buildings and site.

5.4.1.4.5 Site Elements – Preserve historic features: Six hundred and twenty-four square foot courtyard building has connected east, south and west wings about 33 feet in depth. Rear (north) end is enclosed by a buttressed wall connected to the structure by gates at the corners. High round arched interior doorways have been in filled with wood panels and smaller scaled wood doors which are all painted white. Exterior walls have regularly spaced six-over-six light double-hung wood sash windows, some of which have been covered with security wire mesh. Buff-colored, dressed limestone detailing includes large round arches along second floor loggias and around warehouse bay openings on the interior, segmental arch window surrounds with a modified keystone over exterior windows, flat limestone lintels on rear wall openings, and a broad segmental arch made up of graduated limestone voussoirs with "San Antonio Depot 1876" carved into its keystone. The Tower, Building 40 is the centerpiece of interior courtyard space, with pedestrian access by paved walkways. It originally served as both a water and watch tower; now largely a symbolic landmark and clock tower. Segments have gray limestone in random ashlars, with buff-colored limestone trim and cast iron balcony railings with overhanging hipped roof with lantern at peak. Eaves are "supported" by carved stone brackets. Entrance in south side has wood door with single light. Narrow slatted openings are spaced at intervals along all four walls. Triple arched windows with eight lights are located above the balcony, high up on each facade. Other tower features include: dressed buff-colored limestone trim around arched doorway and windows; carved stone brackets under eaves and balconies; cast iron balcony railings and large Seth Thomas clock face on each facade.



5.4.2 Staff Post

5.4.2.1 Visual Character

Staff Post – 1881 – 1885 is laid out according to the traditions that developed in the planning of the frontier posts. A central parade ground is bordered on two sides (the north and the west) by quarters for staff officers, and the Quadrangle forms its eastern edge. During this early part of its history, there was a small troop garrison housed in tents and temporary barracks. As the staff post housed the Department Headquarters only, there was no plan to enclose the south side with barracks. Centrally located on the north side of the parade ground, the Sam Houston House, Building 48, originally a hospital is set back from the line of officer quarters. The semicircular drive sets it off from the rest of the post. The southern boundary fencing along Grayson Street established a standard for the post with the larger limestone columns and wrought iron looking fence material.

Figure 5.6 – Staff Post Bldg.

5.4.2.2 Visual Analysis Map

- Layout & Circulation

Although layout is along the traditional lines of dozens of contemporary frontier forts, the overall effect of the setting is much more elegant than most would have been. The lush green parade ground lined with double rows of trees contrasts sharply with the dusty drill grounds of the frontier experience. Uniform setbacks and similar late Victorian architectural treatment create a visual whole. The integrity of this district, as defined by the architecture set within the landscape, remains

Figure 5.7 – Bldg. 48

remarkably intact.

- Historical and/or Architecturally Significant Features

Additional significance is attributable to Staff Post because noted San Antonio architect Alfred Giles designed all of the quarters specifically for the site. The Pershing House (Building 6), which stands at the northwest corner of the parade ground, is the most elaborate quarters at FSH. Of the remaining fourteen officers quarters, each is one of two different floor plans that illustrate the two plan types Giles used for residential designs throughout his career.

5.4.2.3 Assets

5.4.2.3.1 Site Planning – High level of historic integrity with houses oriented toward the prevailing winds. Imposing garages create a well-defined edge on the west and north sides.

5.4.2.3.2 Buildings - Buildings and grounds have been well maintained over time. Outbuildings, both garages and servants quarters, form a pleasant complex to the rear of each house

5.4.2.3.3 Landscape – Established trees provide a shady atmosphere for outdoor relaxation and entertainment.

5.4.2.3.4 Site Elements – Houses are oriented toward the prevailing winds.

5.4.2.4 Liabilities

5.4.2.4.1 Site Planning – The garages on the west side back right up next to the edge of the installation boundary.

5.4.2.4.2 Buildings – The Sam Houston House (Building 48) has been substantially altered: brick walls were not painted historically and the original full length window have been replaced by small aluminum windows

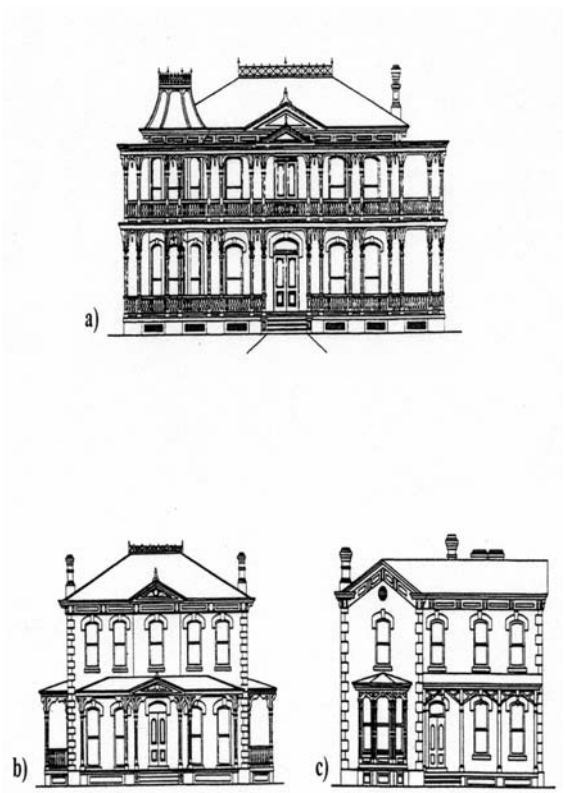


Figure 5.8 **Officer Quarters on Staff Post: a) Commanding General's Quarters (Pershing House); b) Field Officer Quarters; c) Company Officer Quarters.**

5.4.2.4.3 Landscape – Surface parking at the southeast corner of the parade ground is an intrusion. Uneven age and species of parade ground palm trees.

5.4.2.4.4 Site Elements – The 20th century military equipment displayed on the parade ground is inappropriate for this 19th century district.

5.4.2.5 Recommendations

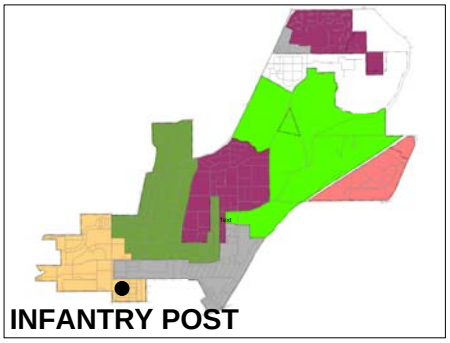
5.4.2.5.1 Site Planning - Documentation is available for a full restoration of both the buildings and the grounds. Interim improvements could include: Replacement of 20th century military hardware with more appropriate equipment.

5.4.2.5.2 Buildings - Removal of screened porches added to officers' quarters.

5.4.2.5.3 Circulation - Removal of surface parking on parade grounds.

5.4.2.5.4 Landscape - Replacement of dying ash trees, consolidation of palm tree species.

5.4.2.5.5 Site Elements – Maintain massing, proportion and scale: Two-story rectangular masses with smaller wing to the rear. Buildings 1 through 4 and 8 through 11 have symmetrical plan with central gable. Buildings 5, 7 and 12 through 15 have asymmetrical el plan with intersecting gable roof and bay window to one side. Building 6, the largest quarters in this group, is a symmetrical rectangular volume with surrounding two-story porches, offset by an octagonal cupola on the west side. Maintain materials and color: Officers quarters are of buff-colored native limestone in random ashlar with dressed limestone trim. Wood porch and portico trim, originally painted in more than one color, are currently painted white. Servants' quarters and garages are wood frame construction with horizontal lapped siding painted white with dark trim. Maintain Roof Characteristics: Quarters have either hipped or gabled roof depending on plan-type. Originally of standing-seam metal, these roofs are currently of a dark green composition shingle. Roof on Pershing House cupola is slate. Each house has from four to six brick chimneys with corbelled cap. Maintain windows and doors: Windows are either two-over-two light or one-over-one light double-hung wood sash. Buildings 5, 7 and 12 through 15 also have a projecting bay window in the front. Main entrances have double wood doors with one light each, topped by a single light transom. Maintain details: Typical Alfred Giles detailing--heavy segmental limestone arches with oversized keystones--top all windows. Bay windows have carved details and dentil cornice. Decorative wood columns, brackets and railings on porticos and porches exhibit the typically restrained, almost geometric, quality of all Giles' designs.



5.4.3 INFANTRY POST

5.4.3.1 Visual Character

Infantry Post, build between 1885 and 1906, was laid out in a horseshoe shape around a large parade ground. Entrance to the complex is at Grayson Street on the western side, where the

original headquarters building and both bachelor officer quarters are also located. Across the full length of the east end of the post are eight two—story barracks in a straight line, separated by fire walls, but designed to appear as one long building. Midway between this line of barracks, a three—storied, crenellated sally port structure acts as a focal point for the entire complex. Officers' quarters, like their accompanying outbuildings, line the long sides of the parade field. Additional barracks buildings and a uniquely designed band building (damaged by fire in 1984) faced each other at the lower end of the parade ground between the officer quarters and the long barracks.

Figure 5.9 - Sally Port

Infantry Post represents, perhaps, the most sophisticated expression of the Frontier Fort design. As originally designed and carried out, it contained the full complement of military buildings arranged around an open parade ground in the traditional order according to rank. Designed by a member of the officer corps and carried out by a well-known local architect, it exemplifies the culmination of a process. Never having had to protect the populace against a hostile force quite like the American Indian, the Army had no precedent from which to design and construct defense works on the Western Frontier. The open arrangement of the Frontier "Fort" developed out of a coordination of ancient traditions of military planning and order, based on the hierarchy of rank and the way these traditions were adapted to the actual experience of the American frontier

5.4.3.2 Visual Analysis Map

Main Entrance and Circulation

The original main entrance to Infantry Post was just off Grayson Street across from the Quadrangle. Main traffic now enters the area from the service roads on the north side of the area, which presents a less than favorable view of this once very ornate Victorian complex.

Focal Points

Only two buildings in the complex have retained their original visual quality. These two buildings parallel Grayson Street where the main entry once was. The contrast between brick walls and the limestone details is still unobscured and the decorative "gingerbread" on the porches is still intact

Open Space

The once open space that made up the original parade ground was in filled with two story brick houses in 1947, thus destroying the visual unity of the complex.

Figure 5.10- Inf. Post – Bldg. 625

Buffer

The buffers that once surrounded the complex have been lost due to urbanization on the south and east side as they are right on the property line between FSH and the city.

Primary Road

The primary road has been closed so access to the area is accomplished by driving on the back service roads.

Significant Vegetation

The original main street within Infantry Post is lined by spacious shade trees.

Figure 5.11 Barracks

Historical and/or Architecturally Significant Features

The barracks and sally port at the east end of the original parade ground stand out as being architecturally significant. Historically, this was the most ornate part of FSH with uniform Italianate detailing of wood porches that created a sort of lacy edge around the parade ground. Heavy limestone lintels and sills were meant to contrast with the bare brick walls.

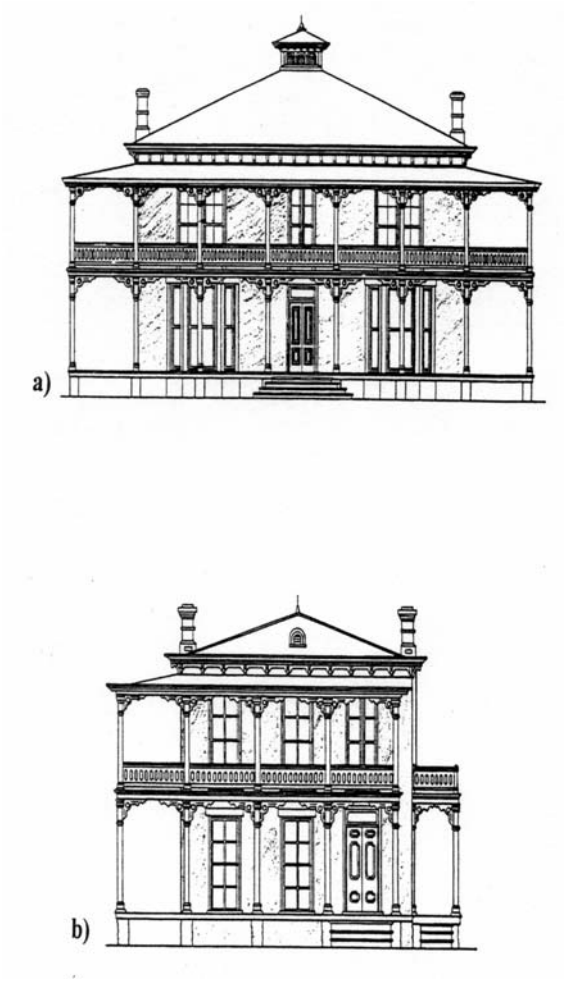


Figure 5.12 - Officer Quarters on Infantry Post: a) Commanding Officer Quarters (Stilwell House); b) Company Officer Quarters.

5.4.3.3 Assets

5.4.3.3.1 Site Planning – The original layout had a distinct sense of enclosure and definition.

5.4.3.3.2 Buildings – Infantry Post is a reasonably complete Victorian complex that, though altered through the years, retains good visual strength. A few of the buildings have been restored or unaltered and reflect a positive image of their historic character.

5.4.3.3.3 Landscape – The large shade trees lining the sides of the main street provide a park-like image.

5.4.3.4 Liabilities

5.4.3.4.1 Site Planning – The intrusion of 24 sets of brick duplexes in 1947 has destroyed the visual unity of the complex and blocked the original views and spatial quality.

5.4.3.4.2 Buildings - Porches on all buildings, which used to form a uniform decorative edge around the parade ground, have been stripped of their original ornamentation and, in most cases, completely enclosed, screened in or removed. Additionally, many buildings have been vacated and boarded up and continue to deteriorate.

5.4.3.4.3 Circulation – The original entry has been closed off shifting access to the site through service roads.

5.4.3.4.4 Landscape – Declining condition of street trees.

5.4.3.4.5 Site Elements – Curbside trash disposal for housing residents detracts from the areas appearance.

5.4.3.5 Recommendations

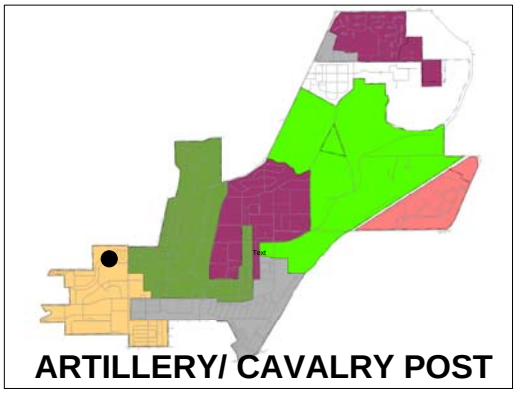
5.4.3.5.1 Site Planning - The Infantry Post complex is visually challenged as a majority of the buildings along the eastern perimeter have been vacated and boarded up. The west end of the complex still retains a good visual strength and could be completely restored with removal of the in fill houses and screened in porches on most of the buildings

5.4.3.5.2 Buildings - Restore historical porch railings. Test various methods of paint removal on inconspicuous parts of exterior brick walls. Restore materials and color: Light-colored brick bearing wall construction with limestone and concrete foundations. Walls have been painted a light cream since 1949.Heavy bush-hammered limestone sills and lintels. Limestone is also painted over. Restore roof characteristics: Low hipped roofs with wide over hang, were originally roofed with standing-seam metal. Roofs are now of green composition shingles. Original decorative brackets under eaves have been removed. Maintain houses large brick chimneys with corbeled cap. Maintain windows and doors: Most openings are full length four-over-four double- hung sash windows or double French doors.

5.4.3.5.3 Circulation – Maintain Even spacing along the long sides of parade ground.

5.4.3.5.4 Landscape - Restore street trees. Thin out trees on parade ground to partially restore views.

5.4.3.5.5 Site Elements - Historically, this was the most ornate part of FSH. Consider restoration of Sally Port detailing of wood porches around the parade ground.



5.4.4 ARTILLERY/ CAVALRY POST

5.4.4.1 Visual Character

The district is picturesquely oriented around an irregularly shaped parade ground in the southwestern Artillery Post area, and then widens to a stricter rectangular parade ground at Cavalry Post area to the east. This represents a departure from the "Frontier Fort" concepts as seen in the earlier constructions of Staff Post and Infantry Post, and suggests a response to the natural topography of the land. The Artillery Post parade ground constitutes the narrowest such open space in the historic areas of the Fort; and, as such, provides a more intimate enclosure than its predecessors. This sense is somewhat lost as the parade ground widens to the east; but even at this point, the scale and rhythm of the surrounding structures preserve the established character of this district. Lining the west and north sides of the parade grounds are the officers' quarters-two-story detached dwellings; the only exceptions being three Bachelor Officers' Quarters which have a more apartment—like appearance. At the north center of the rectangular parade ground area, the consistent setback line is broken as the drive loops to the north creating a cul-de-sac with officers' quarters oriented around an elliptical open space. The south edges of the parade ground follow the typical layout with the quarters for the enlisted men-in this case a series of long two-story detached barracks buildings. In general, all quarters on Artillery/Cavalry Post are taken from plans supplied by the Quartermaster General's office, which accounts for the overlay of consistency that typifies this district. With the exception of the barracks and support structures on the Cavalry Post (east> portion of the parade ground, all the buildings are built of the same buff—colored brick. The above-specified buildings are built of red brick. Rooflines and buildings silhouettes are relatively consistent in the entire area, although roofing materials vary. Building setbacks are consistent throughout the district. Originally, full galleries at one or both levels were the principal facade feature of all residential structures, both officers' quarters and barracks.

Figure 5.13 - Officer Quarters

5.4.4.2 Visual Analysis Map

5.4.4.2.1 Main Entrance - Artillery/Cavalry Post exhibits the full complement of the Frontier Fort formula. It was designed to be a self-contained campus for operation of the cavalry unit assigned to the Post of San Antonio along with its artillery back-up. What makes this post unique is that instead of imposing the usual rectilinear order, the formula was here adapted to the irregularities of the site. Thus we can see this district as a transition stage between the strict order of the Frontier Fort formula and the largess of the Military Park concept.

5.4.4.2.2 Circulation - All houses are sited with deep setbacks and well proportioned side yards. Each facade parallels the line of the drive as it curves along the north side of the parade ground. Access roads appear at the rear of the quarters. Trash pick-up; garages; and other parking, deliveries, and maintenance occurs along this service corridor. General vehicular traffic is routed at the front of the quarters on Artillery Post Road, Artillery Post Loop with an elliptical cul-de-sac, and a short section of New Braunfels Avenue. Pedestrian access to all quarters is by a continuous network of sidewalks along the quarters' street frontage.

5.4.4.2.3 Focal Points

Used as officers quarters since their construction, 1905-1911. Building 107 was built for and continues to be used as Distinguished Visitors' Quarters. Building 167 has always served as quarters for higher ranking officers.

5.4.4.2.4 Historical and/or Architecturally Significant Features

Many design elements are consistent for all officers quarters buildings, although eight different forms exist for 41 buildings.

Figure 5.14 - Officer and Enlisted Quarters on Cavalry and Light Artillery Post: a) Commanding Officer Quarters; b) Field Officer Quarters; c) Captain and Lieutenant Quarters; d) Artillery Barracks.

5.4.4.3 Assets

5.4.4.3.1 Site Planning – This part of FSH has a high level of integrity with few intrusions to the original scheme. It is one of the Post's most cohesive zones. The highly consistent design quality creates an impressive ensemble of buildings, much like a campus.

5.4.4.3.2 Buildings - In this building program, many design elements are consistent. All buildings are built of the same buff-colored brick laid in common bond. The quarters are all two-story structures; all with attic dormers or windows. The dominant feature of every building is a wide two-story gallery that wraps around two or three sides. The Colonial Revival

style is maintained by consistent use of wooden single-story and colossal Tuscan columns at the porches and galleries. Dentils, modillions, and other classical elements appear in the cornices

5.4.4.3.3 Circulation –Vehicle circulation is in the front of the buildings located along each side of the parade field. Secondary driveways and pedestrian ways are used for utilities, trash pick—up, deliveries, and parking. Service vehicles move to their own areas.

5.4.4.3.4 Landscape – The parade ground with its curvilinear lines, tree—shaded drives, and rolling terrain produces a picturesque, park-like environment

5.4.4.3.5 Site Elements – Excellent pedestrian areas, play areas, sidewalks, crossings, street lighting and trees.

5.4.4.4 Liabilities

5.4.4.4.1 Site Planning - Edges of the zone are treated coarsely and inconsistently with a variety of fences and gates. The common denominator is chain link/wire fencing that gives the zone a barricaded appearance incongruous with its character.

5.4.4.4.2 Buildings - Many buildings have lost valuable details due to lack of proper maintenance. Six barracks buildings have had their full double galleries removed from their facades, radically altering not only the buildings' character, but the character of the entire parade ground.

5.4.4.4.3 Circulation - Additions of surface parking on the south side of the parade ground is very intrusive to the zone.

5.4.4.4.4 Landscape – Grounds maintenance needs to be improved for uniformity with the installation plan.

Figure 5.15 - Landscape Maintenance Opportunity

5.4.4.4.5 Site Elements – For uniform appearance and maintenance, cyclical care for buildings needs to include similar materials, hardware, and other products; and uniform construction, fabrication, and consolidation techniques for the different materials and features.

5.4.4.5 Recommendations

5.4.4.5.1 Site Planning – Do not expand surface parking on the parade grounds. Develop additional surface parking as required in the service areas behind the barracks buildings.

5.4.4.5.2 Buildings – Continued renovations of buildings should be consistent by following a well developed master preservation plan that is uniformly carried out.

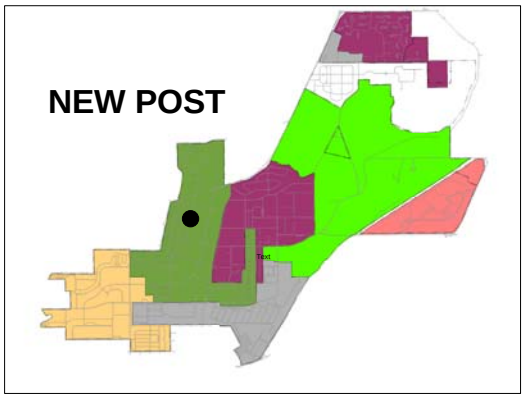
5.4.4.5.3 Circulation – Number of entrances should be limited and well-defined.

5.4.4.5.4 Landscape - Maintenance needs to include cyclical care and a grounds source manual for materials, hardware, and other products.

5.4.4.5.5 Site Elements - Improve the perimeter fencing, with special attention to points of entry into the base

5.5 CONSERVATION– VISUAL ZONE 2

5.5.1 NEW POST, MACARTHUR FIELD & OLD BAMC



5.5.1.1 Visual Character – New Post, the largest permanent building program ever undertaken at FSH, is the result of the Army Housing Act of 1926. The original purpose of the 1926 housing program was to construct a large number of barracks and hospital beds, with a smaller portion of the appropriations going to the construction of officers and noncommissioned officers quarters. The 1926 Reusing Program era was the height of the "Military Park" planning period in the Army. The development of this approach to military planning was affected both by the previously described traditions of frontier fort planning, and by the presence of civilian architects and planners in the Quartermaster Department in Washington, D. C. These designers, contracted from outside the military establishment, brought with them the current ideas about city planning, which were, at the time, very much influenced by the grand formal layouts of the Beaux Arts School. Using the standard arrangement developed on the frontier, a parade ground with barracks along one side and officers quarters along the other, the scale was simply vastly enlarged. Today New Post is still an impressive military park. The sweep of the central parade field, Arthur Mac Arthur Field, is bordered on the west side with rows of Mediterranean style quarters shaded by many, now mature, trees.

Figure 5.16 – Barracks/ Admin.

Figure 5.17 - Old Medical Complex Facility

A large Officers' Club in a similar but more elaborate style is tucked in amongst the quarters at the south end. It was originally planned that seven of the new quadrangle—plan regimental barracks buildings would line the east side of Mac Arthur Field. However, World War II mobilization halted construction in 1939 and only three of the barracks had been built.
The result for New Post is that its eastern side is not as architecturally coherent as is its west side. Seven similar structures of the same mass, scale and style would have created a real visual wall, but today's mixture of different scales and types of buildings along that side creates visual confusion. Completed in 1937, Building 1000, the former Brooke Army Medical Center (BAMC), rises to an above ground height of eight stories. This monumental building, flanked on either side of the parade grounds, by two similarly designed, four-story buildings is the axial focus of the entire New Post visual zone. With their ornate, Spanish Colonial architecture and grand scale, they symbolize the great heritage of this era of military planning for installation development.

Figure 5.18 - Old BAMC

Situated on one of the highest points on Post, these three buildings form the northern terminus of MacArthur Field and the focal point of the entire New Post building program. A large circular drive in front provides formal access to all three buildings, while service drives are provided to the rear of each. Large open space to the front with large buffers between the buildings and the border of the installation reinforce the views and setting for these historic structures. The massive six-story, stepping down to five-story pavilion-type hospital has a central, eight-story tower with projecting port caches at ground level. Flanking four-story rectangular masses both have three-story wings to either side. Highly ornate, Baroque detailing in light-colored cast stone surrounds central openings and is used to create water tables, string courses, spandrels, colossal pilasters, cartouches and turned balusters

5.5.1.2 Visual Analysis Map

5.5.1.2.1 Main Entrance – The corridor along Stanley Road is one of the most heavily used parts of FSH–both by vehicular and pedestrian traffic.

5.5.1.2.2 Circulation – Using the standard arrangement developed on the frontier, a parade ground with barracks along one side and officers quarters along the other, the scale was simply vastly enlarged.

5.5.1.2.3 Focal Points – Monumental hospital (Old BAMC) building as axial focal point.

5.5.1.2.4 Open Space – Large central parade ground providing grand vistas.

5.5.1.2.5 – Buffer – Good visual lineage between New Post and the old parts of FSH.

5.5.1.2.6 – Primary Road – Stanley Road–both by vehicular and pedestrian traffic.

5.5.1.2.7 – Significant Vegetation – Fine mature shade trees especially in the housing areas.

5.5.1.2.8 – Good Views – Predominance of an architecture which is regionally appropriate.

5.5.1.2.9 Historical and/or Architecturally Significant Features – there is an overall integrity to New Post. This integrity is accomplished by the coherence of materials and architectural style of all its bui1dings. The regularity of their spacing and the uniformity of setbacks also contribute to the unity of the whole. Above all else, it is the predominance of the over-sized – parade ground that not only ties New Post's pieces together, but this sweep of relatively uninterrupted green space ties New Post into the older parts of FSH, making it all a harmonious whole.

5.5.1.3 Assets

5.5.1.3.1 Site Planning – Uniform building styles and setbacks, the common Spanish Colonial architectural theme and the predominant, oversized parade ground ties New Post in to the older parts of FSH, making it all a harmonious whole.

5.5.1.3.2 Buildings – The large, three-story, quadrangle style brigade barracks and administration buildings along Stanley Road set the standard for massing, proportion and scale for the eastern edge of the MacArthur Field parade grounds

5.5.1.3.3 Circulation – There is a clear sense of spatial order and circulation with good traffic and visual tie in to the older FSH historic district.

5.5.1.3.4 Landscape – The large central parade ground provides a grand vista while the tree-lined edges provide visual separation from the adjacent housing area.

5.5.1.3.5 Site Elements – New Post is still an impressive military park. The sweep of the central parade field, Arthur MacArthur Field, is bordered on the west side with rows of Mediterranean style quarters shaded by many mature trees.

5.5.1.4 Liabilities

5.5.1.4.1 Site Planning – When only three of the seven originally planned brigade type complexes were built a confusion of scale among buildings built along the east side of the parade ground damaged the visual integrity of this zone.

5.5.1.4.2 Buildings – The bank, credit union, dental clinic and service club on Stanley Road are intrusions to the visual zone. The Academy of Health Science constructed in the 1970's also adds to visual confusion.

5.5.1.4.3 Circulation – Intrusion of surface parking onto the parade ground detracts from an ideal view.

5.5.1.4.4 Landscape – Street trees along the east side of MacArthur Field are too close together, blocking the view and obscuring streetlights.

5.5.1.4.5 Site Elements – The variety of fixtures used for street lighting creates visual clutter. Barriers placed or installed to increase standoff distances for force protection reasons are unsightly and lack any sense of uniformity or visual integrity for the area.

5.5.1.4.6 Force Protection – In some cases the buildings along Stanley Road are less than 10 meters from the traveled way.

5.5.1.5 Recommendations

5.5.1.5.1 Site Planning – Plan appropriately "grand" future use for the monumental BAMC building. Plan another appropriately "grand" building program to replace Building 300 when it is demolished. This site is, both visually and functionally, a critical "hinge" and should be thought of in terms of an appropriately scaled architectural landmark. Scale down and eventually phase out parking on parade ground along Stanley Road and transfer to new parking behind, along Scott Boulevard, and/or create incentive program to use remote parking facility and shuttle bus system. Develop a small park on East New Post.

5.5.1.5.2 Buildings – Consolidate building programs to allow for new projects of scale comparable to the original barracks buildings to be constructed as infill along that side of MacArthur Field.

5.5.1.5.3 Circulation – Reinforce street edge along east side of MacArthur Field by installing continuous sidewalk and street lights at closer spacing.

Figure 5.19 – Parking and Landscaping Opportunities

5.5.1.5.4 Landscape – Thin out street trees, and consolidate by species. Screen large surface parking lot at Harry Wurzbach and Stanley Roads with berms and landscaping.

5.5.1.5.5 Site Elements – Bury and consolidate overhead utilities. Remove signs from building facades and replace all signage to Army Regulation Standards. Adopt one type and color scheme for all street furnishings. Consolidate light fixtures to one type for uniformity.

5.5.2 NEW POST, OFFICER & ENLISTED HOUSING

5.5.2.1 Visual Character

Figure 5.20 - New Post officer and enlisted quarters: a) General Officer Quarters; b) Field Grade Quarters; c) Field & Company Officer Quarters; d) Company Officer Quarters; e) NCO Quarters; f) Infantry Barracks

The officer-housing portion of New Post completed between 1931 and 1935, consists of one- and two-story, Mission/Spanish Colonial Revival structures organized with service roads and garages to the rear and formal access along wider streets in the front. All were built according to standardized Quartermaster plans. A number of exterior designs were employed to add variation to the residences. This was primarily achieved by alternating round-arched, single-bay entry porches with flat-arched, single-bay entry porches, and by reversing floor plans. Foundations are reinforced concrete, and walls are hollow tile and stucco. As with the officer's housing area, a standard Quartermaster plan was used to construct these single-story, Mission/Spanish Colonial Revival style quarters. Completed between 1931 and 1934, these double rows of small single-family detached residences share common alleys in a small strip neighborhood separated from the rest of New Post by the former railroad right-of-way. The device of alternating the roof shape and porch openings on every other house relieves the monotony of these rows of Spanish Colonial bungalows.

5.5.2.2 Visual Analysis Map

5.5.2.2.1 Siting and Circulation – The offices' quarters are generally sited in a linear pattern of streets west of the MacArthur Field parade grounds. Circulation follows the traditional pattern with service roads and garages to the rear and tree lined wider streets to the front.

5.5.2.2.2 Significant Vegetation – The original landscaping followed a specific pattern that was repeated across groups of three to five houses that broke the monotony of identical looking structures, but reinforced the senses of order throughout the development.

5.5.2.2.3 Focal Points – The officer's club (Building 407) stands out as unique to this visual zone. Although it forms the largest structure along the western side of the parade field, its two-story mass is broken up into three long rectangular wings that join to make a u-shape, enclosing a lush courtyard surrounded by an attached double gallery.

5.5.2.3 Assets

5.5.2.3.1 Site Planning – There is a clear sense of spatial order within the housing area along with plenty of room for backyards and attractive front entrances.

5.5.2.3.2 Buildings – These quarters have consistently served as residences since their construction in the 1920's and 30's.

5.5.2.3.3 Circulation – Circulation follows the traditional pattern, with service roads and garages to the rear and formal access along wider streets in front.

5.5.2.3.4 Landscape – Consistent grouping.

5.5.2.3.5 Site Elements – Attractive off-white stucco-faced hollow tile construction with smooth finish, topped by red tile roofs.

5.5.2.4 Liabilities

5.5.2.4.1 Site Planning – Physical separation between noncommissioned officers quarters and the rest of New Post.

5.5.2.4.2 Landscape – Improper pruning of trees in residential areas.

5.5.2.4.3 Site Elements – Variety of fixtures used for street lighting creates visual clutter

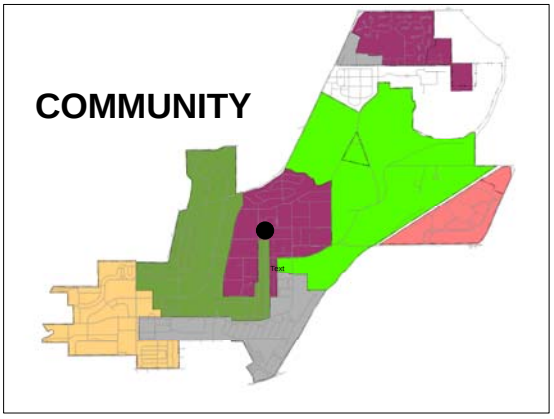
5.5.2.5 Recommendations

5.5.2.5.1 Site Planning – Bury and consolidate overhead utilities.

5.5.2.5.2 Circulation – Scale down and eventually phase out parking on parade ground along Stanley Road.

5.5.2.5.3 Landscape- Prune trees in residential areas.

5.5.2.5.4 Site Elements – Consolidate light fixtures to one type for uniformity.



5.6 COMMUNITY - VISUAL ZONE 3

5.6.1 Central - Community

5.6.1.1 Visual Character

Areas bordered by Schofield Road, Scott Road, Wilson Avenue and the Patch-Chaffee housing area are the least coherent visual zones on the installation. This comparatively large area is without visual or physical order, but has the potential to become a center for on-post residential life and activity. There is a lack of continuity of scale, form and style among the buildings.

Figure 5.21 – Bldg. 360 Commissary

A history of unrelated decisions regarding a wide variety of industrial uses has led to the absence of an overall concept or circulation system for this zone. The major land use is surface parking, randomly occupying the vast spaces between buildings. The pedestrian environment is uncomfortable due to the lack of orientation, shade, landscaping, and visual interest. This zone is without focus and suffers from poorly defined edges. Historically, the presence of the railroad lines made coherence in this zone impossible, but the rail has been removed.

Figure 5.22 – Bldg. 320 Fitness Center

5.6.1.2 Visual Analysis Map

5.6.1.2.1 Main Entrance –The main entrance to FSH from IH-35 brings all traffic to the edge of this area and delivers the first impression of the Post for most visitors. Because of its location relative to the main gate, Scott Road is the primary route used for this high traffic area.

5.6.1.2.2 Siting and Circulation – The relative location of the community support activities like the PX and Commissary is ideal but the traffic circulation needs a lot of work. The area has begun to function as a "Town Center", giving coherence to the central area of FSH.

5.6.1.3 Assets

5.6.1.3.1 Site Planning– This central location adjacent to eastern edge of New Post with its easy access from off post and the IH-35 corridor presents a significant design opportunity for FSH.

Figure 5.23
Bldg. 1350 – HQ Dining Complex

5.6.1.3.2 Buildings - Demolition plans present opportunities to rebuild with a sense of purpose and unity to create a significant "place".

5.6.1. 3.3 Circulation - Development of Scott Road will focus traffic on the edge of the zone, providing easy access from north or south.

5.6.1.4 Liabilities

5.6.1.4.1 Site Planning – Lack of a coherent plan for the development of this area in the past presents a challenge for today.

5.6.1.4.2 Entrances – The Entry Control Point main entrances into the Community zone are temporary structures. Since these areas are considered main gates, permanent designed structures more conducive to a favorable first visual impression need to be planned and constructed. In addition to the Entry Control Points the AAFES Four Season Store with its primary loading dock on Scott Road and its big box-like architecture is an example of what not to do at the Post's main gate area. The remains of the old post laundry facility (Building 330) west of Scott Road also present an adverse visual impression.

Figure 5.24
Main Entrance Structures

5.6.1.4.3 Circulation – Traffic circulation and parking for the entire area is undersized and inefficient. Complete traffic dominance over pedestrians.

5.6.1.4.4 Landscape – No landscape treatment is in place to improve the image of this visual zone. "Sea of asphalt" image created by parking lots and loading areas.

5.6.1.4.5 Site Elements – There is no consistency throughout this visual zone.

5.6.1.5 Recommendations

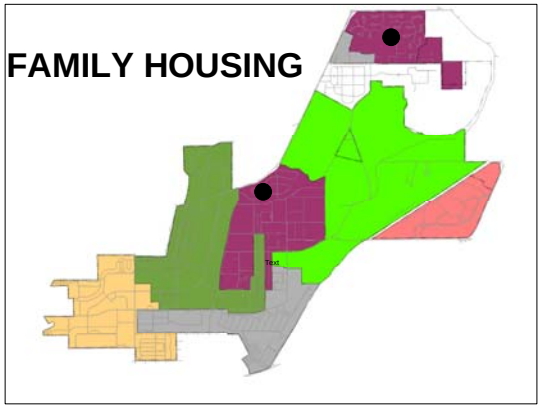
5.6.1.5.1 Site Planning - The greatest single opportunity FSH has to improve itself over the next 30-year period lies in the physical and visual structuring of the "Community Center" area, a quiet atmosphere with enough available land to develop the area. Many existing athletic facilities are in good condition and the land is level making it excellent for an athletic complex. A considerable part of the projects planning and programming has been accomplished.

5.6.1.5.2 Buildings - The first step in this restructuring should be the removal of the cold storage building and the associated trucks (actually in New Post). This small building generates very little human activity, yet dominates one of the most important sites at FSH. The site should be used to complete the eastern wall of buildings facing the parade ground to link the parade grounds with the Town Center, to give purpose and prominence to the Community Center as the primary social space of the whole fort.

5.6.1.5.3 Circulation - Realign major roadways creating an ordering device and linking this area with the rest of the installation. Concentrate community facilities with a systematic placement to create a hierarchy of open spaces and pedestrian networks.

5.6.1.5.4 Landscape – Consider creative recreational/ pedestrian use of the large drainage ditch through the northern portion of this zone.

5.6.1.5.5 Site Elements – Improve access signage since location is hard to find for patrons not familiar with the area.



5.6.2 Family Housing - Community

5.6.2.1 Visual Character

Harris Heights and Watkins Terrace are physically separate areas which have common characteristics. Both are single-family subdivisions of early 1950's vintage constructed under the Wherry Housing Act. On-post housing is highly desirable because it creates 24-hour activity at FSH, supports on-post services, and somewhat reduces on-post commuter traffic.

5.6.2.2 Visual Analysis Map

These housing areas are adequate at present and should remain as long as they have economic life. As the building assets in these areas ages, there will be a need for replacement structures. New housing will probably be denser, better planned and considerably more urban in form, with a premium on privacy and common space.

Figure 5.25 – Bldg. 1721 Chapel

5.6.2.3 Assets

5.6.2.3.1 Site Planning – Human scale and the open park-like atmosphere of these neighborhoods enhance the overall image of FSH and should not be lost with future change.

5.6.2.3.2 Buildings - Housing integrated directly into the Fort is a tradition in U.S. military installations; these neighborhood areas reinforce that policy.

Figure 5.26 Bldg. 1705 – Youth Center

5.6.2.4 Liabilities

5.6.2.4.1 Site Planning – Edges of neighborhoods are exposed to noise, fumes, and traffic of Wurzbach Road and Rittiman Road.

5.6.2.4.2 Circulation – Existing traffic conflicts at the intersection of Scott Road and Foulouis Drive are a major problem. This road should be closed.

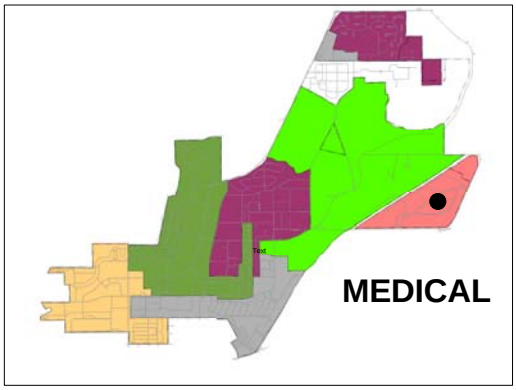
5.6.2.4.3 Landscape – Lack of buffer space and landscaping along Hardee Road and the north edge of the Troop Training Area/East.

5.6.2.4.4 Site Elements – The scale shifts abruptly between Harris Heights and the new buildings of Troop Training Area/East.

5.6.2.5 Recommendations

5.6.2.5.1 Site Planning - The quality of the neighborhood can be strengthened with landscape buffering along the exposed edges of Harris Heights, particularly the northern edge to Wurzbach Road. Similarly, Watkins Terrace should receive buffering along its northern edge, Rittiman Road, with walls/fences and landscaping.

5.6.2.5.2 Circulation - Linkages. Every effort should be made to improve the quality of the pedestrian experience within the neighborhoods and to encourage walking to work as an alternative to driving. On post mass transit should be explored.



5.7 MEDICAL VISUAL ZONE 4

Brooke Army Medical Center (BAMC) is one of eight United States Army Medical Centers. BAMC has history dating back to 1870 when the first post hospital endured as a small medical dispensary located in a log cabin. During the early years, the post hospital was in temporary structures until 1886 when the first permanent hospital was built. It was in this facility that many of Teddy Roosevelt's "Rough Riders" were treated for injuries received during pre-invasion training conducted here at Fort Sam Houston before the Spanish-American War. This stone structure was replaced as the hospital in 1907 when a new 84 bed facility was built. This new hospital was among the nation's most modern health care facilities without equal in the military. BAMC's namesake, Brigadier General Roger Brooke assumed command of the post hospital in 1929 holding that position for 4-years. A true visionary among his peers, General Brooke is credited with instituting the first routine chest X-Ray in military medicine. This, along with his other outstanding contributions to medicine and his remarkably warm relationship with the local community, later resulted in a successful campaign naming the facility "Brooke General Hospital" in 1942. In July 1936, the cornerstone was laid for the construction of yet another post hospital and by November 1937 the 450 bed hospital became operational. The year 1941 saw BAMC again growing, as it prepared for the expected flow of WW II combat casualties, by converting a 220 bed enlisted barracks into additional patient wards. This was not the last conversion of existing facilities to medical service. In 1944, BAMC identified the need to recuperate soldiers injured on the WW II battlefield and converted a Cavalry battalion's barracks into a convalescent unit. In 1946, Fort Sam Houston was chosen as the new site for the United States Army Medical Field Service School and the United States Army Institute of Surgical Research (ISR). These decisions to centralize the Army's medical research and training at one location resulted in the renaming of Brooke General Hospital to Brooke Army Medical Center. From WW II to Operation Desert Shield and Storm, BAMC personnel have answered the call on numerous occasions to sustain effective medical operations both at home and abroad. The new medical center was dedicated on March 14, 1996 is a Level I Trauma center and consisting of 1.5 million square feet of operational space, and features 450 inpatient beds.

Figure 5.27 – BAMC's Visual Image

5.7.1 Visual Character

This site was selected for the monumental BAMC building. This site is, both a visual landmark and functionally located to serve the San Antonio commuting area. It should be thought of in terms of a appropriately scaled architectural developed district.

5.7.2 Visual Analysis Map

5.7.2.1 Circulation - This large triangle is close proximity to the San Antonio freeway system has caused it to be the site for major medical facilities.

Figure 5.28 – BAMC Complex

5.7.2.2 Focal Points - Comprised of three main buildings, the Brooke Army Medical Center is dominated by the 7-story nursing tower, which includes 450 beds. Behind the tower is a 5-story ancillary building that houses radiology and surgical functions as well as the burn unit. There are also separate buildings for the energy plant and the 3-story, 120,000 SF Institute of Surgical Research which oversees the burn unit.

5.7.2.3 Buffer – The fenced complex has distinct three-side boundaries by Benz Engleman Road, IH-35 Access Road and fenced from FSH recreational use and open area.

5.7.2.4 Primary Road – Entrances are IH-35 Access Road and Benz Engleman Road.

5.7.2.5 Significant Vegetation- The complex is landscaped and maintained.

5.7.2.6 Good Views – A distinctive facility both in scale and color.

5.7.2.7 Historical and/or Architecturally Significant Features – This facility centralizes the Army's medical research and training at one location. From WW II to Operation Desert Shield and Storm, BAMC personnel have answered the call on numerous occasions to sustain effective medical operations both at home and abroad.

5.7.3 Assets

5.7.3.1 Site Planning - Remaining vegetation and animal habitats.

5.7.3.2 Buildings – Grouping is similarly constructed and has a definite scale, proportion and color.

5.7.3.3 Circulation - Close proximity to highways.

5.7.3.4 Landscape – Site well maintained.

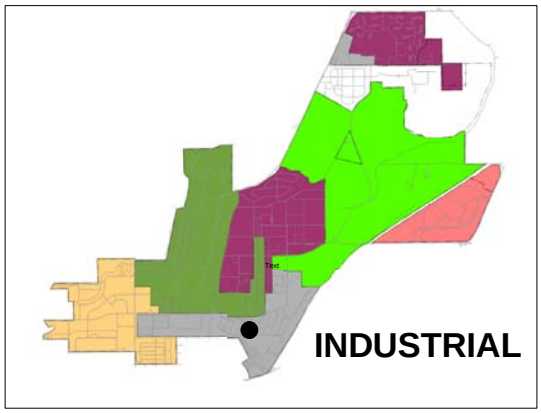
5.7.3.5 Site Elements - An impressive medical center complex.

5.7.4 Liabilities

5.7.4.1 Site Planning - Isolation from major administrative and educational facilities on main post could cause inconvenience.

5.7.5 Recommendations

5.7.5.1 Site Planning- State-of-the art model medical facility. Proximity to the freeway provides opportunity for development of new access to the post on its northeast edge.



5.8 INDUSTRIAL VISUAL ZONE 5

5.8.1 Visual Character

This visual zone traces its beginnings to 1917 when 104 acres in the area between Camp Travis and Infantry Post were allotted for a general supply depot. The construction of the warehouses began in 1918. With the mobilization for World War I, the Quadrangle was vacated as a depot and made over into offices to accommodate the great increase of staff officers.

Figure 5.29 - Bldg 4055
Consolidated Maintenance Center

All depot supply functions were then moved to the warehouses district. The original district extended from New Braunfels Avenue to Scott Road. In 1941, as part of the mobilization buildup prior to WWII, newer warehouses were added to the east of Scott Road and extended along the entire southeastern edge of the installation. This concentration of industrial facilities was originally serviced by rail lines that were very poorly integrated into the street system at the lower end of the post and its connection to the city. Today the 1918 vintage warehouses have all been removed opening up the west end of this zone for new development. A large consolidated maintenance facility (Building 4055) was constructed west of Scott Road and the WWII vintage warehouses to the east remain.

5.8.2 Visual Analysis Map

5.8.2.1 Main Entrance – This industrial zone lies along the southeastern boundary of FSH and is crossed by Scott Road, the main entrance to Post. The western portion that includes the Consolidated Maintenance facility is screened by a large berm, the remains of the railroad bed that once connected the fort to the city.

5.8.2.2 Circulation – Traffic within the warehouse district flows well, but access from and egress to the main post arterial roads (Scott Road and Wilson Avenue) could be improved. Construction of the new commercial vehicle access control point (ACP) at Jadwin Road and the IH-35 access road improved off post access but emphasized the need for better egress routes out of the district and on to main post.

5.8.2.3 Open Space and Buffers – There is ample open space between the maintenance and warehouse buildings in this zone and surrounding area, additional visual screening through the lines between zones are becoming less rigid. For instance, if residential, retail, and employment zones are mutually supportive then collocation may work well.

5.8.2.4 Primary Road – Wilson Road access and boundary.

Figure 5.30 WWII Warehouses

5.8.2.5 Historical and/or Architecturally Significant Features- Newer warehouses were all built in one area at the southeast edge of FSH in 1941 as part of the mobilization buildup prior to WWII. This concentration of industrial facilities was originally serviced by rail lines which have been very poorly integrated into the street system at the lower end of the post and its connection to the city.

5.8.3 Assets

5.8.3.1 Site Planning - The zone is fortunately confined to one clear area so that the effects of the visual chaos can be contained.

5.8.3.2 Circulation - The location at the edge of FSH and toward IH 35 makes it possible to improve access directly from IH 35 by redirecting the traffic that is currently forced to filter through the streets of FSH.

5.8.4 Liabilities

5.8.4.1 Site Planning – Lack of visual screening; no landscape treatment whatsoever.

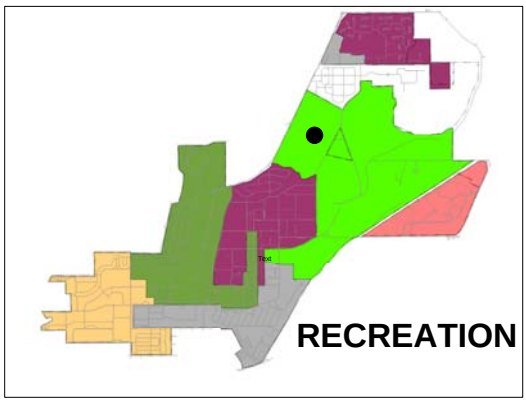
5.8.4.2 Buildings - Obtrusive color calling attention to warehouse buildings.
5.8.4.3 Circulation - Poor access from major roads.

5.8.5 Recommendations

5.8.5.1 Site Planning – A study could address things such as landscaping, parking, sidewalks, and the cohesion between existing facilities.

5.8.5.2 Buildings – Several mixed-use efficient facilities allow better use of the available land area and bring the functions closer together thereby reducing the distance required for pedestrian travel.

5.8.5.3 Circulation- Improved access from Scott Road could be the major point of access for traffic, particularly from IH 35. The proposed Parker Road extension along the south edge of the zone could serve to keep traffic off Wilson Street.



5.9 RECREATION VISUAL ZONE 6

5.9.1 Visual Character

A vast space, generally open, that lies between the eastern edge of FSH and the MK&T Railroad. The land is remote from the center of FSH and contains a wide variety of land uses. Much of the area is flood plain, well suited for recreational uses; some is used for training activities; the golf course is well-placed and convenient to FSH and the rest of the city.

5.9.2 Visual Analysis Map

5.9.2.1 Main Entrance – Recreational areas are numerous on FSH.

5.9.2.2 Circulation – Numerous accessible roads lead to recreation areas and parks.

5.9.2.3 Open Space and Buffers – The recreation areas are the FSH buffers.

5.9.2.4 Historical and/or Architecturally Significant Features- While many different measures can be used to provide force protection in facility site design, distance is the most effective and desirable tool because other measures vary in effectiveness, are more costly.

Figure 5.31 FSH Recreational Area

5.9.3 Assets

5.9.3.1 Site Planning - A well-balanced combination of tree stands and open space.

5.9.3.2 Circulation - Promising area for establishment of a principal entry to a flood plain hiking trail system.

5.9.3.3 Landscape- Railroad and power lines right-of-way provide wildlife habitat and define zone edges.

5.9.3.4 Site Elements - Vegetable garden plots well-established with useful relationship to stables, which furnish fertilizer.

Figure 5.32 Vegetable Garden Plots

5.9.4 Liabilities

5.9.4.1 Site Planning – Run-off from stables is poorly accommodated in open ditches; flatness of stable area aggravated by problems of standing water due to improper drainage. Views marred by high voltage power lines.

5.9.4.2 Circulation – Lack of paved access to vegetable gardens makes maintenance and harvesting inconvenient.

5.9.4.3 Landscape - Area dominated by less desirable early succession vegetation of low visual or intrinsic value with short a life span.

5.9.4.4 Site Elements - Unconcealed trash bin storage detracts from landscape.

5.9.5 Recommendations

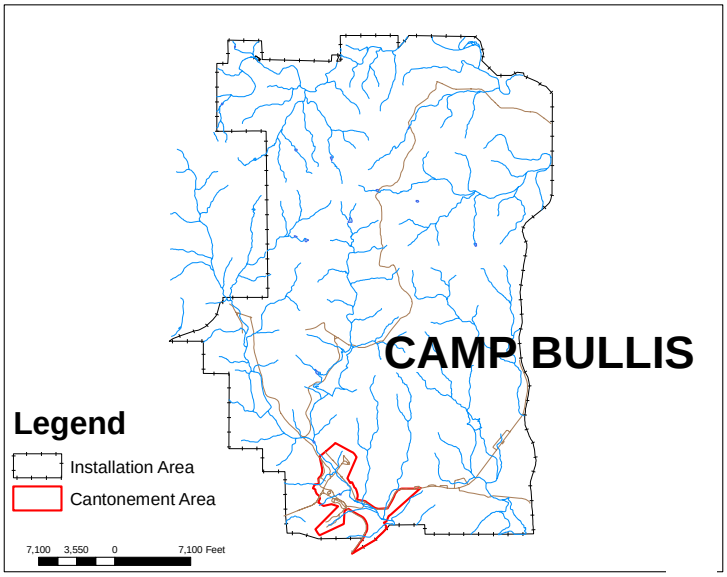
5.9.5.1 Site Planning – Investigate the potential of screening the stables and recreation areas from views of the heliport and power lines.

5.9.5.2 Circulation- Bridle paths could become a comprehensively planned recreational facility, ameliorating or eliminating hazardous railroad crossings and barriers.

5.9.5.3Landscape – Encourage installation environmental oversight volunteer programs to weed out low value species and encourage healthy diversity of species in remaining stands of trees.

5.10 CAMP BULLIS VISUAL ZONE

Camp Bullis is located to the north of San Antonio at the end of Military Highway approximately 1.5 miles north of Loop 1604, and on Camp Bullis road which accesses Interstate I-10 approximately 1.5 miles to the west. The city of San Antonio borders Camp Bullis to the south. The mission of Camp Bullis is to provide quality ranges, training areas, airspace, outdoor recreation programs and necessary installation support to all active duty services, Reserve and National Guard unit, law enforcement agencies, and various civic groups.



Camp Bullis serves primarily as the field-training environment in support of the curriculum of the Academy of Health Sciences and the Joint Medical Readiness Training Center under Army Medical Department Center and School (AMEDDC&S) from Fort Sam Houston. Other units with permanent facilities (training, administrative, or support) at Camp Bullis include the Texas Army National Guard, the Airways Facility Sector-Federal Aviation Administration, the 5th U.S. Army, 6th Military Intelligence Battalion, the U.S. Air Force 343rd TRS Ground Combat School and the Inter-American Air Force Academy Field Training.

5.10.1 Visual Character

The visual setting at Camp Bullis is based upon expanding and enhancing training facilities, compatible, with emphasis on color, material selection and massing. Although many of the buildings within the Camp Bullis cantonment area have historical significance, newer facility exterior designs should be compatible with a traditional hill-country setting. Exterior concepts include contemporary design utilizing selections of exterior finish materials from the existing Camp Bullis palette. Use of materials for the wall surfaces include split faced CMU, brick, and natural cut limestone. Horizontal banding of these materials must be consistent with the contextual setting of the nearby buildings. Roof materials are standing seam metal in a beige color, again to comply with the local context. Fenestration should be minimal to afford the opportunity for a large area of solid wall masonry, to highlight the use of the selected materials. In addition, pleasing building massing must be beneficial the architectural style at Camp Bullis.

Figure 5.33 Camp Bullis Visual Concept

5.10.2 Visual Analysis Map

5.10.2.1 Main Entrance – The primary access from Loop 1604 is via Military Highway leading directly into the Camp Bullis cantonment area. The only entrance control point is located on Military Highway on the north side of the installation. The traffic speed is reduced by limits to 25 mph, which decreases noise levels.

5.10.2.2 Circulation - Loop 1604 leads to the east and west, which intersects both I-10 to the west and Highway 281 to the east, which provides easy access from the entire San Antonio area. The site is accessible to both the labor force and the delivery vehicles via Military Highway, from Loop 1604.

5.10.2.3 Focal Points – The Camp Bullis cantonment site of historical significance is located in a central, prominent and highly visible location and easy accessible to all personnel from within Camp Bullis.

5.10.2.4 Open Space – Beyond the cantonment area, Camp Bullis is well situated with many acres of open space for maneuver area and range training.

Figure 5.34 Camp Bullis Visual Exteriors

5.10.2.5 Buffer - Due to the fact that many of the buildings within a enlarged Camp Bullis cantonment area are a mixture of facilities of historical significance and newer complexes, the area of historical significance needs to be reassessed to a minimally defined area, whereby establishing an area to be buffered visually as needed.

5.10.2.6 Primary Road - Military Highway is the primary access road.

5.10.2.7 Significant Vegetation - The vegetation consists of juniper/oak woodlands and grasslands, with grasses consisting of little bluestem, Texas wintergrass, sideoats grama-and Indian grass. In the cantonment area, the principal vegetation is bermuda grass, curly mesquite, and buffalo grass with scattered live oak. Impact on vegetation shall be considered in all facility designs.

5.10.2.8 Historical and/or Architecturally Significant Features - In addition to-the prehistoric (archeological) sites, nine historical sites were encountered from the European occupation period (1850-1930). The cultural background seems to be that of generally Anglo-American middle class farmers and ranchers.

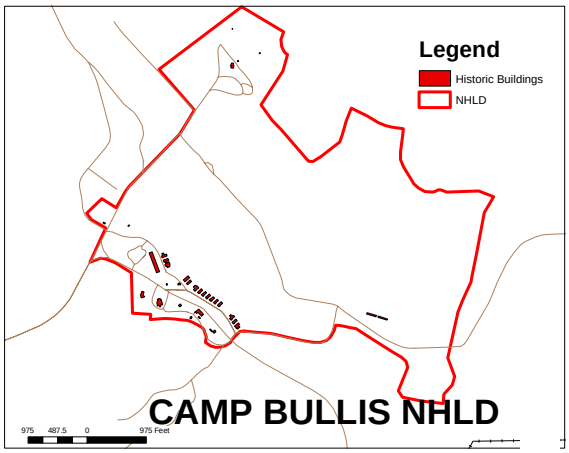


Figure 5.35 Camp Bullis Historical Area

5.10.3 Assets

5.10.3.1 Site Planning - Characteristic concept of cantonment development originally based on an extension of the echelons of command (i.e. company, battalion, and regiment) configuration is reflected. The cluster exhibits a linear arrangement of single land use zone with the administration in the front progressing through the housing with support facilities to the motor pool in the rear.

5.10.3.2 Buildings – Bullis benefits from clustering related activities to enhance force protection. Functionally compatible facilities with similar threat levels are clustered, and the perimeter area requiring protection provides compact security areas, and limits access points to serve multiple facilities.

5.10.3.3 Circulation - Routes are direct, well lighted and free of isolated areas. The various activities are arranged with control points located for good visibility and to direct and control its area of responsibility.

5.10.3.4 Landscape – Buildings are sited to maintain the natural oak trees, which are the site's greatest assets, to the greatest extent possible.

5.10.3.5 Site Elements – Newer buildings shape outdoor space through their siting, orientation, and layout. To give shape to a street, building edges were brought closer to the curb and parking set behind the facilities. To give shape to a courtyard, elements of a building were arranged in wings that wrap the outdoor space.

5.10.3.6 Force Protection- Tree removal was accomplished to enhance force protection.

5.10.4 Liabilities

5.10.4.1 Site Planning- The Cantonment area contains structures of historic, architectural and cultural significance. A significant structures inventory needs to be reviewed and updated periodically to determine restrictions on future sitings and area development.

5.10.4.2 Buildings – Cantonment building exteriors require substantial painting and maintenance. The appearance of the area detracts from a professional image and organizational pride.

5.10.4.3 Site Elements - Camp Bullis has been used for training for almost 100 years. Unexploded Ordinance (UXO) is a known possibility for any location at Camp Bullis. Final stabilization is established when all soil disturbing activities have been completed and a uniform perennial vegetative cover with a density of 70% of native background vegetative cover has been established on all unpaved areas, or other stabilization measures (such as riprap, gabions, or geotextile).

5.10.5 Recommendations

5.10.5.1 Site Planning- The Hill Country's natural systems are characterized by erosion-prone rolling hills, intermittent streams, and springs. Discretion should be used in the removal of natural vegetation, which exposes bare soil to the elements (allowing runoff and wind erosion). The development of irrigation can significantly alter the soil moisture regime. An understanding of these natural systems is important in sustaining a healthy landscape that can continue to adequately accommodate human use. Care must be taken to ensure that the materials, massing and siting are all in keeping with the historic character of the cantonment area. Proper drainage is an important design consideration to ensure satisfactory long-term foundation performance. Exterior grading adjacent to the building should be sloped away from the structure a minimum of 5 percent for the first 10 feet. Runoff from the roof should be adequately discharged away from foundation edges. In no case should water be allowed to pond adjacent to or beneath buildings.

5.10.5.2 Buildings - Due to the fact that many of the buildings within the Camp Bullis cantonment area are a mixture of facilities of historical significance and training complexes, utilization of low slope standing seam hip roofs, split face decorative concrete masonry units, natural aluminum finishes and painted metal finishes in various conditions should be continued. These building masses are simple and uniform with limited vertical height.
Building entrances are accentuated with elevated entry canopies and decorative painted steel accents. The colors utilized in the building materials consist of primarily earth tones in varying colors of brown and natural stone. The two most commonly used foundation systems at Camp Bullis have been shallow spread footings and straight-shaft drilled piers. When properly designed, both of these systems have a history of performing satisfactorily with respect to limiting long-term foundation movements in the form of settlement.

Figure 5.36 Camp Bullis Building Design Concept

5.10.5.3 Circulation - Traffic Types and Conditions. Four pavement structures are found throughout, namely, privately-owned vehicle (POV) parking areas; service roads, both are flexible pavement features; concrete hardstand for mechanical yards and concrete aprons in front of trash dumpster pads. Types of vehicles expected to occupy these pavement structures are light- to medium-duty passenger cars and trucks, two- and three-axle trucks, trash trucks, and fire/emergency medical vehicles. The edge of driveways and parking areas needs to be better defined, to limit access by vehicles in areas that are better left untraveled. By designating parking areas around or near each building, more of the adjacent land can be returned to a suitable groundcover, such as uncompacted gravel, mulch, or native grass. Limiting traffic and parking beneath the oak trees will help extend the life of the trees as well by reducing soil compaction at the roots. An edge detail of piled stone was used in 1940. This solution is not labor-intensive, and makes good use of local stone, an ample resource. Alternatively, low mortared stone walls would be appropriate throughout the cantonment area.

5.10.5.4 Landscape - Landscaping adjacent to new building should be kept to a minimum. Large trees and bushes should not be placed closer to the foundation than its mature "umbrella" width. Maintaining a growth of grass around the facility is recommended. Installing an irrigation system adjacent to the foundation is not advisable unless this system and the drainage conditions around building are maintained over the life of the structure.

5.10.5.5 Site Elements - Site furnishings for the cantonment area should emphasize the historic use of wood and stone masonry. Many fine examples of stone work in the camp have been painted, presumably to present a uniform image. In fact, the unpainted stone is more in keeping with the construction materials of the buildings. Paint should be removed from the stone retaining walls and culverts. Small support-type structures (≤500 GSF) can be founded on reinforced concrete slabs-on-grade with turned-down edge beams. The turned-down edge beam should extend a minimum of 12 inches below outside finished grade and should be sized for a safe bearing pressure of 2.0 ksf (net). Sub-grade preparation should consist of providing a minimum of 12 inches of compacted non-expansive fill below the soil-supported slab.

5.10.5.6 Force Protection – New projects incorporate all required features to satisfy AT/FP proposed design. In addition to facility setbacks from primary existing roads, new site access roads, new parking areas, and service drives with removable bollards or other methods of control; propane tanks must be located outside the 82 foot line with a secure fence.

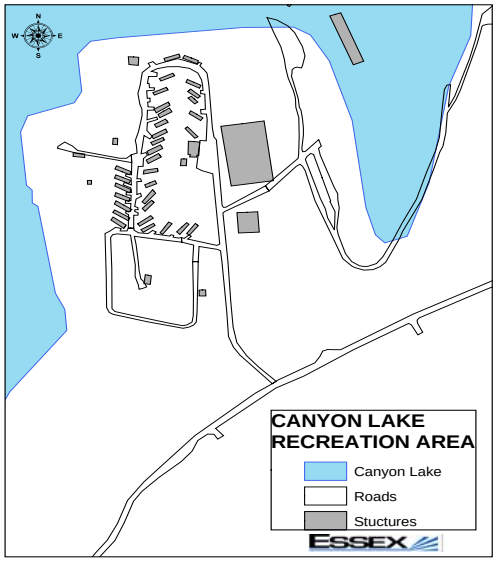


Figure 5.37 Canyon Lake Recreation Area

5.11 CANYON LAKE VISUAL ZONE

Located north of San Antonio off I35 North exit 191 (Farm road 306), and an additional 17 miles, the

Fort Sam Houston Recreation Area is left on Jacob Creek Park Rd.

5.11.1 Visual Character

One room cabanas are screened shelters and include BBQs, fire ring, picnic tables, ceiling fans (4 units have AC), refrigerators, microwaves, water and electricity. Lake-side and woods camping is also available. A 33-site RV park includes BBQ, fire ring, concrete pad with table, electric and water hook-ups. Restrooms and showers available within walking distance. Dump station is also available. RV and boat storage are also available on-site. Three covered picnic areas are available for rent and include picnic tables, BBQ and volleyball net.

5.11.2 Visual Analysis Map

The Recreation Area, located approximately 50 miles North of Fort Sam Houston on the shores of Canyon Lake, offers camping, fishing, boating and swimming. Currently 33 - three bedroom mobile homes, 75 primitive camping sites in the woods or near the shore, and 33 RV sites with water and electric hook ups. A marina provides water sports equipment.

Figure 5.38 Canyon Lake Cabana

Water is supplied from a 65 GPM-rated well and feeds a 20,000-gallon water storage tank for the entire site. A water treatment plant services a 35-year old water distribution system. Water contains a high level of iron and rusty water is observed when water is left standing. The Recreation Area has a sanitary treatment plant and collection system. Electric power is supplied by a private electric company and maintains the high voltage lines. All existing service is supplied overhead. Propane gas is supplied to sites by a buried distribution system.

Figure 5.39 Canyon Lake RV Park

5.11.3 Assets

5.10.3.1 Site Planning – The Project Delivery Team and Operations staff maintain health, safety, security, and comfort of the customers, by meeting local and regional recreational needs, by considering the present requirements as well as potential future needs. There are many user friendly areas and facilities to serve all populations. This includes incorporation of universal access design principles to address accessibility and user diversity.

Figure 5.40 Canyon Lake Covered Picnic Area

5.10.3.2 Buildings – Considering economy of scale and life cycle costs.
Trailers were cost effective, operated and maintained as a large comprehensive site rather than several smaller single use areas.

5.10.3.3 Circulation – The site layout provides for ease and economy in cleanup and maintenance.

5.10.3.4 Landscape – Vegetation is maintained to protect resources from physical and aesthetic degradation and includes correction of existing environmental problems such as erosion, siltation, and soil compaction.

5.10.3.5 Site Elements – To preserve their integrity, campgrounds are physically separated from day use areas and other potentially conflicting uses. Typical day use activities, include picnicking, swimming and boat launching, are physically separated from campgrounds, marinas, or other types of potentially conflicting uses.

5.10.3.6 Force Protection- Access to recreation areas is controlled to protect the general public and project resources. A controlled entrance reduces vandalism and provides for controlling the hours or season an area is available for use.

5.10.4 Liabilities

5.10.4.1 Site Planning - The recreation area and structures need improvements as revenues allow to: Roadways and parking areas; Launch ramps, walkways and floor surfaces; Overall park appearance; Overall environmental conditions, e.g., health and vigor of vegetation, erosion; Sites and amenities; Stability and integrity of structures; Water delivery and sanitation systems; Electrical systems, wiring, piping, plumbing, telephone, and communications; Docks and other water-related facilities; Security features; Customer services, looking at future trends and projected customer needs.

5.10.4.2 Buildings – Trailers replacement and additional primitive cabins are planned.

5.10.4.3 Site Elements – Utility distribution systems need to be replaced. Planned projects address: force protection features, fire and life safety concerns, fire sprinklers systems, landscaping and support spaces.

5.10.5 Recommendations

5.10.5.1 Site Planning - To preserve their integrity, campgrounds should be physically separated from day use areas and other potentially conflicting uses. Typical day use activities, which include picnicking, swimming and boat launching, should be physically separated from campgrounds, marinas, or other types of potentially conflicting uses. Playgrounds should be located away from interpretive facilities, roadways, and nearby campsites due to noise considerations. Playgrounds are an important and necessary feature that should be centrally located within any recreation area. Opportunities should be provided for a variety of experiences including imaginative and physical play without disturbing the natural, park-like setting of the area in which it is located. Interpretive facilities should be considered in the design of every recreation area. Knowledge of the recreation area and its significance encourages the users' sense of responsibility and appreciation for an area and may help develop specific interests such as ecology and history. Major projects require an

accurate topographic map that locates important site features. Survey criteria are not absolute but should provide a visual basis to aid in the design of the area. It is recommended that the map and survey information be incorporated into existing GIS systems. The minimum information that maps and site surveys should provide includes: Corps boundary limits, Construction limits, Water level fluctuation elevations that would affect facilities within the area, Shoreline areas requiring protection/stabilization, Major natural features including large trees or unusual rock formations that can be designed into the facility, Cultural resources, Historic properties, Roads, Utilities, Existing buildings and facilities that will remain or whose demolition and/or removal are part of the plan, Facilities to be constructed - current and future. Existing site features, vegetation of significance, and aesthetic views should be preserved and incorporated into the designs for site improvements. Recreation area design should locate facilities and roadways among existing trees and vegetation with minimum disturbance. Features such as rock outcroppings, riparian areas, and overlooks should be incorporated into designs as natural amenities and points of interest. New park facilities should be sited to blend with existing contours and the lay of the land. Replacement trees should be planted at the time of disturbance at a minimum of 2:1 replacement ratio to mitigate impacts to park users and enhance aesthetics. Arrange replacement trees to take advantage of contrasts in texture and color and make the park more interesting. Landscaping can generally be used to improve park aesthetics, control erosion, improve safety, and reduce maintenance costs. Aesthetic improvements include use of landscape materials to screen undesirable views such as service and storage areas, parking lots, dumpster and trash receptacle locations, electrical transformers, and other negative features. Landscape designs and plantings should contribute to the natural appearance of the site. Use of indigenous landscape materials preserves the character of the recreation area and may result in lower maintenance costs. Protect existing plants and site materials during construction. Promote security and safety through proper placement of landscape materials. Emphasize low maintenance design considerations such as minimizing mowing and maintenance requirements and landscaping with drought-tolerant plants. Alternatively, maximum consideration should be given to creating natural or low maintenance areas that do not require mowing. Planting and irrigation should reflect the goals of sustainable design with minimal vegetative and mechanical maintenance, including landscaping with drought tolerant plants. Planting and irrigation should also be designed to withstand park and climatic conditions and conserve water. Access into a recreation area should be limited to a single road whenever possible to promote the safety and security of the visiting public and for ease of management of the recreation area. Roadways and parking areas help create the customers' first impression regarding the quality and recreation experience an area offers. The design, layout, and orientation of roads and parking areas should: Preserve a park-like character with minimal impact on the site, avoiding the appearance of a thoroughfare; Avoid disturbance of significant park features and vegetation; Provide convenient, enjoyable, and safe access to facilities; Avoid significant barriers to pedestrians traveling between activity areas. Parking areas should be designed for customer convenience, safety, and ease of parking with well-defined striping, curbs, barriers, and signage to encourage orderly and proper parking. Circulation patterns should be simple, direct, and obvious to the driver. Pull through parking should be utilized to the maximum extent possible for RV units, buses, and vehicles pulling trailers to eliminate the need for backing. Parking spaces angled to the flow of traffic are encouraged for safety and user friendly aspects for all vehicles. In certain areas there may be a demonstrated demand for parking spaces larger than the standard. Site factors and actual

demand will determine the number and location of these spaces. Bicycle routes or lanes should be considered in the design of new roads due to the increasing number of cyclists within Corps recreation areas. Improvements to existing roadways can also create lanes for cyclists in areas where bicycle use is prevalent. Pedestrian walkways, ramps, and steps provide access and circulation in recreation areas. Along with a UA ramp, limited use of stepped designs may be incorporated into some hardened areas, picnic sites, parking lots, and access to new buildings when necessary to fit within the existing topography, facilities and pathways. Utilities should be designed to meet existing and anticipated future demands. Utilities should be designed to be functional, aesthetic, economical, easy to maintain, and user friendly. Water supply must be adequate in quantity and quality to handle peak flow required to furnish water to restrooms, shower facilities, sanitary dump stations, drinking fountains, and irrigation for landscaped areas. Sewage facilities must be designed to handle peak sewage discharge from restrooms, fish cleaning, and sanitary dump stations. Private power utilities serving the facility should be contacted at the concept stage to ensure power is available in the vicinity and to ensure that utility connection charges are included in cost estimates. Where feasible, all electric power lines should be placed underground inside recreation areas. Lines between use areas and lines from site boundaries to use areas can be placed above ground only if they do not interfere with safety, maintenance, or aesthetics. Overhead power lines should be aligned behind forest cover out of view where feasible. Clearances should be thoroughly checked in accordance with current codes and regulations. Accessible telephone or emergency call box service should be provided in public use areas. At least one telephone or call box should allow for emergency calls to be made without coins. International symbol signs should be used to denote phone or call box locations. Support amenities should include adequate parking, lighting, and shelter from the elements. Phone service should be provided at all entrance stations and maintenance facilities. A designated corridor for placement of utility systems and infrastructure should be established to facilitate new construction and the prompt location of system problems when they occur. Design and placement should be accomplished by a certified professional to ensure that the corridor works in concert with other park systems. Ideal complementary systems are open play areas, campground perimeters, roadways, trails, or large drainage systems. Utility corridors should be kept open and free of trees and brush. A good alternative use for utility corridors could be wildlife plantings. Power and communication lines inside recreation areas should be placed underground. Conspicuous utilities such as storage tanks and onsite wastewater treatment systems should be fenced and screened. Odor-generating utilities should be remote to and downwind of park user activities. Adequate lighting for safety, security, and accessibility should be designed into all facilities and recreation areas when available at reasonable cost. This includes lighting access to buildings and major facilities. Adequate fountains and hydrants should be provided in recreation areas. Drinking water should be convenient to group activity areas and major facilities. Fountains and communal hydrants should meet accessibility requirements. Trash services should be provided for all recreation areas. Each receptacle should be easily accessible by park users and service vehicles. Receptacle distance from user activities should be considered due to the potential for odor. Control gates and barricades will generally be located at main park entrances and other access points that must be temporarily closed for maintenance, quiet hours, or seasonal closure. Fencing should generally only be constructed for access control, traffic control, screening, and safety purposes. Care must be exercised in determining the type and location of fencing. Where fencing is necessary it should be of the minimum height and design possible to be unobtrusive

and still accomplish the required function. Signs should be provided only where needed to regulate traffic, warn of hazardous conditions, establish restrictions, and provide information. The number of signs should be kept at a minimum. Symbol signs should be used whenever feasible.

5.10.5.2 Buildings- Emphasis should be placed on purchase and incorporation of off-the-shelf commercial products when available. Virtually all types of recreation facilities and structures offering multiple design options, durability, and quality are available through commercial vendors or through General Services Administration. Most facilities and structures can be made to order to include style, materials, texture, color, and numerous other options that have been proven in the market place across the country. Benefits of using off-the-shelf commercial products include:
Reduction of design cost; Proven design and durability; Reduced construction time; Lower cost; Orders for prefabricated facilities can be placed at any time of the year and change orders can be made prior to shipment; Many of the products are modular in design and can be expanded or modified if the need occurs; Most commercial products come with a warranty.

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SECTION 6 IMPROVEMENT PROJECTS

6.1 INTRODUCTION

6.1.1 One purpose of the Installation Design Guide (IDG) is to provide guidance that, when applied to the planning, programming, design, and execution of individual projects, will result in improving and maintaining installation quality and the visual environment of Fort Sam Houston. Use of the IDG is required for all project accomplished on Fort Sam Houston (FSH) and its sub-installations regardless of scope, cost, or source of funds. Compliance with the IDG will result in a visually pleasing and effective installation.

Improvement Projects may consist of enhancement of a single visual element or improvement of an area that includes a variety of visual elements. Depending on the project scope and cost, the projects could include: Military construction (MILCON), Non-appropriated funds (NAF), Other Procurement, Army (OPA) and maintenance and repair, local minor construction, and community ventures. Each improvement project is described. Projects require a Capital Investment Strategy.

6.1.2 The IDG is a component of the Installation Real Property Master Plan (Master Plan). Its use is mandatory for all maintenance, repair, minor construction/alteration, and major construction/post-acquisition improvements projects (regardless of size, fund source, or method of execution) on Fort Sam Houston (FSH) and its sub-installations.

6.1.2.1 The IDG is not intended to be a detailed schedule of design proposals, nor is it a set of detailed specifications for improvements. It is an attempt to identify the existing design vocabulary at FSH and to present a vision for its future.

6.1.2.2 The IDG provides guidelines to be used on a day-to-day basis by facility developers, such as architects, planners, engineers and maintenance personnel who develop detailed solutions within the framework of the guidelines responsive to FSH's history and missions. Concurrent use of this IDG by different developers will provide compatible solutions to their respective problems. The ultimate effectiveness of these guidelines will depend on the degree of commitment to them during the master planning and design review stages of their implementation.

6.1.2.3 The IDG does not serve as the sole basis for justification of maintenance, repair, minor construction/ alteration, or major construction/post-acquisition improvement program

projects. Work shall not be accomplished solely to comply with the IDG; however, when work is accomplished for any other justification, compliance with the IDG standards is mandatory.

6.1.2.4 Exceptions to use of the IDG Standards require approval on a case-by-case basis.

6.1.3 Appendix G of this Army Installation Design Guide, the Prioritized Improvement Projects List, records information on each project and prioritizes them in accordance with the installation goals and objectives stated in paragraph 3.2, Goals, Objectives and Recommendations. The appendix is designed to be altered as circumstances effecting the prioritization scheme change.

6.2 VISUAL ENHANCEMENT PROJECTS

6.2.1 In order to improve the appearance and functioning of the installation, it was necessary to first identify and take stock of its existing components, visual enhancement studies, and the chronological development of FSH. This was followed by an analysis of the various areas which make up the past. Because of the incremental nature of its development over a long period of time, and because of its many missions, past and present, FSH encompasses a variety of conditions and uses. For the purpose of analysis it was necessary to divide the installation into visual areas based largely on its historic development and current/ future use(s). Some of these visual areas were than consolidated into visual zones in an effort to unity a design quality of contiguous areas and in order to simplify their implementation. These zones are reflected in Section 5. In order to address the special requirements of historical facilities and others, design checklists were included in Appendix A. These should greatly facilitate the implementation of the guidelines throughout all phases of planning and design. Specific appendices, dealing with technical and functional areas, were then developed.

6.2.2 Additional Required Studies. The IDG is one of the basic design standards which must be consulted in accomplishment of work on FSH and its sub-installations. Additional studies include, but are not limited to, the current editions of: (1) Historic Preservation and Maintenance Plan (HPMP). The HPMP defines detailed maintenance, standards, practices, and procedures which must be complied with within the National Landmark Register District and the National Historic Conservation District to comply with the provisions of Section 105 of the National Historic Preservation Act (NHPA). (2) Landscape Plan. The Landscape Plan provides a detailed and integrated concept for enhancing and maintaining the landscape of the installation.

6.2.3 New work should:

6.2.3.1 Seek to enhance and protect the historic quality and existing resources. For example, it should:

- Conduct a survey of the level to which all existing facilities are currently utilized before determining the need for new construction.
- Immediately identify any work within the district as needing to meet the requirements for Section 100 review.
- Follow the Standards for Historic Preservation Projects as recommended by the Secretary of the Interior.

6.2.3.2 Provide necessary modern conveniences as unobtrusively as possible. For example, it should:

- Site new construction so that it does not destroy existing building relationships or configurations.
- Scale new buildings down so as to minimize their visual impact.
- Place parking to the rear of historic buildings.
- Landscape parking areas and modern mechanical equipment so as to screen them from view.

6.2.3.3 Phase out (gradually eliminate) existing structures. For example, it should:

- Demolish structures designated as classification 5 on the National Register Inventory when they are no longer needed.
- Remove unnecessary parking lots from the parade grounds and reseed them to grass.
- Restore buildings which have been altered by inappropriate color schemes, replacement windows, porch enclosures, etc.

6.2.3.4 FSH should portray the image of an elite Army installation, a special place integrated and responsive to the city and the region, but set apart and portray *—a self-contained park-like campus*. Use of this IDG strengthens existing images, or creates these images where scale new facilities are planned. It encourages maintenance for existing areas which already conform to identified images, and seeks to create such visual images through new construction and landscaping in areas which have not been fully developed.

6.2.3.5 A project spreadsheet is at Appendix G. As much as possible each project will contain the following elements of information:

- Existing Conditions
- Project Description
- Design Concept
- Cost Estimate
- Site Plan
- Maintenance Impact
- Recommended Funding Source
- Alternate Funding Source

SECTION 7
SITE PLANNING
DESIGN STANDARDS

7.1 INTRODUCTION

7.1.1 Site Planning is the process of arranging an external physical environment in complete detail to include the structures, circulation patterns, and other elements that form the built environment. The site planning and design process is used to develop a project that fulfills facility requirements and creates the optimal relationship with the natural site. See Unified Facilities Criteria (UFC) *3-210-06FA,* Design: Site Planning and Design for detailed guidance on site planning to include program analysis, site analysis, site verification, and concept development. This TM also discusses site design guidelines, describes the steps in the site planning process, and contains examples of various sketches/diagrams developed in support of these steps. Also see TI 800-01, *Design Criteria, Chp. 3, Site Planning and Design Criteria*. Environmental documentation will be prepared prior to site selection to support the construction activity in accordance AR 200-2, *Environmental Effects of Army Actions*.

7.1.2 The site planning component provides the spatial arrangement of the installation. (Fig. 7.1) The installation master plan provides information that forms the foundation for site planning. The master plan is a mechanism for ensuring that individual projects are sited to meet overall installation requirements. AR 210-20, *Master Planning for Army Installations*, and the Master Planning Instructions (MPI) , provide additional information concerning the master plan.

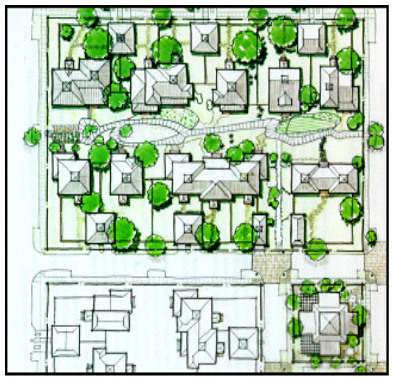


Figure 7.1 – Site Plan

7.1.3 The other five design components are dependent upon site planning for their location and spatial relationships. The other five components are identified below and discussed in Sections 8-12.

- Section 8 - Buildings Design Standards
- Section 9 - Circulation Design Standards
- Section 10 - Landscape Design Standards
- Section 11 - Site Elements Design Standards

- Section 12 - Force Protection Design Standards

7.1.4 Specific site planning factors have been taken into consideration for the various Visual Zones for Fort Sam Houston and Camp Bullis and are presented at the end of this section of the IDG. The site planning factors and requirements for each Visual Zone are discussed in paragraphs 7.7.1 through 7.7.6 below.

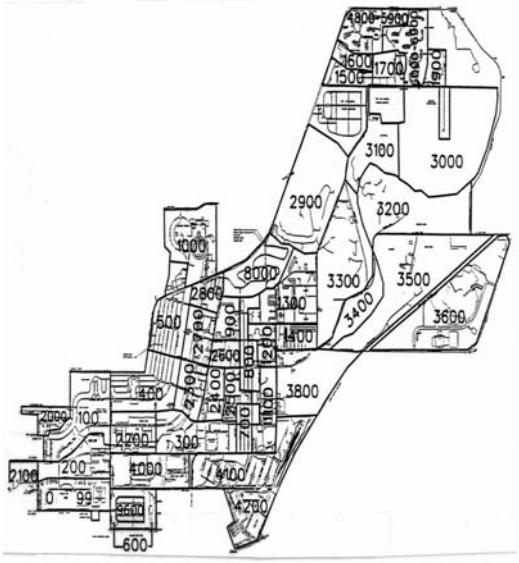


Figure 7.2 Block Map for Fort Sam Houston

7.2 SITE PLANNING OBJECTIVES

7.2.1 The goal of site planning for the installation is to produce an attractive, sustainable development. Sustainability requires the built environment to be designed and constructed to preserve and enhance the natural environment. Manmade facilities are designed as a part of the environment to minimize negative environmental impacts. General site planning techniques resulting in sustainable development are cost efficient because they conserve energy and reduce construction and maintenance cost. Typical site planning objectives include the following.

7.2.1.1 Preserve natural site features such as topography, hydrology, vegetation, and tree cover.

7.2.1.2 Locate facilities with consideration of climatic conditions such as wind, solar orientation, and microclimate.

7.2.1.3 Preserve the natural site by molding development to fill around existing landforms and features. This development approach minimizes extensive earthwork, preserves existing drainage patterns, and preserves existing vegetation.

7.2.1.4 Plan for facilities to be clustered to preserve land and reduce construction cost. Clustering should occur on the flattest land areas. Room for expansion should be provided. When clustering facilities, Force Protection measures must be considered.

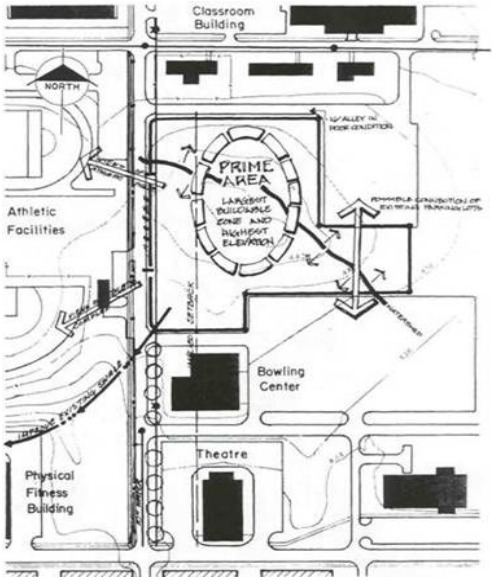


Figure 7.3 – Site Opportunity and Constraint Plan

7.3 SITE PLANNING CONSIDERATIONS

7.3.1 The primary "fit" of the development to its environment is initially determined by the site analysis and subsequent site planning. The determination of primary issues that provide basic location and organization of spatial relationships are determined during the site planning (Fig. 7.3).

7.3.2 Accessibility. Any building or facility used only by able-bodied personnel need not be accessible to the disabled. Nevertheless, when feasible and appropriate, seek to incorporate accessibility measures into the design since the facility use may change over time (military exclusion is provided by UFAS 4.1.4 (2)). All other structures or facilities must meet the standards of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS), with the most stringent standards applied in the event of conflicting guidelines. (See AR 420-70, Chapter 2, Para 2.8). This includes the avoidance of site barriers through the use of curb cuts, ramps, handrails, and grade-level entrances to avoid site barriers. Provide designated handicapped parking spaces in all major parking lots and drop-off zones for persons with mobility impairments. Modify existing structures for handicapped accessibility whenever possible, especially community facilities that are most likely to be used by families, veterans or visitors.

7.3.3 Environmental. Environmental issues to consider in the preparation of a site plan include any action or proposal that has a detrimental affect on a site area's land, water, or air quality. The location of facilities on land that results in minimal disturbance to the existing topography, vegetation, and drainage patterns greatly reduces the negative impact on the environment. It is the Garrison Commanders responsibility to ensure that all National Environmental Policy Act (NEPA) documentation is started before the site selection process, as this process feeds the 1391 process.

7.3.3.1 NEPA requires that an Environmental Impact Statement (EIS) be submitted to the U. S. Environmental Protection Agency (EPA) for major projects that may significantly effect the environment. The EPA reviews and responds to filed impact statements. Information pertaining to Environmental Impact Statements and their submission can be found at the following EPA websites.

- Environmental Impact Statement (EIS)
- Submitting Environmental Impact Statements (EISs)

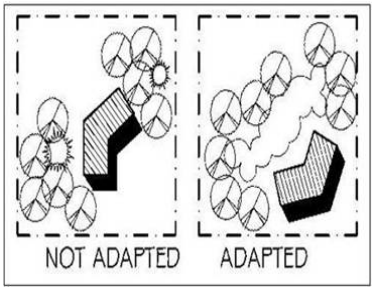
7.3.3.2 Federal law requires that prior to the undertaking of activities which effect the nation's waterways, described as "navigable waters of the United States" and "waters of the United States" to include wetlands, a permit must be acquired. Information regarding statutory, administrative, and judicial matters, including general regulatory policy, definitions of "waters of the United States" and "navigable waters", and processing of permits can be obtained at the following Corps of Engineers website.

- Statutory, Administrative, and Judicial Materials

7.3.3.3 Include procedures for mitigating environmental concerns in the early stages of project development. To the maximum extend possible avoid siting development or individual buildings in environmentally sensitive areas. The installation master plan environmental overlay should be reviewed prior to the development for areas designated as threatened and endangered species habitat areas.

7.4 SITE PLANNING DESIGN CRITERIA

7.4.1 The site planning component of installation design comes first in the design process and determines the general location of the other components. Consequently, site planning must consider the criteria for architectural design, circulation, landscape architecture, site elements, and force protection. Site planning criteria is divided into two categories, natural conditions and manmade conditions. Each is discussed separately in the following paragraphs. These criteria are to be utilized for the assessment of the visual and spatial impacts of site planning.



7.5 NATURAL CONDITIONS

7.5.1 Topography. The natural terrain is a major determinant of the layout and form of the installation. The following guidelines should be used to maintain the natural topography of the installation (Figs. 7.4 and 7.5).

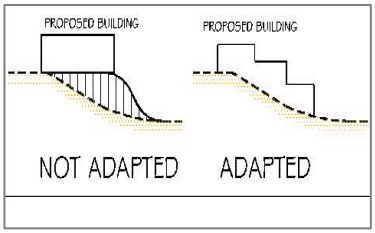


Figure 7.4 – Accommodate Natural Conditions

7.5.1.1 Maintain natural ground slopes and elevations.

7.5.1.2 Align roadways and buildings along topographic lines.

7.5.1.3 Locate facilities that have expansive ground coverage on relatively flat terrain.

7.5.1.4 Use moderately sloping areas for buildings with less ground coverage area.

7.5.1.5 Avoid development on steep slopes.

7.5.1.6 Avoid development in natural drainage ways and flood plains.

7.5.1.7 Provide a reasonable balance of cut and fill.

7.5.2 Hydrology. The site planning team will consider the following hydrologic concerns for natural drainage corridors, floodplains, and waterways during the site planning process.

7.5.2.1 Preserve and maintain natural drainage areas and floodplains.

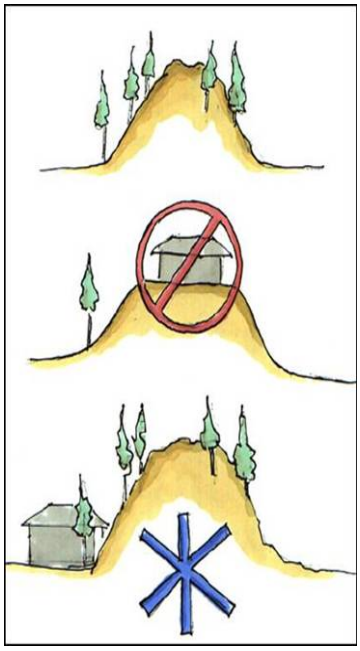


Figure 7.5 Develop Around Natural Landforms

7.5.2.2 Limit development in floodplains to open spaces and recreation uses.

7.5.2.3 Preserve rivers, lakes, streams, or other waterways, and incorporate them into the design layout.

7.5.3 Climate. The installation will be designed in response to local climatic conditions to provide a more comfortable environment, and reduce the demands for heating and cooling.

7.5.3.1 Cool Regions. Design and site development by maximizing the warming effect of solar radiation in winter and reduce the impact of cold winter winds.

7.5.3.2 Temperate Regions. Design and site development to balance the effects of seasonal thermal variations promoting both winter and summer cooling in terms of seasonal solar orientation and prevailing winds.

7.5.3.3 Hot Arid Regions. Design and site development to minimize solar heat gain and maximize shade and encourage humidity in outdoor spaces.

7.5.3.4 Hot Humid Regions. Design and site development to minimize solar heat gain and promote air movement and cross ventilation.

7.5.4 Views and Vistas. The installation will be designed to preserve and enhance scenic and other attractive views and vistas, and to screen unattractive views and vistas. Visual extensions through open spaces provide a sense of orientation, relief, and enjoyment.

7.5.5 Vegetation. The installation will be designed to protect and preserve existing native vegetation. This preservation reduces maintenance and enhances sustainability. A preferred plant matrix (Appendix O, Plant Palette) is included in this Army Installation Design Guide. (Also, see Section 10 – Landscape Design Component).

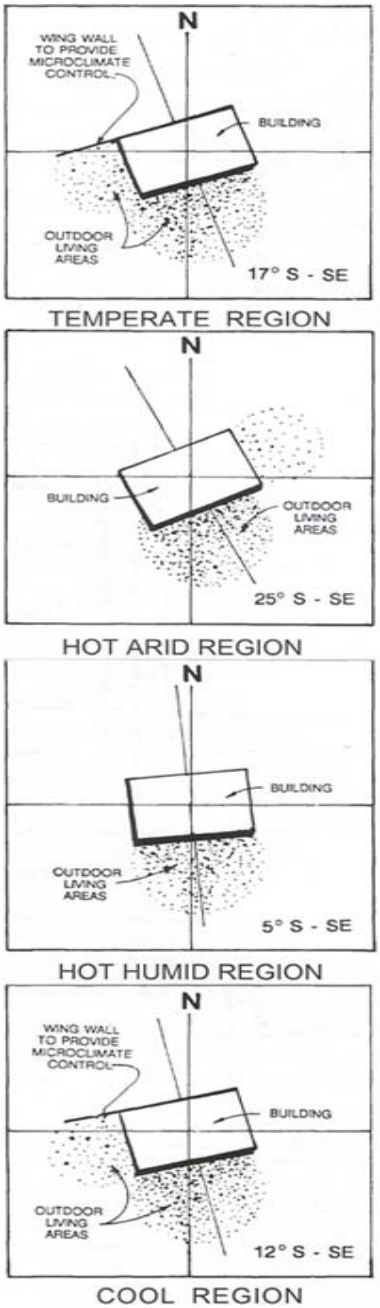


Figure 7.6 - Building oriented for passive solar heating and cooling

7.6 MANMADE SITE CONDITIONS

7.6.1 The site plan provides the locations of the manmade development that will occur on site. It establishes the spatial relationships as well as the relationships between manmade and existing natural features. Manmade site conditions include all development on the installation to include buildings, roadways, parking lots, walkways, walls, fences, utilities, and other facilities. Buildings, roadways, parking lots and above ground utilities are the primary manmade visual determinants.

7.6.2 The following site planning guidelines will be used in the visual and spatial review of the installation:

7.6.2.1 Cluster buildings to reduce impact on the natural environment, and reduce roadways and utility corridors needed

to serve the development, however, at the same time giving full consider to antiterrorism and force protection requirements.

7.6.2.2 Locate large buildings in relatively flat areas to reduce the cut and fill and preserve the natural vegetation and drainage and orient to topography (Fig. 7.7).

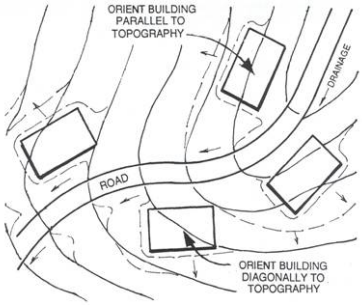


Figure 7.7 - Orient Buildings and Roads to Topography

7.6.2.3 Minimize solar heat gain for cooling and maximize solar heat gain and retention for heating.

7.6.2.4 Site buildings with consideration for the microclimate conditions of the site that result in variances in wind or light because of adjacent land forms, structures, or trees.

7.6.2.5 Orient outdoors pedestrian areas for most comfortable exposure.

7.6.2.6 Utilize lighter colored building surfaces exposed to the sun and darker colors on recessed surfaces to absorb radiation.

7.6.2.7 Orient windows according to impact of climatic conditions.

7.6.2.8 Locate development on leeward side of hills.

7.6.2.9 Design and locate roads to provide a hierarchy of traffic carrying capacities.

7.6.2.10 Locate roads to blend with topography and vegetation.

7.6.2.11 Design and locate parking lots to minimize visual impact of broad expanses of pavement and vehicles.

7.6.2.12 Design and locate pedestrian walkways and bicycle paths to fit the physical environment, and provide a comfortable pedestrian experience, limiting conflicts with vehicular traffic (Fig. 7.8).

Figure 7.8 Screen Parking Areas

7.6.2.13 Locate trees and shrubs to buffer harsh natural conditions.

7.6.2.14 Deciduous material provides for sun in the winter and shade in the summer. Evergreen material provides windbreaks for cold north winds.

7.6.2.15 Design and locate site elements to blend with and enhance the physical environmental.

7.6.2.16 Force Protection requirements should be designed and located to blend with the physical environment.

7.7 SPECIFIC SITE PLANNING CONSIDERATIONS

7.7.1 In order to protect Fort Sam Houston's rich historical heritage and preserve, to the extent possible, the visual character of its man-made environment, special siting considerations must be made for the different visual zones on the installation. The first zone encompasses all of the National Historic Landmark District and has limited remaining development opportunities (Fig 7.9).

Figure 7.9 – N H L D Building

7.7.1.1 **Siting**. All of the posts within the Landmark District were designed as variations on the Frontier Fort formula; thus, placement of buildings follows a certain ordered arrangement. In order to retain the historic character of each post, it is critical that new construction not violate the established order by inappropriate placement of buildings, parking lots, trees or other site features.

7.7.1.2 **Placement** Site new structures to parallel the existing arrangement of buildings along the periphery of parade grounds, or in rows behind, as already established by the historical pattern of placement. New construction should not intrude into any of the parade grounds. Service buildings and parking lots should be sited, according to the same ordered arrangement, to the rear of the buildings (Fig. 7.9).

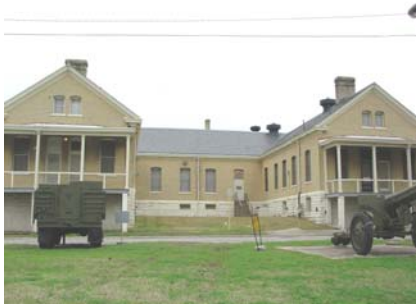


Figure 7.10 – Building Orientation

7.7.1.3 **Orientation** (Fig. 7.10). Orient new structures so that the main entrance/elevation faces the same direction as the principal facade of contiguous buildings. In most cases this will mean that buildings will face out toward the parade ground or the major focal point of that grouping.

7.7.1.4 **Spacing** (Fig. 7.11). The spacing of new buildings should continue existing proportional rhythms. That is, the width of side yards between buildings should reflect the same building-open space-building proportions as those already set by the historic grouping within/along side which the new building is placed.

Figure 7.11 – Symmetrical Elements

7.7.1.5 **Alignment** (Fig. 7-10). New structures should maintain the same setback distance from the road/walkway as that already uniformly established by the primary historic buildings in the grouping within which they are placed. That is, the main elevation of a new structure should be aligned with the main facade of the principal historic buildings along side it.

7.7.1.6 **Views** (Fig. 7.12). New buildings and site features should not block major historic views into or across open parade grounds. Maintain the visual connection which ties the whole installation together; this means that view corridors from the Quadrangle Tower to Building 1000 should never be blocked, either partially or in full, by new construction or plantings.

7.7.1.7 **Design Vocabulary**. The historic architecture within the Landmark District reflects various styles from the late Victorian era, and each post establishes its own spatial character. Nevertheless, the similarities in scale and in the quality of the materials and craftsmanship throughout portray a unified visual whole. Thus, in order to preserve the historic character of the place, it is essential that new construction follow these unifying principles of design.

7.7.1.8 **Height**. New buildings within the landmark district should maintain the predominant two-story height and roof alignments. No building should exceed three stories or 36 feet from grade to cornice line. Roof peaks may rise up to 12 feet beyond the three-story limit for a maximum building height of 48 feet. Chimneys, cupolas and other such features may exceed this height as needed.

7.7.1.9 **Massing** Building components should be similar in size and shape to the historic buildings in the district within which new construction is sited. Predominant geometric shapes are either two or three-story rectangular masses, or a cubic mass (two stories and almost square in plan) frequently with an attached wing at the rear. These rectilinear masses are topped, almost universally, by sloped roofs.

7.7.1.10 **Scale and Rhythm** (Fig. 7.10). Elevations should be designed to reflect the predominant scale and rhythm of the historic buildings nearby. One of the outstanding characteristics of each of the early posts is its pedestrian scale. The low height of buildings, their relationship to human scale and the ease with which one can recognize and achieve entry, all contribute to the open, tranquil quality of the place. Maintain the established proportion and rhythm of the window (void) to wall (solid) ratio. Maintain/reinforce the alignment and articulation of rooflines, eaves, cornice lines, fenestration and other scale defining building elements. Main entrances should be emphasized by means or architectural treatment, such as change in roof line, recessing, protrusions, or decorative detailing (See Fig. 7.13). Consider the use of large galleries across main facades to reinforce the established rhythm and to improve thermal efficiency.

7.7.1.11 **Materials and Color**. All of the primary structures in the Landmark District have masonry load-bearing walls. Although such construction would be prohibitively expensive today, new construction should reflect the permanence and solidity of these structures by using high quality masonry cladding or stucco. Maintain the solid appearance of masonry construction. Brick and stucco are the preferred materials for exterior walls. Brick and/or stucco colors should be similar to that used on existing structures within view of the new building. Roofing materials should complement the chosen cladding materials, and be compatible with the predominant historic roofing materials in the area. Clay tile and/or metal standing-seam roofs are recommended because of their visual compatibility and also their durability.

7.7.1.12 **Detailing**. Reinforce the scale defining elements of new buildings with architectural detailing. Limestone, cast stone, terra-cotta, or wood are recommended for the detailing of windows and major doorways. Wood or metal work is recommended for other decorative detailing on porches, porticos and stairways. The level of detail of new architecture should be in keeping with the craftsmanship and quality of materials used historically throughout FSH. (See Fig. 7.13) Paint color schemes on new structures should be in the same family of colors as those chosen for the historic area in which they are placed.

Figure 7.12 – View of Quadrangle Tower

7.7.2 The **New Post Historic Conservation District** – encompasses all of those areas included in the New Post building program, better known as the Historic Conservation District. This zone is sub-divided as follows: MacArthur Field, Old BAMC, Officer Housing, Community Center and Enlisted Housing. Since three of the named locations border the MacArthur Field parade grounds they will be discussed together.

Figure 7.13 - Detailing

7.7.2.1 **MacArthur Field Area Siting**. This area, New Post, was the biggest domestic building program ever carried out by the U.S. Army largely because, as the Depression dragged on, government construction projects became a means of putting people back to work.

7.7.2.2 **Siting.** Although the formal layout of New Post followed the basic arrangement of the old Frontier Fort formula; changes in the size and structure of the Army, as well as major changes in military technology, resulted in some important differences. The Army was now motorized and planning for this Division post was on a much larger scale. So large is the physical extent of New Post that we can no longer speak of one scale of architecture. Although the usual placement of "officers' row" on one side of the parade ground with barracks buildings along the other side was followed, and the stylistic features and materials were uniform throughout, there is a great disparity between the scales of the architecture on either side of MacArthur Field. In addition, the hospital complex at the north end of the parade ground sets a precedent for a single monumental grouping of much more highly articulated architecture as the focal point of the whole arrangement. Thus, while many of the guidelines for New Post will be uniform, there are sub-divisions of the Conservation District that require more specific criteria.

Figure 7.14 – Placement and Orientation

7.7.2.3 **Placement**. Site new structures to parallel the existing arrangement of buildings along the periphery of parade grounds, or in rows behind, as already established by the historical pattern of placement. (See Fig. 7.14) New construction should not intrude into any of the parade grounds. Service buildings and parking lots should be sited, according to the same ordered arrangement, to the rear of the building.

7.7.2.4 **Orientation**. Orient new structures so that the main entrance/elevation faces the same direction as the principal facade of contiguous buildings. In most cases this will mean that buildings will face out toward the parade ground or the major focal point of that grouping. (Fig.7.14).

7.7.2.5 **Spacing**. The spacing of new buildings within the residential areas on the west side should continue existing proportional rhythms. That is, the width of side yards between buildings should reflect the same building-open space-building proportions as those already set by the historic grouping. On the east side of MacArthur Field new structures should re-establish a pattern of regular spacing proportional to the larger mass of buildings as originally intended.

7.7.2.6 **Alignment**. New structures should maintain the same setback distance from the road/walkway as that already uniformly established by the primary historic buildings in the grouping within which they are placed. (See Fig. 7.15) Align the chief facade, or the facades of major building components, with the main elevation of the principal historic buildings alongside it.

Figure 7.15 – Historic Views & Alignment –Old BAMC

7.7.2.7 **Views**. (Fig. 7.15) New buildings and site features should not block major historic views into or across open parade grounds. Maintain the visual connection which ties the whole installation together; this means that view corridors from the Quadrangle Tower to Old Brooke Army Medical Center should never be blocked either partially or in full by new construction or plantings.

7.7.2.8 **Design Vocabulary**. The historic architecture within the Conservation District reflects the Colonial Revival style recommended for the Southwest by the civilian planners who assisted the Quartermaster Corps in carrying out the Housing Act of 1926. Spanish Colonial Revival architecture had several different sub-types, three of which are represented in the different parts of New Post: the Mediterranean type for all residential structures as well as the officers' club; the Mission type, as represented here by the original barracks buildings and many of the other community support facilities such as the theatre and by several large warehouse structures; and, finally, the highly decorated Baroque type.

7.7.2.9 **Height**. Within residential areas height should not exceed two stories or 25 feet from grade to cornice line. Along Stanley Road (within New Post) new buildings should not be less than three stories in height, nor exceed four stories. Building heights along this corridor should be between 36 and 50 feet high in order to reinforce the intent of the original design. Buildings to the rear, along Scott Road, should not exceed the height of those along Stanley

Road. New structures along Wilson Street, or in any of the areas which might visually impact the Conservation or Landmark Districts, should not exceed four stories in height.

7.7.2.10 **Form and Massing**. Residential area buildings should conform to the simple rectangular or square masses topped by taut, shallow-pitched gable roofs that predominate. Along Stanley Road, as temporary buildings are removed, they should be replaced by new structures of mass and scale comparable to the old barracks quadrangles, such as those in the 2200 block, the 2300 block, or the 2700 block. New facilities here should be built as groupings of component masses, which form an enclosed or partially enclosed outdoor space (Fig. 7.16). Roof shapes may be hipped or a combination of hipped and flat roofs with a parapet wall. At the north end of MacArthur Field, no building should exceed six stories in height.

Figure 7.16 – Form & Massing 2700 Block

7.7.2.11 **Scale and Rhythm**. Elevations should be designed to reflect the predominant scale, rhythm and entry sequence of the historic buildings nearby. Maintain the established proportion and rhythm of the window (void) to wall (solid) ratio. Maintain/reinforce the alignment and articulation of roof lines, saves, cornice lines, fenestration and other scale defining building elements. Emphasize main entrances by means of architectural treatment, such as change in roofline, recessing, protrusions, or decorative detailing. Consider the use of arcaded galleries surrounding interior courtyards or plazas.

7.7.2.12 **Material and Color**. All of the primary structures on New Post, with the exception of the hospital complex, were built of structural clay tile faced with stucco. Clay tile roofs are used exclusively throughout this post. New construction should continue the regionally appropriate look of these materials. Maintain the existing pallet of building materials. Stucco is the preferred material for exterior walls. Stucco colors should be in the off-white/beige range. Gabled or hipped roofs should continue the use of Mission tiles, or they may employ metal roofs colored to match the red of the true Mission tile.

7.7.2.13 **Detailing**. The level of detail on new architecture should be in keeping with the craftsmanship and quality of materials historically used throughout New Post. Reinforce the scale defining elements of new buildings with architectural detailing. Cast stone, terra-cotta, glazed tiles, wrought iron or wood are recommended for the detailing of windows, and major doorways. Wood or metal work is recommended for other decorative detailing on porches, porticos, and stairways. Paint and stucco color schemes on new structures should be in the same family of colors as those chosen for the historic area in which they are placed.

7.7.3 The **Community Center** is that area bounded by Scott Road to the west, Schofield Road to the north, Patch Road to the east, and Wilson Street on the south. As planned new facilities and activities are added to this central location, it will increasingly become the "Main Street" of the post. Physical planning should promote the social life of the place and still allow it to change. The effect of each new facility here must be carefully considered

with regard to its generation of both vehicular and pedestrian traffic, compatibility with adjacent land uses, and appropriateness of design image in relation to the neighboring historic districts.

7.7.3.1 **Placement.** Establish a common setback aligning the major masses of all new buildings. Primary considerations include prevailing placement patterns, vehicular and pedestrian traffic and existing view corridors.

7.7.3.2 **Orientation and Spacing**. Consolidate service functions and access to the rear of buildings. Group new facilities to form a wall along Scott Road and Funston Road corridors and avoid the isolated building in a sea of parking image. (See Figures 3-12 and 3-13) Create a view corridor through the Community Center; and orient buildings toward the road and reinforce with alley of street trees.

7.7.3.3 **Siting**. The remaining site planning considerations are essentially the same as above. Designers of future facilities in this zone must pay special attention to edges of Community Center zone and the adjacent historic district buildings.

7.7.4 The **Medical Training Campus** encompasses the area where 90% of the military medical training mission is accomplished on FSH. It includes student housing (barracks), classrooms and training support facilities. Geographically its boundary is Scott Road on the west, Schofield Road on the south, Williams Road on the east and on the north by Hardee Road, the Harris Heights Housing area and the Golf Course. A portion of the New Post Enlisted Housing area nearly bisects the zone. Existing facilities within this zone represent several, uncoordinated building programs. In order to establish a more coherent appearance, circulation patterns should be re-ordered; pedestrian amenities provided; and, where possible, older buildings or building elements should be repainted to match or blend in with the newer palette of building materials and colors.

No one overriding architectural style or theme has guided the development of this portion of the post we see today, nor should styles and themes dictate the look of this part of post for the future. New building design should, therefore, reflect the architectural trends of the day, and not be an attempt to recreate the past. Emphasis should be placed on site analysis (siting, spacing, orientation) and the building's relationship to the built environment surrounding it. New designs must be compatible in terms of massing, scale, materials, colors, etc. For example, a new design should not be so large as to overwhelm the buildings around it, nor should it be so small as to appear out of place; materials need not be identical to those employed in the immediate vicinity, but should be of a similar nature (masonry, wood, metal, etc.)

Where the architect wishes to express a particular vernacular, it should be done as an abstraction, not a literal expression. Contradicting or complicating the architectural feeling of the area should only be done for a valid reason, and not as a matter of whimsy. Generally speaking, themes, motifs and similar vehicles should be avoided. Otherwise, even in areas as sensitive as National Historic Landmark Districts, the architect can still enjoy a degree of freedom of choice, the overriding principle being the building's ability to relate to its surroundings.

7.7.4.1 **Siting** Reestablish an ordered circulation pattern by alignment of major roadways and/or elimination of excessive curb cuts and vehicular entries. Build new parking lots in smaller increments; subdivide and landscape existing lots to cut down on reflective heat gain. Relate buildings to one another, creating designed outdoor spaces between them and shared parking in the least visually intrusive manner. Establish common setbacks. Provide gateways to the area by placing larger scale buildings at the corners of major intersections on the periphery of the zone.

7.7.4.2 **Materials and Colors**. Continue the use of light-colored brick or other good quality masonry unit, or a combination of masonry unit and cast concrete, tinted to match the surrounding buildings like the NCO Academy (B1397). Get away from flat roofs and box-like buildings and introduce more sloped standing seam metal roofs to provide for better visual interest.

7.7.4.3 **Massing, Scale and Height**. Establish massing, scale heights for complexes of scaled building components which form interior open spaces and courtyards and establish the image of a modern day college campus.

7.7.5 The **Industrial Zone** encompasses all the area between Wilson Road and Garden Avenue and the south and southeast boundary of the installation, starting east of Infantry Post and extending to the Binz Engleman entry to Main Post. Utility grade construction is to be confined to these industrial zones. Buffering should be provided along major arterials such as Wilson, Schofield, Scott and Forage Roads to minimize the visual effect on adjacent zones. Even though this area by definition has a lower visual quality than the rest of the installation, it straddles the main entry corridor to FSH from IH-35 and requires a consistently higher level of maintenance.

7.7.5.1 **Siting.** Place new facilities along major exterior roadways so as to screen motor pools, parking lots and industrial activities on the interior of the zone.

7.7.5.2 **Views.** Where possible provide visual screening along major transportation corridors, especially east of Scott Road as in enters the installation.

7.7.5.3 **Height.** New facilities should not exceed two stories in height.

7.7.5.4 **Materials and Color.** Continue the use of concrete masonry units and/or cast concrete panels with an exterior paint finish or texturing to upgrade their visual appearance. The preferred roofing material is metal colored to match existing new roofs within this zone. Wall surfaces will be painted or tinted in low-keyed earth tones

7.7.6 The **Medical Center** encompasses all the area bounded by railroad right-of-way, Binz-Engelman Road and IH-35. The visual image of this area is set by Brook Army Medical Center. The design intent of BAMC was to recall the regionally appropriate feel of original earth and clay building materials using more contemporary materials including concrete tinted to approximate earth tones. The additional large scaled glazing of atrium and entranceways introduced a completely new visual image on the installation.

7.7.6.1 **Siting**. Any buildings added to the Medical Center Complex must blend and not take away from the dominance of BAMC as the focal point. Views from BAMC outward and from the outside looking inward must be considered.

7.7.6.2 **Parking**. The parking lots should not be allowed to dominate, but should be broken up into well landscaped increments and carefully placed to minimize its visual impact. Parking structures should be considered with architectural features that compliment the main medical center building.

7.7.6.3 **Architecture**. Future buildings should take their clues from the materials, colors and detailing used on the BAMC facility. Large expanses of exterior glazing are discouraged as they are regionally and traditionally inappropriate.

7.7.7 Major portions of the **Recreation Zone** lie within the flood plain. No new permanent structures should be located in the flood plain. This area should be developed only for outdoors recreational and training uses. Great care must be taken to preserve the natural environment.

7.7.7.1 **Siting**. New facilities should be placed in areas that are compatible with its planned activity. If the facility includes utilities, then the existing utility systems should be carefully analyzed in conjunction with the siting locations.

7.7.7.2 **Height**. New facilities should not exceed two story in height.

7.7.7.3 **Materials**. Selected materials should be conducive to the natural environment and require low maintenance. Proposed materials should also blend with the natural environment and existing facilities. Outdoor recreation and training facilities are often subject to vandalism because of seasonal usage and remote locations. Materials and fixtures should be selected for their resistance to damage from hard usages. They should have surfaces that are dense and not easily stained or marked. Porous materials such as concrete, stucco, concrete block, and some woods and metals should be painted to provide a more vandal-resistant surface that can be easily repaired. Non-combustible materials should be used since water flow for fire protection may be difficult to provide at these locations

7.7.7.4 **Color**. Buildings in this zone should characteristically have a strong relationship with the sites and uses they serve. Exterior color schemes should blend with the natural elements of the site and remain subdued so that the site remains the primary interest. Facilities should promote the qualities of simplicity, a leisure time atmosphere and inside-outside relationship of architectural spaces. Color schemes are an important means of achieving a successful solution. It is desirable to adapt the system of exterior color schemes for use in the interiors of the structures. The exterior color palettes used inside will require adjustment in values and intensity with the limited use of accent and contrast components.

7.7.8 The **Camp Bullis Zone**

The mission of Camp Bullis is to provide quality ranges, training areas, airspace, outdoor recreation programs and necessary installation support to all active duty services, Reserve and National Guard unit, law enforcement agencies, and various civic groups. Camp Bullis

serves primarily as the field-training environment in support of the curriculum of the Academy of Health Sciences and the Joint Medical Readiness Training Center under Army Medical Department Center and School (AMEDDC&S) from Fort Sam Houston. Other units with permanent facilities (training, administrative, or support) at Camp Bullis include the Texas Army National Guard, the Airways Facility Sector-Federal Aviation Administration, the 5th U.S. Army, 6th Military Intelligence Battalion, the U.S. Air Force 343rd TRS Ground Combat School and the Inter-American Air Force Academy Field Training.

7.7.8.1 **Siting.** Military Highway (south boundary of the site) is the primary access road with Camp Bullis Road along the west boundary and Wilkerson Road along the north boundary. Tree removal is required for site clearing of improved areas, building pad location, grade differential, and force protection. The design team must minimize the number of trees that will be required to be removed and protect as many as possible. New facilities should be placed in areas that are compatible with its planned activity. If the facility includes utilities, then the existing utility systems should be carefully analyzed in conjunction with the siting locations. If construction area will be greater than 1 acre, a Storm Water Pollution Prevention Plan (SWPPP), Notice of Intent (NOI), and Notice of Termination (NOT) will be developed.

7.7.8.2 **Parking, Access, and Pavements**.

POV parking areas will be graded at approximately 1.5% and surface grading around buildings will be approximately 2% or greater away from the structure. A short retaining wall may need to be constructed around the service roads and mechanical yards in order to minimize the road grade. This wall should taper down to match the finished grades at the low points. Storm drainage systems will be designed for a 10-Year frequency storm as recommended by the U.S. Army Corps of Engineers. Pedestrian access from the POV parking areas will be on concrete walks. The maximum walk grade will not exceed 3 percent. All required handicapped ramps will be provided. Pavement designs are based on criteria contained in *TM 5-822-2/AFM 88-7, Chapter 5, TM 5-822-5/AFM 88-7, Chapter 1,* and engineering judgment. It should be noted that pavement sections take into account the possibility of a greater thickness of overburden soils above the limestone primary than may actually exist at the site; the actual subsurface conditions will be established by the geotechnical field investigation. Where hard limestone primary material is encountered, the section should be modified to require Aggregate Base Course material to the top of limestone, always maintaining at least 6 inches of Aggregate Base Course thickness; compacted to maximum laboratory density (ASTM D 1557).

7.7.8.3 **Architecture, Color, Material Selection and Massing**.

The contextual setting at Camp Bullis for the exterior design concept for will be based upon existing nearby facilities. New facility design will be compatible with other facilities on the installation with emphasis on color, material selection and massing. Due to the fact that many of the buildings within the Camp Bullis cantonment area have been designated with historical significance, the exterior design must be compatible with the historical setting and the guidance set forth by the Historical Preservation section of Fort Sam Houston. The exterior design of new facilities will be based upon the Air Force Base Ground Defense facility, which was constructed in the late 1990's. The buildings in this complex utilize low slope standing

seam hip roofs, split face decorative concrete masonry units, natural aluminum finishes and painted metal finishes in various conditions. The building masses are simple and uniform with limited vertical height. Building entrances are accentuated with elevated entry canopies and decorative painted steel accents. The colors utilized in the building materials consist of primarily earth tones in varying colors of brown and natural stone.

7.7.8.4 **Water and Gas**
Existing water mains need testing to insure water pressure is sufficient for both potable and fire protection supply. There are no natural gas supply lines on Camp Bullis, all gas will be provided by on site propane tanks.

7.7.8.5 **Energy Considerations**

The following energy saving considerations should be considered during the design:

Existing mature trees on the site will be retained as far as practical to provide summer shading and shelter from winter wind shelter.

Ventilation loads will meet the UFC 4-510-01 and modify the supply air to individual spaces to minimize the outside air to supply air ratio.

Variable frequency drives will be utilized on all variable flow systems such as supply and return fans, secondary chilled water and heating hot water systems.

Review controls to reduce system requirements on low or partial loads and to schedule systems on and off to meet operational needs.

Use fluorescent lamps with high efficiency electronic ballasts.

7.7.8.6 **Circulation and Security**

Circulation routes will be direct, well lighted and free of isolated areas. Designers will give emphasis to the daytime and nighttime security of facilities to the maximum extent. The various facility activities will be arranged by design with control points located for good visibility and to direct and control its area of responsibility. Site layout will be designed to provide parking area as close to controlled entrances as possible. Parking and traffic areas will be well lighted. Antiterrorism (AT) Design UFC's will be utilized in the design process.

7.8 ARMY STANDARDS

7.8.1 SITE PLANNING AND CIVIL ENGINEERING

7.8.1.1 **Design Standards and Codes.** Comply with TI-804-01 Area Planning, Site Planning and Design for site planning and civil engineering and UFC 4-010-01 DOD Minimum Antiterrorism Standards for Buildings, as well as other applicable requirements.

7.8.1.2 **Site Planning Objective.** Provide a functional layout of buildings and site elements. The site plan should place emphasis on creating a safe work environment. Arrange vehicular circulation to minimize conflict with pedestrian circulation. Pavement marking and signage shall clearly delineate traffic patterns, especially important to first time visitors at the site. Integrate sustainable design principles by retaining and using existing topography to advantage; preserve environmentally sensitive areas and reduce overall project impact on the site.

7.8.1.3 **Site Selection.** The location of the facility shall be integrated with the Installation Master Plan and be consistent with the approved Land Use Plan and Army Installation Design Standards. It shall be located in an accessible area based on the use of the facility. Consider requirements for future expansion as well as transient service requirements. Use sustainable planning and design principles to take advantage of passive energy and siting efficiencies.

7.8.1.4 **Site Design.** Site planning is an essential aspect of the facility design. The art of site planning requires the interdisciplinary involvement of the community planner, architect, landscape architect, civil, mechanical, electrical, and communication engineers. Community planning is an integral part of site planning. The facility must be located in relation to other functional areas. Siting should consider shared use parking based on the time that adjacent facilities are in use. The design of vehicular paths, pedestrian paths and landscape design can define the functional campus yet enhance the flow into and out of the area. Provide appropriate buffer areas to separate and visually isolate the facility from adjacent areas. Consider providing landscaping or other screening between incompatible land uses.

7.8.1.5 **Vehicle Traffic.** Site the facility so it is clearly visible to pedestrians, cars and delivery vehicles. Separate service/delivery access from the workforce/ customer access and circulation. Plan for daily deliveries to the loading area in larger facilities. Control vehicular access within UFC 4-010-01 standoff distances for the building.

7.8.1.6 **Parking and Vehicular Circulation.** Comply with TI 804-11 Design for Non-Organizational or Privately Owned Vehicles (POV) Site Circulation and Parking. Coordinate parking and vehicular circulation with AT/FP standards. Prepare a site traffic impact study to determine the traffic patterns and impact on the local roads and circulation patterns. Access requirements for fire equipment, trash/recycling removal, and service vehicles on site should be considered. Consider shared use parking with adjacent sites. Design entrance and exit drives for safe and controlled traffic flow. Consider pavement maintenance. Consider the use of alternate materials such as turf pavers for service vehicle access to mechanical rooms. Provide concrete paved parking for motorcycles. Pavement for organizational vehicle parking should be designed for the heaviest vehicle at the installation. Provide handicap-parking area when required.

7.8.1.7 **Walkways.** Connect the building to public walkway system and to parking with pedestrian walkways. Primary building entrances shall be at least 2438 mm [8 ft] wide. The minimum width of a sidewalk shall be 1524 mm [5 ft]. Place handicapped curb cuts in convenient locations while not creating obstacles for walkers. Depress curbs for handicapped access where possible instead of creating ramps. Consider brick or concrete pavers or

patterned concrete to identify significant entrances. Provide well-lighted walkways if the facility is often used in the evening.

7.8.1.8 **Grading and Drainage.** The grading should maintain existing topography while recognizing standard gradients. There should be a balance of the quantity of cut and fill soils which would create a smooth transition of graded areas into the existing natural site. The plan should reflect selective site clearing that preserves groups of trees. Grading should manage site runoff to maintain rate of flow and quantity to pre-construction levels, or reduce site runoff where possible. The principles of positive drainage should be applied to control the conditions that remove rainfall away from facilities and functions. Site design should seek to minimize the disturbance of land, and utilize natural drainage paths where possible. Federal, State and local regulations regarding the design of storm water management systems shall establish minimum design criteria. Coordinate requirements for downspouts, underground and surface drainage with the Installation. Limit sheet drainage in pedestrian and parking areas. Rather than creating large retention basins, control storm water at the source by using micro-scale features that are distributed throughout the site. Integrate the landscape design into the storm water management strategy, creating plant areas that benefit from storm water while pollutants are controlled through natural processes. Additionally, minimize the impact of construction activities on drainage and prevent loss of soils by water and wind erosion.

7.8.1.9 **Utilities.** Consider the location and adequacy of existing utilities and their connection points when making the site selection and building orientation. The required services include water, sewer, storm water, electricity, telephone, cable television, fiber optics, possibly gas or steam lines, emergency generator, or satellite antennas.

7.8.1.10 **Storm water Management Systems.** The storm drainage system shall be properly coordinated with surrounding properties to ensure that runoff does not cause damage to other properties. Treat contaminated storm water prior to discharge from the site. Design storm water management systems in accordance with the applicable requirements of "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPS", by the Department of Environmental Programs or in accordance with the requirements of the agency having jurisdiction. Coordinate requirements for an on-site storm water retention/detention system based on the requirements of the Installation. Connection to building roof (as required by the Installation) or area drain lines shall be constructed in accordance with the International Building Code latest edition.

7.8.1.11 **Outdoor Furnishings.** Provide outdoor furnishings including trash and recycling receptacles, seating, bicycle racks, lighting standards, bollards in coordination with the Installation Design Guide. Where the climate is acceptable, provide outdoor break areas with tables, seating and shading devices.

7.8.1.12 **Signage.** Plan site identification signage in coordination with site approach, landscape, and lighting. Comply with the Army Installation Design Standards. Provide traffic control signage as well as "No Parking" signs at service drives. Provide informational signs to direct to appropriate entries.

7.8.1.13 **Site Lighting.** Site lighting is an integral part of the design. Provide lighting to ensure safe movement through outdoor areas. Consider the color rendition of outdoor lighting. Use

bollards or variations in lighting to articulate entrances and public areas. Design lighting levels in accordance with the *Illuminating Engineering Society (IES) Lighting Handbook* illumination levels. Use photocells, motion detectors and timers to control lighting and conserve energy.

7.8.1.14 **Facility Energy Conservation Requirements.** The entire facility design, inclusive of siting, building envelope, plumbing systems, lighting, electrical systems, and HVAC systems as a complete assembly/structure, must be in compliance with ASHRAE 90.1-2001 and UFC 3-400-01.

7.8.2 **GEOTECHNICAL.**

7.8.2.1 **Geotechnical Design.** Geotechnical information shall be considered during the planning of the project. Where confident assumptions may be made based on past projects in the area, the geotechnical investigation may take place during the design phase. The geotechnical information is to consider loads from the structure, pavement, walkways, and vehicles. It shall assess the sub-surface condition determining soil type, density, and moisture content. Where significant debris is expected to exist on site, excavations shall be performed.

7.8.2.2 **Capillary Water Barrier.** A capillary water barrier is required for all interior slabs on grade, including storage, loading dock, mechanical and electrical spaces.

7.8.2.3 **Termite Treatment.** Preventive methods for subterranean termites shall be applied in accordance with local regulations.

7.8.2.4 **Radon Testing.** Test shall be performed for potential radon exposure to occupants in accordance with TI 810-10.

7.8.3 **COMMUNICATIONS.**

7.8.3.1 **Outside Cable Plant Infrastructure**. Extend the information system infrastructure from the nearest existing information system node having sufficient capacity to satisfy the facilities requirements -- coordinate with the DOIM on this location. New underground conduits will be multiple concrete encased 100-mm [4-inch] PVC ducts (or equivalent) and will be sized, designed and installed in the underground manhole and duct system IAW the installation's current approved I3A Plan to ensure maximum flexibility for future growth. Place outside plant information systems cabling, both copper cable(s) and fiber optic cable(s), from the servicing nodes into the new facility; extend and terminate the OSP information system cabling on the building's entrance facility per applicable fire and safety code.

7.8.4 **COST**

7.8.4.1 **Criteria.** Programming and cost estimate shall be done in accordance with UFC 3- 701-03 DoD Facilities Pricing Guide.

7.8.4.2 **Life Cycle Cost.** During design, consideration must be given to not only the initial cost of construction, but also the cost of operation, maintenance, and custodial care during the

intended life of the building. Both initial and life costs must be analyzed, especially in the selection of utility systems, interior and exterior finishes.

7.9 REFERENCES

7.9.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 7
- Unified Facilities Criteria (UFC) *3-400-01,* Design: Energy Conservation
- Unified Facilities Criteria (UFC) *3-210-01A* Design: Area Planning, Site Planning, and Design,
- Unified Facilities Criteria (UFC) *3-230-15FA,* Design: Subsurface Drainage Facilities for Airfields and Heliports
- Unified Facilities Criteria (UFC) *3-230-16FA,* Design: Drainage and Erosion Control Structures for Airfields and Heliports
- Unified Facilities Criteria (UFC) *3-230-17FA* , Design: Drainage for Areas Other than Airfields
- Unified Facilities Criteria (UFC) *3-230-18FA,* Design: General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas
- Unified Facilities Criteria (UFC) *3-260-02,* Design: Pavement Design for Airfields
- Unified Facilities Criteria (UFC) *3-250-01FA,* Design: Pavement Design for Roads, Streets, Walks and Open Storage Areas
- Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*
- Technical Instructions (TI) 800-01, *Design Criteria*
- Technical Instructions (TI) 801-02, *Family Housing*
- Master Planning Instructions (MPI)
- Whole Building Design

ADDITIONAL REFERENCES

GOVERNMENT PUBLICATIONS:

Department of The Army
ATTN: DAIM-MD; Assistant Chief of Staff for Installation Management
2511 Jeff Davis Highway
Arlington, Virginia 22202

Army Regulation 415-28, and DA Pamphlet 415-28, Guide to Army Real Property Category Codes

US Army Corps of Engineers Technical Instructions for facility design may be found at
http://www.hnd.usace.army.mil/techinfo/ti.htm

Army Technical Manuals may be found at
http://www.usace.army.mil/inet/usacedocs/armytm/

Relevant Technical Instructions for facility design.

Relevant Army Technical Manuals
TI 810-10 Mechanical Design – Heating, Ventilating, and Air Conditioning
TI 800-01 Design Criteria
TM 5-810-5 Plumbing

Department of Defense
Unified Facilities Criteria (UFC) documents may be found at
http://65.204.17.188//report/doc_ufc.html
Refer to the Unified Facilities Criteria (UFC) documents for the latest relevant DOD requirements

UFC 1-200-01 Design: General Building Requirements
UFC 3-400-01 Design & Energy Conservation
UFC 3-501-03N Electrical Engineering preliminary Considerations
UFC 3-520-01 Interior Electrical Systems
UFC 3-550-03N Design: Power Distribution Systems
UFC 3-600-01 Design: Fire Protection Engineering for Facilities
UFC 4-010-01 Design: Minimum Antiterrorism Standards for Buildings
UFC 4-010-02 Design (FOUO): DOD Minimum Standoff Distances for Buildings
UFC 4-021-01 Mass Notification Systems

U.S. GOVERNMENT PRINTING OFFICE

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

U.S. Government Printing Office (GPO) Style Manual Standard for Use of the International System of Units (SI): the Modern Metric System

NON-GOVERNMENT PUBLICATIONS:

Electronic Industries Association (EIA)
2500 Wilson Blvd

Arlington, VA 22201-3834

EIA/TIA 568-B (2001) Commercial Building Telecommunications Cabling Standards
EIA/TIA 569-A (2001, Amendment 5)
Commercial Building Standard for Telecommunications Pathways and Spaces

U.S. Government Printing Office (GPO) Style Manual

Illuminating Engineering Society of North America
120 Wall Street, 17th Floor
New York, NY 10005-4001

IESNA RP-8 (1983; R 1993) Roadway Lighting
IES LHBK (1993) Lighting Handbook, Reference and Application

International Code Council, Inc.
5203 Leesburg Pike, Suite 708
Falls Church, VA 22041-3401

ICC (2000) International Building Code
ICC (2000) International Plumbing Code
ICC (2000) International Mechanical Code

National Fire Protection Association
One Batterymarch Park
Quincy, MA 02269-9101

NFPA 10 (1998) Standard for Portable Fire Extinguishers
NFPA 13 (1999) Installation of Sprinkler Systems
NFPA 70 (2002) National Electrical Code
NFPA 72 (1999) National Fire Alarm Code
NFPA 101 (2000) Life Safety Code

Institute of Electrical and Electronics
Engineers Inc. (IEEE)
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331

Standard for Use of the International System of Units (SI): the Modern Metric
System IESNA RP-8 (1983; R 1993)
Roadway Lighting
IES LHBK (1993) Lighting Handbook,
Reference and Application

Links
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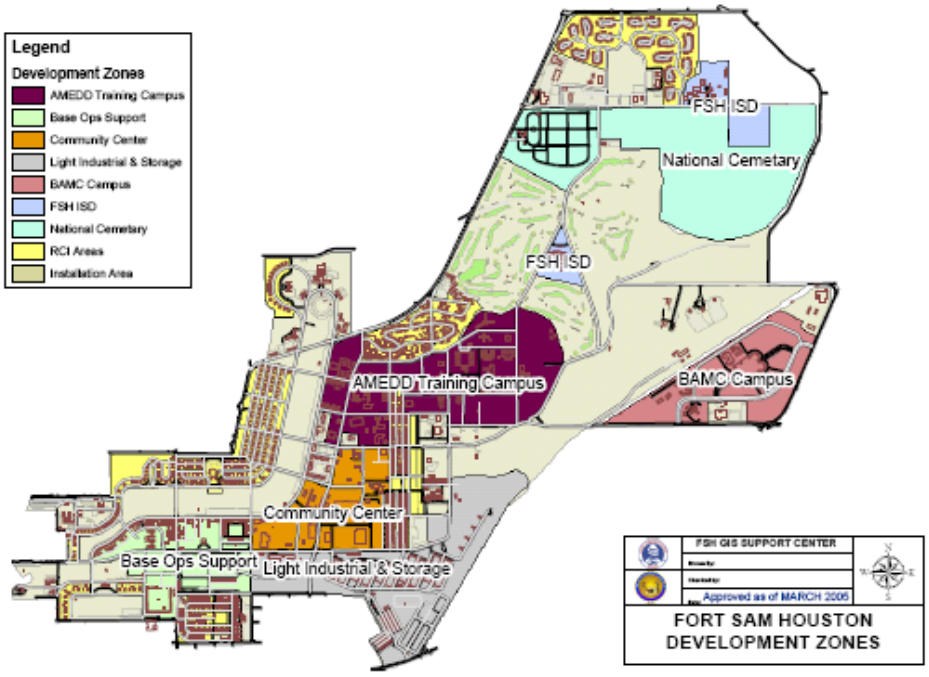
SECTION 8 BUILDINGS DESIGN STANDARDS

8.1 INTRODUCTION

8.1.1 The design character of an installation's buildings affect the installations overall image. The visual analysis of buildings and related structures helps define visual zones and themes and is an important part of an installation's assets and liabilities assessment.



8.1.2 The building design component encompasses the character of the buildings as well as the arrangement of buildings to one another and to their environment. In general, use architectural style, materials, and colors indigenous to the region. The preservation of historically and culturally significant structures adds to an installation's character and provides a sense of heritage.

8.1.3 The visual analysis of structure also includes concern for accessibility, use of materials, placement of entrances, incorporation of additions and renovations, the incorporation of plazas and courtyards, interior design and the appropriateness and quality of building maintenance.

8.1.4 This section provides the objectives and visual determinants that should be utilized to identify and assess the building design quality of the installation. The section also provides standards and guidance pertaining to the development and maintenance of the various interiors and exteriors of buildings on the installation.

8.2 BUILDING OBJECTIVES

8.2.1 Sustainability. The architectural style of existing and future buildings should reflect and reinforce the sustainability of the installation. Sustainable design reduces construction and maintenance cost and conserves energy through proper construction and materials selection. See Appendix D for a more complete discussion on Sustainable Design.

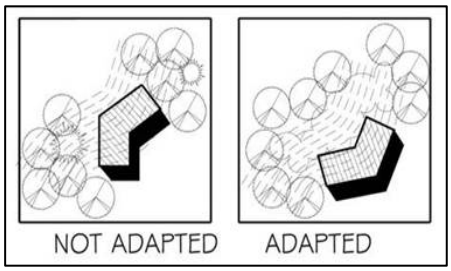


Figure 8.1 – Adapt Building Design to Site Conditions

8.2.2 Building Design Objectives:

8.2.2.1 Adapt building designs to natural site conditions (Fig 8.1).

8.2.2.2 Design buildings in clusters to preserve land and reduce construction and maintenance costs.

8.2.2.3 Develop a coherent architectural style that results in the blending of new and old structures. However, when considering historical buildings one should be able to differentiate between the historic fabric and the new material.

8.2.2.4 Design buildings to include more floors in a vertical structure that results in a smaller footprint and more efficiently utilizes limited installation land areas.

8.2.2.5 Combine multiple activities in one building to reduce the number of buildings required and more efficiently utilize limited installation land areas.

Figure 8.2 - Use of Indigenous Construction Materials Reduces Transportation Cost

8.2.2.6 Design multiple use facilities with the capability to quickly change interior layouts to accommodate changing requirements.

8.2.2.7 Use indigenous construction materials and practices that require less energy to produce and transport and may be recycled at the end of their usefulness.

8.2.2.8 Locate windows to maximize natural light, ventilation and outward views.

8.2.2.9 Consider adaptive reuse of buildings once their initial use is no longer required.

8.3 STRUCTURAL CHARACTER

8.3.1 The character of installation architecture varies according to the use of the structure and when it was built. This use and age variation can result in character incompatibilities.

8.3.2 The difference in character may also result when the designer ignores the character and scale of adjacent buildings or uses an imitative technique unsuccessfully.

8.3.3 The coordination of structural character on an installation provides a consistent and coherent "sense of order" and "sense of place". This relationship of design comes from using compatible scales, massing, form, color, texture, materials, and fenestration. These design techniques can be utilized in the visual review and analysis of the installation. They are further explained below:

8.3.3.1 Scale. Scale refers to the size of a building facade in relation to humans. Buildings that include predominant vertical facades, which dwarf the individual, are defined as monumental in scale. Buildings with more horizontal facades designed to relate more to the size of the human figure are defined as human scale (Fig. 8.3). The scale of most buildings on installations should be more human than monumental. All new construction should be compatible in scale with adjacent buildings. Monumental architectural design is typically utilized for more ceremonial buildings, such as worship centers, headquarters complexes, and hotel facilities. These buildings make use of large, glazed areas at entrances and oversized fenestration elements to create a scale appropriate to the building's use. Scale and relief should be provided through roof form, fenestration, building articulation and landscape plantings.

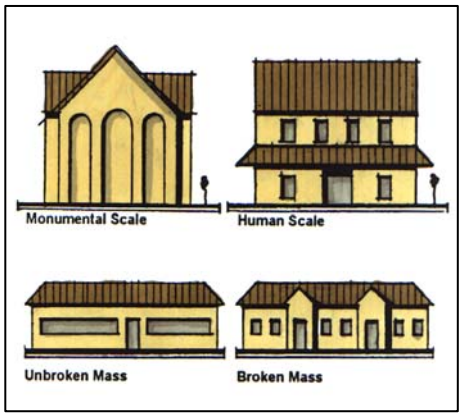


Figure 8.3 – Structure Scale and Massing

8.3.3.2 Massing. Massing refers to the overall bulk or volume of a building or buildings (Fig. 8.3). The size and proportion of the individual buildings in a grouping of buildings should be designed to be proportionally compatible with the adjacent structures.

8.3.3.3 Form. The form of a building is determined by its size, mass, shape and proportions. The use of similar building forms provides continuity to the installation architectural impact. The result is a more aesthetically pleasing environment.

Figure 8.4 - Color and Form Contribute to a Sense of Place

8.3.3.4 Color. The use of a color scheme that is consistent throughout the installation, where possible, results in a continuity of buildings and contributes to a sense of place (Fig. 8.4). However, color schemes throughout the installation often vary according to the visual zone and visual theme in which the structure is located.

8.3.3.5 Texture. The use of materials of similar texture in buildings helps to provide visual continuity for the installation

8.3.3.6 Materials. The use of the same materials in the exterior finish and trim of buildings helps provide visual continuity.

8.3.3.7 Fenestration. Building fenestration includes features such as doors, windows, and building decoration details. These features should be similar in arrangement, design, size, and proportion for architectural compatibility and visual consistency and continuity (Fig. 8.5).

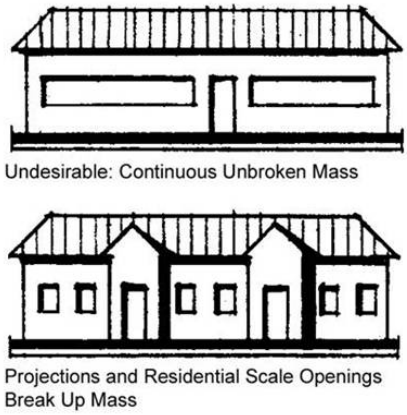


Figure 8.5 - Fenestration breaks up mass

8.4 BUILDING ENTRANCES

8.4.1 A building entrance is a primary feature of any building design. The entrance should be defined and recognizable as the point of entry regardless of the size or importance of the building (Fig. 8.6).

8.4.2 The entrance to a building should be in a prominent location and should be oriented toward the primary adjacent public spaces such as a courtyard, lawn, parking lot, or street.

8.4.3 The details of an entrance should be designed to provide continuity with other entrances to the building and the entrances of adjacent buildings.

Figure 8.6 – Entrance is Positive Visual

8.5 SERVICE AREAS

8.5.1 Service areas, such as loading docks and trash dumpsters, should be screened from the views of primary use areas such as entrances, courtyards, gathering areas, streets, and parking lots.

8.5.2 Service areas should be screened as an enclosure by using walls and landscaping. Screen walls should be between six and eight feet high and should be in harmony with the adjacent building.

8.5.3 Trash and garbage collection areas must be located a minimum of 25 meters (82 feet) from troop billeting, family housing areas (containing more than 12 units), and stand-alone retail facilities. They will be placed a minimum of 10 meters (33 feet) from all other inhabited structures (UFC 4-010-01, Table B-1).

Figure 8.7 - Enclosures in Service Areas Present a Positive Visual Image

8.6 BUILDING ACCESSIBILITY

8.6.1 All structures or facilities, other than the exceptions mentioned below, must meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS) accessibility standards. The more stringent standards apply in the event of conflicting guidelines (Fig. 8.8).

8.6.1.1 Any building or facility that is specifically restricted by occupancy classification to use only by able-bodied personnel during the expected useful life of the building or facility need not be accessible (military exclusion is provided by UFAS 4.1.4 [2]), but accessibility is recommended since the intended use of the facility may change with time.

8.6.1.2 In particular, the following facilities need not be designed to be accessible: unaccompanied personnel housing, closed messes, vehicle, and aircraft maintenance facilities.

Figure 8.8 - Facilities Must Meet UFAS Standards

8.7 SEISMIC POLICY

8.7.1 The minimum performance objective for Army facilities is Substantial Life-Safety. To ensure compliance, seismic evaluations and mitigation of unacceptable seismic risks shall be performed. Higher levels of seismic protection for mission essential facilities will be considered in the evaluation.

8.7.2 Seismic evaluation. Guidance for the seismic evaluation of existing facilities is given in TI 809-05, *Seismic Design Evaluation and Rehabilitation for Buildings*. Buildings will have a seismic evaluation performed when:

- A change in the building's use causes a change in the occupancy category, as defined in TI 809-04, *Seismic Design for Buildings*, to a category of greater importance (lower category number).
- A project is planned which causes the capacity of the structural system or components to be reduced to 90 percent or less of original stability and strength.
- A project will significantly extend the facility's useful life or will significantly increase the facility's value and the cost exceeds 50 percent of the current replacement value.
- A facility is damaged or is deemed to be an exceptionally high risk to occupants or to the public.

8.7.3 Exceptions to Seismic Evaluations. Existing facilities are exempt from seismic evaluation if:

- The original design was done according to the provisions of the 1982 or later edition of TM 5-809-10, or the 1988 or later edition of TM 5-809-1.

- Replacement is scheduled within 5 years.

- The facility is intended only for minimal human occupancy, and occupied by persons for a total of less than 2 hours a day.

- The facility is a one or two family dwelling, two stories or less, located in zone 1 or 2, as shown in TM 5-809-10.

- The gross area is less than 3000 square feet (275 square meters). Mitigation of unacceptable seismic risks. If the seismic evaluation determines that the facility does not meet Substantial Life-Safety or higher performance standards, as appropriate, unacceptable seismic risks will be mitigated. Rehabilitation will be performed in accordance with TI 809-05.

8.7.4 New Facilities or Additions or Extension of Existing Facilities.

8.7.4.1 New facilities and additions or extension of existing facilities will be designed to provide the level of seismic protection required by TI 809-04.

8.8 INDIGENOUS STRUCTURES

Sustainability in the design and construction of buildings includes incorporating time-proven building designs that are indigenous to the region (Fig. 8.9). Indigenous design elements should be utilized in the design of new buildings.

Figure 8.9 - Indigenous Design Elements

8.9 HISTORIC ARCHITECTURE

8.9.1 The visual integrity of historic buildings or districts on the installation will be preserved and protected. The Army's management of historic properties is pursuant to the duties and responsibilities established by Congress under the National Historic Preservation Act (NHPA). The NHPA also created the National Register of Historic Places as the official listing of the nation's historic properties considered worthy of preservation. When working with historic properties the Army uses the following three categories:

Figure 8.10 - Historical Structure

8.9.1.1 Historic Buildings or Structures. These are significant buildings or structures, which are listed in or eligible for listing in the National Register of Historic Places.

8.9.1.2 Historic District. A distinct group of buildings, structures, or landscapes that possesses significance and are listed in or eligible for listing in the National Register.

8.9.1.3 National Historic Landmarks. Buildings, structures, or landscapes listed in the National Register, but also recognized as nationally significant. National Historic Landmarks can either be listed individually or as a district.

8.9.2 For further guidance use Army Regulation 200-4 and Department of the Army Pamphlet 200-4. Specific requirements and recommendations for the treatment of historic properties are available in the National Park Service's Secretary of the Interior's Standards for the Treatment of Historic Properties. A working awareness of historic preservation policies and procedures followed by the Army Corp of Engineers can be found in the Technical Instruction (TI) 800-01, Design criteria, Chp. 16, Preservation of Historic Structures.

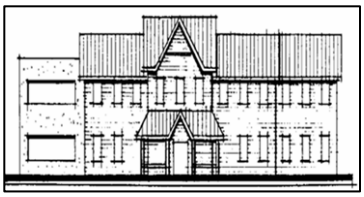


Figure 8.11
Not This This
Renovation/Additions should be Compatible

8.9.3 See Appendix M, Historic Preservation Guidelines.

8.10 RENOVATIONS AND ADDITIONS

When existing buildings are renovated or additions are constructed, the architectural character of the renovation or addition should be compatible with the architectural character of the existing building and the adjacent buildings (Fig. 8.11). This compatibility includes the use of materials, color, shape, size, scale, and massing in the addition or renovation that blends with the architectural character of the existing structure. However, when renovating or adding to historical buildings one should be able to differentiate between the historic fabric and the new material.

8.11 PLAZAS AND COURTYARDS

Plazas and courtyards can be located as part of the primary entrance to a building, or as an extension of non-primary entrance areas to the outside (Fig. 8.12). Wide, paved entrance plazas need vehicular barriers.

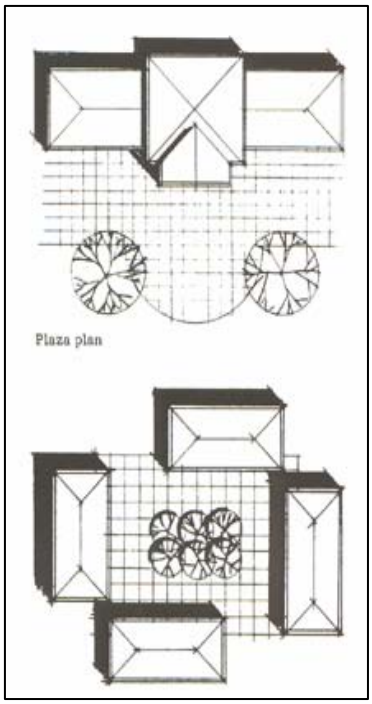


Figure 8.12 – Plazas and Courtyards

8.12 BUILDING MAINTENANCE

Buildings designed and constructed to incorporate sustainable design criteria should minimize life cycle, energy and maintenance costs through proper selection of forms, materials, and construction details.

8.13 INTERIOR DESIGN

8.13.1 Introduction. Inhabited spaces, that require the selection of furnishings or equipment, should be designed by professional interior designers. Interior design impacts the functioning and productivity of people. People spend the majority of their time inside, working, eating, sleeping, and relaxing. The productivity, comfort, and safety of the personnel living, working, or relaxing in the facilities they inhabit is directly related to the quality of interior design provided within the facility.

8.13.2 Interior design is required on building construction and renovation projects regardless of the funding source. General interior design guidance and interior design guidance for medical facilities and family housing is provided at the following websites.

- General Guidance. Design Guide (DG) 1110-3-122, *Design Guide for Interiors*.
- Medical Facilities. Interior design guidance for medical facilities is furnished in Unified Facilities Criteria (UFC) 4-510-01, Design: Medical Military Facilities.
- Family Housing. Interior design for family housing will be in accordance with Technical Instruction (TI) 801-02, *Family Housing*.

8.13.3 Engineering Regulation (ER) 1110-345-122, *Engineering and Design, Interior Design*, defines projects that require interior design, design requirements and responsibilities of participants, and methods and funding for execution of interior design. For cost estimating see Air Force Interior Design Guides, Chap. 3, Cost Estimating Guide.

8.13.4 Space Planning.

8.13.4.1 Space planning is the basic building block of the facilities program for administration and operational facilities. Army Regulation (AR) 405-70, *Utilization of Real Property* (Appendix D) provides numerical planning allowances and addresses the quantities for programming space for personnel and equipment.

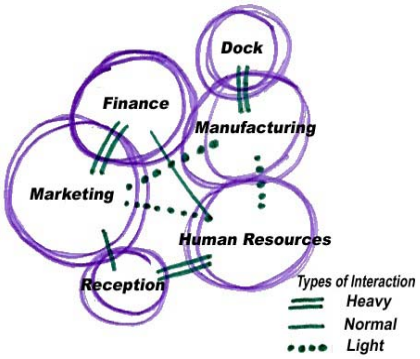


Figure 8.13 - A typical Bubble Diagram Indicating

8.13.4.2 Space planning takes into consideration the following; who will be using a space, how this space will be used, what activities will take place there, and the interaction of other people in the building. Professionally trained interior designers are best at gathering the required information to formulate a space utilization plan.

8.13.4.2.1 Bubble Diagrams. Bubble diagrams show the working relationship of one group to another (Fig 8.13). They do not represent a space plan or floor plan, but the relationship of organizations to one another. The adjacency requirements for individuals, user groups, and support functions to accomplish the product of service provided are analyzed. Bubble diagrams assist in organizing an existing facility as well as a new facility.

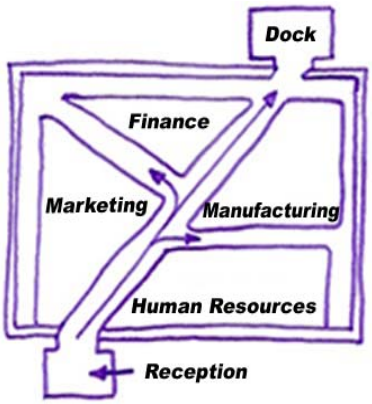


Figure 8.14 - A Typical Blocking Diagram Demonstrating the Fit into the Floor Plan

8.13.4.2.2 Blocking Diagram. An extension of the bubble diagram is the block diagram. The blocking diagram is made more regular and is for fit inside the proposed floor plan (Fig. 8.14).

8.13.4.2.3 The next step in the process is the development of the actual space plan. The layout of the space plan is detailed to the workstation level.

8.13.5 Electrical and Communications.

8.13.5.1 Electrical. Electrical power supply in the United States is available in a number of configurations, the most common of which are 120/240 volt single-phase three wire, 120/208 volt 3-phase 4-wire, and 277/480 volt 3-phase 4 wire.

8.13.5.1.1 Design standards for interior electrical systems are found in Unified Facilities Criteria (UFC) 3-520-01, *Interior Electrical Systems*. Compliance with this UFC is mandatory for the design of interior electrical systems. This UFC:

- Establishes criteria for the design of interior electrical systems.
- Establishes system-level design criteria.
- Establishes facility-level criteria for interior electrical systems,
- Provides a starting point for determining the applicable design criteria for a facility.

8.13.5.1.2 Facilities outside the United States must comply with the applicable host nation standards; refer to Technical Manual 5-688, *Foreign Voltages and Frequencies Guide*, for additional information.

8.13.5.2 Communications. Communications systems handle the transport of telephone and data networks (e.g. video, multi-media, teleconferencing, data transfer, facsimile transmission, and voice conversation).

8.13.5.2.1 The design criteria for interior wiring of communications and information system is found in the Installation Information Infrastructure Architecture (I3A) Design and Implementation Guide. This guide shall be used as the basis for designing both the premises distribution system (inside plant) and the outside plant cable distribution system for all new construction and renovation projects. The Installation Information Infrastructure Architecture (I3A) Design and Implementation Guide is Appendix A of U.S. Army Corps of Engineers engineering technical letter (ETL) 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide.

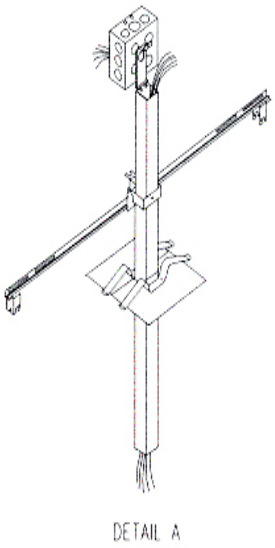


Figure 8.15 - System Furniture Utility Column

8.13.5.3 Distribution. Distribution of electrical and electronic systems through a building is generally accomplished through branched distribution. A central chase or trunk will run the length or height of the facility, and then horizontal distribution systems run from a central

connection closet to the end user. This distribution may be overhead or underfoot, in many instances it is a combination of the two (Fig. 8.15).

8.13.6 Color.

8.13.6.1 Color plays an important role in the design of interior environments. Color has a large impact on how we feel and behave in a space. Its quality affects emotions directly and immediately. Successful interior designs harmonize form, space, light, and color.

8.13.6.2 Information on color and light, optical effects, basic color theory, color schemes, and applying color in facilities can be found in Corps of Engineers, Design Guide (DG) 1110-3-122, *Design Guide for Interiors*, Chap. 3, Light and Color and in the Air Force Interior Design Guides, Chap. 9, Color Principles, Part 1 and Part 2.

8.13.7 Acoustics.

8.13.7.1 Acoustics as an environmental variable significantly impacts the human impression of an interior environment. Productivity, speech intelligibility, privacy, safety, positive user attitude and response, and environmental comfort all depend on proper acoustic design. The interior designer is concerned with reducing unwanted noise and preserving desirable sound in a space. Sound can be controlled in the following three ways: eliminate the source, isolate the source, i.e. provide a barrier between the user and the source or mask the offending sound.

8.13.7.2 A discussion of the dynamics and control of acoustics can be found in the Design Guide (DG) 1110-3-122, *Design Guide for Interiors*, Chap. 5.

8.13.8 Interior Lighting.

8.13.8.1 Lighting will be designed with the work activities being performed in mind. Always supplement overhead lighting with task lighting and use architectural lighting in entrances, corridors, waiting rooms, and other spaces to light artwork and provide interest.

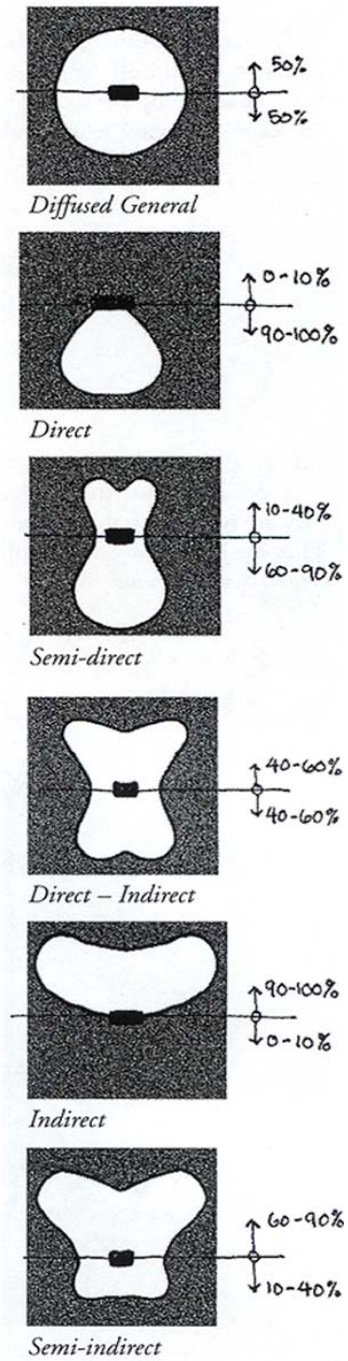


Fig. 8.16 - Typical Distribution of Light

8.13.8.2 For Army installation buildings to achieve a high quality lighting environment, lighting equipment/systems selected must satisfy both performance and aesthetics (Fig 8.16). Factors for consideration in this selection are based on the following: lumens per watt, color temperature, color rendering index, life and lumen maintenance, availability, switching, dimming capability, and cost.

8.13.8.3 Lighting design approaches and lighting applications can be found in the following publications:

- Technical Instructions (TI) 811-16, *Lighting Design*; Design Guide for Interiors, DG 1110-3-122 Chap. 5
- Air Force Interior Design Guides, Chap. 10
- Unified Facilities Criteria (UFC) 3-520-01, Interior Electrical Systems, Appendix F.

8.13.8.4 Lighting Maintenance. Types, and Problem Solving. Information on lighting maintenance, types, and lamp trouble-shooting is found in TM 5-683, Electrical Interior Facilities, Chap. 9.

8.13.9 Finishes. Interior finish standardization is important for administrative and financial reasons. Standardization presents a unifying element throughout all buildings that is more cost effective, efficient, and easy to maintain.

8.13.10 Installation Finish Standards. Installation finish standards are found in Appendix I, Interior Finishes Standards of this guide.

8.13.11 Furnishings. Furnishings are elements added to a building for utility or ornamentation following construction. These include furniture such as chairs, desks, sofas, and tables and also cabinetry, window treatments, signage, accessories, art, and plants (Fig. 8.17). When selecting furnishings for an interior environment, care should be taken to include their design as an integral part of the overall concept and to ensure coherency between architecture, materials, furniture, art, and signage. The following paragraphs discuss the various furnishings components and give guidance on the programming, acquisition, functionality, and maintenance of the various components.

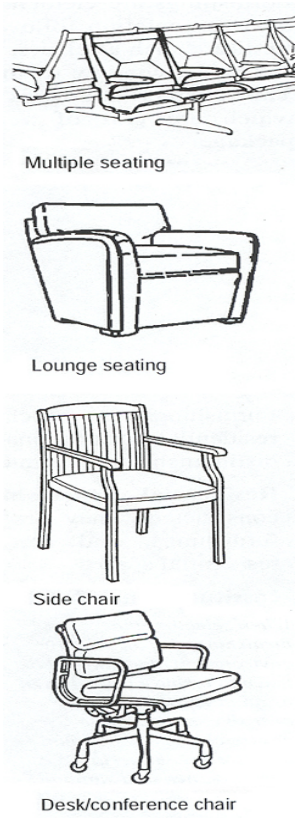


Figure 8.17 - Contract Seating, Various Chair Classes

8.13.11.1 Furniture. Furniture systems are a wide range of furniture types comprised of components to create a custom designed work environment to meet specific functional needs. Furniture includes seating and case goods. Case goods are furniture elements constructed from box-like components. These include desks credenzas, file cabinets, etc. Case goods fall under two major categories: conventional and modular. Conventional case goods are delivered as pre-assembled, ready-to-use products. Modular case goods are manufactured as separate pieces that may be grouped into a number of different arrangements.

8.13.11.1.1 Systems Furniture. Systems furniture is ergonomically designed to meet a variety of conditions and requirements. Careful planning is critical during the initial stages of designing new systems furniture layouts. Power and communications requirements must be

determined and planned so they are available at the locations were they are needed. Provisions for furniture systems electrical and data requirements must be made a part of the construction documents. See paragraphs 8.13.5.1.1 and 8.13.5.2.1 for interior design standards for electrical and communications wiring respectively. Surface mounted conduit and power poles are unsightly and should be avoided.

8.13.11.1.2 For a detailed discussion on the Army Interior Design Process (planning and programming, procurement, and design services) and Planning for Administrative Work Environments (data collection, analysis, space planning, layout, design coordination, documentation, and implementation) see Appendix A and Appendix B of Design Guide for Interiors, DG 110-3-122 respectively.

8.13.11.1.3 Budgeting for Furniture Systems. Furniture systems represent a significant percentage of a project. Furniture systems are O&M funded and should be included in the project scope along with such items as built-in casework. Furniture systems are listed on the DD Form 1391 as a non-add entry in Block 9 for "Equipment Provided for Other Appropriations". In Block 12b, the furniture systems should be as an O&M funded item, the fiscal year the funds are requested, and the line item cost. Accessories can amount for a significant portion of the furniture systems package and should be budgeted with the basic system components.

8.13.11.1.4 Systems Furniture Design Guidelines.

8.13.11.1.4.1 General.

- During the initial planning of new systems furniture, consider the condition and appearance of existing paint, wall coverings, carpet, and base of the area.
- When planning the location of office equipment and break areas, do not place heat generating devices, such as coffee makers or copiers, near a thermostat.
- Circulation paths should be clear and easy to navigate.
- Topics that should be considered when designing new systems furniture layouts include:
    - Function of the office
    - Adjacencies of personnel and activities
    - Meeting and conference room requirements
    - Individual storage needs

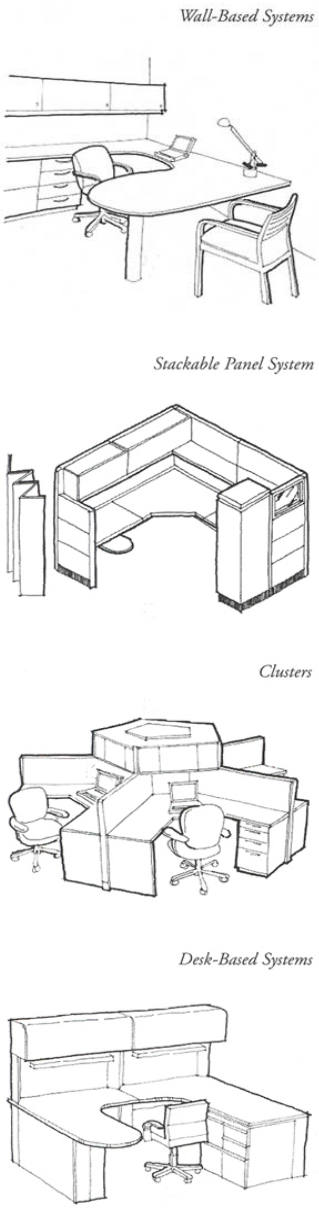


Figure 8.18 - Systems Furniture

- Areas for common use office equipment such as the copier and fax
- Reception area with waiting and guest seating space
- Special furniture or needs of a particular office, such as drafting tables or extra storage space
- Communications equipment
- Task lighting, daylight, and ambient lighting
- Special security requirements
- Budget constraints
- Flexibility to allow future changes
- Schedules of design, delivery, and installation
- Air conditioning
- Acoustic performance requirements

8.13.11.1.4.2 Panels.

- Full height panels should be used only in areas with a specific need for increased privacy or separations, such as conference rooms, break areas, and certain private offices.
- Provide glass panels in corners and at windows to open up the space and allow natural light to filter into the center of the space.
- Provide access panels in the systems furniture to allow for communications connection.
- Panels should generally not exceed 66 inches in height in an open office area. Taller panels cut off air circulation, block views and natural light, and create a closed-in feeling.
- The location and use of taller panels must be carefully planned and coordinated because they can interfere with the proper functioning of air conditioning diffusers, fire sprinklers and smoke detectors, lighting fixtures, switches, thermostats, and sensors.
- Panels should not block service access to mechanical, electrical, or telephone equipment.

- Do not install panels in front of windows, as they will block natural light for the entire area. Panels installed perpendicular to windows should be installed at a window mullion.

8.13.11.1.4.3 Color and Texture.

- To maintain a professional atmosphere, the style and types of systems furniture should be consistent throughout the area.

- The materials and colors of the panels and chairs should be durable. They should be heavy-duty and stain resistant.

- The fabric on the systems furniture panels should harmonize with the overall building color scheme.

8.13.11.2 Window Treatments.

8.13.11.2.1 Window treatments serve many purposes in an interior environment. They provide privacy, light and sun control, reduced energy consumption, and decreased sound transmission. The type of treatment, as well as the type of material used, will determine the effective of the treatment in and give instance. The following should be taken into consideration when selecting fabric type:

- Sheer or semi-sheer fabrics will provide minimum privacy, shade, and energy conservation.

- Heavy, opaque fabric and hard treatments should be used only where total light exclusion is required.

- Full, soft treatments will absorb more sound than hard treatments.

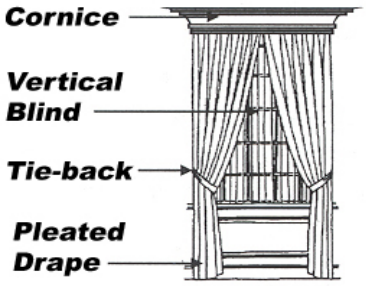


Figure 8.19 - Window Treatments Should Complement the Interior Space

8.13.11.2.2 Window treatments should complement and support the interior design of a space (Fig. 8.19). Window treatments also conceal architectural defects, or change the apparent size, shape, and character of a room. Consider the following factors when making a window treatment selection:

- Light control requirements

- Architectural style

- Historical context

8.13.11.3 Signage.

8.13.11.3.1 Signage may be informational, directional, or regulatory. Informational signage provides the user with information and includes room or area labels, bulletin boards, menus, artwork descriptions, and emergency information. Directional signage directs circulation and provides orientation. It includes entry directories, directional arrows, and maps. The purpose of regulatory signage is control: providing prohibitions, warnings, emergency instructions, and use restrictions (Fig. 8.20).

8.13.11.3.2 Interior signage is covered in detail in Technical Manual (TM) 5-807-10, *Signage*. The manual includes graphics for the following: directional, identification signs, information, and pictograms.

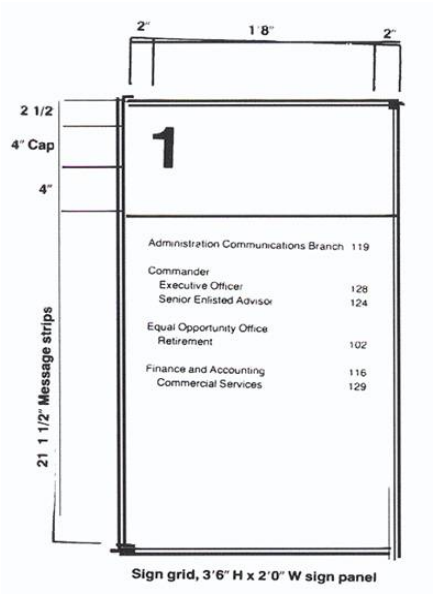


Figure 8.20 - Directional Signal Directs Circulation

8.13.11.4 Accessories.

8.13.11.4.1 Accessories may be either functional or decorative. Whatever the purpose, accessories serve to make a room appear inviting and personal.

8.13.11.4.2 Functional Accessories. These accessories include letter trays, coat racks, lamps, product displays, magazine racks, brochure racks, and message boards. This group of accessories should be selected for utilitarian aspects as well as aesthetic qualities that may contribute to the total design concept. Repetitive elements can act as unifiers and help tie the accessories to the design theme.

8.13.11.4.3 Decorative Accessories. Decorative accessories are objects such as artwork and plants.

8.13.11.5 Art. The preparation of artwork to be displayed and positioned in an interior space involves many important decisions. The designer must work closely with the user to determine placements that are satisfactory for both functional and visual composition. Some of the factors to be taken into consideration in the selection of are:

- Quality (posters, prints, original art),
- Subject matter,
- Medium (photography, paper, oil, etc.),
- Size,
- Placement,
- Method of display (permanent collection or rotating program),
- Lighting, and

- Integration with design scheme.

8.13.11.6 Plants.

8.13.11.6.1 Plants add color, texture, and variety of form and shape to the interior. They bring a natural element to an interior space. They are used for focal points, screen, and for psychological effect. Increasingly, plants are being incorporated into the interior environment for the health and well-being of the user, as well as enrichment of the space.

8.13.11.6.2 When selecting plants, their light, water, and temperature needs, continuing care requirements, and ease of replacement must all be considered. Also, the types and amount of light the space has (direct or indirect) daylight, fluorescent, or incandescent must be considered. Plants should not be positioned such that their location presents a problem when watering.

8.13.11.6.3 Detailed information on interior planting to include design considerations (light requirements, temperature, atmosphere considerations, and planters), plant maintenance, and a listing of recommended plants can be found at the following web locations (Air Force Interior Design Guides, Chapter 8):

- Design Considerations
- Maintenance
- Recommended Plant List

8.13.12 Unified Facilities Guide Specifications. See the "Division 12 - Furnishings" section on the Construction Criteria Base website for Unified Facilities Guide Specifications for furnishings.

8.13.13 Installation Furnishings Standards. Installation furnishings standards are found in Appendix J, Interior Furnishings Standards of this guide.

Like This

Not This

Figure 8.21 - Decorative Accessories Can Add a Sense of Uniqueness

8.13.14 Interior Operations Policies. To preserve the quality of facilities, operations policy is set between the user and the installation management. The user is responsible for preserving the visual appearance of the facility, and installation management is responsible for providing maintenance needed to preserve facility quality. Interior operations policies address the following issues (See Appendix N, Housekeeping Rules (Example) :

- Housekeeping responsibilities.

- Policy to prevent and eliminate visual clutter.
- Carpet cleaning, repair, and replacement policy.
- Height restrictions for partitions and furniture.
- Policy on buildings modifications including: partitions, painting, window treatment, HVAC, lighting, and the installation of communications and electric wiring.
- Maintenance of directories and signage.
- Smoking and eating locations.
- Procurement information on matching or compatible furniture.
- Policy on personalization and plants.

8.13.15 Interior Appearance Policy. The following are Army standards to follow..

- Keep work areas cleared of clutter. Cleanup, throw away.
- Avoid hanging things in the work area. Find another way to refer to organization charts, personnel listings, and calendars, other than having them hung on walls or partitions except framed artwork, diplomas, awards, etc.
- Notes and references hung on partition walls should be kept below the height of the partitions. Some things may be mounted on the partitions by hooking into the metal supports between the partitions, but not by hooking into the fabric.
- Anything not contributing to the overall décor of the work area should be put in a drawer or on a shelf behind a closed door.
- Do not overwhelm the work area décor with an excess of plants or personal artifacts.
- Thin out your files.
- Keep walkways into work areas open and free of clutter. Do not store things on the floor, or on top of shelves, or partitions.
- Office chiefs should consider the overall office appearance and visual contrasts between work areas.
- Be sure that anything you do in your work area contributes to color coordination, rather than detracts from it.
- Keep vacant workstations and common areas clean. Do not use them as a dumping area for things you do not know what to do with.

8.14 EXTERIOR BUILDING MATERIALS AND COLOR

Figure 8.22 - Exterior Quadrangle

8.14.1 Exterior Building Materials

8.14.1.1 Building materials make a major contribution to the scale, color, texture, and character of a military installation. A limited palette of durable, low maintenance materials should be used that, while encouraging a variety of expression provides a cohesive and consistent architectural character through the installation and within each visual zone. Material should reflect the function of a building, and its hierarchy within the installation.

8.14.1.2 Use the following guidelines when selecting exterior building materials.

Figure 8.23 – Exterior 100 Area

8.14.1.2.1 Choose materials for their longevity and maintenance characteristics.

8.14.1.2.2 Use materials with integral colors - avoid painting exterior colors.

8.14.1.2.3 Use installation standard colors for exterior walls. Add accent colors sparingly. Accent colors can be used in recesses and to accent certain portions of a buildings façade.

Figure 8.24 – Exterior 200 Area

8.14.1.2.4 Use pre-finished material where possible - gutters, window frames, doorframes, etc.

8.14.1.2.5 Use blended colors on pitched roofs.

8.14.2 Appendix K, Exterior Materials Charts list the building materials applicable to the visual zones listed.

8.14.3 Exterior Building Color

8.14.3.1 Color charts have been developed for specific geographical areas giving consideration to climate, geography, culture, facility function, historical context, architectural character, etc. Color changes will be implemented during normally scheduled paint cycles (see Appendix L, Exterior Color Charts).

Fig.8.25 - The Geographical Areas for Exterior Colors

8.14.3.2 Color is closely linked to the appropriate selection of exterior building materials and is a critical design element in relating adjacent buildings and creating a compatible visual environment within an installation.

8.14.3.3 Historic Buildings. Repaint the building or structure to match the existing colors or colors that can be documented to have been used on that building.

8.15 KEY FACILITY TYPES STANDARDIZATION

8.15.1 The Assistant Chief of Staff for Installation Management (ACSIM) establishes Army facility standards and approves deviations from the standards.

8.15.2 Residential Communities Initiative.

8.15.2.1 The intent of the Residential Communities Initiative (RCI) is to improve the housing for military families by providing quality housing that is built in attractive neighborhoods.

8.15.2.2 The Military Housing Privatization Initiative (MHPI) legislation allows developers to build housing to local standards. In those areas where local standards do not meet the quality of life requirements of soldiers, the Community Development and Management Plan (CDMP) process allows a negotiated determination of those standards. To ensure a uniform level of quality throughout RCI, Headquarters, Department of the Army has developed a "Quality Standards for New and Replacement Residential Communities Initiative (RCI) Family Housing" to be used as reference points during CDMP preparation.

8.15.2.3 All RCI projects planned or under design will meet the "Gold" SPiRiT rating (as of 18 March 2003). See Assistant Secretary of the Army Memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003.

8.15.3 Department of the Army (DA), Facilities Standardization Program.

8.15.3.1 Under the DA Facilities Standardization program, standard design packages are developed for facility types that are repetitively designed and constructed at Army installations. These design packages are developed to the definitive design level (10%-15%) and once approved are mandatory for Army MILCON.

8.15.3.2 Currently, there are thirty one (31) DA standard design packages. Headquarters, U.S. Army Corps of Engineers has established eight (8) Centers of Standardization to develop and maintain the definitive and design packages. See Appendix P, DA Facilities Standardization Program Centers of Standardization for a list of the various centers and the facility type assigned to each center. (Centers of Standardization homepage.)

8.15.3.2.1 Army Chapel Design Standards are complete and approved. See The Army Standard for Chapel Construction – January 2004 and Memorandum for Record, subject: The Army Standards for Chapels, dated 21 January 2004.

8.15.4 Unaccompanied Personnel Housing (Army Barracks Modernization Program).

8.15.4.1 The Army's Barracks Modernization Program is based upon a whole community approach providing modernized private living and sleeping areas for soldiers as well as a more functional work environment. This is being realized with the construction and renovation of barracks, and associated Company Operations Facilities (COF), Battalion Headquarters (BN HQ)

and Brigade Headquarters BDE HQ), and Dining Facilities (DFAC). For a detailed discussion of the Army Barracks Modernization Program see the Army Barracks Master Plan. The Army Barracks Master Plan only includes requirements for activity duty permanent party soldiers' barracks.

8.15.4.2 Army Barracks Standards. The Army Barracks Modernization Program design criterion gives commanders and contractors the direction to incorporate best business practices around a modular floor plan. The Army Barracks Master Plan, Appendix I, Army Barracks Standards, promotes barracks with an appropriate balance between private and common areas. The Vice Chief of Staff of the Army (VCSA) specified the "New Army Barracks Construction Criteria" in his Memorandum Subject: New Barracks Construction Criteria, dated 11 July 2002 in which he strongly endorsed the new standards. The criterion was further revised in Memorandum Subject: Revised Barracks Construction Criteria, dated 1 May 2003 which makes the following four changes to the Army Barracks Standards:

- Establishes the two-bedroom/one bath module as the standard module;
- Requires installation of a stove or cook top;
- Requires laundries in the barracks; and
- Eliminates the separate solider community building.

See the above memorandum for detailed guidance.

8.15.4.3 Furnishings.

8.15.4.3.1 Acquisition of new furnishings is planned and accomplished in concert with the facility design and construction schedule so that delivery of the new furnishings coincides with the beneficial occupancy date (BOD).

8.15.4.3.2 The U.S. Army Interior Design Manual (IDM) for Single Soldiers provides guidance to help furniture managers prepare order packages. The manual uses standard Army furniture specifications; i.e. medium oak wood furnishings or acceptable wood/steel alternatives; construction and fabric specification, and specific information for authorized items of furniture. The manual also contains standard living/sleeping room arrangements, and SCB plans with color schemes. The manual includes information on waiver requirements, the procurement process, order forms, and final inspection checklist.

8.15.4.4 Construction design criteria for COFs, BN HQ buildings, BDE buildings, and DFAC facilities can be viewed on the web at ProjNet.

8.15.5 Army Lodging.

8.15.5.1 The Army Lodging Standards promote economies in serving the Army traveler, but not at the expense of quality or service. The standards define the facilities and the level of service the Army traveler should expect.

8.15.5.2 The following standards provide the level of service that a guest should expect when they travel to an Army installation. That expected level of service should be consistent from installation to installation. The following documents provide the service, operations, and facilities standards for Army Lodging.

- Army Lodging Standards for Service
- Army Lodging Standards for Operations
- Army Lodging Standards for Facilities

8.15.6 Morale, Welfare, and Recreation (MWR) Branded Theme Operations.

8.15.6.1 The U.S. Army Community and Family Support Center (CFSC) through its Theme Operations, offers comprehensive theme packages pertaining to restaurants and entertainment centers. The packages are customized to the installation.

8.15.6.2 CFSC will conduct an assessment for market viability; provide architectural designs, and other promotional items. Information on the CFSC Branded Theme Operations to include how to get a theme operation, management support, and food service support is located on the CFSC website at the Army Brand Theme Operations Home Page.

8.15.7 Range Standards.

8.15.7.1 The Army Sustainable Range Program (SRP), proponent is HQDA Office Deputy Chief of Staff Operations, ODCSOPS/G3 (DAMO-TRS), phone number (703) 692-6410. To contact SRP technical support call (256) 895-1535 or e-mail RTPL@HND01.usace.army.mil.

8.15.7.2 The SRP develops and manages standard designs for Army Ranges in accordance with AR 210-21 and Training Circular 25-8 Army Training Ranges. The Range Standards are available on the following web pages.

- Design Manual for Remoted Target Systems (RETS) Ranges, CEHCN 1110-1-23 Manual.
- Revised Range Design/Construction Interface Standards.
- Unexploded Ordinance Considerations in the Planning, Design, and Construction of Ranges, Supplement to CEHNC 1110-1-23 Manual.

8.16 PHYSICAL SECURITY REQUIREMENTS

To assure the required physical measures are met the installation Provost Marshall or Physical Security Officer will be coordinated with during the planning, design, and construction of all construction projects. (AR 190-13, *The Army Physical Security Program*, Para 1-26) See Section 12, Force Protection for a more detailed discussion regarding Antiterrorism measures.

8.17 SALE AND OUTLEASE OF ARMY ASSETS

8.17.1 In an effort to offset some of the impacts of constrained resources, the Army has implemented initiatives that improve cost effectiveness and efficiency of installation operations. To the extent permitted by law, funds that become available as a result of these initiatives are retained by, or returned to, garrison commanders.

8.17.2 The Office of the Assistant Secretary of the Army for Financial Management and Comptroller (OASA (FM&C)) has developed the "Sales and Outlease of Army Assets - Installation Guide" to assist garrison commanders in using the sales and outlease program. The guide provides an overview of major policies, procedures, and responsibilities pertaining to the following three major initiatives of the program:

- Sale of Real Property;
- Outlease of Real Property; and
- Outlease of Personal Property.

The guide provides hyperlinks to Sale and Outlease governing regulations and legal and informational references.

8.18 ARMY STANDARDS

8.18.1 The cited Army Standards shall be met.

- Army Regulation (AR) 420-70, *Buildings and Structures*
- Unified Facilities Criteria (UFC) 3-520-01, *Interior Electrical Systems*
- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Secretary of the Interior's Standards for the Treatment of Historic Properties
- U.S. Army Corps of Engineers Engineering Technical Letter (ETL) 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide
- Standards of Seismic Safety for Existing Federally Owned and Leased Buildings
- Army Barracks Master Plan, Appendix I, Army Barracks Standards
- Memorandum Subject: Revised Barracks Construction Criteria, dated 1 May 2003
- Quality Standards for New and Replacement Residential Communities Initiative (RCI) Family Housing
- Army Lodging Standards
- Design Manual for Remoted Target Systems (RETS) Ranges, CEHCN 1110-1-23 Manual
- Unexploded Ordinance Considerations in the Planning, Design, and Construction of Ranges, Supplement to CEHNC 1110-1-23 Manual

- Revised Range Design/Construction Interface Standards

8.19 REFERENCES

8.19.1 The following references are provided for guidance.

- Army Regulation (AR) 190-13, *The Army Physical Security Program*
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*
- Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*
- Army Regulation (AR) 200-4, *Cultural Resources Management*
- Army Regulation (AR) 405-45, *Real Property Inventory Management*
- Army Regulation (AR) 405-70, *Utilization of Real Property*
- Unified Facilities Criteria (UFC) *2*-600-01*, Installation Design,* Chap 8
- Unified Facilities Criteria (UFC) 1-200-01, *Design: General Building Requirements*, 31 July 2002
- Unified Facilities Criteria (UFC) 4-510-01, Design: Medical Military Facilities
- Unified Facilities Criteria (UFC) 3-400-01, Design: Energy Conservation
- Engineering Regulation (ER) 1110-345-122, *Engineering and Design, Interior Design*
- Department of the Army Pamphlet (DA PAM) 200-4, *Cultural Resources Management*
- U.S. Army Corps of Engineers, Design Guide (DG) 1110-3-122, *Design Guide for Interiors*
- Department of Defense (DoD) Interior Design Website
- Technical Instructions (TI) 800-01, *Design Criteria*
- Technical Instructions (TI) 809-04, *Seismic Design for Buildings*
- Technical Instructions (TI) 809-05, *Seismic Design Evaluation and Rehabilitation for Buildings*
- Technical Instructions (TI) 811-16, *Lighting Design*
- Technical Manual (TM) 5-683, *Electrical Interior Facilities*
- Technical Manual (TM) 5-688, *Foreign Voltage and Frequencies Guide*
- Technical Manual (TM) 5-809-10/Navy NAVFAC P-355/Air Force AFM 88-3, Chap 13, *Seismic Design for Buildings*
- Technical Manual (TM) 5-809-10-2/Navy NAVFAC P-355.2/Air Force AFM 88-3, Chap 13, Sec B, *Seismic Design Guidelines for Upgrading Existing Buildings*
- Army Barracks Master Plan
- Air Force Sustainable Facilities Guide
- Air Force Interior Design Guides

- Office of the Assistant Secretary of the Army for Financial Management and Comptroller (OASA (FM&C)) Sales and Outlease of Army Assets - Installation Guide
- Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website
- U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website
- U.S. Army Corps of Engineers Engineering Technical Letter (ETL) 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide
- Whole Building Design Guide
- Unified Facilities Guide Specifications (UFGS), "Division 12 - Furnishings", Construction Criteria Base
- Engineering and Construction Bulletins

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SECTION 9 CIRCULATION DESIGN STANDARDS

9.1 INTRODUCTION

9.1.1 The image of the installation is greatly determined by the design and location of roadways, walkways, entrances, and parking lots. The primary roadway system and parking lots utilize considerable amounts of land and are a visually dominant element of any installation. The location of primary circulation elements is presented in Section 7, Site Planning. This section discusses the details of circulation design and impacts.

9.1.2 The circulation system provides a primary vantage point from which all installations are viewed. Safe and efficient vehicular movement results in better orientation and contributes to the development of a positive environment for installation personnel and visitors. The circulation component is used to assess the circulation elements of the installation and identify specific characteristics that provide visual zone and theme identity.

9.1.3 Roadways, pedestrian walkways, and bicycle trails will be designed to provide a hierarchy of circulation design and carrying capacity. Functionally, a hierarchical network can be created that separates incompatible types of traffic. This separation of traffic promotes sustainability because it results in more efficient energy consumption.

9.1.4 Visually, the circulation hierarchy can be reinforced through design, planting, signage, and lighting to promote a more attractive visual experience and promote a sense of orientation.

9.2 CIRCULATION OBJECTIVES

The goal for the circulation system on the installation is to establish a sustainable system that promotes aesthetic appeal, environmental preservation, and energy conservation while providing safe and efficient circulation. The objectives below should be followed to achieve a sustainable circulation system:

- Provide circulation that meets antiterrorism and security requirements and promotes and enhances public health and safety.

- Provide a system of circulation that includes all forms of vehicular and pedestrian circulation (Fig. 9.1).
- Provide a system that includes hierarchies of vehicular and pedestrian traffic flow (Fig. 9.2).
- Adapt the circulation system to the natural conditions of the site (Fig. 9.3).
- Improve the existing circulation network for expansion, safety, way finding and appearance.
- Promote maintenance and repair of existing and proposed circulation systems.

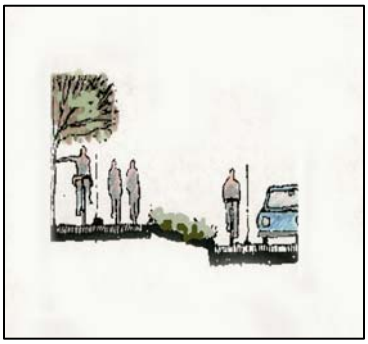

Figure 9.1 – Vehicular/Pedestrian

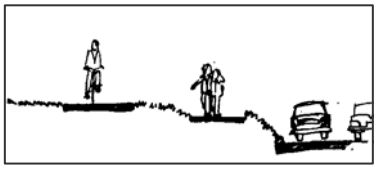

Figure 9.2 – Separate Pedestrian/ Bicycle/ Vehicular Access

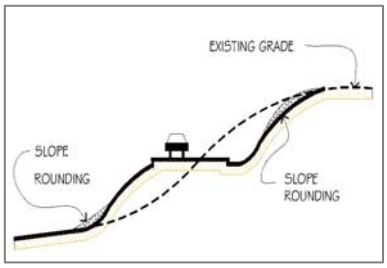

Figure 9.3 – Adapt Circulation to Topography

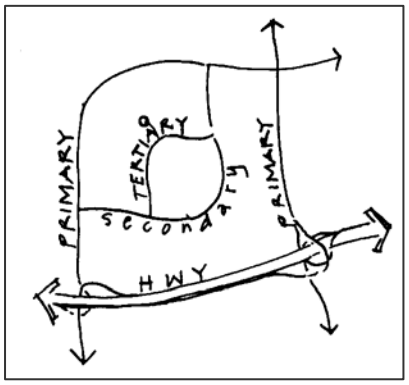

Figure 9.4 – Roadway Hierarchy

9.3 ROADWAY HIERARCHY

9.3.1 The roadway network of the installation should functionally and visually reflect a logical hierarchy of traffic circulation. The network should separate types of traffic by function and volume, ranging from through traffic to local traffic. The visual character of each segment of the network should appropriately convey its role and function within the overall network. The basic network is classified as follows in terms of the type, character, and appearance of the road (Fig. 9.4).

9.3.1.1 **Highways**. Highways provide primary high-speed traffic access to, around, or through a military installation. The design includes:

9.3.1.1.1 Continuous, relatively straight or large radii curvilinear alignments that carry high-speed through-traffic movement between major activity centers within a region.

9.3.1.1.2 A minimum of two lanes on each direction typically divided by a median or median divider.

9.3.1.1.3 Alignments that border lane use areas rather than bisect them, and green space buffers between the road and adjacent uses.

9.3.1.1.4 Controlled access onto the road.

9.3.1.1.5 Either grade-separated or at grade channelized intersections with traffic signal controls.

9.3.1.1.6 Shoulders for emergency stopping but strict prohibition of on-street parking.

9.3.1.1.7 Street signing, lighting, and planting that reflects the high-speed nature of traffic movement.

9.3.1.2 **Primary Roadways**. These are arterial routes that connect major activity centers, provide the primary access through the installation, and provide the means by which most people view the installation (Fig. 9.5). These roadways often traverse the entire installation and carry the heaviest volume of traffic that results in high speed and high visibility corridors. Direct access to this type of road should be restricted to crossing at major intersections. Primary roadways are designated as boulevards in urban areas and as avenues in rural and suburban areas (Fig. 9.6). Design characters include:

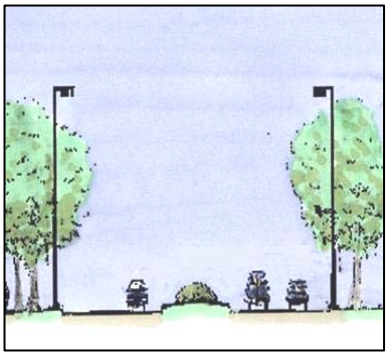

Figure 9.5 – Primary Roadwav

9.3.1.2.1 Continuous, through-traffic alignments that are relatively straight or large-radii curvilinear to handle moderate to heavy traffic.

9.3.1.2.2 Alignments that form the boundary between different land uses are preferable to alignments that transect a land use zone.

9.3.1.2.3 Two or more moving lanes in each direction typically divided by a median.

9.3.1.2.4 Controlled access and a minimum of curb cuts limited to entranceways to major facilities or building groups.

Figure 9.6 - Boulevard

9.3.1.2.5 At-grade intersections with signal controls.

9.3.1.2.6 On-street parking prohibited.

9.3.1.2.7 Medians, street lighting, signing, and planting that enforces the moderate- to-high speed nature and importance of the road.

9.3.1.2.8 Curbs, gutters, and sidewalks provided in all cantonment area and other residential areas with densities greater than two dwelling units per acres.

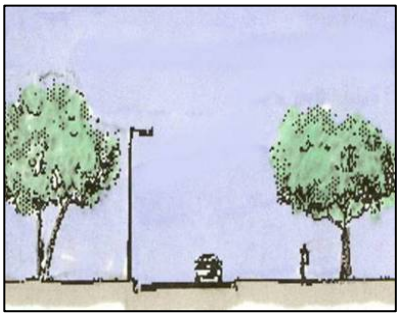

Fig. 9.7 – Secondary Street

9.3.1.3 **Secondary Roadways**. Secondary roadways serve as connectors between primary roads and tertiary roads and typically connect primary roads to adjacent land use zones (Fig. 9.7). Secondary roads accommodate moderate to slow traffic speeds with one moving lane in each direction. On-street parking should be prohibited and left-turn lanes provided at intersections with primary roads. Design characteristics include:

9.3.1.3.1 Continuous through-traffic alignment between primary roads, either straight or curvilinear based upon the design speed topography and land pattern.

9.3.1.3.2 Direct access to abutting property.

9.3.1.3.3 A maximum of two moving traffic lanes in each direction, either undivided or a boulevard with planted median.

9.3.1.3.4 On-street parking generally prohibited.

9.3.1.3.5 Sidewalk separated from the road by a planting strip.

9.3.1.3.6 Street lighting, signing, and planting that reflects the moderate-to-slow speed nature of traffic and the character of the land use area they are in.

9.3.1.3.7 Curbs, gutters, and sidewalks provided in all cantonment area and other residential areas with densities greater than two dwelling units per acres.

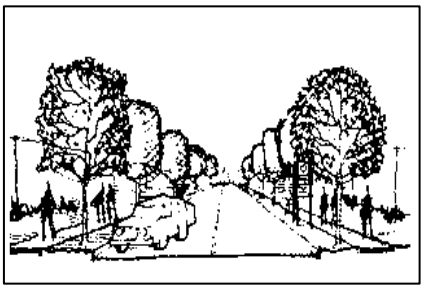

Figure 9.8 - Improved, Visually Appealing Streetscape

9.3.1.4 **Tertiary Roadways.** Tertiary roadways provide access to individual facilities, parking and service areas. They are designed to handle low speed, low volumes of traffic, with one lane in each direction. Tertiary roadways make use of "T" intersections and cul-de-sacs to reduce through traffic, promote safety, and limit noise impacts from truck traffic. Design characteristics include:

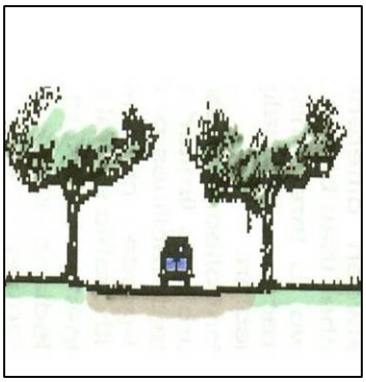

Figure 9.9 - Tertiary Street Elevation

9.3.1.4.1 Alignments designed to discourage through-traffic.

9.3.1.4.2 Alignments are relatively short straight or curvilinear keeping with topography, land use, and slow speed nature of traffic.

9.3.1.4.3 Generally a maximum of two moving traffic lanes, one in each direction.

9.3.1.4.4 On-street parking allowable on an infrequent overflow basis by the addition of a parallel parking lane or bay.

9.3.1.4.5 Curbs, gutters, and sidewalks provided in all cantonment area and other residential areas with densities greater than two dwelling units per acres.

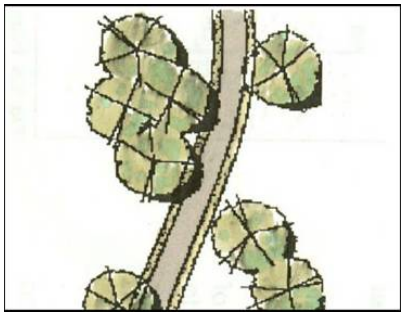

Figure 9.10- Tertiary Street Plan

9.3.1.4.6 Sidewalks maybe limited to only side, depending upon need.

9.3.1.4.7 Street lighting, signing, and planting in character with slow speed nature of traffic and the land use area within which the road is located.

9.3.1.5 **Cul-de-sacs**. Cul-de-sacs are short dead-end tertiary streets located primarily in residential areas. They connect at one end to a tertiary or secondary street and have a turnaround at the other end, providing direct access to a abutting property while preventing through traffic. Design characters include:

9.3.1.5.1 Short, straight, or curvilinear alignment to serve abutting property (Fig. 9.11).

9.3.1.5.2 Generally a maximum of two traffic lanes, one in each direction.

9.3.1.5.3 Generally a maximum length of 600 feet, or less, except in areas where terrain and low density justify a longer length.

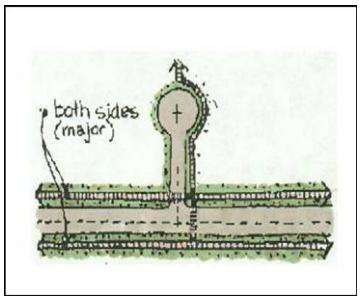

Figure 9.11 - Cul-de-sac Plan

9.3.1.5.4 Turnarounds must include a diameter to accommodate fire and garbage trucks.

9.3.1.5.5 Turnarounds can be either symmetrical or offset.

9.3.1.5.6 Turnarounds should have center planting islands to reduce the expanse of paved area.

9.3.1.5.7 Overflow parking can be provided on street in parking bays or within center of turnarounds.

9.3.1.5.8 Sidewalks, if any, are generally limited to one side of the road.

9.3.1.5.9 Street lighting, signing, and planting is character with the slow speed nature of traffic and the land use area being served.

9.3.1.6 Tactical vehicle trails provide alternative access for armored vehicles and other vehicles utilized in combat readiness training. They are recommended for installations with high use of armored vehicles to enhance the movement of the vehicles and reduce traffic congestion on the other installation roadways. These trails provide one lane access for vehicles between motor pools and maneuver areas. It is recommended that these trails be hard surfaced within developed areas with concrete of a thickness to withstand the weight of armored vehicles. The hard service will reduce dust pollution. These trails should be designed to provide as direct access as possible while minimizing crossings with primary, secondary, or tertiary roads. All crossings with the other roadway systems should be paved with concrete to support the weight of the vehicles and clearly marked with signage.

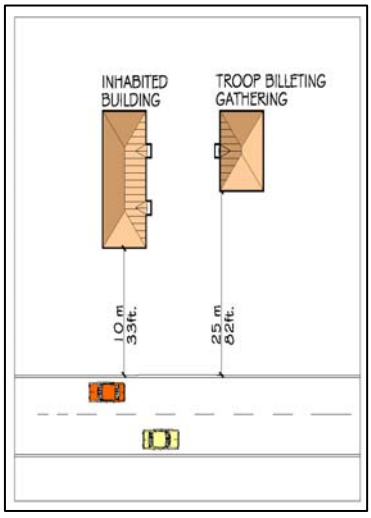

Figure 9.12 - Antiterrorism Roadway Setbacks Within a Controlled Perimeter

9.4 ROADWAY SETBACKS

Department of Defense Antiterrorism standards state that all inhabited buildings within a controlled perimeter will be setback a minimum of 10 meters (33 feet) from roadways, and that troop billeting and primary gathering spaces shall be setback a minimum of 25 meters (82 feet) from roadways.(Fig. 9.12) Inhabited buildings not within a controlled perimeter the minimum setback distance is 25 meters (82 feet) and for primary gathering places and troop facilities the minimum distance is 45 meters (148 feet). (See, Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

Figure 9.13 - Positive Visual Image

9.5 ROADWAY SYSTEM DESIGN

9.5.1 The location and design of new circulation system alignments as well as improvements to the existing system should be prepared to promote development sustainability. They should be designed to minimize impacts, relieve driver monotony, and provide a positive visual experience for the user, without compromising safety (Fig. 9.13). The following design techniques should be applied to circulation system design.

Figure 9.14 – Build Circulation into Natural Landform

9.5.2 Blend Circulation With Natural Landform. The horizontal and vertical alignment of roads, walkways, and bikeways should minimize landform disturbance and blend with the natural setting (Fig. 9.14).

9.5.2.1 Minimize cut and fill by avoiding steeping terrain and aligning roadway, walkway, or bicycle system to cross slopes diagonally or parallel to the contours rather than perpendicular to the contours.

9.5.2.2 Mold cut and fill slopes to blend into the natural landform.

9.5.2.3 Blend road drainage ditches, swales, or channels into the natural landform.

9.5.2.4 Use cluster development wherever possible to limit the lengths and required intersections of roadway and other circulation system elements and to preserve land. Consideration should be given to meeting

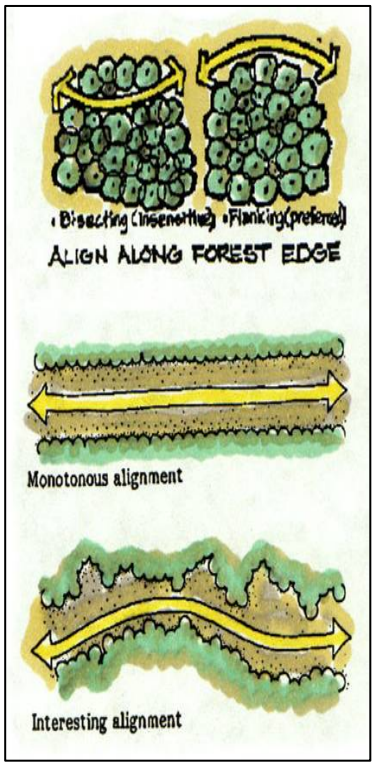

Figure 9.15 – Roadway

antiterrorism requirements when developing cluster type facilities.

9.5.2.5 Minimize pedestrian, railroad, and bikeway crossings of highway, primary, and secondary roads.

9.5.2.6 Use natural topographic conditions to create grade separated pedestrian, railroad, and bikeway road crossings wherever possible especially on highways and primary roads.

9.5.3 Adapt Circulation to Preserve Vegetation. Design roads, walkways, and bike paths to minimize disturbance to existing vegetation, encourage re-vegetation in disturbed areas, and reduce the visual impact of landscape disturbance (Fig. 9.15).

9.5.3.1 Align roads through open areas rather than forested areas.

9.5.3.2 Minimize cut and fill to reduce the limits of clearing.

9.5.3.3 Clear only for sight distances rather that uniform right-of-way clearing.

9.5.3.4 Utilize tree wells or retaining walls to preserve specimen trees or significant vegetation areas.

9.5.3.5 Provide optimum conditions for re-vegetation by following proper planting and maintenance techniques.

9.5.3.6 Restore vegetation to disturbed areas using naturalistic plantings of native plant material.

9.5.4 Minimize Adverse Impacts on Adjacent Land Uses.

9.5.4.1 Air Pollution. Locate roadway alignments to minimize the impact of traffic-emitted pollutants on adjacent development. This can be accomplished by the following:

9.5.4.1.1 Locate roads adjacent to land uses that are minimally affected by traffic-emitted air pollutants.

9.5.4.1.2 Reduce the impact of traffic-emitted pollutants on more sensitive land use areas by locating the roadways downwind and/or providing planted buffers. Tactical

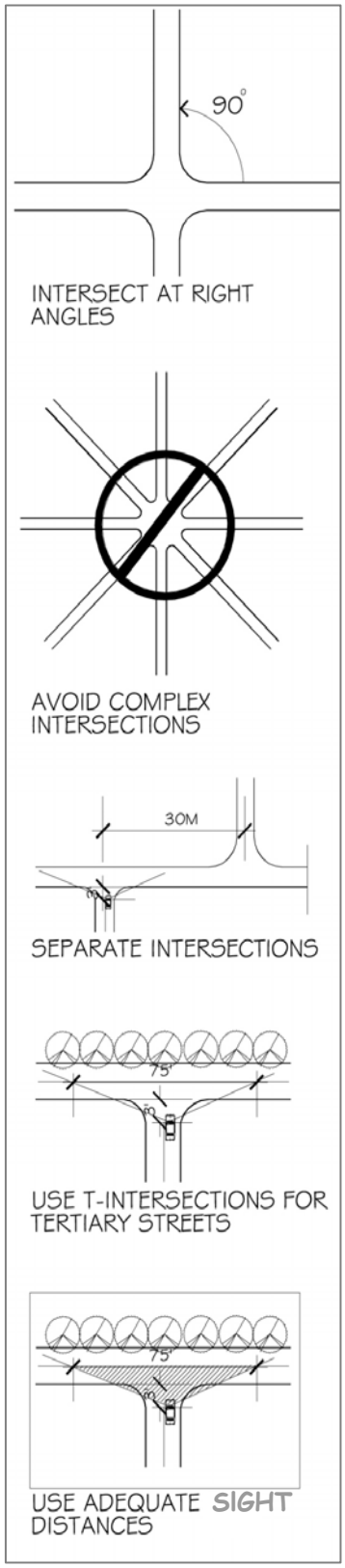

Figure 9.16 – Intersection Design

vehicle trails should be hard surfaced to reduce dust pollution.

9.5.4.2 Noise Pollution. Design and locate roadways to reduce the impact of traffic noise on adjacent development.

9.5.4.2.1 Roads should be physically separated from sensitive land uses including residential, medical, education, recreation, administration, religious, library, community, or child care facilities.

9.5.4.2.2 Utilizing noise abatement techniques such as berms, sound barrier walls, and plant material to reduce noise levels.

9.5.4.2.3 Reroute truck and tank traffic to roadways adjacent to less noise sensitive land uses. Tracked vehicle traffic should, ideally, be routed to a system of tank trails that are totally separate form corridors used by wheeled traffic vehicles.

9.6 INTERSECTIONS

9.6.1 Intersections are the most dangerous areas of the installation circulation system. They should be planned or improved to provide safe and efficient traffic flow for both pedestrian and vehicular traffic. The following design techniques should be used to plan or improve intersections (Fig. 9.16):

9.6.1.1 All roadways should intersect at right angles (90 degrees), although 85-95 degrees is acceptable.

9.6.1.2 Avoid dangerous, complex intersections of more than two streets intersecting at one point or offset intersections.

9.6.1.3 Eliminate intersections that are in close proximity to one another. They should be no closer than a minimum distance of 30 meters (100 feet).

9.6.1.4 Use T-intersections for tertiary road intersections with secondary or primary roads to reduce conflict and promote safety.

9.6.1.5 Provide turning lanes at all intersections along primary roads to eliminate interference with through traffic flow.

9.6.1.6 Minimize intersections along primary roads to reduce points of conflict and increase safety. Existing intersections with secondary and tertiary streets can be eliminated by the use of cul-de-sacs with traffic routed along parallel streets to primary and secondary streets.

9.6.1.7 Include adequate sight distances to meet minimum standard requirements at all intersections. The location from where the driver is waiting to cross or enter a traffic lane to a point 23 meters (75 feet) down the centerline to the right and the left forms the sight triangle.

9.6.1.8 Minimize pedestrian and bicycle intersections with primary streets.

9.6.1.9 Provide crosswalks at all intersections where necessary, marked with paint or vinyl strips or identified with a different paving surface.

9.6.1.10 Provide pedestrian access to persons with disabilities in accordance with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS). In the event of a conflict the most stringent standards will be applied.

9.6.1.11 Create local service drives or access roads to parallel highways and primary roads to provide access to properties fronting the primary road avoiding a direct curb cut form the primary road to each individual property.

9.6.1.12 Intersections between railroad track and high-speed roads must be signaled, well marked and have a smooth transition. All other road crossings must be well marked and have clear line of sight down the tracks.

9.7 ENTRANCE GATES

9.7.1 The location and design of the installation entrance gates is a primary component of the installation circulation system. Entrance gates must be designed to be functional, while providing security protection not only for the installation itself, but also for personnel and others waiting to be admitted to the installation. Gates should also be designed as a visual amenity to provide an aesthetically pleasing entrance to and exit from the installation. See Section 12, Force Protection, para 12.7 for information on the design standards for installation gates.

9.8 PARKING REQUIREMENTS

9.8.1 The total quantity of parking in any one location will vary with the needs of the facility. The following are general considerations considering parking requirements.

9.8.1.1 All parking lots will be accessible to persons with disabilities in accordance with the requirements of the UFAS, paragraph 4.1.1(5)(a). If parking spaces are provided for employees or visitors, or both, then accessible spaces shall be provided in conformance with the required minimum number of accessible spaces shown in Figure 9.17.

Total spaces in parking area	Required minimum number of accessible spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of total
1001 and up	20 plus 1 for each 100 over 1000

Figure 9.17 - Required Minimum Number of Accessible Parking

9.8.1.2 For initial planning and programming, allocate 400 square feet of parking lot area per car. The total provides adequate minimum space for the parking spaces, access drives, and planting islands that make up a parking lot. This allocation is not withstanding tactical military vehicles.

9.8.1.3 Minimize parking space requirements of a facility by selecting a site that will allow the sharing of parking with related activities.

9.8.1.4 Small parking lots are usually preferable to large lots because they enhance the visual environment by increasing the percent of landscaped area to paved area and allow more conformances to natural topography.

9.8.1.5 The monotony of large parking areas can be altered by the use of designs such as curvilinear parking or the introduction of large planting islands.

9.8.1.6 Promote means of access other than vehicular by providing alternative means of access such as walkways and bikeways.

9.9 PARKING LOT LOCATION AND DESIGN

9.9.1 Parking areas can be designed and enhanced to provide a more pleasing impact and a more comfortable physical experience for the user. The following design techniques should be used to create more aesthetically pleasing, physically comfortable parking lots.

9.9.1.1 Locate parking lots between and behind buildings to reduce the visual impact from the circulation system.

9.9.1.2 Locate parking lots on relatively level areas to avoid excessive cut and fill.

9.9.1.3 Design parking lots to be efficient in the design and placement of access drives and parking spaces. All drives providing direct access to parking spaces should provide spaces on both sides of the drive.

9.9.1.4 Provide planting areas at the ends of all rows of parking spaces. Provide islands with trees within the main parking lot to soften the visual expanse of the parking lot, provide shade and/or wind breaks (Fig. 9.18).

9.9.1.5 Use natural topography and existing trees to visually screen parking areas from adjacent facilities and other parking bays (Figs. 9.19).

9.9.1.6 Design parking lots to preserve significant existing trees. Provide a planting area around the tree that is large enough to allow water to the root system.

9.9.1.7 On street parking along primary and some secondary streets should be avoided because it reduces the vehicular carrying capacity of the street, is visually unattractive, and is

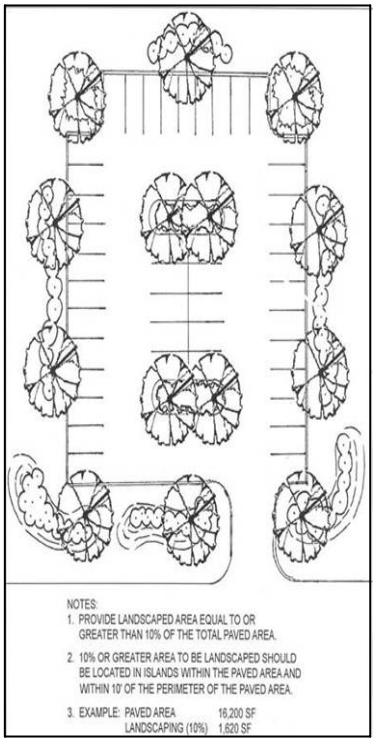

Figure 9.18 - Provide Islands with Trees to Soften Visual Expanse

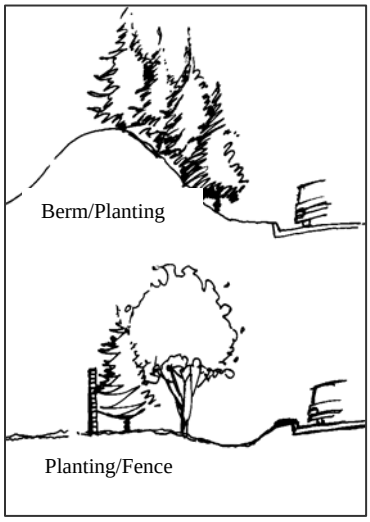

Figure 9.19. – Trees/Berms/Walls Screen Parking Lot

unsafe.

9.9.1.8 Parking lots should be paved with concrete, asphalt, or other paving material.

9.9.1.9 Parking structures, both below grade and above grade, provide for greater parking capacity in densely developed areas where available land is scarce. Parking structures are expensive, but they provide a number of benefits including efficient land use, reduced visual impact and protection of vehicles from inclement weather. If parking structures are built they shall be designed to meet antiterrorism requirements.

9.9.2 Parking Area Design Guide. A comprehensive parking area design guide which includes siting, parking area types, geometry (parallel, perpendicular, angled), access, and maintenance consideration is located at the following website: U. S. Air Force Landscape Design Guide, Section 14, Parking Areas.

9.9.3 Antiterrorism Setback Requirements.

Parking lots within a controlled perimeter shall be located a minimum of 10 meters (33 feet) from inhabited structures, and 25 meters (82 feet) from troop billeting and primary gathering structures. Parking lots without a controlled perimeter shall be located a minimum of 25 meters (82 feet) form inhabited structures, and 45 meters (148 feet) from troop billeting and primary gathering areas (UFC 4-010-01, Table B-1). Designated parking for family housing located within secured perimeters with access control is excluded from the 25-meter (82 feet) setback requirement.

9.10 SERVICE AREAS

Facilities that require pickup and deliveries should have a service area that allows for easy access to a loading dock exclusively for service vehicles. These areas should be designed to provide direct, easy access for vehicles and not conflict with railroad operations (Fig. 9.20). They should be screened from public view to reduce negative visual impacts. Service areas shall meet all antiterrorism requirements.

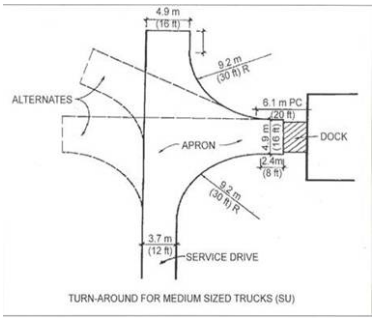

Figure 9.20 - Typical Loading Area

9.11 DROP-OFF AREAS

Facilities that include a high percentage of persons arriving by vehicle should include a vehicle drop-off area for users. Included are buildings such as headquarters, child development centers, schools, dining facilities, and clubs. Antiterrorism standards state that the access drive must be clearly defined and marked and that their intended use is clear to prevent parking of vehicles in those areas and that drop-off lanes will not be located under any inhabited portion of a building (UCF 4-010-01, para B-1.4) It is recommended that physical barriers be used to define the area.

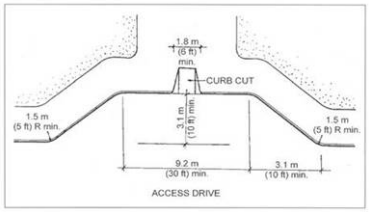

Figure 9.21 - Typical Drop Off Area

These barriers may include curbing, planters, or other barriers together with signage to identify and restrict access. The driveway shall be configured so that vehicles can be restricted during times of high alert. Access to the driveway shall be located outside the standoff area with the initial approach parallel to the building, or a barrier must be directed to prevent direct vehicular movement toward the building (Fig. 9.21).

9.12 WALKWAYS AND PEDESTRIAN CIRCULATION

9.12.1 Walkways provide connections for pedestrians between buildings and ancillary facilities such as parking lots and other areas. Well designed and located pedestrian walkways also provide a desirable alternative to total dependence on motor driven vehicles (Fig. 9.22).

Figure 9.22 - Promote Means of Access Other Than Vehicular: Provide Walkways and Bikeways

9.12.2 The goal is to encourage the use of walkways as an alternative means of circulation. Pedestrian walkways should be designed and located to provide a comfortable, enjoyable experience for the user. The use of walkways within the installation promotes development sustainability by conserving energy, reducing air pollution, and decreasing the land requirement for parking. These walkways as well provide a means to increase physical fitness.

9.12.3 In order to achieve this goal the following objectives must be met:

- Provide walkways that are designed at a pedestrian scale to be comfortable and pleasant.
- Provide safe and secure pedestrian facilities that are separate from vehicular and railroad traffic.
- Provide amenities for pedestrians.
- Provide accessibility to all users, including physically impaired or challenged persons (Fig. 9-23).. All street and driveway crossings shall be ramped, marked, and accessible to persons with disabilities in accordance with requirements of the UFAS. See the following UFAS paragraphs for the respective standards: Curb Ramps, paragraph 4.7; Ramps, paragraph 4.8; Stairs, paragraph 4.9.

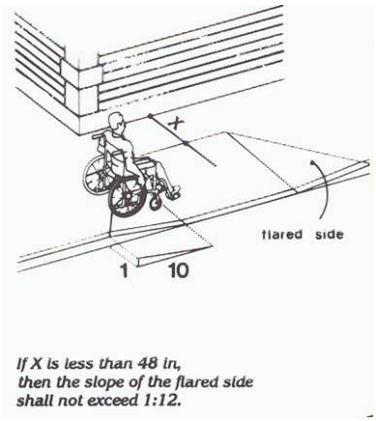

Figure 9.23 - Ramps Must Be Provide Per UFAS Standards

- Provide links to major attractions and generators of pedestrian traffic.
- Provide design consistency throughout the walkway and be well drained.

9.12.4 Walkway Network Hierarchy. Sidewalks are classified to conform to the hierarchy roadway system - Primary walkways, secondary walkways, and tertiary walkways. Non-

roadway oriented sidewalks should be sized and placed where people will use them rather than creating worn "shortcut" paths. Railroad track crossing should be avoided, but where necessary, they should be well marked and have good line of sight. Walkways through railroad track ballast should be maintained with small, well-drained rock.

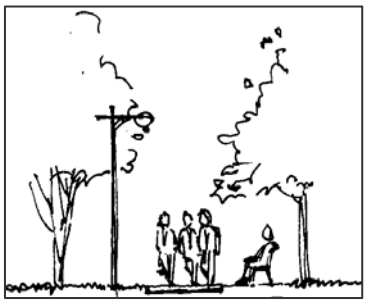

Figure 9.24 – Primary

9.12.4.1 Primary Walkways.

9.12.4.1.1 Primary walkways (Fig. 9.24) should be placed along both sides of primary roadways, wherever possible, within the cantonment areas. These walkways are also used for high volume pedestrian routes to facilities and should be designed along axis lines relating to adjacent building entries, plazas, or streets. They should be paved with concrete, brick, or other pavers.

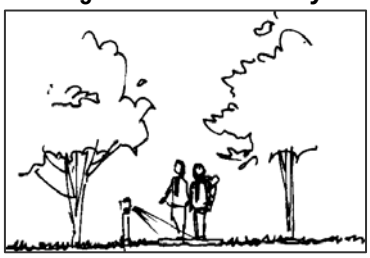

Figure 9.25 – Secondary Walkways

9.12.4.1.2 Primary walkways should be sized to accommodate anticipated pedestrian use. They should have a minimum width of 1.8 meters (6 feet), and a maximum width should be 3-3.5 meters (10-12 feet) in high use areas.

9.12.4.2 Secondary Walkways.

9.12.4.2.1 Secondary walkways (Fig. 9.25) should be provided along one or both sides of secondary and tertiary streets. They are designed to carry moderate volumes of pedestrians between activity centers and housing areas. They should provide access to building entrances, plaza areas, or streets. They should be paved with concrete, brick, or other pavers.

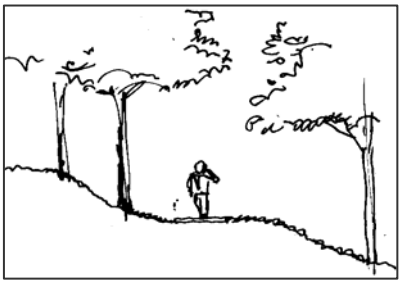

Figure 9.26 – Tertiary Walkways

9.12.4.2.2 These walkways should be sized to accommodate anticipated pedestrian use, but not less than 1.2 meters (4 feet), and a maximum of 3-3.5 meters (10 - 12 feet) in high use areas.

9.12.4.3 Tertiary Walkways.

9.12.4.3.1 Tertiary walkways (Fig. 9.26) provide pedestrian walkways in recreational and scenic areas for casual walking and hiking. They can be paved with concrete or bituminous asphalt or constructed with woodchips. The layout of the walkway should have a meandering and curvilinear alignment. Paved walkways should have a minimum width of 1.2 meters (4 feet). Wood chip trails should have a minimum width of 1 meter (3 feet) (Fig. 9.27). Where paths are designated for use by bicyclists and pedestrians, these widths should be increased

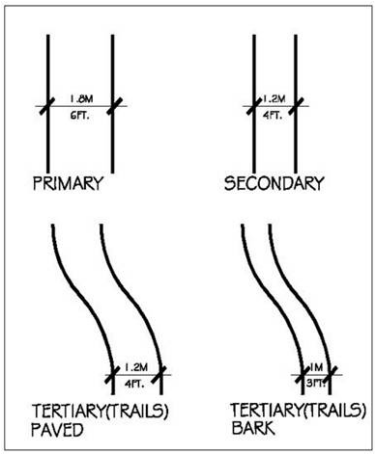

Figure 9.27 – Minimum Walkway Widths

an additional three feet for each bike lane.

9.12.5 Troop Running Trails.

Troop running trails should be provided for soldiers both in and out of formation. The width should 4.5-5 meters (approximately 15 feet) to provide the width necessary for four soldiers abreast with a cadence caller. Primary, secondary, and tertiary walkways can be designed to provide this function.

9.12.6 Troop Movement Paths.

In locations where troops need to move four (4) abreast; for example, troops marching in formation between classrooms, barracks/dinning hall facilities, a hard surface walkway of adequate width should be provided.

9.12.7 Site Amenities at Walkways.

9.12.7.1 Utilize site furnishings to reinforce the walkway system hierarchy. Provide directional and informational signage, where appropriate. Locate site furnishings, such as benches, tables, waste receptacles, drinking fountains, and signage in response to travel distance and traffic volume.

9.12.7.2 Site furnishings should be placed at regular intervals along walkways, parallel to the walk and facing the flow of pedestrian traffic (Fig. 9.28).

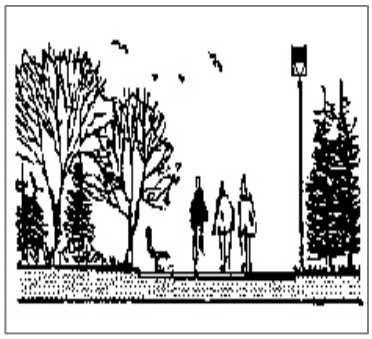

Figure 9.28 – Place Landscape and Site Furnishings along Walkways

9.12.8 Landscaping at Walkways.

Use a combination of canopy and ornamental trees along sidewalks to provide shade, define the path, provide visual interest, and discourage the creation of “shortcuts”. Utilize evergreen buffer plantings to screen harsh winds and undesirable views. Discourage the use of flowering/fruit bearing trees and shrubs along walkways because of threat of insects or other problems.

9.13 BIKEWAYS

9.13.1 The use of bicycles as alternatives to the automobile has become more acceptable to installation personnel This trend is encouraged as a method of reducing the automobile vehicle trips within the installation and reduce the need for greater carrying capacity. Also, cycling is a popular recreation activity that is enhanced by the availability of a safe and well planned system of bike trails.

9.13.2 A bikeway system should provide direct routes between primary traffic and destination within the installation. This network should be continuous and minimize conflicts between bikes, pedestrians, and vehicles. Bikeways should be planned and designed according

to the classifications that define the level of separation they maintain from roadways and walkways. The ideal solution for the development of bikeways is to physically separate them from both roadways and walkways.

9.13.3 Bikeways are design according to the following classifications:

9.13.3.1 Class I Bikeway. A Class I Bikeway is intended for the exclusive use of bicycles. While it may parallel a roadway, it is physically separated by distance or a vertical barrier (Fig. 9.29). Class I Bikeway considerations include:

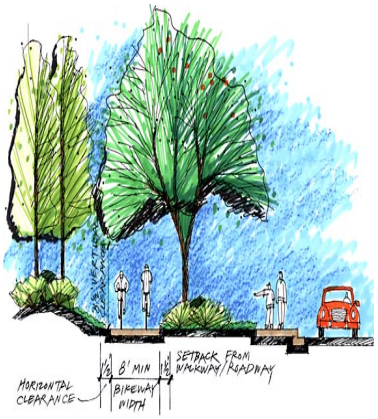

Figure 9.29 - Class I

- A class I Bikeway provides the safest and most efficient means of bicycle travel and is the preferred option for bikeway development.
- Crossing of a Class I Bikeway by pedestrians, train, or automobile should be minimized.
- If a Class I Bikeway does not closely parallel a roadway, it should be designed to provide appropriate bikeway gradient and curvature.
- Class I Bikeways require the greatest amount of space and advance planning to reserve land and assure appropriate routing.
- Railroad crossings should be well marked, with proper operating signals and clear sighting down the tracks. Road crossing transitions should be smooth and well drained.

9.13.3.2 Class II Bikeways. A Class II Bikeway shares the right-of-way with a roadway or walkway. It is indicated by a bikeway pictograph on the pavement and a continuous strip on the pavement or separated by a continuous or intermittent curb or other low barrier (Fig. 9.30). Class II Bikeway considerations include:

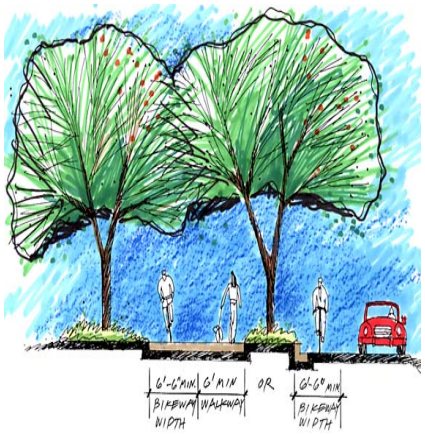

Figure 9.30 - Class II

- Because some separation is provided for bicycle travel, a Class II Bikeway provides some level of safety for the bicyclist and pedestrian.
- While crossing by pedestrians or automobiles are discouraged, they are not as controllable as they are on a Class I Bikeway because the Class II Bikeway is adjacent to the walkway or roadway.
- Because Class II Bikeways are tied to the adjacent roadway or walkway, route selection is important to maintain appropriate bikeway gradient and curvature.

- Class II Bikeways generally require less space than Class I Bikeways because they follow the alignment of and share the right-of-way with a roadway or walkway.

9.13.3.3 Class III Bikeways. A Class III Bikeway shares the right-of-way with a roadway or walkway. It is not indicated by a continuous strip on the pavement or separated by any type of barrier, but it is identified as a bikeway with signs (Fig. 9.31). Class III Bikeway considerations include:

- Because no separated is provided, there is a higher potential for safety conflicts between automobiles and bicycles and between bicycles and pedestrians.

- Class III Bikeways provide continuity within the bikeway network and designate preferred shared routes to minimize potential conflicts. To maintain safety for bicyclist and pedestrians, Class III Bikeways should be developed, if possible, only where automobile and pedestrian traffic is moderate to light.

- Because Class III Bikeways share the roadway or walkway, route selection is important to maintain appropriate bikeway gradients and curvature.

Figure 9.31 - Class III Bikeway

- Class III Bikeways require the least space because they share the pavement with a roadway or walkway.

9.13.4 General Guidelines.

9.13.4.1 Wherever possible, provide a designated right-of-way for bike traffic, separate from vehicular and pedestrian routes.

9.13.4.2 Locate bikeway crossings away from vehicular intersections with crossings marked on the street pavement.

9.13.4.3 When separate bicycle right-of-ways are not feasible, designate bikeway lanes with paint on the right-hand side of roadways.

9.13.4.4 Bikeways should never share undesignated space with roadways except at crossings.

9.13.5 Bikeway Furnishings. Encourage use of the bicycle system by making trails visually attractive and providing pedestrian amenities in appropriate locations. Provide site furnishings such as benches, tables, waste receptacles, drinking fountains, and signage along paths. Location of these amenities should be in response to travel distance and traffic volume.

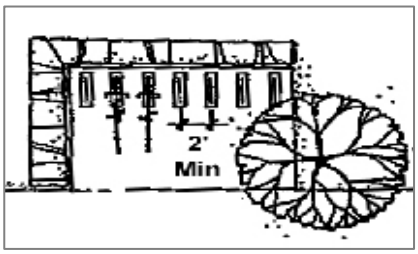

Figure 9.32 – Provide Convenient Bicycle Storage

9.13.6 Bicycle Storage. Provide bicycle storage racks in areas that can be visually supervised and in close proximity to building entrances, high activity areas, major workplaces, and recreational facilities, while avoiding conflicts with pedestrian circulation (Fig 9.32). Bicycle storage areas should be covered, especially at barracks, and easily accessible to building entrances (Fig. 9.33).

9.13.7 Landscaping. Use a combination of canopy and ornamental trees along bicycle paths for shade, route definition, and visual interest. Provide evergreen buffers to screen harsh winds and undesirable views.

9.13.8 Crosswalks. Provide crosswalks at all intersections of roads and walkways/bikeways. When laying out the crosswalk, consider the following:

- Extend walk's paving across the road in heavily used areas. Raised crosswalks eliminate the need for curb ramps in sidewalks.
- Provide a clear line of sight for motorist and pedestrians. Do not plant in sight lines. Walkways should meet the road at 90 degree angles (Fig 9.34).
- Adequate light should be provided.
- Provide barrier-free access at all intersections or used raised crosswalks.

Figure 9.33 - Bicycle Storage Should Be

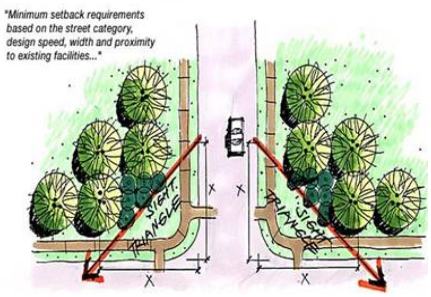

Figure 9.34 - Adequate Sight Lines Give Pedestrians an Unobstructed View of Crosswalks

9.13.9 Walkway and Bikeway Lighting Design. Roadway lights and building exterior lights can serve also as walkway and bikeway lights. Maximum use will be made of multi-purpose lighting systems. Paragraph 10.4 of Technical Manual (TM) 5-811-1, Electric Power Supply and Distribution directs the following walkway and bikeway lighting standards.

9.13.9.1 Intensities. Values are dependent upon whether walkways and bikeways are adjacent to roadways or are isolated from vehicular traffic.

9.13.9.1.1 Adjacent to Roadways. Walkways and bikeways will be illuminated to not less than one-half the maintained illumination required for adjacent roadways. Areas having in grade, such as stairs and ramps, will require special treatment. Crosswalks in the middle of the block will be illuminated to 1.5 to 2 times the normal roadway lighting level.

9.13.9.1.2 Remote from Roadways. Walkways and bikeways remote form roadways will have a minimum of 5 lux (.5 foot-candle) average illumination measured in foot levels. Pedestrian tunnels will have 40 lux (4.0 foot-candles), stairways will have 6 lux (0.6 foot-candles), and overpasses will have 3 lux (0.3 foot-candles) illumination.

9.13.9.2 Pole design. Where pole mounted lights illuminate only walkways or bikeways, shorter poles are most suitable, but luminaire height will not be less than 10 feet. Construction will be such as to minimize vandalism by use of break-resistant lenses, tamperproof screws, and sturdy poles.

9.13.10 Signs. The federal Manual of Uniform Traffic Control Devices (MUTCD) provides standards signs and markings for bicycle lanes and related bicycle facilities. See the MUTCD, Chapter 9 and any applicable amendments for traffic controls for bicycle facilities standards.

9.14 ARMY STANDARDS

9.14.1 The cited Army Standards shall be met.

- Army Regulation (AR) 420-72, *Transportation Infrastructure and Dams*
- Unified Facilities Criteria (UFC) *3-210-02,* Design: POV Site Circulation and Parking
- Unified Facilities Criteria (UFC) *3-230-18FA,* Design: General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas
- Unified Facilities Criteria (UFC) *3-260-02,* Design: Pavement Design for Airfields
- Technical Manual (TM) 5-811-1/Air Force AFJMAN 32-1080, *Electric Power Supply and Distribution*
- Technical Manual (TM) 5-850-2/Air Force AFJMAN 32-1046, *Railroad Design and Rehabilitation*
- Manual For Railway Engineering
- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Manual of Uniform Traffic Control Devices (MUTCD)

9.15 REFERENCES

9.15.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 9
- U.S. Air Force, Landscape Design Guide, Parking Area

- U.S. Air Force, Landscape Design Guide, Walkways and Bikeways (Provides a comprehensive walkways and bikeways planning guide including sections on paving materials and gradients and curvature data).

- Chicago's Bike Lane Design Manual (Provides a comprehensive series of technical drawings and design specifications for bike lanes).

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SECTION 10 LANDSCAPE DESIGN STANDARDS

10.1 INTRODUCTION

10.1.1 The Landscape Design Standards includes the selection, placement, and maintenance of plant material on the installation. Landscape plantings provide a simple and cost effective enhancement to the general appearance of the installation. **(Fort Sam Houston developed and published a Landscape Master Plan in 1997 and a Historic District Landscape Master Plan in 1999, both of which provide very specific guidance concerning landscaping for different parts of the installation. The general guidance included in the remainder of this section of the IDG will be followed only if a design consideration is not addressed in the existing Landscape Master Plan or the Historic Landscape Master Plan).**

10.1.3 The visual image conveyed by a military installation is defined not just by architectural character and site organization, but also by an attractive, organized landscape design. The presence of plant material on the installation greatly enhances the visual character and environmental quality of the installation.

10.1.2 Plantings add an element of human scale to open spaces and can be used functionally to screen undesirable views, buffer winds, reinforce the hierarchy of the circulation system, or provide a visual transition between dissimilar land uses.

10.2 LANDSCAPE OBJECTIVES

10.2.1 The overall objective of the use of plant material within the installation is to improve the physical and psychological well being of the people who live and work on the installation. This is achieved through the following objectives:

10.2.1.1 Preserve and enhance urban trees, forest lands, and detailed planting features such as shrubs and groundcovers.

10.2.1.2 Improve the overall visual quality of the installation through the use of native plant material to (Fig. 10.1):

Figure 10. 1 - Use native Plants to Improve Visual Quality

10.2.1.2.1 Blend the built environment with the natural

environment.

10.2.1.2.2 Provide scale and comfort to pedestrian environments (Fig. 10.2).

10.2.1.2.3 Reinforce the hierarchy of the traffic circulation system (Fig. 10.3).

10.2.1.2.4 Screen unsightly views or elements.

10.2.1.2.5 Buffer incompatible land uses.

10.2.1.2.6 Minimize maintenance through the use of native plant materials that require less maintenance to survive.

10.2.1.2.7 Enhance Antiterrorism capabilities.

Figure 10.2 - Provide Comfort to Pedestrian Environment

Figure 10.3 - Landscaping Reinforces Circulation Hierarchy

10.3 PRINCIPLES OF LANDSCAPE DEVELOPMENT

10.3.1 Landscape design is based on the following principles.

10.3.1.1 **Unity**. The selection and placement of plant material can be used to blend, screen, and soften incompatible architectural or other unattractive visual impacts. Plant material as a unifying element can be placed in front of a building or view to frame and enhance the visual impact.

10.3.1.2 **Balance**. Plant material can be selected and placed to provide visual equilibrium or balance through the use of either a symmetrical or asymmetrical planting scheme. Symmetrical plantings are generally more formal while asymmetrical plantings are informal.

10.3.1.3 **Contrast**. Plant material can be selected and placed to provide differences in size and shape that add interest to the environment. Plants can be located to provide a backdrop for other plants such as a hedge behind a bed of annuals or perennials.

10.3.1.4 **Rhythm**. Repetition of a single plant or a mass of plants provides visual interest and formality to the landscape. Rhythm produces emphasis and unity and is especially effective in articulating main circulation routes.

10.3.1.5 **Color and Texture**. Plants can be selected and placed to provide visual interest according to their color and texture. Colors are classified as either warm (red, orange, yellow) or cool

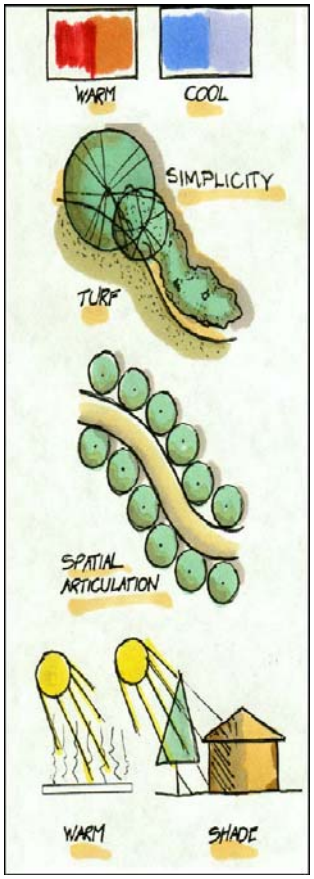


Figure 10. 4 - Principles of Design

(violet, blue, green). Texture is classified as either coarse or fine.

10.3.1.6 **Simplicity**. Landscape plans should be broad and simple in form to limit excessive maintenance. Plant material should be grouped in beds with simple edges that are easy to mow. Small turf areas should be avoided because of the difficulty of mowing. The use of annuals should be minimal because of the high maintenance involved.

10.3.1.7 **Ultimate Effect**. The landscape plan should be prepared with consideration for the mature size of all plants. The spacing of all material should utilize nursery industrial standards for mature material to account for spread as well as height. The ultimate height of the material should also be considered in relation to windows and other visual concerns.

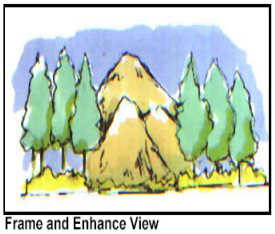
10.3.1.8 **Spatial Articulation**. Plants can be selected and placed to create enclosed spaces or to separate spaces from one another. They can also be used to direct people by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement is dependent upon the density, form, and type of plants used.

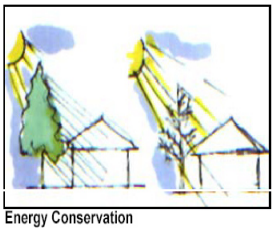
10.4 SUSTAINABLE LANDSCAPE DEVELOPMENT

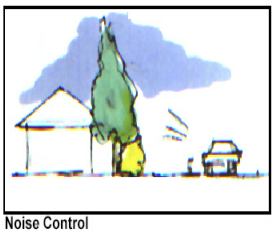
10.4.1 The use of plant material on the installation promotes the sustainability of the development. Trees, shrubs, groundcover, and vines provide aesthetic appeal as well as preservation of fauna and flora, energy conservation, climate modification, erosion control, air purification, and noise abatement (10.5).

10.5 LANDSCAPE DESIGN GUIDELINES

10.5.1 Proposed plantings must be reviewed to ensure that site conditions (soil, topography, adjacent uses, and architecture) and climatic criteria (sun, shade, and moisture requirements) are considered in the desired plant design and selection (i.e., form, texture, color, size). The uses and users of the site must also be considered. Landscape planting plans should be approved by qualified personnel to provide quality assurance and promote design consistency within each visual zone.


Frame and Enhance View


Energy Conservation


Noise Control

Wind Protection

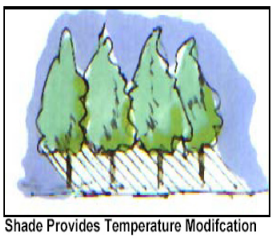

Shade Provides Temperature Modifcation

Figure 10.5 Plant Material Promotes Sustainability

10.5.2 The following paragraphs present landscaping guidelines for the various locations of plant material use.

10.5.2.1 **Foundation Planting**. Foundation planting provides a green background for additional plantings, adds scale and character to the building, helps to integrate the building with its surroundings, screens HVAC and other utilities and helps create a sense of arrival (Fig.10.6). When developing foundation planting plans consideration should be given Antiterrorism measures (See paragraph 10.11).

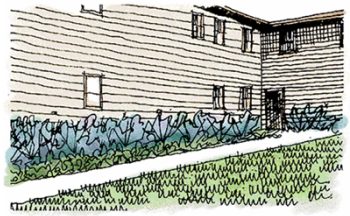


Figure 10.6 - Foundation Plantings Help Screen Utilities

10.5.2.1.1 Focal and seasonal plantings should be located at building entries for pedestrian interest.

10.5.2.1.2 Use the architecture of the building to evaluate the planting design and selection of plants.

10.5.2.1.3 Plant materials should not block windows and views from interior spaces.

10.5.2.1.4 Trees shall be setback from the building walls to provide space for mature growth and to prevent root systems from damaging the foundation.

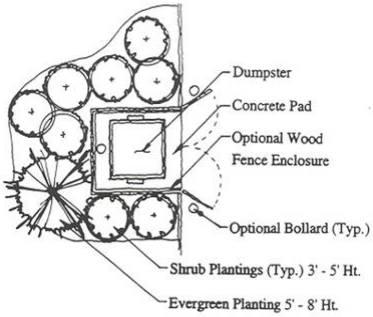


Figure 10.7 - Screen Dumpsters

10.5.2.1.5 A symmetrical foundation planting design should be used for a symmetrical building.

10.5.2.1.6 Due to the possibility of insect problems (bee stings, etc.) do not plant flowering plants near entrances.

10.5.2.2 **Screening**.

10.5.2.2.1 **Windscreens**. Use a combination of evergreen and deciduous trees to provide windbreak protection from prevailing winds. Windbreak plantings should be irregular in form, rather than straight and evenly spaced, in order to provide more effective wind control and to visually blend with the natural character of the installation.

Figure 10.8 - Enhance Open Spaces with Plantings

10.5.2.2.2 **Screening of Dumpsters**. Landscape planting should be used to supplement wood fence and masonry wall dumpster enclosures (Fig. 10.7).

10.5.2.3 **Buffer Planting**. Use a mixture of evergreen and deciduous trees and shrubs to visually separate land uses and to help separate visual zones.

10.5.2.4 **Open Space Planting**. Enhance open space areas with planting. Use a mix of evergreen, deciduous, and flowering trees. Plant the same kind of trees in massive groupings to impact the vast open areas (Fig. 10.8).

10.5.2.5 **Street Trees**. Street tree plantings should be used to reinforce vehicular hierarchy, orient and direct traffic, upgrade views, and to visually de-emphasize on-street parking (Fig. 10.9). Also, in the design of a street tree planting, separate plant species may be used to identify distinctive details or areas of the installation, for example, a particular land use relationship, historical district, community area, or other similar entity.

10.5.2.5.1 Use formal street trees in single rows to visually reinforce primary and secondary roads. Use regularly spaced and uniformly shaped deciduous trees to provide a regimented appearance.

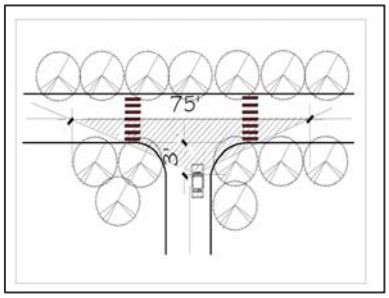


Figure 10.9 – Use Street Trees to Visually Reinforce Roadway Hierarchy

10.5.2.5.2 Use informal groupings of street trees along tertiary routes. Utilize medium size deciduous trees to screen on-street parking along roadways. Set trees 1 to 2 meters (3 to 6 feet) from the back of curbs. Spacing should be uniform, except where curb cuts interrupt regular spacing.

10.5.2.5.3 As a general rule, street trees should be deciduous species, resistant to salt and root pressure, and should have a 10' to 12' high clearance between the street pavement and branch height to allow adequate clearance for pedestrian and vehicle traffic to pass unimpeded by lower branches.

10.5.2.5.4 The street tree layout should be coordinated with the layout of proposed street lighting.

10.5.2.5.5 Appropriate plant heights should be used within sight triangles to ensure safe views from intersections.

10.5.2.5.6 Weeping trees should not be used in locations where they may hang over the roadway or block views.

10.5.2.6 **Parking Lot Planting**. Parking lots are often the least attractive elements on a military installation. The use of landscape plant material and earth berms can greatly improve the appearance of these areas as well as help define circulation and reduce heat gain during summer months (Fig. 10.10).

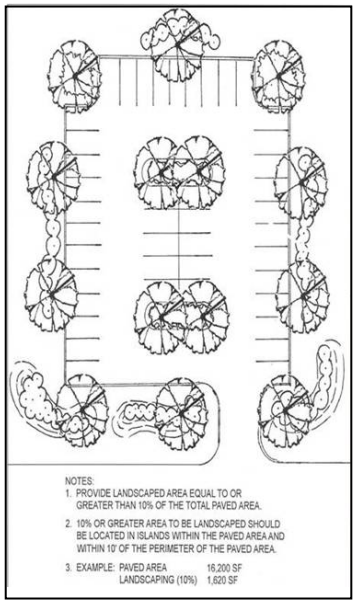


Figure 10.10 - Provide Parking Lot Planting to Reduce Heat Gain

10.5.2.6.1 Use shade tree plantings at parking lots to reduce glare and moderate ambient air temperatures on the lot. Optimum spacing of parking lot shade trees is 10 to 12 meters (35 to 40 feet) on center.

10.5.2.6.2 Choose trees and shrubs that require minimum maintenance and will not litter the parking area with leaves, fruit, or nuts.

10.5.2.6.3 Consider sight distances near entrances and exits when selecting and placing plant material.

10.5.2.6.4 Select trees, shrubs, and ground covers that can withstand harsher conditions, such as sun, glare, heat, and reduced water supply.

10.5.5.6.5 Use a mix of evergreen and deciduous plant material to screen parking areas from adjacent uses.

10.5.2.7 Environmental Control Planting. When properly placed, plants can provide environmental benefits, as well as address visual concerns.

10.5.2.7.1 Use deciduous trees and shrubs at courtyards, buildings and along streets to provide shade, moderate temperatures and reduce glare during the summer months while allowing solar exposure in the winter.

10.5.2.7.2 Locate deciduous plantings on the southeast and southwest corner of buildings or courtyards to mitigate solar radiation and glare due to heat build-up and lower sun angles in the mid-morning and late afternoon hours.

10.5.2.7.3 Use mixed massing of deciduous shrubs and evergreen trees and shrubs to provide sound control along primary and secondary roads.

10.5.2.8 Image Planting. The image of the installation is formed by the visual impressions that exist within the installation. The primary locations of highly visible images are the main gate, along primary circulation systems, and at areas of high concentrations of people. Features such as signs, statues, static displays, and other primary visual images can be improved by the use of trees, shrubs, and ground cover.

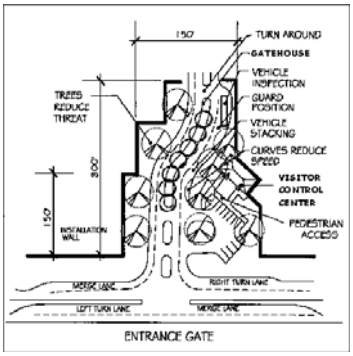


Figure 10.11 - Landscaping at Entrance Gates will Meet AT/FP Requirements

10.5.2.9 Entrances to the Installation. The entrances and streetscapes into the installation are areas to place landscaping that will develop a strong visual image and provide visual interest during all four seasons. The entrance to the installation creates the first visual impression for the visitor (Fig. 10.11).

10.5.2.9.1 The landscape materials and planting areas should be proportional in scale to the hierarchy of the street on which they are located.

10.5.2.9.2 Landscaping must be integrated with the Force Protection requirements of Section 12. Low shrubs, groundcover, annual/perennial plants and canopy trees provide seasonal interest as well as maintain views required to ensure force protection measures. Large evergreen trees are discouraged in these locations because they may obstruct sightlines and impact the need for force protection. Adequate lines of sight must be maintained fro guard personnel to observe vehicular and pedestrian traffic approaching the gate.

10.5.2.10 Zeroscaping. Where appropriate, to conserve water and lower maintenance consider zeroscaping.

10.5.2.11 Xeriscape. Xeriscape is the conservation of water and energy through creative and adaptive landscape design. Xeriscape landscapes provide attractive solutions that save money, water, and maintenance. The following website provides guidance on specific design principles of the xeriscape design process and xeriscape design application:

- USAF Landscape Design Guide, Xeriscape.

10.6 PLANT MATERIAL SELECTION

10.6.1 Trees, shrubs, ground cover and turf are the major elements of a planting composition. Basic plant selection criteria should consider creating a unified composition utilizing native materials for low maintenance and sustainability, avoiding incompatible colors, textures and forms, and matching the appropriate plant to the land use, situation, and environmental condition.

10.6.2 The ability of plant material to provide lasting benefit is dependent upon the plant's hardiness and its appropriateness to the site use. Major factors affecting plant hardiness are soil type and organic content, temperature, moisture and light. These climatic conditions can be modified to an extent by specific site conditions, such as wind protection, solar orientation, and planting design, to create microclimates.

10.6.3 Selecting appropriate plants for a given condition is only one aspect of planting design. Compositional arrangement to provide texture variety and to accent site and building features is another. The selection and composition of a planting design requires an understanding of each plant's characteristics, form, and environmental needs as well as how each plant can relate to and complement other plants in the design. Plants are used in four basic design categories (Fig 10.12):

- Canopy
- Barrier
- Screen (or Baffle)
- Groundcover

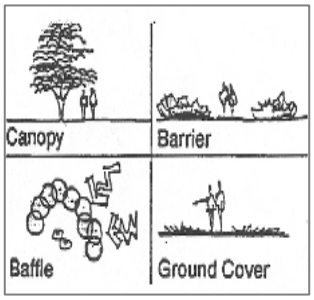


Figure 10.12 Basic Design Categories

Plant Categories

Cultural Characteristics

Growth Rate-Rapid

Growth Rate-Medium

Growth Rate-Slow

Disease/Pest Resistance

Environmental Characteristics

Acidic Soil Tolerant

Alkaline Soil Tolerant

Dry Soil Tolerant

Moist Soil Tolerant

Poor/Rocky Soil Tolerant

Salt Tolerant

Shade Tolerant

Summer Wind Tolerant

Urban Condition Tolerant

Ornamental Characteristics

Blue Flowers

Figure 10.13 – Plant Categories

10.7 PLANT PALETTE AND PLANT CATEGORIES

10.7.1 The plant palette and categories are designed to help the designer choose the best plant for each particular set of design requirements. The plants that appear on the palette and in the categories were selected for their hardiness and their ability to survive in this geographical area. To use them effectively, the design requirements must be well defined for the specific site.

10.7.2 The Plant Palette.

10.7.2.1 A select group of plant materials has been divided into the following six categories:

- deciduous trees
- coniferous trees
- deciduous shrubs
- coniferous shrubs
- broadleaf evergreen shrubs
- groundcover and vines

10.7.2.2 On the palette, the plants appear in alphabetical order by their botanical name, followed by their common name, design characteristics, cultural information, recommended use, and miscellaneous notes. The plant palette is presented in a matrix format in Appendix O.

10.7.3 The Plant Categories.

10.7.3.1 Plants from the plant palette with similar characteristics have been cataloged in the Plant Categories (Fig. 10.13). These characteristics could be cultural (e.g., upright, narrow form), environmental (e.g., shade tolerant), ornamental (e.g., red fall color), or functional (e.g., screening plant). Characteristics include: Cultural Conditions (mature height and spread, form and growth rate, disease and pest resistance), Environmental Conditions (sun/shade, pH range, soil moisture required, and wind/sun), and Ornamental Characteristics (flower color, autumn color, fruit color, and/or summer leaf color).

Plant Categories Cont.

Ornamental Characteristics

Pink/Purple Flowers

Red/Crimson Flowers

White/Cream Flowers

Yellow/Orange Flowers

Yellow/Orange/Red Fall Color

Functional Characteristics

Erosion Control/Bank Stabilizer

Foundation Plants

Large Hedges (+25')

Medium Hedges (10-20')

Low Hedges (4-10')

Naturalizing/Conservation

Park Trees

Figure 10.14 – Plant Categories Continued

10.7.3.2 Each category describes a list of plants that share a similar quality. For example, materials that are shade tolerant would be placed in the Shade Tolerant group under the "Environmental Conditions" heading. To further explain the Categories, under the

"Environmental Conditions" heading, in the Shade Tolerant group, all shade tolerant deciduous trees would be listed under “Deciduous Trees"; all shade tolerant Coniferous trees would be listed under "Coniferous Trees"; and so on.

10.8 PLANT MATERIAL INSTALLATION

10.8.1 A key step in assuring successful planting is to select plants of the highest quality. Plant material should be of the size, genus, species, and variety to comply with the recommendations and requirements of the "American Standard for Nursery Stock" ANSI Z60.1.

10.8.2 As part of the design process and prior to plant installation, review the installation's Master Plans, Basic Information Maps, or As Built Drawings for utility locations and verify with the Directorate of Public Works or equivalent.

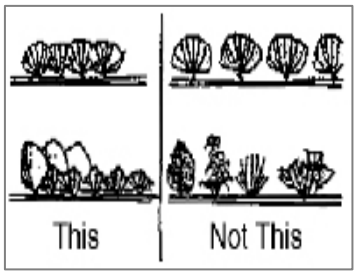


Figure 10.15 – Space Plants According to their Mature Size

10.8.3 The planting and establishment of trees, shrubs, ground covers, and vines is detailed in TM 5-803-13, Chapter 3.

10.8.4 General Guidelines for Plant Installation.

10.8.4.1 At planting time, thin plants by removing one-third of the vegetative material.

10.8.4.2 Spray all evergreens with an antidesiccant within 24 hours of planting.

10.8.4.3 Water all plants thoroughly during the first 24-hour period after planting.

10.8.4.4 Site all plants and stakes plumb.

10.8.4.5 Space plants according to their mature size (Fig. 10.15).

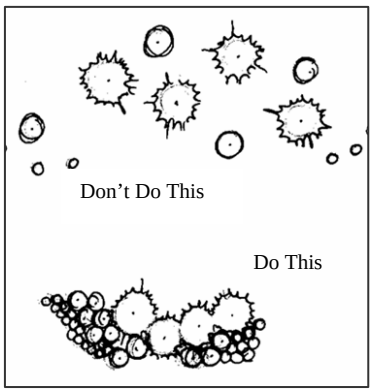


Figure 10.16 – Grouped Plants Have Greater Impact

10.8.4.6 Install plant materials in groups for greater impact (Fig. 10.16).

10.8.4.7 Installation of Lawn Areas.

10.8.4.8 Installation techniques for turf are detailed in Unified Facilities Criteria (UFC) *3-210-05FA,* Design: Landscape Design and Planting Criteria, Chapter 4. The details include site evaluation, site preparation, selection of turf, and maintenance requirements.

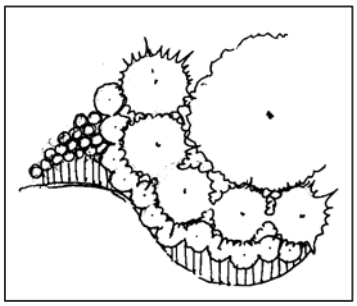


Figure 10.17 – Group Plants in Mulched Beds to Reduce Maintenance

10.9 MAINTENANCE OF PLANT MATERIAL

10.9.1 The ease of maintenance should be one of the primary goals when considering the success of any planting design (Fig. 10.17).

10.9.2 Pruning. In general plant material should be allowed to conform to its natural shape. This practice allows the plant to mature in a health manner, and saves the time and energy required for trimming. The pruning of trees and shrubs is done to maintain overall plant health, direct plant growth, maintain a desired shape, and increase flower or fruit development.

10.9.2.1 Pruning Shrubs.

- Do not prune shrubs flat across the top.
- Prune branches yearly on thick-branched shrubs and at the base of the shrub.
- When pruning deciduous shrubs prune shrub stems as close to the ground as possible and shrub branches as close to the stem as possible.
- When "thinning out" deciduous shrubs prune about one-third of all branches where they meet their main stem.

10.9.2.2 Pruning Trees.

- Remove a large limb by making three cuts as follows:
- Make the first cut at the bottom of the branch 12-24" from the branch attachment (Cut A, Fig 10.18).
- Make the second cut on the top of the branch within 1" of the undercut (Cut B, Fig 10.18).
- Make the final cut just beyond the outer portion of the branch collar (Cut C, Fig 10.18). The first two cuts were necessary to remove the weight of the branch to allow cut #3 to be clean without ripping the bark.
- Never cut the central leader of the tree.
- Coniferous evergreens trees should be pruned, during the spring, by snipping off new growth. Avoid geometrically shaping plant material while pruning.

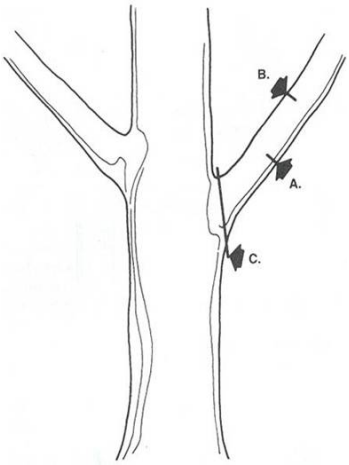


Figure 10.18 - Proper Tree Pruning Procedures

10.9.3 Mulching.

- Use mulch around the base of plant material to provide for greater moisture and help inhibit the growth of weeds and grasses. Mulch should be maintained at a depth of two (2) to four (4) inches.

- The best time to mulch for water conservation is in the late spring. Apply mulch immediately to new fall plantings.

10.9.4 Ground Cover Maintenance. Although ground covers do not require pruning, they may be periodically dug up in the spring or fall for propagation and to prevent overcrowding in their beds.

10.9.5 Landscape Maintenance Schedule. The general objective of a landscape maintenance schedule is to ensure an orderly and efficient care of the grounds. The landscape maintenance schedule included in the Army Installation Design Guide (See Appendix F) identifies times throughout the year when specified maintenance should be undertaken. Use of the landscape maintenance schedule will improve all aspects of landscape on the installation. Materials and supplies can be ordered in a timely fashion, manpower needs can be calculated and anticipated, and a correlation between the level of maintenance and appropriate cost can be derived.

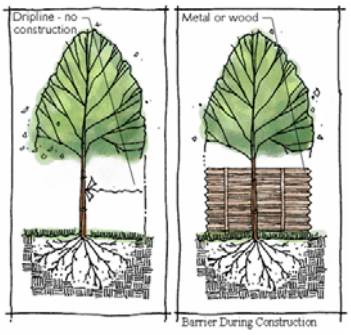


Figure 10.19 - Construct a Barrier at Drip Line During Construction to Maintain Grade

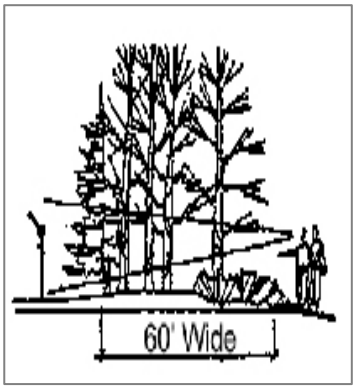


Figure 10.20 – Establish a Visual Barrier in Perimeter Setback

10.10 TREE PROTECTION AND PRESERVATION

10.10.1 Existing urban trees and forest should be preserved if they are in good health. Construction should be planned to provide for the preservation of significant trees.

10.10.2 During the clearing and construction process, trees should be protected from damage. Construction barricades should be erected to protect the existing trees to be preserved. The barricades should be no closer to the trunk of the tree than one-half the distance form the trunk to the drip line. Existing trees that cannot be preserved should be considered for transplanting to a different location on site or to a different site.

10.10.3 Changes in the grade of the soil around trees can cause extensive root damage and eventually death of the tree. To prevent damage to the tree, it is important to maintain the existing grade for least the size of the threes canopy (the drip line) (Fig. 10.19).

10.11 ANTI-TERRORISM/FORCE PROTECTION CONSIDERATIONS

10.11.1 The presence of vegetation on an installation can have both beneficial and detrimental impacts on security. The selection and placement of landscape plant material on Army installations is an integral element in the provision of protective measures to reduce the threat of terrorism.

10.11.2 Proper selection and placement of trees and shrubs can be utilized to provide visual screening without creating concealment for covert activity. The landscape architect

responsible for tree placement should work closely with installation force protection experts to design a landscape plan that provides visual screening without compromising Antiterrorism measures (Fig. 10.20).

10.11.3 The plant material must allow building occupants to see out, but must not allow outside forces to monitor interior activity. The landscape architect should incorporate the following aspects into the design:

- Avoid conditions within 10 meters (33 feet) of inhabited structures that permit concealment of aggressors or obscure the view of objects or packages 150-millimeters (6 inches) in height from the view of security personnel. This results in the placement of shrubs and trees that are loose rather than dense in growth habit and possess multiple small stems rather than a single trunk that will obscure a 150 mm (6 inch) package.
- Vegetation groupings provide reduction of blast effect.
- Plant material selection and placement shall minimize potential hiding places for bombs and aggressors.
- Provide vegetation screens for play areas and outdoor recreation areas to obscure from off-installation view.
- Use trees to obscure sight lines of on-installation buildings from off-installation buildings (Fig. 10.21).

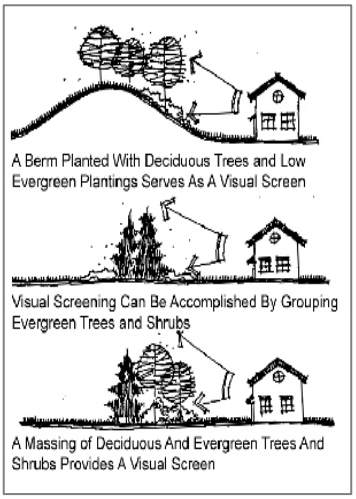


Figure 10.21 – Use Trees to Obscure Sight Lines

10.12 ARMY STANDARDS

10.12.1 The cited Army Standards shall be met.

- Army Regulation (AR) 420-70, *Buildings and Structures*
- Unified Facilities Criteria (UFC) *3-210-05FA*, Design: Landscape Design and Planting Criteria
- Technical Manual (TM) 5-630, *Natural Resources Land Management*
- American Standard for Nursery Stock, ANSI Z60.1
- Overseas (Host Nation Standards)

10.13 REFERENCES

10.13.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design*, Chap 10
- USAF Landscape Design Guide
- C. Brickell and D. Joyce. Pruning and Training, 1996.

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SECTION 11 SITE ELEMENTS DESIGN STANDARDS

11.1 INTRODUCTION

11.1.1 Site elements include all visual elements of the installation that are considered utilitarian in use (Fig. 11.1). These elements include the following four categories of utilitarian amenities:

- Site Furnishings
- Signs
- Lighting
- Utilities

11.1.2 The four sub-components provide dominant visual impacts within the installation. The specific site element features and equipment should, to the extent possible, reflect the local or regional design standards. This allows for ease of maintenance and blending into the local community. The four sub-components and their visual impacts are discussed in detail in this chapter.

11.1.3 Fort Sam Houston and Camp Bullis will reflect consideration of local design standards.

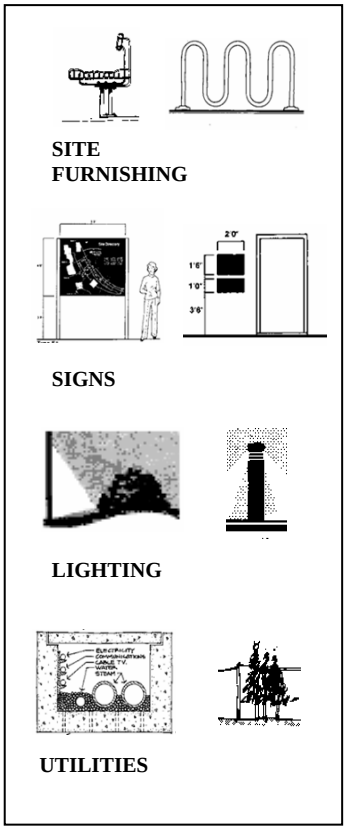

Fig. 11.1 – Site Elements

11.2 SITE ELEMENT OBJECTIVES

11.2.1 The site element plans for existing and future installation use should be prepared and the site elements selected to enhance the sustainability of the installation. To this end, site elements should meet the following objectives:

11.2.1.1 Provide site elements that are appropriate to their intended function.

11.2.1.2 Establish a coordinated system of site elements that provide consistency and continuity throughout the installation to convey a sense of organization.

11.2.1.3 The design and location of the various site elements should express an image, character, and scale appropriate to the installation.

11.2.1.4 Design and locate all site elements to meet AT/FP requirements.

11.2.1.5 Use recycled/salvaged materials wherever possible.

11.2.1.6 Minimize maintenance and repair through the use of efficient products that are vandal-proof.

11.2.1.7 Minimize negative visual impacts of all utility systems (Figs. 11.2 and 11.3).

11.2.1.8 Minimize environmental impacts of all utility systems.

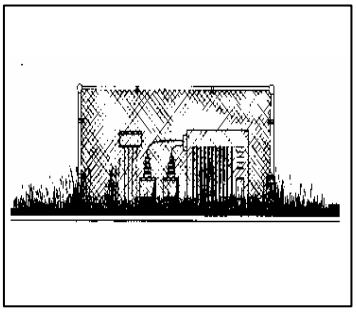

Fig. 11.2 - Negative Visual Impact

Fig. 11.3 - Planted Screen Minimizes Negative Visual Impact

11.3 SITE FURNISHINGS

11.3.1 Site furnishings include all of the utilitarian outdoor amenities found on an installation. These outdoor furnishings should be located in coordinated clusters to provide areas of multi-furnishing amenities, and avoid the haphazard proliferation of furniture elements around the installation. All furnishings shall be accessible to, and usable by, persons with disabilities, in accordance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS), with the most stringent standards to apply in the event of conflicts. The site furniture details described herein are based on a uniform design to insure that the landscape character is compatible throughout the site, with a smooth transition between the historic and non-historic areas of FSH.

11.3.2 Site furnishings include the following:

- Seating
- Tables
- Telephone Booths
- Shelters

- Kiosks
- Walls and Fences
- Trash Receptacles
- Dumpsters
- Flagpoles
- Movable Planters
- Bicycle Racks
- Tree Grates
- Bollards
- Play Equipment
- Mailboxes
- Monuments, Memorials, Military Equipment Static Displays
- Drinking Fountains

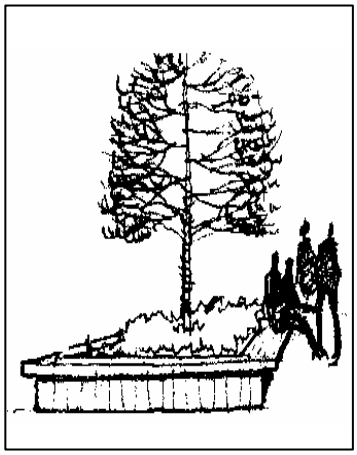

Fig. 11.4 - Planter Serves as Bench

11.3.3 Site Furnishings and Fixtures. The site furniture details described herein are based on a uniform design motif to insure that the landscape character is compatible throughout the site, with a smooth transition between the historic and nonhistoric areas of FSH. Materials, forms, colors and textures have been recommended to harmonize with each other while still being adaptable for various site situations. Variability should accommodate more refined elements in the developed areas and the less sophisticated pieces which will be found in the naturalness of park areas. Standardization in materials and design can simplify maintenance and afford economies of scale in purchasing. Special attention has been paid to vandal-resistant materials. Influencing the design characteristics is the heritage of FSH-especially limestone which has been a locally prevalent material. This material is available in a variety of finishes, and is indigenous, durable and economical. Limestone, where practical, should be utilized in site furnishings. An acceptable substitute is a simulated masonry product textured and proportioned to replicate the natural limestone in color and finish. These details should be incorporated wherever possible. If new situations arise which are not covered by an existing detail, additional details should be developed based on the described character and materials. In general, the following standards apply.

11.3.3.1 Materials. Concrete, asphalt, limestone, brick (match adjacent brick structures, stucco, tile (roofs), painted wood, painted metal, granite chat, composition roof shingles and metal roofing.

11.3.3.2 Colors. Dark green, muted flat brown and black except when material is being used in its natural state.

11.3.3.3 Guidelines.

11.3.3.3.1 Benches. Benches in the Historic District should be replicated or ordered through a manufacturer in accordance with the design of the bench depicted in as Item b, Figure 11.5. Benches f or other should have a stone or concrete aggregate base and a seat with a steel back. Item p, Figure 11.5, depicts both a backless bench and a full bench with back. Steel members of the seat and back should be painted a muted flat brown. Orient benches toward special views or toward each other to encourage interaction.

11.3.3.3.2 Picnic Table. The picnic table and seats should be made of smooth cast concrete resembling limestone, which is resistant to weather, food stains and vandalism. The tabletop should be cantilevered to provide handicapped accessibility and ease of use when entering and leaving the seats. (Item n, Figure 11.5)

11.3.3.3.3 Shelters. The waiting shelter in use on FSH and depicted as Item d, Figure 11.5, and Item g, Figure 11.5, should be replicated for use in other locations. The design is classical, functional and adaptable to all parts of FSH. To reduce long term maintenance costs, consideration should be given to metal fabrication of the structural frame for the shelters. The seat and back rest should be fabricated of a concrete masonry or similar product to resemble limestone with a metal back rest. The metal frame and back rest should be painted muted flat brown. Roof should be a standing metal seam for durability.

11.3.3.3.4 Drinking Fountain. The standard drinking fountain for use throughout the installation should be a simple, durable, cast metal pedestal with stainless steel bowl and mouth guard (Item i, Figure 11.5). An additional fountain design should consist of a concrete base with a fountain unit attached to one side. The fountain should be of stainless steel and easily operable by the handicapped; therefore cantilevered from the base for ease of access. (Item k, Figure 11.5) Steps should be provided for children and the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and Uniform Federal Accessibility Standards (UFAS) standards meet.

11.3.3.3.5 Tree Guards. Tree guards should be used only where he tree needs to be protected from grazing animals, as in the Quadrangle, or where pedestrian traffic might endanger the health of a young tree, as in a congested courtyard or entry plaza. The design of the tree guard consists of vertical metal elements held together by metal horizontal bands. They should be painted muted flat brown. (Item h, Figure 11.5)

11.3.3.3.6 Trash Receptacles and Ash Urns. The trash receptacles are comprised of thin metal vertical members held together by a metal base and additional metal bands at the top of the receptacle. This design is manufactured by at least one manufacturer of site furniture and should be economical for use in both the Historic Districts and non-historic zones. It should be painted muted flat brown. (Item g, Figure 11.5) An alternative design for a trash receptacle

in the non-historic districts should be a cylinder form manufactured of a masonry product to recall the color and texture of limestone. A metal or plastic liner may be inserted for disposal purposes. (Item 1, Figure 11.5) An ash urn of the same design and material should be used where this appurtenance is needed.

11.3.3.3.7 Planters. To be utilized sparingly in hardscape areas to soften the architecture and provide human scale. Planters to be cylindrical of varying heights and widths and fabricated of the same masonry material as the trash receptacles.(Item j, Figure 11.5)

11.3.3.3.8 Telephone/Kiosk. The "walls" which intersect to form a cross are made of concrete to match other site furnishings. The roof of this structure reflects that of the shelters in materials and pitch. A metal shelf shall be provided at the telephone portions with lights recessed in the roof to illuminate all portions at night. The notice boards shall be fitted with plexiglass for vandal and weather proofing. The structure shall be side enough to house an optional vending machine or two. (Item r, Figure 11.5)

11.3.3.3.9 Vending. An outdoor vending area of approximately 200 square feet shall be provided adjacent to buildings where no interior area is available. Locate at side or rear of building, preferably near service drive. Provide screen walls which complement the architecture on at least two sides of the vending area and a roof for protection from the weather. (Item r, Figure 11.5)

11.3.3.3.10 Bollard. Where control of pedestrians or vehicles is required, but fences or walls are not desirable, bollards connected by chains are encouraged. In historic districts the iron bollard depicted in Figure 11.5 b, page 3-68, should be utilized. The color black should be used on the bollard and connecting chain. Bollards which may be used in the non-historic, as well as the historic zones should be the design as illustrated as Item o, Figure 11.5. Construction should be masonry to recall the columns and walls constructed along the edges of the installation.

11.3.3.3.11 Bike Racks. Bicycle compounds should be provided to encourage the use of bicycles an FSH. The manufactured steel units illustrated in Item m, Figure 11.5, should be utilized in all bicycle compounds on FSH. Color should be factory finish dark brown.

11.3.3.3.12 Monuments, Historical Markers and Flagpoles. Monuments and historical markers should be encouraged and utilized to their fullest advantage to commemorate events and individuals, to inform or educate visitors of the significance of sites and structures and to stimulate patriotism and pride in the installation. The number, design, and placement of these elements should be carefully reviewed prior to an actual installation. Guidelines:
(1) Monuments. No monument which would endanger the historical designation of the district or which would be inappropriate for the site should be placed in the Historic Districts. Monuments considered for placement should be of compatible design, materials and scale for the area in which they are to be placed, and should be sited to enhance the overall development of the installation. Adjacent parking for public access should be provided.
(2) Historical Markers. The purpose of historical markers is to designate and/or interpret buildings or significant sites on the installation. Markers should be compatible with the

structure being designated in terms of design, scale and materials. Memorials will conform to the guidance set forth in Army Regulation (AR) 1-33, *Memorial Programs*

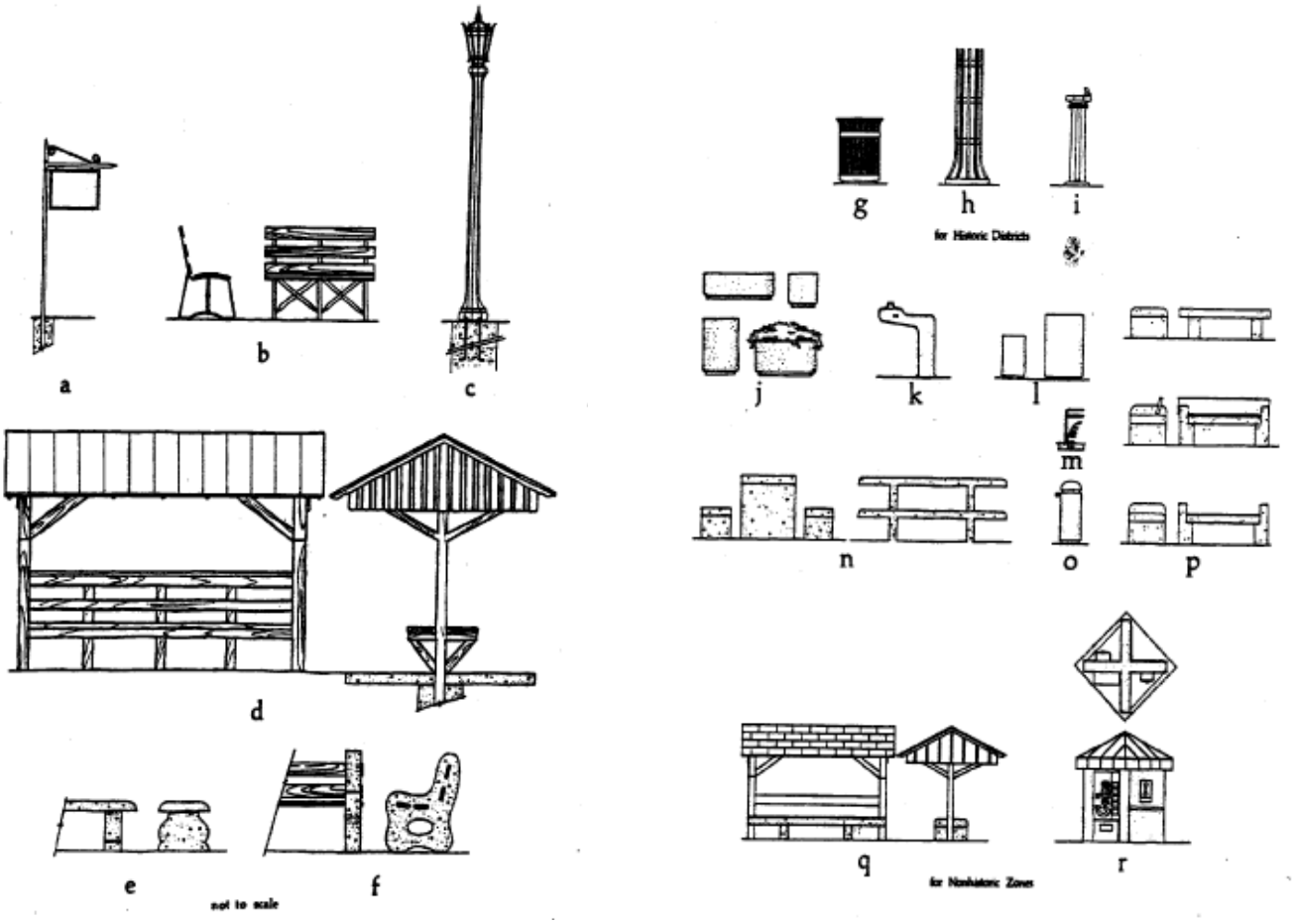

Fig. 11.5 – Site Furnishings and Fixtures Found on Fort Sam Houston

11.3.4 Walls and Fences.

11.3.4.1 Location and Use.

Walls and fencing should be used to provide visual screening, define pedestrian plaza areas, wind screening, pedestrian and vehicular control, security, and to retain soil. The design of walls and fences should fulfill their function in harmony with the character and appearance of their setting.

11.3.4.2 Walls.

Low walls should be used to define pedestrian court areas and provide informal seating. Screening walls can be used where appropriate to screen building service areas. Walls adjacent to walkways should be free of any projections, such as signs or drain pipes that would pose a hazard to passing pedestrians. Construction of walls should incorporate either brick to match adjacent buildings, with stone or concrete cap, or concrete with a textured finish and stone or concrete cap. Retaining walls may be constructed of brick, native stone, versa-lock modular stone with a light tan finish, or concrete block with a light tan stucco finish, concrete block planters, or other appropriate material. Walls used to screen service areas or trash enclosures should incorporate landscape plantings to help reduce the negative visual impact of these areas (Figure 11. 6).

Fig. 11.6 - Equipment Screen at FSH RV Site

11.3.4.3 Fences.

The quality of FSH neighborhoods can be strengthened with buffering along the exposed edges with walls/fences and landscaping. Fences should be utilized for screening of service areas and site utilities, particularly dumpsters. Screen fencing should consist of square tubular metal posts and rails with vertical wood fence boards. All fence posts should be securely anchored with concrete footings. All metal posts and framework should be painted standard dark brown and wood fencing should be western cedar. Hardware shall be stainless steel to prevent rust. Chain link fences should be screened with trees and shrubs. The use of chain link fence should be held to a minimum in the cantonment area. Avoid placing fences or barriers where they would create a visual barrier or interrupt important historic views.

11.3.5 Trash Receptacles.

11.3.5.1 Trash Receptacle Location.

Trash containers should be highly visible and accessible for effective litter control. Containers should be located conveniently along walkways, near major pedestrian intersections, near building entrances and near seating and eating areas. Antiterrorism/force protection requirements

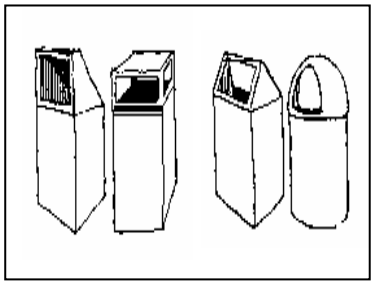

Fig. 11.7 - Trash Receptacles

restrict the location of dumpsters to a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) from billeting and primary gathering areas (*Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

11.3.5.2 Trash Receptacle Design.

The trash receptacles are comprised of thin metal vertical members held together by a metal base and additional metal bands at the top of the receptacle. This design should be economical for use in both the Historic Districts and non-historic zones. It should be painted muted flat brown. An alternative design for a trash receptacle in the non-historic districts should be a cylinder form manufactured of a masonry product to recall the color and texture of limestone. A metal or plastic liner may be inserted for disposal purposes. An ash urn of the same design and material should be used where this appurtenance is needed. Containers should be of a design that is compatible and in harmony with other site furnishings.

11.3.5.3 Trash Receptacle Type.

An alternative design for a trash receptacle in the non-historic districts should be a cylinder form manufactured of a masonry product to recall the color and texture of limestone. A metal or plastic liner may be inserted for disposal purposes. An ash urn of the same design and material should be used where this appurtenance is needed. Containers should be of a design that is compatible and in harmony with other site furnishings.

Fig. 11.8 – Dumpster without Enclosure, FSH RV Site

11.3.6 Dumpsters.

11.3.6.1 Dumpster Location.

The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning. To the greatest extent possible, incorporate dumpster placement into areas screened with walls, fencing, or plant material (Fig. 11.9). Avoid locating dumpsters along major circulation or use areas. Dumpsters should be directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Antiterrorism/force protection requirements restrict the location of dumpsters to a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) from billeting and primary gathering areas (*Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

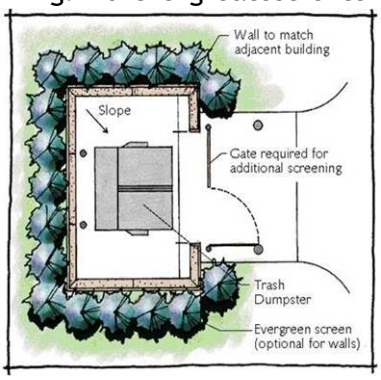

Fig. 11.9 – Enclose Dumpsters with Walls, Fences, or Plantings and Place on Concrete Pad

11.3.6.2 Dumpster Site Design.

Incorporate plantings to buffer the visual impact of screen walls.

Walls or fencing should be a maximum 6' in height. Provide a minimum 3' clearance on each side between screen walls and dumpsters to allow adequate pedestrian and truck access. All dumpsters should be placed on concrete pads with aprons large enough to encompass the bearing points of the service vehicle.

11.3.7 Flagpoles.

The standard replacement flagpole for FSH will be tapered mill finish aluminum, fitted with a gold anodized finish "ball" finial (Figure 11.X). The mounting detail should be simple with a concrete base flush at grade. A concrete pad should be used when poles are located in lawn areas. In plaza areas, flagpole locations and mounting detail should be integrated into the paving pattern. Flagpoles should include lighting and may be accented with planting beds around the base of the flagpole.

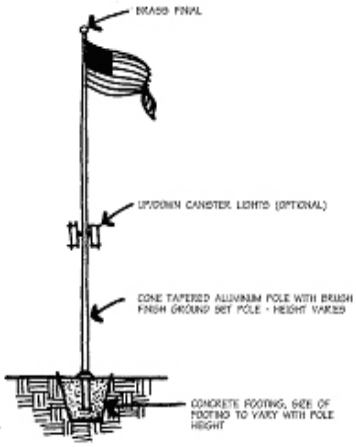

Fig. 11.10 – Standard Flagpole

11.3.8 Planters.

11.3.8.1 Movable pre-cast concrete planters may be used outside building entrances to provide seasonal color and interest and function as security threat barriers. Planters should be located so they block uninterrupted vehicular access to a building, but not so they excessively impede pedestrian movement. Several planters of various sizes should be grouped together to produce an aesthetically pleasing display.

11.3.8.2 Planters Sizes and Design.

Planters can be utilized sparingly in hardscape areas to soften the architecture and provide human scale. Planters should be cylindrical of varying heights and widths and fabricated of the same masonry material as the trash receptacles.

11.3.9 Tree Grates.

Tree grates should be used when installing trees in large paved areas such as pedestrian plazas, walks, and ceremonial entrance courts. Tree grates and planting pits should be a minimum of 5'x 5'.

11.3.10 Playgrounds/Tot Lots.

11.3.10.1 The playgrounds and tot lots within the installation should use equipment that is consistent throughout the installation or that meets specific criteria of materials, color, and design (Fig. 11.11).

Fig. 11.11 - Playgrounds and Tot Lots meet Specific Criteria of Materials, Color, and Design

11.3.10.2 Playground Planning and Design.

Guidance for planning and designing unsupervised outdoor play areas that meet child safety and child development requirements is found in Unified Facilities Criteria (UFC) *3-210-04,* Design: Children's Outdoor Play Areas. The guidance given in this publication meets the needs of children with and without disabilities.

11.3.10.3 Playground Inspection and Maintenance.

A play area inspection and maintenance program for Child Development Centers can be found in Technical Manual (TM) 5-663, *Child Development Center, Play Area Inspection and Maintenance Program*.

11.3.10.4 Recalled and Banned Playground Equipment.

For updates on banned or recalled playground equipment consult the Consumer Product Safety Commission Press Releases and Recalls web site.

11.3.11 Mailboxes.

11.3.11.1 All mailboxes should be located in close proximity to the facility they serve. However, when locating mailboxes consider the potential for the site element being used as a container for the concealment of explosive, etc. Consider Antiterrorism/force protection requirements for locating similar container types i.e. trash receptacles which are located a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) form billeting and primary gathering areas (*Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

11.3.11.2 The location should be coordinated with the Postal Services.

11.3.11.3 If group mailboxes are required, provide central locations for them adjacent to hard-surface walkways but not to impede pedestrian movement.

11.4 SIGNS

11.4.1 In general, signage at FSH and its sub-installations shall follow the standards set out in this IDG in order to unify the visual appearance throughout the whole post. Because so much of this installation falls within designated historic districts, exceptions to these standards must be made in reference to the historic significance/appropriateness of many existing signs of historic materials which could be damaged or obscured by the installation of standard signage. Signs are used to visually communicate information. They are highly visible features that should be attractive and compatible with their surroundings. Careful consideration must be given to what a sign says, how it is said, its visual appearance and organization, its location, structural support system, and relation to other signs within the installation. Standardized signage systems facilitate movement, provide a sense of orientation, and reinforce standards of excellence. Signage creates a unifying element throughout the installation that visually ties the installation themes together and builds a reference and continuity that translates into confidence and reassurance when traveling throughout the installation. The standards to apply for signage color, type, and sizing is found in Technical Manual (TM) 5-807-10, *Signage*.

11.4.2 Sign System Characteristics. There are several basic design characteristics that, by serving to convey necessary information clearly and attractively, are an integral part of any successful signage system.

11.4.2.1 **Simplicity**. An effective strategy provides only needed information, avoids redundancy, and eliminates over-signing with resultant clutter and visual confusion. Sign messages must be clear, simple, and easy for motorists to process quickly.

11.4.2.2 **Continuity**. It is essential that the system be applied uniformly and consistently throughout the entire installation. The importance of consistent implementation extends from the larger issues of sign type and size down to accurate color continuity and matching typestyles.

11.4.2.3 **Visibility**. Sign location is a very important ingredient within the system. Signs must be located at significant decision points and oriented to provide clear sight lines for the intended user. Close coordination of locations with respect to landscaping, utilities, adjacent signage, and various other street design elements is important to ensure long-term maximum visibility.

11.4.2.4 **Legibility**. Sign typestyle, line spacing, color, and size all combine to create the crucial design characteristics of legibility. This aspect of sign design should take into consideration users such as motorist, pedestrians, or bicyclists, and the relative travel speed at which each type of user will be traveling when viewing the signs.

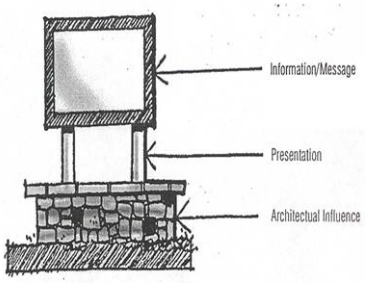

Fig. 11.12 - Signing Language Helps Establish A Signing System

11.4.3 Vocabulary-Communications.

11.4.3.1 A common language has been created for establishing a signing system. The different components that create the sign package have been named and referred to within the total signing system.

11.4.3.2 The creation of a "signing language" helps generate a unified bond within sign types that make up a signing family.

- Reference
    - Information/Message
    - Presentation
    - Architectural Influence
    - Graphic Architecture

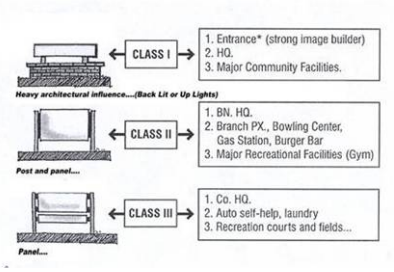

Fig. 11.13 - Signs Can Be Organized Into Classes Within The Visual Hierarchy

11.4.4 Visual Hierarchy.

11.4.4.1 The entire signing system must communicate, through a range of sign and typestyle sizes, the relative importance of the individual activity that the sign identifies. The system should follow a logical progression from a point of origin to the desired destination.

11.4.4.2 A stated ranking method supports the visual standard of hierarchy within the signing system. Signs can be organized within assigned classes with emphasis on the function and image of the installation.

11.4.4.3 Within each class, the level of architectural influence evokes the importance of the sign to the installation. This is also critical to the idea of progression. The importance of a sign must be presented in its size and level of detail.

11.4.4.4 As individuals move closer to their destination on the installation, the scale of the sign becomes progressively smaller and the level of the message more detailed.

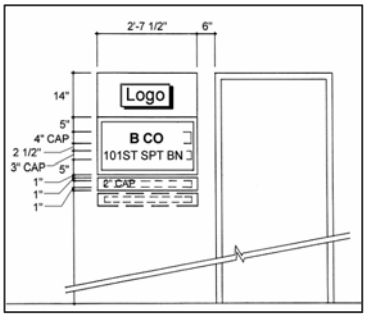

Fig. 11.14 – Building Mounted Information Sign

11.4.5 Types of Signs.

11.4.5.1 Information / Identification Signs.

These are signs that identify entrances to the installation, areas within the installation, major tenants, buildings, and organizational or functional components (Fig. 11.14). They identify a location, and greet the visitor to that location. They should be compatible in scale and character with the architecture and also blend with the natural surroundings (Fig. 11.15). These signs are designed to include the following:

Fig. 11.15 – Use of Street Addresses On All Building Identification Sign

11.4.5.1.1 **Typeface**: Lettering is self-adhesive backing material.

- Building Title: Helvetica Medium, Upper and lower case
- Building Numbers: Helvetica regular
- Building Addresses: Helvetica Medium, Upper and lower case

11.4.5.1.2 **Color**:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown

- All paint: Semi gloss

11.4.5.1.3 **Materials**:

- Panel: Double-face 1/8” thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.1.4 Building Identification.

11.4.5.1.4.1 Street Addresses. The addressing procedures prescribed in DoD 4525.8-M, DoD Official Mail Manual are mandatory for use by all DoD components. DoD 4525.8-M, Chapter 3 prescribes the following:

All DoD address shall be assigned so they are compatible with the United States Postal Services automated delivery point sequencing (C3.3).

The DoD installation is responsible for assigning city-style, street address on the installation (C3.3.2.2).

Street addresses shall be assigned and used even though a DoD activity may deliver the mail to the addressee (C3.3.2.2.1).

Only geographically locatable civilian-style street address (such as 4102 Cindy Avenue, Fig. 11.X) shall be used (C3.3.2.2.4).

Installations shall not use one street address for the entire installation and then use secondary unit designators such as "Building 123" to designate the delivery addresses on the installation (C3.3.2.2.5).

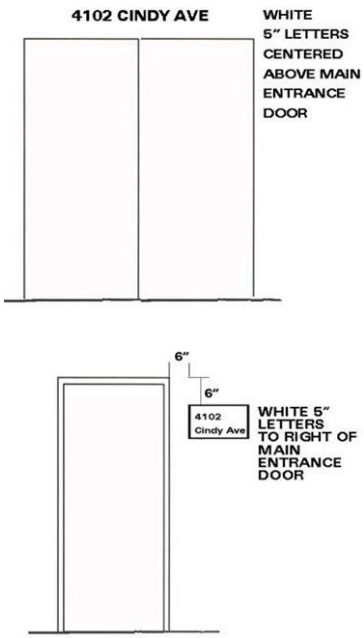

Fig. 11.16 - Street Address Location at Entrance Doors

Addresses such as "Building 123 Roberts Street" are not a valid address format and shall not be used (C3.3.2.2.6).

11.4.5.1.4.2 Address Placement.

Place addresses by the front entrance of the building so they can be seen (C3.3.2.3.1).

Place both the street name and address number on the building if both the building number and street address are visible from the street.

Building identification signs will use street addresses (Fig. 11.16).

Buildings without identification signs shall have the address number and street name centered above the main entrance or located to the right side (Fig. 11.16).

11.4.5.1.5 Housing Areas.

11.4.5.1.5.1 The sign should be complimentary to the architectural setting of the housing area and approved by the installation Real Property Planning Board.

11.4.5.1.5.2 Housing numbers should be placed on the curb in front of the respective house and on the house where lighting will effectively light the numbering.

11.4.5.1.6 Installation Identification Signs.

11.4.5.1.6.1 Installation identification signs name the installation and display the official US Army plaque (Fig. 11.17). The designation "United States Army" must appear at the top of the sign in accordance with AR 420-70, para 2-7h. Every installation entrance shall have an installation identification sign displaying only the US Army plaque, with the words "United States Army, Fort (Name of Fort), and gate name as indicated in "Figure 11.17 - Installation Entrance Signs". The placement of Senior Mission Commander logo, unit crest, and other installation identification signs, monuments, or displays shall be located inside the installation beyond the cleared area of the Access Control Point (ACP) of entry. When used service-wide, these signs convey a uniform image of strength and stability to the public. Emblems, branch colors, unit mottos, names, and titles of individuals are not to be displayed.

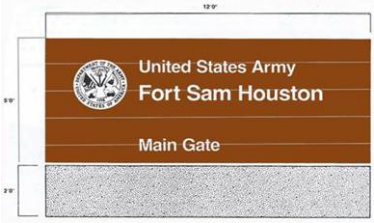

Fig. 11.17 - Installation Entrance Signs

11.4.5.1.6.2 Installation identification signs consist of three types:

- Sign type A1, main entrance sign, identifies the principal visitor entrance.
- Sign type A2, secondary entrance sign, identifies entry points with relatively high volumes of visitor traffic.
- Sign type A3, limited access entry gate signs, identifies entry points with limited public access.

11.4.5.1.6.3 See Technical Manual (TM) 5-807-10, Signage, paragraph 3-3, for sign specifications and paragraph 3-11 for sign placement guidelines.

11.4.5.1.6 Street Signs.

Street name identification signs should be designed with the same lettering, color, and materials as other information signs (Fig. 11.18).

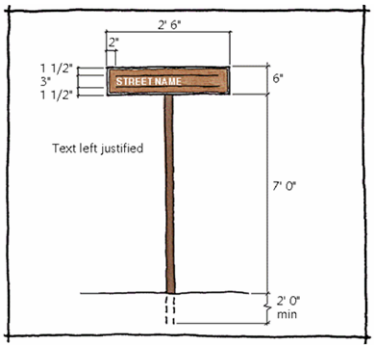

Fig. 11.18 - Typical Street Signs

11.4.5.1.7 Wheeled Electrical Signs.

Wheeled electrical signs will have an attractive presentation. Temporary landscape elements should be used whenever possible. The siting of this type of sign will be approved by the

RPPB. No sign of this type will be left in place for longer than six (6) months. After which time, the sign will be removed or turned into a permanent sign.

11.4.5.2 Directional Signs.

These signs guide the motorist or pedestrian in, around, and out of the installation (Fig. 11.19). The legibility and placement of these signs, as well as the ordering of information, is critical to their effectiveness. These signs should be placed in central locations and at major decision points along circulation routes. These signs are designed to include the following:

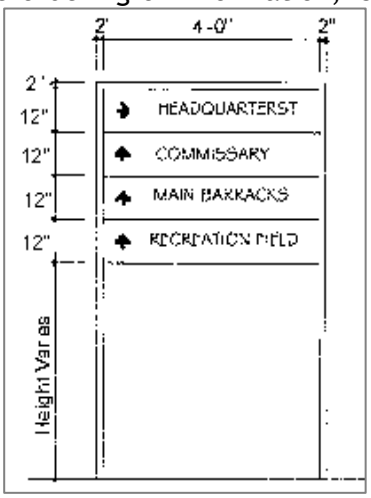

Fig. 11.19 – Direction Sign

11.4.5.2.1 **Typeface**: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.2.2 **Arrow**:

- Place at end indicating direction.
- Stoke width: Helvetica Medium cap

11.4.5.2.3 **Color**:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint: Semi gloss

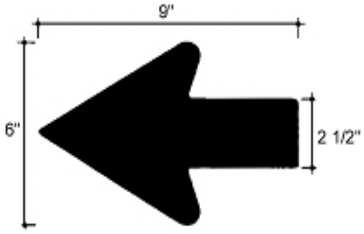

Fig. 11.20 - Typical Arrow For Use On All Destination Signs

11.4.5.2.4 **Materials**:

- Panel: Double-face 1/8” thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.3 Regulatory Signs.

These signs provide the rules for travel and parking on the installation. They include speed signs, turning and lane use signs, warning signs, parking control signs, etc. (Fig. 11.21). Related to these signs are pavement markings and traffic signals. These signs are designed to include the following:

11.4.5.3.1 **Typeface**: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.3.2 **Color**:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint: Semi gloss

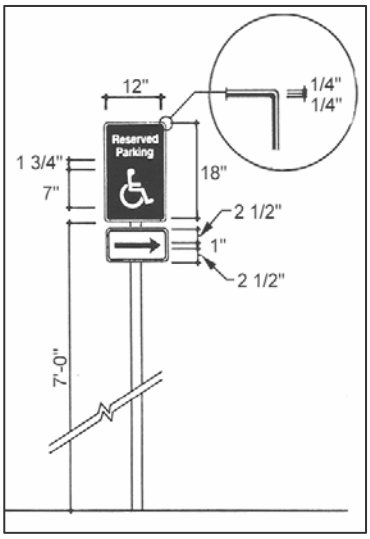

Fig. 11.21 – Regulatory Sign

11.4.5.3.3 **Materials**:

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

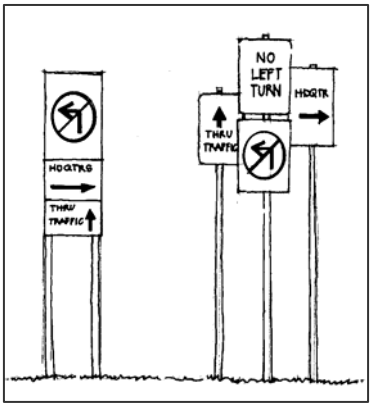

Fig. 11.22 – Sign should be Simple, Legible, and Combined

11.4.5.3.4 Traffic Control Signs.

11.4.5.3.4.1 CONUS Installations. National highway standards will be used for signs to regulate vehicular traffic on CONUS installation (AR 420-72, Transportation Infrastructure and Dams, Para 2-15f). These standards are described in the Manual of Uniform Traffic Control Devices (MUTCD). Also see MTMC Pamphlet 55-14, Traffic Engineering for Better Signs and Markings. This pamphlet clarifies existing standards and provides definite guidelines for installation officials to conform to the MUTCD. These standards shall be used installation wide to include installation Access Control Points.

11.4.5.2.4.2 OCONUS Installations. OCONUS installation streets and roads are to be considered extensions of the road system of the host nation and shall use traffic control device standards and criteria of the host nation (AR 420-72, Transportation Infrastructure and Dams, Para 2-15e).

11.4.5.3.5 Prohibitory (Warning) Signs. This category of signage is intended to maintain security and safety on the installation perimeter and at other specific secure areas. These signs notify visitors of restrictions, as well as other security procedures. The guidelines for design, fabrication, and placement of warning signs are found in Technical Manual (TM) 5-807-10, Signage, para 3-9.

11.4.6 Electronic Exterior Signs

All exterior flashing signs, traveling lights, or signs animated by lights of changing degrees of intensity or color are prohibited.

11.4.7 Sign Placement

Placement of signs differs according to the type of sign and the specific site constraints. The following guidelines apply to placement of the majority of signs.

Do not place more than one sign at any location. Traffic rules are the exception to this rule (Fig. 11.X).

Place signs in areas free of visual clutter and landscape materials.

Place signs in locations that allow enough time for the user to read and react to the message.

Signs should not be placed to block sight lines at intersections.

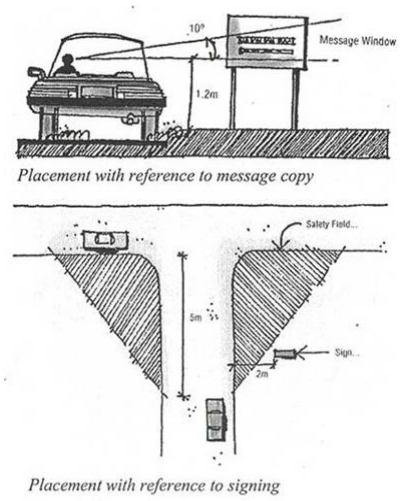

Fig. 11.23 - Placement Is Critical To Ensure Easy Readability

Place signs approximately 1.2 meters (4 feet) above ground level to be within 10 degrees the driver's line of vision (Fig 11.23). Provide proper placement to avoid a hazard to children.

11.4.8 Sign System Typography.

11.4.8.1 Military Emblems. The Army has a rich tradition of military heraldry. Military emblems are an important part of the soldiers' identity and the emblems have been carefully crafted over the years to express unit pride and unique history and function of the unit. The care and use of organizational emblems in a signage system can add visual interest as well as build pride and a sense of history. However, the overuse of miscellaneous emblems can lead to clutter and a dilution of their importance. Colors for military emblems must be in accordance with the Institute of Heraldry.

11.4.8.2 Department of the Army Plaque. The plaque should be displayed on installation identification signage to emphasize the heritage and professionalism of the United States Army. The design of the plaque must be in accordance with Army Regulation (AR) 840-1, Department of the Army Seal, and Department of the Army Emblem and Branch of Service Plaques, and must be reproduced in full color.

11.4.8.3 Insignias. The use of branch insignia, shoulder sleeve insignia, coat of arms and/or distinctive insignia on headquarters signs is permitted. All military emblems must appear in full color. Motivational symbols or motifs will not be used.

11.4.9 Reduce Visual Clutter.

11.4.9.1 Over-signing detracts form a uniform sign system and if left uncontrolled will eventually destroy the integrity of the system.

11.4.9.2 Clutter creates confusion and ineffectiveness. Often motorist and pedestrians are confused by the bombardment of messages that have no relationship to each other, or the communication is on such a minimal level that the sign serves no purpose.

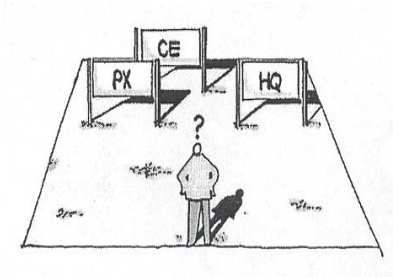

Fig. 11.24 - Visual Clutter

11.4.10 Location Maps.

11.4.10.1 The location map is an integral element of an installation entrance. The location map display provides information and sense of place to the viewer. The design and construction should be of compatible architectural materials found throughout the installation.

11.4.10.2 The location map should contain the following characteristics within the design.

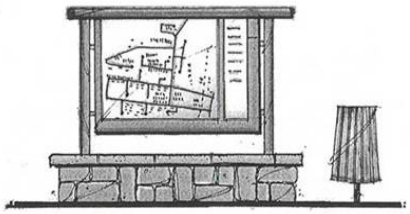

Fig. 11.25 - Location Maps Provide a Sense of Place

- Plexiglas covered map for protection
- Architectural compatible materials used for the base
- Paved walk-up area
- Litter receptacle
- Provide parking adjacent
- Provide current takeaway maps

11.5 LIGHTING

11.5.1 Lighting is a functional requirement of installations that also impacts the visual environment. The installation lighting system conveys a sense of order and organization. There are five primary types of lighting on military installations. They are:

- Roadway Lighting
- Pedestrian Lighting
- Parking Lot Lighting
- Outdoor Architectural Lighting
- Security Lighting

All lighting shall at a minimum be controlled by photocells. Timers, if used will be set to turn off the lighting at 2300 hours, unless the lighting is required for safety or security reasons. If necessary timers can be set to turn lighting back on at 0400 hours to accommodate early morning physical training. Every attempt will be made to use solar power lighting in parking lots and common use areas.

11.5.2 The primary visual problem that exists with exterior lighting on most military installations has been the lack of overall coordination of a lighting system.

11.5.3 A lighting system provides the proper type of lighting for different lighting requirements and locations. A system is composed of six primary components – fixtures, light height, type of pole, light spacing, type of lamp, and level of intensity of lamp.

11.5.4 The proper type of lighting for various locations is shown in Table 11.1 - Lighting Design Matrix.

11.5.5 All lighting should be located or designed to prevent undesirable spillover of light into other areas. Spotlights in particular should be aimed or screened to prevent glare that could blind motorists or pedestrians or light sleeping areas.

Table 11.1 Light Design Matrix

LIGHT DESIGN MATRIX		TYPICAL AREAS OF USE																		
		Entry Gates	Primary Roadways	Secondary Roadways	Tertiary Roadways	Primary Walkways/Bikeways	Secondary Walkways/Bikeways	Tertiary Walkways/Bikeways	Courtyards	Playgrounds	Ball fields	Basketball Courts	Tennis Courts	Buildings	Landscaping	Fence Parameters	Signs & Monuments	Large Parking Lots	Small Parking Lots	Training areas
LAMP	Incandescent													▫						
	Halogen	▫	▫																	
	Mercury Vapor		▫	▫	▫	▫	▫		▫	▫	▫	▫	▫		▫					
	Florescent																			
	Metal Halide		▫	▫	▫	▫	▫		▫	▫	▫	▫	▫	▫	▫		▫			
	High Pressure Sodium	▫	▫							▫	▫	▫	▫			▫		▫	▫	▫
LEVEL	Lux (lx)		20	15	10	10	2		50		200	200	50							
	Foot-candles (fc)		2	1.4	0.9	0.9	0.2		5		10	20	5.6			0.2		1	1	1
HEIGHT	40' Max	▫							▫					▫	▫	▫		▫		
	25' Max	▫				▫	▫	▫						▫	▫				▫	
	15' Max			▫	▫															
	Varies		▫							▫	▫	▫	▫				▫			▫
FIXTURE	Cutoff		▫	▫	▫													▫	▫	
	Utility	▫														▫				▫
	Bollard																			
	Spot													▫			▫			
	Wall Mount																			
POLE	Metal		▫	▫	▫													▫	▫	
	Wood															▫				
SPACED	120' Max		▫	▫	▫											▫		▫		
	90' Max																		▫	
	Varies													▫			▫			▫

11.5.6 Light Fixtures.

11.5.6.1 A lighting fixture is the frame or housing for holding the lamp in position and for protecting it from damage. Light fixtures should be selected and located to maintain the minimum foot-candle requirements for safety and security purposes. Beyond that, aesthetic considerations should take precedence.

11.5.6.2 Lighting fixtures are grouped into five general categories as defined below. Figure 11.26 includes examples of four of the categories.

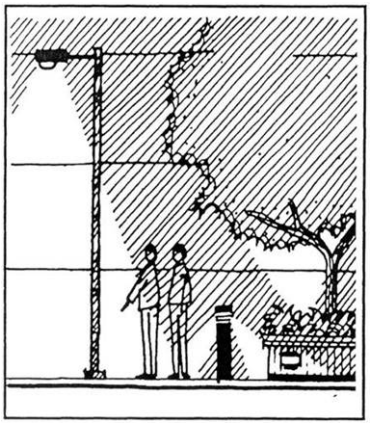

Fig. 11.26 – Example of Cutoff, Bollard, Wall and Spot Lighting

11.5.6.2.1 Cutoff Lighting.

Refers to the large shoebox-shaped fixtures placed on tall poles and used to illuminate streets and parking lots. They are designed to cut off light traveling to the top and sides of the fixtures, concentrating it down onto the parking lot. The fixtures reduce the spillover of light where it is not wanted.

11.5.6.2.2 Utility Lighting.

Refers to simple, inexpensive fixtures that are used in industrial areas of low visibility.

11.5.6.2.3 Bollard Lighting.

Refers to fixtures that are mounted on or in a short post to illuminate pedestrian areas. They can also be used as physical barriers between pedestrian and vehicular traffic.

11.5.6.2.4 Spotlighting.

Refers to high intensity fixtures that concentrate light into a narrow beam and are used to highlight signs and other important objects. Spotlights should be screened by landscaping or other methods so they are inconspicuous during the day.

11.5.6.2.5 Wall-Mounted Lighting.

Refers to fixtures attached to the wall of a building or a wall bordering a walkway or stairway.

11.5.7 Light Poles

11.5.7.1 The light fixture size should be proportional to the intended pole height.

11.5.7.2 Many different styles of poles are in use at FSH which detract from a desirable uniform appearance. Light poles shall be standardized. Guidelines: (a) Historic Districts: The aggregate concrete pole currently in use should be used exclusively in the historic areas. Taller poles, where necessary, can be manufactured to match the existing pole in use.
(b) Non-historic Areas. Standard pre-stressed concrete pole shall be used in other than recreation areas. In recreation areas, tapered metal poles should be used exclusively.

(c) Color. Concrete poles shall match existing aggregate poles in use at FSH. All metal poles should be painted a uniform color. Dark brown is recommended. An acceptable substitute is a factory finish of anodized black or dark brown. A standard aluminum color should not be used.

11.5.8 Light Fixtures and Poles.

Light poles should be consistent and provide uniformity throughout the installation. The pole height shall be determined by their intended function as shown below (Fig. 11.27).

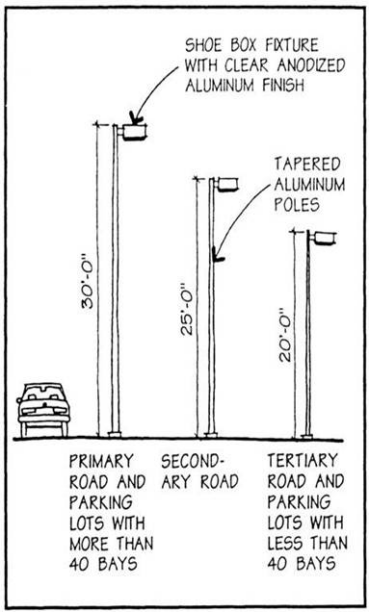

Fig. 11.27 – Pole Height Determined by Function

11.5.9 Lamp Characteristics.

Selection of a lamp involves evaluating its optical control, efficiency, lamp color rendition, lamp life, cost, and maintenance. The following is a summary of the characteristics of typical lamp types.

11.5.9.1 Incandescent

- Superior color rendition
- Inexpensive
- Good optical control
- Short life span
- Lowest efficiency

11.5.9.2 High Pressure Sodium

- Poor color rendition
- Broad application
- Low maintenance
- Superior optical control
- Superior life span
- Excellent efficiency
- Expensive

11.5.9.3 Low Pressure Sodium

- Poor color rendition

- Good efficiency
- Superior life span
- Expensive

11.5.9.4 Fluorescent

- Good color rendition
- Poor optical control
- Good life span
- Good efficiency in mild climates
- Produces glare

11.5.9.5 Metal Halide

- Superior color rendition
- Superior optical control
- Efficiency better than mercury vapor but poorer than pressure sodium.
- Expensive

11.5.9.6 Mercury Vapor

- Good color rendition
- Good foliage lighting
- Good life span
- Good efficiency
- Inexpensive

11.6 UTILITIES

11.6.1 Utility systems provide the basic infrastructure of power, communication, water, and sewer services necessary for the operation of the installation. Utilities play a key role in the visual quality on an installation. Their primary impact on the visual quality is the result of the clutter of overhead utility lines and poorly designed storm drainage systems.

11.6.2 The visual and environmental impact of utilities should be minimized on the installation. Also, the systems should be designed to minimize maintenance and

repair. The result is a more sustainable utility system that will promote the overall sustainability of the installation. The primary components of the utility system and recommendations for their location and design are included below.

11.6.3 Overhead Transmission Lines

11.6.3.1 Unsightly overhead utilities should be relocated underground wherever possible to reduce negative visual impacts, and reduce maintenance and repair requirements. Underground utilities are also desirable for protection from terrorist or other enemy attack. When underground locations are not possible, the negative visual impacts should be minimized by using the following design techniques:

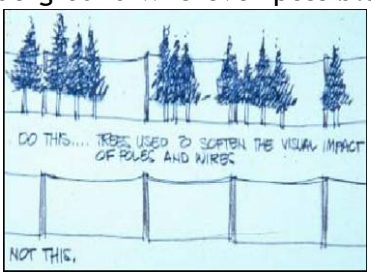

Fig. 11.28 - Soften Impact of Overhead Lines

11.6.3.2 Overhead Transmission Lines Location.

Overhead transmission lines should be aligned along edges of land use areas to avoid dividing an area and creating gaps or unusable areas. They should conform to natural landforms that can be utilized to screen them from public view. Hills should be crossed obliquely rather than at right angles. Alignments along hillcrests or steep grades should be avoided.

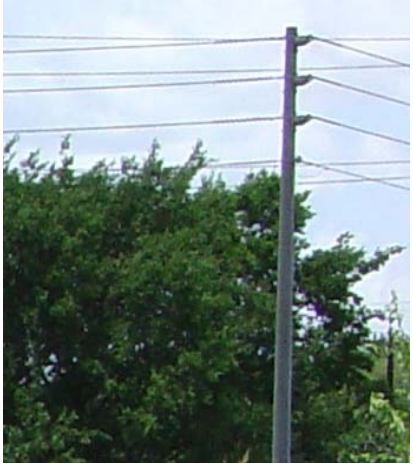

Fig. 11.29 – FSH Tree Screen Reduces Impact

11.6.3.2 View Screening.

Minimize long views or silhouette views of overhead transmission lines from along roads and other public viewing areas. Avoid the "tunnel effect" of long, straight, uninterrupted views along the alignment by clearing vegetation only within the right-of-way that threatens the overhead lines. Jog the alignment at road crossings and periodically undulate and feature plant materials along the edges of the right-of-way.

11.6.4 Distribution Lines.

Power distribution lines should also be located underground to minimize negative visual impact, reduce maintenance, and protect from terrorist or other enemy attack. If overhead, they should be located out of view from main public visibility areas or screened to be as unobtrusive as possible (Fig. 11.28 and Fig. 11.29). Avoid alignments of overhead lines along major circulation corridors. Use minor streets, alleyways, rear lot lines, and vegetation or topography that provide screening and minimize visual impact. Minimize the number of poles and pole height, and use poles that blend into their surroundings to reduce visual impact. Poles should also be multi-functional for power, telephone, cable television, street lighting, etc., to reduce visual clutter.

11.6.5 Substations and Transformers.

Substations and transformers should be designed and located to minimize their visual impact and be compatible with the character of their setting. Substations are best located in industrial use areas rather than in major public circulation areas. They should be screened from public view by using plant material, berms, and walls.

11.6.6 Sewer and Water.

11.6.6.1 All sewer and water lines should be underground.

11.6.6.2 Sewage treatment facilities should be located 1,250 ft. (0.38 Km) distance and in a downwind direction from all inhabited facilities.

11.6.6.2 Treatment facilities should be screened from view of major roads and other installation facilities by plant material, berms, walls, and fences.

11.6.6.3 A water storage tank that has visual strength in its form can be used as a focal point or identifying landmark that can provide a sense of orientation within the installation.

11.6.6.4 Fire hydrants should be highly visible and free of any screening. They shell be nutmeg brown in color with luminous paint. Caps shall indicate tested water pressure (Fig. 11.30).

Fig. 11.30 - Fire Hydrants Shall be Nutmeg Brown. Caps Shall Indicate Tested Water Pressure

11.6.7 Storm Drainage

11.6.7.1 Installation storm drainage systems should be appropriate to the character of development they serve. Storm drainage systems in densely developed areas require curbs, gutters, and underground lines. Storm drainage systems in low-density areas can utilize drainage swales and ditches that are contoured to be compatible with the natural landform. Where retention ponds are required, they should be designed to appear as a natural amenity that is part of the natural contour of the land, rather than a square or rectangular hole in the ground. Retention ponds that are designed to be dry most of the time can be utilized for recreational purposes or as open space. In either case, the areas should be designed to conform to the natural contours of the land.

11.6.7.2 Large hard surfaced parking lots should have covered drainage at the entry to prevent water draining into adjacent streets.

11.7 ARMY STANDARDS

11.7.1 The cited Army Standards shall be met.

- DoD 4525.8-M, DoD Official Mail Manual
- Army Regulation (AR) 420-49, Utility Services
- Army Regulation (AR) 420-70, Buildings and Structures

- Army Regulation (AR) 420-72, Transportation Infrastructure and Dams
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Technical Manual (TM) 5-807-10, Signage
- Manual of Uniform Traffic Control Devices (MUTCD)
- MTMC Pamphlet 55-14, Traffic Engineering for Better Signs and Markings
- Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings

11.8 REFERENCES

11.8.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) 2-600-01, Installation Design, Chap 11
- Unified Facilities Criteria (UFC) *3-210-04,* Design: Children's Outdoor Play Areas
- Army Regulation (AR) 1-33, Memorial Programs
- Army Regulation (AR) 840-1, Department of the Army Seal, and Department of the Army Emblem and Branch of Service Plaques
- Technical Manual (TM) 5-663, Child Development Center, Play Area Inspection and Maintenance Program
- Technical Manual (TM) 5-803-5, Installation Design Manual

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SECTION 12
FORCE PROTECTION DESIGN STANDARDS

12.1 INTRODUCTION

12.1.1 Accommodating the need for security and antiterrorism is a significant concern for all military facilities design. The security and antiterrorism requirements must be integrated into the total project. Design of protective elements should seek to visually enhance and complement the design of a facility. Site elements such as fences, courtyards, screen walls, swales, berms, planters, and retaining walls can be used effectively for facility protection. These design elements should be designed to provide visual harmony with the main facility, producing architectural compatibility through consistent use and application of materials, forms, and colors.

12.1.2 Final design decisions to meet security and antiterrorism requirements and resolve conflicts will require coordination among the design disciplines and appropriate functional areas to include land planners, landscape architects, architects, intelligence personnel, security personnel, Force Protection Officer, facility users, and engineers. The designers must work to balance force protection requirements with all other requirements that impact design and development. These include the Americans with Disabilities Act Accessibility Guidelines (ADAAG), the Uniform Federal Accessibility Standards (UFAS), National Fire Protection Codes (NFPA), and all applicable local building codes and ordinances. The design team will also consult security personnel to determine whether portions of the design documents are subject to access limitations.

12.2 BUILDING SITING AND DESIGN STANDARDS

12.2.1 A primary concern for Army installations throughout the world is the threat of terrorist attack. To minimize the likelihood of mass casualties from terrorist attacks against DoD personnel in the buildings in which they work and live DoD has developed the Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings.

12.2.1.1 UFC 4-010-01 establishes the minimum building antiterrorism standards for all DoD components.

- Mandatory DoD minimum antiterrorism standards for new and existing inhabited buildings are contained in Appendix B.
- Mandatory DoD minimum antiterrorism standards for expeditionary and temporary structures are contained in Appendix D.

- Additional recommended measures for new and existing, inhabited buildings are contained in Appendix C.

Implementation of the mandatory standards is obligatory for all new construction regardless of the funding source. The standards will be reviewed before any site planning or design is initiated.

12.2.1.2 Minimum Standoff Distances and Separation for Buildings:

- The minimum standoff distances and separation for new and existing buildings are found in Table B-1 of UFC 4-010-01.
- The minimum standoff distances and separation for expeditionary and temporary structures are found in Table D-1 of UFC 4-010-01.

12.2.1.3 The DoD minimum standards, when applicable, may be supplemented by more stringent force protection building standards to meet specific threats inherent in the geographical area where the facility is to be constructed. Those additional requirements may be established by either standards for specific Combatant Commanders or based on Risk and/or Threat Analysis.

12.2.1.4 When the minimum standoff distances can not be achieved because land is unavailable, the standards allow for building hardening to mitigate blast effects. Costs and requirements for building hardening will be are addressed in the DoD Security Engineering Manual. (See para 12.2.2 below for information regarding the DoD Security Engineering Manual).

12.2.2 Implementing Design Guidance. Additional guidance on applying the *DoD Minimum Antiterrorism Standards for Buildings* will be found in UFC 4-010-02, *DoD Security Engineering Manual*. Currently, this document is in draft form. Until the *DoD Security Engineering Manual* is published, see the guidance provided on the Security Engineering Working Group website.

12.2.2.1 Website Access for Military and Government Users. This is a password protected website. To enter the site you must be accessing the site from either a ".mil" or ".gov" address. Upon initial entry, you will be prompted with instructions on how to acquire your password.

12.2.2.2 Website Access for Non Military and Government Users. Currently, the Protective Design Center is developing a procedure for e-mailing the network administrator to receive procedures to enter the site. If upon initial entry into the site there are no instructions on this procedures, contact the Protective Design Center (CENWO-ED-S) at (402) 221-3151 for instructions.

12.2.3 Orientation of Buildings on a Site. The following will be given consideration when determining the orientation of a building.

12.2.3.1 Deny aggressors a clear "line of sight" to the facility from on or off the installation where possible. Protect the facility against surveillance by locating the protected facility outside of the range or out of the view of vantage points.

12.2.3.2 Protect against attack by selecting perimeter barriers to block sightlines such as obstruction screens, trees, or shrubs. Non-critical structures or other natural or man-made features can be used to block sightlines.

12.2.3.3 Create "defensible space" by positioning facilities to permit building occupants and police to clearly monitor adjacent areas.

12.2.3.4 If roads are nearby, orient building so there are no sides parallel to vehicle approach routes.

12.2.3.5 Design vehicular flow to minimize vehicle bomb threats, avoid high-speed approach into any critical or vulnerable area.

12.2.3.6 Avoid siting the facility adjacent to high surrounding terrain, which provides easy viewing of the facility from nearby non-military facilities.

12.3 FENCING

12.3.1 Fences are used as protective measures against project-specific threats. They are most appropriately used to define boundaries and to deter penetration of a secure area (Fig. 12.1). A fence will assist in controlling and screening authorized access to a secured area. Fences also serve the purposes listed below.

Fig. 12.1 – Fences offer various Force Protection measures

12.3.1.1 As a platform for the Intrusion Detection System.

12.3.1.2 As a screen against explosive projectiles.

12.3.1.3 To stop moving vehicles if they are reinforced to do so.

12.3.2 Plants with tall growth habits and/or large mature growth will be located well away from security fences.

12.4 LANDSCAPE CONSIDERATIONS

12.4.1 Landscaping guidelines for buildings should not be ignored because of standoff distances. The landscape design should enhance the overall attractiveness of the facility while still providing or enhancing the objective level of security level of security.

12.4.2 Establish clear zones along both sides of security fencing. Vegetation in the clear zone should not exceed four inches in height. (DoD 0-2000.12-H, *Protection of DoD Personnel and Activities Against Acts of Terrorism and Political Turbulence*, Appendix EE, Table EE-4).

12.4.3 Strategically locate trees and planters to prevent penetration of an attack vehicle into the secure area perimeter.

12.4.4 Vegetative groupings and earth sheltering berms provide inherent blast effect reduction from external blast forces.

12.4.5 Plant material that can provide concealment will not be used adjacent to high security structures or fence lines.

12.4.6 Use dense, thorn-bearing plant material to create natural barriers to deter aggressors.

12.4.7 Screen play and outdoor recreation areas from public (off-installation) view.

12.4.8 Place trash containers as far away from the facility as possible. Antiterrorism/force protection requirements restrict the location of dumpsters to a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) from billeting and primary gathering areas (*Unified Facilities Criteria [UFC] 4-010-01, DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

12.4.9 Unobstructed Space. Ensure that vegetation and site features within 10 meters (33 feet) of inhabited buildings do not conceal form observation objects of 150mm (6 inches) in height. (UFC 4-010-01, Appendix B, Para B-1.3). This does not preclude landscaping within the unobstructed space, but it will affect the design and may affect plant selection.

12.5 LIGHTING

Lighting systems for security operations provide illumination for visual and closed-circuit television (CCTV) surveillance of boundaries, sensitive inner areas, and entry points. When CCTV is used as part of security operations, the lighting system will be coordinated with the CCTV system. The specific installation environment and the intended use determines lighting system requirements. Often two or more types of lighting systems are used within a single area (Fig. 12.2). Guidance on the use of security lighting may be obtained from TM 5-811-1, Electrical Power Supply and Distribution.

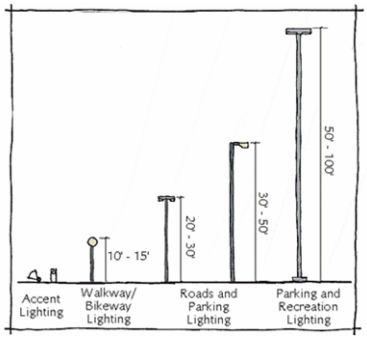

Fig. 12.2 – Lighting creates a deterrent

12.6 BERMS

12.6.1 Use of berms for force protection can fulfill one of more of the following functions (Fig. 12.3).

- Define boundaries of property or boundary limits.
- Provide a barrier to moving vehicles.
- Hinder pedestrian movement.
- Intercept projectiles.

Fig. 12.3 – Berms can serve many Force Protection functions

- Obstruct lines of sight.

12.6.2 Berms used to block lines of sight or projectiles must be high enough to achieve those objectives or may be combined with landscaping or other construction elements. Detailed design guidance is contained in Army Technical Manual (TM) 5-853-3/AFMAN 32-1071, Vol. 3, *Security Engineering Final Design.*

NOTE: This Army Technical Manual is a "For Official Use Only" document and is not accessible on the Army Corps of Engineers publications website. A copy of the manual can be acquired by ordering it through your standard publications account.

12.7 GATES AND ENTRANCES (ACCESS CONTROL POINTS [ACP])

12.7.1 Installation entry points are key components in the force protection security program. The most effective entrances accommodate the functions of observation, detection, inspection, access control, and disablement of hostile personnel and vehicles, while containing the vehicles and pedestrians until access is granted. These areas are one of the most important installation features in the creation of a sense of arrival for both installation personnel and visitors. It is important that these areas present a positive public image (Fig. 12.4).

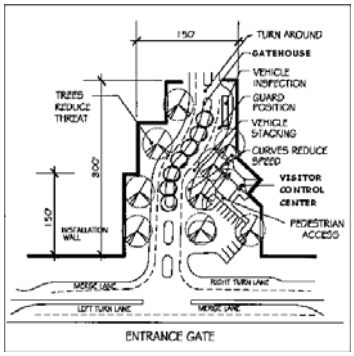

Fig. 12.4 – Conceptual Entrance Gate to Meet AT/FP Requirements

12.7.2 The Headquarters Department of the Army, Deputy Chief of Staff for Operations and Plans, DAMO-ODL, office in coordination with the Protective Design and Electronic Security Centers of Expertise are currently developing standards for Army Access Control Points (ACP). These standards will be published in the near future. Contact number for the current status of the Access Control Point standards is (703) 693-2906.

12.7.2.1 Canopies for ACPs. ACPs will have a canopy, which will cover the full width of incoming lanes at the Guard Booth. The canopy shall have a minimum clearance of 14.5 feet and shall have a minimum length of 50 feet. Supporting structure of roof will consist of columns sized and located to create peripheral vision for the guards with minimal obstructions. Lighting will provide a minimum of 10 ft-candles with a Color Rendition Index of 65. Measures will be taken to protect the canopy from the threat of an over-height vehicle.

12.7.2.2 *The Interim Army Standard for Canopies at Army Installation Access Points, Feb. 2004*.

12.7.3 Physical Security Equipment.

12.7.3.1 The Product Manager, Physical Security Equipment (PM-PSE) under DoD Directive 3324.3 is assigned the mission of developing, fielding, and supporting Physical Security Equipment (PSE) throughout its life cycle for the Army, Joint Services, and other Government agencies.

12.7.3.2 The DoD Directive assigns specific areas of responsibility which include: interior PSE, Command and Control Systems, security lighting, force protection systems, barrier and systems, and interior and exterior robotics. The PM-PSE homepage and the DA-approved equipment Blank Purchase Agreements (BPAs) are listed below.

- Product Manager - Physical Security Equipment Homepage
- DA-approved PSE Equipment Blanket Purchase Agreements (BPAs)

12.8 *AREA SPECIFIC STANDARDS - NONE.*

12.9 ARMY STANDARDS

12.9.1 The cited Army Standards shall be met.

- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*
- Unified Facilities Criteria (UFC) 4-010-10, *DoD Minimum Antiterrorism Standoff Distances for Buildings*. (This document is a "For Official Use Only (FOUO)" publication. Users may contact the Point of Contact posted at the noted website for inquires regarding this document).
- Uniform Federal Accessibility Standards (UFAS)
- Americans with Disabilities Act Accessibility Guideline (ADAAG)
- DoD Instruction 2000.16, DoD Antiterrorism Standards

12.10 REFERENCES

12.10.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 12
- DoD Handbook 2000.12-H, *Protection of DoD Personnel and Activities Against Acts of Terrorism and Political Turbulence*, February 1993 (This Handbook is a "For Official Use Only (FOUO)" publication. Users may contact the Point of Contact posted at the following website to obtain a copy of the Handbook). http://www.dtic.mil/whs/directives/corres/html/o200012h.htm
- Army Regulation (AR) 525-13, The Army Force Protection Program (Available only through the Army Knowledge Online web portal).
- UFC 4-010-02, *DoD Security Engineering Manual,* (This document is in draft form. See the Security Engineering Working Group website.

- U.S. Air Force, Installation Force Protection Guide: (Contains information on installation planning, engineering design, and construction techniques that will preclude or minimize the effect of a terrorist attack).

- Technical Manuals/Air Force Manual series TM 5-853/AFMAN) 32-1071, Security Engineering, 3 volume series: (Volumes 2 and 3 are "For Official Use Only [FOUO]" and are not available on the Army Corps of Engineers publications website. A copy of the manuals can be acquired via your standard publications account. The three volumes cover, Project Development, Concept Design, and Final Design respectively).

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APPENDIX A DESIGN TEAM IDG CHECKLIST

A.1 A completed Design Team Installation Design Guide (IDG) Checklist should be completed for all projects that impact the appearance of an Army Installation. The Master Planner shall provide the checklist to all teams designing new facilities, additions, or renovations to existing facilities, or maintenance on the installation. The Design Team IDG Design Checklist is to be completed by the design team to assure the guidelines and standards have been considered and complied with in the design process, and by the Master Planner in project review.

A.2 The Designer of Record or Design Agent will provide a copy of the completed checklist, together with a signed certification statement with each design submittal (10% [pre-concept], 35%, 60%, and 90% for each MILCON projects). The Designer of Record will complete the checklist and verify compliance in the space provided. In the case of Design Build, all agents i.e. the Corps of Engineers, NAF, AFFES, Host Nation, tenants, etc. shall have the perspective design build contractors submit a completed IDG Checklist as part of their proposal. The completed checklist will be provided to the Master Planner for review with concurrence or denial. Upon a determination of concurrence by the Master Planner, the plan and checklist with signatures will then be provided to the Real Property Planning Board for final acceptance or denial. The accepted checklist will become a part of the project record files.

A.3 If plans are denied for non-compliance at the installation or command level (where applicable) of review, an explanation of the denial will be provided to the Designer of Record. The plan and checklist can be resubmitted with revisions as indicated in the explanation of denial.

A.4 ARMY INSTALLATION DESIGN GUIDE (IDG) COMPLIANCE CHECKLIST

1. PROJECT TITLE AND DESCRIPTION.

Title:_____

Description:_____

_____

2. PROJECT JUSTIFICATION:_____

_____

_____

3. SUSTAINABLE DESIGN:

a. Has SPiRiT Checklist been attached? (If not, obtain completed checklist)

b. Does SPiRiT meet or exceed Silver level? ("Silver" is the standard for all FY06 MILCON vertical construction projects currently under design (as of March 18, 2003). For all other FY06 and future-year MILCON projects the minimum SPiRiT rating requirement is "Gold".)

Yes _____ - Review project as submitted.

No _____ - Return submittal to design team for revisions to meet SPiRiT.

4. SITE PLANNING

a. Was a site plan prepared for the proposed project utilizing the IDG Design Process included in Sections 2, 3 and 5 of the IDG?

Yes _____ No _____

b. Does the site plan include Site Planning Design Component guidelines of the IDG?

Yes _____ No _____

c. Does the site plan meet AT/FP requirements identified in Section 12 of the IDG?

Yes _____ No _____

d. Designer Comments on Site Planning:

_____

_____

e. Does Site Planning comply with the IDG? If not, provide justification.

_____

_____

f. Does Site Planning meet approved installation master plan siting compliance?

Yes _____ No _____ If not, provide justification.

_____

_____

g. Has NEPA been initiated for the construction effort in accordance with AR 200-2?

Yes _____ No _____

h. Has airspace criteria been consider relative to airfield accident potential zones?

Yes _____ No _____

5. BUILDINGS

a. Does the building exterior design meet the Building Design objectives defined in the IDG?

Yes _____ No _____

b. Is the exterior building designed to meet the Structural Characteristics defined in the IDG?

Yes _____ No _____

c. If the project is a renovation or addition, does the proposed renovation or addition meet IDG building design and structural characteristics?

Yes _____ No _____

d. If the project is a renovation or addition to a historic building, does the renovation or addition maintain the design integrity of the original building or meet Historical Approval Agencies' requirements for any deviations?

Yes _____ No _____

e. Does the building exterior design meet AT/FP requirements (if applicable)?

Yes _____ No _____

f. Designer Comments on exterior Building Design:

_____

_____

g. Does Building design comply with the IDG? If not, provide justification.

_____

_____

6. CIRCULATION

a. If the project includes roadway construction, does the proposed plan meet Federal Highway and/or local guidelines defined in the IDG?

Yes _____ No _____

b. If the project includes roadway construction, does the proposed plan meet AT/FP roadway setback requirements defined in the IDG?

Yes _____ No _____

c. If the project includes roadway construction, does the proposed plan include applicable roadway alignment and intersection guidelines defined in the IDG?

Yes _____ No _____

d. If the project is an entrance gate, does the proposed plan include entrance gate guidelines and standards defined in the IDG?

Yes _____ No _____

e. If the project includes parking, does the proposed plan meet the Parking Lot Location/Design guidelines defined in the IDG?

Yes _____ No _____

f. If the project includes pedestrian circulation, does the proposed plan meet the Walkways and Pedestrian Circulation Guidelines in the IDG?

Yes _____ No _____

g. If the project includes bicycle circulation, does the proposed plan meet the Bikeway Guidelines in the IDG?

Yes _____ No _____

h. Designer Comments on Circulation Design:

_____

_____

i. Does Circulation Design comply with the IDG? If not, provide justification.

_____

_____

7. PLANT MATERIAL

a. All projects for new construction should include the planting of trees shrubs and/or groundcover. Does the proposed planting plan include a project plan?

Yes _____ No _____

c. Does the proposed planting plan meet AT/FP requirements defined in the IDG?

Yes _____ No _____

d. Does the proposed planting plan include plant material recommended in the selected Plant Palette Matrix included in the IDG?

Yes _____ No _____

e. Designer Comments on Landscape Design:

_____

_____

_____

f. Does Landscape Design comply with the IDG? If not, provide justification.

_____

_____

8. SITE ELEMENTS

a. If the project includes Site Furnishings, does the proposed plan follow the guidelines in the IDG?

Yes _____ No _____

b. If the project includes Signs, does the proposed plan meet the Signs standards in the ?

Yes _____ No _____

c. If the project includes exterior Lighting, does the proposed plan meet the exterior Lighting guidelines defined in the IDG?

Yes _____ No _____

d. Will all power and other distribution lines to be located underground?

Yes _____ No _____

e. Will all substations and transformers be designed as to be screened from view?

Yes _____ No _____

f. Will all sewer and water lines to be located underground?

Yes _____ No _____

g. Are all storm drain systems designed to meet the guidelines defined in the IDG?

Yes _____ No _____

h. Designer Comments on Site Elements Design:

_____

_____

i. Does Site Elements Design comply with IDG? If not, provide justification.

_____

_____

9. ANTITERRORISM (SECURITY)

a. Have installation boundary setbacks been included?

Yes _____ No _____

b. Have building setbacks from roads, parking, other buildings been included?

Yes _____ No _____

c. Do site plans and landscape plans include the criteria outlined for AT/FP?

Yes _____ No _____

d. Designer Comments on AT/FP Compliance:

_____

_____

e. Does AT/FP Design comply with the IDG? If not, provide justification.

_____

_____

I hereby certify that the information provided is in compliance with the guidelines of the installation or applicable IDG, except as justified as non-compliance.

_____ _____
Designer of Record **Date**

Concur _____ **Deny _____, Explanation of denial is attached.**

_____ _____
IDG Coordinator **Date**

Accept _____ **Deny _____, Explanation of denial is attached.**

_____ _____
Command Review (Where Applicable) **Date**

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APPENDIX B PROJECT REQUIREMENTS IDG CHECKLIST

B.1 The following checklist is optional and is designed for use on major projects.

PROJECT REQUIREMENTS CHECKLIST

For Completion by Installation Personnel for Use in Preparation of the Request for Proposals (RFP).

PROJECT _____ **LOCATION** _____

DPW/DIS POC _____ **PH#** _____

ADDRESS: _____

_____

E-MAIL _____

DATE CHECKLIST COMPLETED _____ **BY** _____

When completing this form it is important to remember that it is the responsibility of the installation to resolve any conflicts between the different "users" (i.e. DPCA, DPW, etc.) about wants, needs, etc. The A/E that prepares the RFP must have the specific guidance contained herein to get you what you want. If there is information you wish to provide that is not specifically requested or you are unable to make your desires clear within the confines of this checklist, then add those comments at the end. Overseas installations consider compliance with Host Nation codes.

1.0 GENERAL INFORMATION

A. Maps and plans available: (Provide copies with completed checklist)

1. Basic Information Maps (BIMs): (List Drawing Numbers)

   (Maps should be provided in Spatial Data Standards (SDS) compatible GIS format whenever possible.)

   Site topography
   Site Sanitary Sewer
   Site Storm Sewer
   Site Electrical
   Site Water
   Site Plan Extract - from RPMP (Future Development Site Plan)
   Other
   Project Location Plans
   Area Map
   a) Site Map

2. Aerial Photograph (Preferred to Topographic)

3. USGS Map

4. Project Siting Plan (Proposed)

5. Environmental

a) Jurisdictional wetlands designation
b) Other historical concerns:

B. Project Building Plans: (If renovation/addition or prior design, provide available information and plans)

1. Foundation
2. Basement
3. Floor
4. Structural
5. Roof
6. Elevations
7. Electrical
8. Mechanical
9. Plumbing
10. Site Utilities
11. Specifications
12. Other

C. Applicable Codes and Standards:

List all known applicable codes and regulations. Generally, NAF construction will not follow Federal or Military Specifications.

Department of Defense (DoD) governing criteria is UFC 1-200-01, *Design: General Building Requirements*, 31 July 2002

Local Building Codes:

State and County Codes:

Environmental Regulations:

Installation Regulations:

Cultural Regulations:

Other:

National Fire Protection Codes (NFPA), Military Handbook 1008C

1.1 TEMPORARY FACILITIES AVAILABLE TO THE CONTRACTOR

A. Facilities available to contractor during construction:

1. General Site Plan has been annotated to show limits of construction site: _____Yes, _____No. If the contractor requires the use of additional area, he must obtain written approval from the Contracting Officer.

2. Construction Office available: _____Yes, _____No.

3. Covered materials storage available: _____Yes, _____No.

4. Uncovered materials storage available: _____Yes, _____No.

NOTE: Security of construction site and materials is the Contractor's responsibility.

5. Select fill borrow areas, spoil areas, sanitary fill and haul routes are shown on attached Installation map: _____Yes,_____No.

   List any restrictions or notes on the use of those areas:

NOTE: Disposition of scrap and salvageable materials resulting from construction is the responsibility of the contractor unless otherwise noted and agreed.

B. Utilities available to contractor during construction:

1. Potable Water: ____Yes, _____No; Metering required: _____Yes, _____No;

   Cost $_____per_____.

2. Non-Potable Water (Irrigation, Machine Washing, etc.): _____Yes, _____No;

   Metering required: _____Yes, _____No; Cost $_____ per _____.

3. Electricity: _____Yes, _____No; Metering required: _____Yes, _____No;

   Cost $_____ per _____.

4. Natural gas: _____Yes, _____No; Metering required: _____Yes, _____No;

   Cost $_____ per _____.

5. Sanitary sewer: _____Yes, _____No

NOTE: Utilities used at the construction may be metered and/or charged to the contractor. The rate schedule for utilities will be provided as part of this completed checklist and shall be the basis by which the installation will bill the utility usage. Installation of temporary meters, where required, and temporary tie-

ins to the utility systems shall be the responsibility and at the cost of the contractor.

1.2 DEMOLITION REQUIREMENTS

Facilities for demolition, relocation, or retention.

Provide description, size, type construction, and location of any existing facilities on the site that must be demolished, relocated or retained. Consider all structures, foundations, pavements, communications, and utilities (whether active or abandoned). Consider demolition hazards (i.e. lead, asbestos, etc.). Every effort shall be made by the installation to ensure compliance with the clean site policy. Provide the date when the clean site will be available. Recycle building demolition and debris material when ever possible.

1.3 PAVING REQUIRMENTS

A. Parking area (s) required: ____Yes, _____No.

1. Location and brief description:
2. Number of parking spaces for passenger vehicles: _____

   (including _____ spaces for the handicapped).
3. Type of pavement: _____
4. Perimeter of parking area (s) to have concrete curb:____Yes, _____No.
5. Striping of parking spaces required: _____Yes, _____No.
   a) Width of stripes: _____
   b) Type of paint to be used: _____
1. Special signage required: _____
2. Concrete wheel stops required: _____Yes, _____No.
3. Handicapped ramps/depressed curbs required: _____Yes, _____No.

B. Service road (s) required: _____Yes, _____No.

1. Location: _____
2. Type pavement: _____
3. Concrete curbing required on both sides of road: _____Yes, __No.
4. Minimum roadway width: _____Feet _____.

List any other special paving considerations or needs: _____

_____

_____

_____

C. Sidewalks required: _____Yes, _____No.

1. Type of paving material: _____
2. Location: _____
3. Minimum width: _____
4. Minimum thickness shall be 4" with welded wire fabric.

D. Concrete dumpster pads required: _____Yes, _____No.

1. Number of pad (s): _____each. See note below.
2. Size of each pad: _____ feet by _____ feet.
3. Provide bumper stops at rear of pads: _____Yes, _____No.
4. Provide architectural screening of pads: _____Yes, _____No.

   Type: _____

NOTE: Building orientation or design may eliminate need for screening. Screening shall be in accordance with the Army Installation Design Guide (IDG).

1.4 UTILITIES SERVICE REQUIREMENTS

A. Electrical Service: Meter required: _____Yes, _____No,

Type: _____

1. Type system to be installed: _____underground, _____aerial.
2. Type transformer (s) to be installed: _____Pole mtd., _____Pad mtd.,

NOTE: Screen in accordance with Army Installation Design Guide (IDG).

3. Available Voltage: _____
4. Location of tie-in point: _____

B. Water Service: Meter required: _____Yes, _____No.

1. Size and location of tie-in point: _____

2. Additional fire hydrant (s) required: _____

C. Sanitary Sewer Service: Size and location of tie-in point: _____

_____

D. Storm Drainage:

1. Design for _____year occurrence.

2. Type System: _____Surface, _____Underground

3. Location of tie-in point for existing underground storm drainage system if incorporated in contractor design: See Site Plan.

E. Gas Service: _____Natural, _____Propane;

Meter required: _____Yes, _____No.

1. For Heating: _____Yes, _____No.

2. For domestic hot water: _____Yes,_____No.

3. For laundry dryers: _____Yes,_____No.

4. For kitchen equipment: _____Yes,_____No.

5. Size and location of tie-in point: _____

NOTE: Contractor (Offeror) shall be responsible to determine that all of the existing service utilities are of sufficient capacity to accommodate all of the design loads for this total facility. Should a Contractor (Offeror) determine that one or more of the existing service utilities are not adequate to accommodate the Contractor's (Offeror's) design loads for this total facility, then the Contractor (Offeror) shall submit with his initial and any subsequent proposal (Best & Final Offer), the requirements, design data and the price for increasing the capacity of each existing service utility system or for providing a new service utility system. Design loads for this facility shall be calculated in accordance with the criteria specified in this Request for Proposals (RFP), with the most stringent criteria governing. The responsibility for verification and field location of any and all information provided in the RFP and on any attached or enclosed drawings, or other documents shall be and is the responsibility of the Contractor (Offeror).

F. Coordination and Notification Required for Utilities Tie-in:

1. Point of contact for coordination: _____

   Tel. _____ Email _____

2. Road Closing:

   a) Can both lanes be closed to traffic: _____Yes, _____No.

   b) Maximum time road can be closed:

   c) Can road be closed over a holiday or weekend: _____Yes, _____No.

3. Minimum notification time required for utilities outages and road closing:

   a) Electric Power: _____working days.

   b) Water: _____working days.

   c) Gas: _____working days.

   d) Steam: _____working days.

   e) Central AC lines: _____working days.

   f) Roads: _____working days.

   NOTE: Enclose underground primary electrical service in concrete from the new utility tie-in points to the pad mounted transformer and/or mechanical room panel boxes. Provide one spare conduit for each service sealed at both ends. The conduit may be PVC provided it conforms to NFPA 70, current edition.

   NOTE: If existing sidewalk, curbs, gutters, or paving are disturbed or removed during construction, the paving or concrete must be replaced by the Contractor.

   NOTE: At overseas installations, utility work must meet Host Nation codes. Notably, in Europe utilities connections shall comply with the supplier's local codes. Contractors in Europe shall meet local utilities provider's conditions.

G. Coordination and Notification Required for Railroad Track Work:

1. Point of contact for coordination: _____

   Tel. _____ Email _____

2. Road Closing:

   a) Can both lanes of traffic be closed: _____ Yes, _____ No.

   b) Maximum time road can be closed:

   c) Can road be closed over a holiday or weekend: _____ Yes, _____ No.

3. Railroad Track Closing:

   a) Can track be closed to traffic: _____ Yes, _____ No.

   b) Maximum time track can be closed: _____

   c) Can track be closed over holiday of weekend: _____ Yes, _____ No.

4. Minimum notification time required for railroad track and road closing:

   a) Railroad track: working days.

   b) Road: working days.

5. Are used track components to be sorted and properly stored: _ Yes, ___ No.

6. Are samples, ultra-sonic inspections, temperature recordings, and certificates to be submitted for ties, rail track components, or ballast: ____ Yes, ____ No.

7. Are RAILER markings and reporting required: _____ Yes, _____ No.

8. Are there special radio or communication requirements: ____ Yes, _____ No.

NOTE: If existing sidewalk, curbs, gutters, drainage, ballast, or paving are disturbed or removed during construction, the paving, drainage, ballast, or concrete must be replaced by the Contractor.

1.5 ARCHITECTURAL AND STRUCTURAL BUILDING DESIGN REQUIRMENTS

A. Seismic Design Zone: _____. Structural design shall be in accordance with codes specified in the RFP.

B. Basic wind speed: _____ mph.

C. Ground Snow Load: _____ PSF (Plus code live load).

D. Maximum Frost Penetration: _____inches.

E. Heat Transmission: "U" Factors:

1. Walls: _____.
2. Floor (slab-on-grade) at perimeter foundation wall: _____.
3. Floor over ventilated crawl spaces: _____.
4. Ceiling and/or roofs: _____.

F. Roof:

1. Minimum pitch: _____

2. Type: _____

3. Scuppers and drains are required: _____ Yes, (If a parapet type roof is proposed); _____ No.

4. Gutters and downspouts: _____ Yes, _____ No, Type: _____

5. Drainage carry off: _____ Splash Blocks; or _____ Underground drainage system (internal roof drains not permitted.)

6. Access to roof: _____.

NOTES: Catwalks to and around rooftop HVAC units and other equipment are required (Cary tread or equal). Where possible, architectural screening of visible rooftop equipment is required.

G. Site Conditions:

1. Environmental Assessment required: ____ Yes, ____ No.

   Completion Date: _____.

   EIS Required: _____ Yes, _____ No.

   Completion Date: _____.

   (Provide copies of actions to date.)

2. Cultural Resources Compliance Completed: _____ Yes, _____ No.

3. Site Conditions:

   Topographical feature description: _____

   _____

   _____

   _____

   Confirm or identify subterranean hazards:

   Fill area
   Old foundations
   Unexploded ordnance
   Existing/abandoned utility line
   Tunnels/mines
   Other

4. Soil investigation data available: ____ Yes, ___ No.

   At project location: _____ Yes, _____ No.

   Other:

5. Soil bearing capacity: _____ PFS. Actual test _____, Assumed _____.

NOTE: The successful Offeror shall be responsible for accomplishing additional necessary testing to verify soil characteristics at the site and design of the foundation system to meet these requirements.

H. Building Exterior: Brick: _____Yes, _____No.

Other: _____

NOTE: Where brick is required, the exterior walls shall be finished with face brick with through body integral color and shall match the brick currently in place in Building No's _____.

NOTE: The final floor plan as designed by Offerors shall include all functional areas outlined subsequently in this section. Gross building areas shall not exceed that specified in the RFP, including the mechanical room.

I. Barrier Free Requirements: (Where applicable) as minimum, _____ guest units shall be barrier free.

NOTE: Where required, "Barrier Free Requirements" shall be designed and constructed to provide for the Physically Handicapped (interior and exterior), in accordance with Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

J. Kickplates required on interior wood doors: _____Yes, _____No.

K. Approximate total maximum occupancy:

1. Female: Adults _____ Children _____

2. Male: Adults _____ Children _____

3. TOTAL: _____

   Comments: _____

   _____

   _____

   _____

L. Landscape Requirements:

List any special requirements:

NOTE: Offerors will provide a Landscaping Plan for the project area as required in the RFP. Surface area disturbance and tree removal will be minimized. Trees determined to be retained will be incorporated in the Landscaping Plan. Landscaping shall refer to the planting of trees, shrubs, plants, etc. and shall not be associated with establishment of turf as defined below. Trees, shrubs, plants, etc. shall be guaranteed for a period of one (1) year from time of planting.

M. Establishment of Turf:

N. Soil Poisoning: For termite protection is _____, is not _____ required.

NOTE: It will be the Contractor's responsibility to protect all existing turf and landscaping affected by the construction and to replace any turf or landscaping that has been damaged, for the term of the contract.

O. Paint Color:

List standard paint colors:

P. Finishes:

List standard finishes:

1.6 ELECTRICAL DESIGN REQUIREMENTS

A. Exterior lighting:

1. Parking area (s) lighting required: _____Yes, _____No.

   a) Type of lighting: _____ High Pressure Sodium

   _____ Low Pressure Sodium

   _____ Mercury

   _____ Halogen

   _____ Other

   b) Average Intensity: _____ foot candles per sq. yd. with a uniformity ratio of 4:1_____, Other _____. (Avg. to min.)

   c) Type pole: _____.

   d) Special mounting requirements:

   e) Switching:

   Type: _____ Manual

   _____ Clock _7 day _7 day

   _____ Astronomical

   _____ Photo Electric

   _____ Combination of above as indicated.

   _____ Other

2. Exterior building lighting required: _____Yes, __No.

   a) Type of lighting: _____ High Pressure Sodium

   _____ Low Pressure Sodium

   _____ Mercury

   _____ Halogen

   _____ Other

   b) Average Intensity: _____foot candles per sq. yd.

c) To be mounted on the building structure: _____Yes, _____No.

d) Switching:

1) Type: _____ Manual

_____ Clock _7 day _7 day

_____ Astronomical

_____ Photo Electric

_____ Combination of above as indicated.

_____ Other

2) Location: _____.

3) Lighting for plumbing and electrical chases required:

_____Yes, _____No.

NOTE: All electrical wiring (exterior and interior) shall be copper.

B. Outside weather proof receptacles: shall be installed every _____ feet along the building exterior. Outside weather proof receptacles should be RCD (GFCI) protected.

NOTE: The building shall have emergency light fixtures and exit lights in accordance with NFPA requirements. Both shall have battery powered back-up, charge level meters and test buttons.

C. Electromagnetic Shielding:

List any electromagnetic shielding requirements.

D. Standby/Backup Power Requirements:

List and standby/backup power requirements.

1.7 MECHANICAL/PLUMBING DESIGN REQUIREMENTS

A. Heating design data:

1. Below is the outside dry bulb temperature that is equaled or exceeded 97 ½ percent of the time, on the average, during the coldest 3 consecutive months (Dec., Jan., and Feb.). Heating design shall be based on the dry bulb temperature equaled or exceeded 97 ½ percent of the time.

a) Dry bulb temperature: _____.

b) Wind velocity: _____.

c) Degree days: _____.

2. Interior design temperatures: 68 degrees.

B. Air conditioning design data:

1. Outside dry bulb and wet bulb temperatures that are equaled or exceeded 2 ½ percent of the time, on the average, during the warmest 4 consecutive months (Jun. thru Sep.) are given below. Air conditioning design shall be based on the 2 ½ percent dry bulb, wet bulb temperature.

   a) Dry bulb temperature: _____.

   b) Wet bulb temperature: _____.

2. Interior design temperatures: _____.

   a) Dry bulb temperature: _____.

   b) Wet bulb temperature: _____.

C. Heating and air conditioning system: shall be designed to provide a relative humidity of 50% + 10% or -10%.

D. Mechanical Systems: Economy cycle. The air conditioning system except where room fan coil units are located, if located where the winter design dry bulb temperature is 35 degrees F (97 ½% basis) or less, shall be designed so that 100% outside air may be used in the system during those cool weather periods when the outside air temperature is sufficiently low to provide all the cooling needed, or reduce the load on the air conditioning refrigeration equipment. Use of the economy cycle in areas above 358 F shall be provided when it can be clearly shown that use of the economy cycle is cost effective.

E. Install humidity control override: _____Yes, _____No.

F. Automatic timer controls required for:

1. Heating System: _____Yes, _____No.

2. Air Conditioning System: _____Yes, _____No.

G. Heating and Air Conditioning Source:

1. Self contained plant: _____Heat, _____AC.

2. Supply lines from central plant: _____Heat, _____AC.

3. Purchased heat: _____

H. Low profile roof mounted HVAC units are permissible:_____Yes, _____No.

I. Automatic timer controls required for:

1. Heating System: _____Yes, _____No.
2. Air Conditioning System: _____Yes, _____No.

J. Heating fuel to be used:

Fuel: _____Natural gas, _____#2 Fuel oil, _____Propane.

K. Dual fuel heating plant required: _____Yes, _____No.

Primary Fuel _____, Secondary Fuel_____.

L. Outside air supply intake: to close when building is unoccupied:

_____Yes, _____No.

M. Outside air supply intake: to close when building is unoccupied:

_____Yes, _____No.

N. Type heating and air conditioning filters required:

( ) Permanent ( ) Throw away

O. Covers and locks: required on interior utilities controls: _____Yes, _____No.

P. Plumbing Design Data:

1. Exterior hose bibs: Minimum of _____ each with ¾" hose connection on building exterior.
   a) Frost protection required: _____Yes, _____No.
   b) Removable cutoff handles required: _____Yes, _____No.
2. Interior hose bibs: See Functional Requirements
3. Grease trap (s) required: _____Yes, _____No.

   Location (s):
4. Commodes shall be floor mounted flush valve type.
5. Lift station required: _____Yes, _____No.
6. Hot water heater (s) required: _____Yes, _____No.

a) Energy source: _____ Natural gas, _____ #2 Fuel oil.

b) Required minimum temperature: _____

c) System: _____

NOTE: All domestic water piping below grade shall be type K copper. All domestic water piping above grade shall be either type L copper in accordance with appropriate codes. All joints shall be soldered with 95/5 Tin/Antimony solder. The entire potable water system shall be lead free. Vent piping shall be schedule 40 galvanized steel or DWV weight copper.

7. Provide a minimum of _____ floor drain (s) in the laundry and mechanical room.

8. Insulate all water pipes (hot & cold) above slab: _____Yes, _____No.

NOTE: The domestic hot and cold water piping below grade shall be kept to a minimum, and below the frost line if located outside the building perimeter.

9. All domestic water pipes (hot & cold) shall be stenciled HW or CW. If pipes have been insulated then the pipe insulation shall also be stenciled.

10. Provide grease interceptor: _____Yes, _____No.

    Location: _____

11. Provide a water filtration system: _____Yes, _____No.

    Location: _____
    Type: _____

12. Other plumbing considerations or requirements:

2.0 MINIMUM REQUIREMENTS FOR RESTROOMS

The following criteria are for minimal requirements only and may be superseded in quantities and/or finishes, providing that changes are an upgrading of the minimal requirements.

A. General: MALE and FEMALE

ITEM	QUANTITY	SPECIAL REQUIREMENTS
Lavatory	_____	
Commode	_____	
Faucets	_____	chrome finish.
Expose pipes/valves	_____	chrome finish.
Pipe penetrations	_____	chrome finish escutcheons.
Clean outs	_____	chrome covers.
Mirrors	_____	mech. wall fasteners.
		Lighting
Floor drain	_____	each restroom.
Hose bib	_____	under lavatory in each restroom.
Wall finish		ceramic tile to 5' height
Ceiling		moisture resistant DW.
Floors		ceramic tile w/ceramic tile base, or quarry tile w/quarry tile base. Tile shall be MUD-SET.
Toilet Partitions	_____	at all commodes and urinals. overhead braced w/door bumpers baked enamel w/skirts.
Skirts	_____	18" stainless steel. watertight top edge.
Duplex receptacle	_____	GFCI type over vanity.
Paper towel dispenser with trash receptacle	_____	recessed in wall.
Hand dryer	_____	over each lavatory.
Soap dispenser	_____	liquid pump.
Toilet paper dispenser	_____	each commode stall.
Ash receptacle	_____	recessed, each restroom.

B. Specific: WOMENS

Sanitary napkin disposal	_____	each commode stall.
Sanitary napkin disposal	_____	each restroom, coin operated.

C. Specific: MENS

Urinal	_____	porcelain wall mounted w/stainless steel part.

NOTE: Each restroom shall be designed and constructed with provisions for the handicapped and shall conform to the latest edition of the National Standard Plumbing Code and the Uniform Federal Accessibility Standards published in the Federal Register, August 7, 1984 (Current Edition).

3.0 FIRE PROTECTION REQUIREMENTS

A. Sprinkler system required: _____ Yes, _____ No.

1. Type system to be installed: _____ Wet, _____ Dry.

2. Complete coverage throughout the structure: _____Yes, _____No.
   If no, describe proposed system, layout, etc.:

3. Exterior siamese connections are required.

B. Detection System:

1. Smoke detectors required: _____Yes, _____No.

NOTE: Radium type shall not be used.

2. Heat detectors required: _____Yes, _____No.
   (Rate of Rise Heat Detectors shall not be permitted.)

NOTE: When smoke and heat detectors are specific, full coverage of the building is required. In addition, heat detectors are also to be installed in conjunction with potential fire producing equipment such as furnaces, electric motors, etc. All detection devices shall be spaced and installed in accordance with manufacturer's specifications and the latest edition of the NFPA in effect at the time of installation. Heat detectors shall be set to trigger at 1358 F. The heat and smoke detectors shall be the combination type. The smoke detection unit shall alarm locally and the heat detection unit shall alarm the facility and transmit the alarm to the fire department via a dedicated telephone line or appropriate transmission media, i.e. radio transmission equipment. Automatic cutoff of air handling equipment is required when smoke or heat detectors, sprinkler systems, or any other automatic/manual fire alarm suppression system are activated.

C. Manually Activated Fire Alarm System: installed in accordance with the latest edition of the NFPA in effect at the time of installation, is required. Also provide manual pull stations at the ends of the building. The pull stations shall be tied into a central panel box that will signal the fire department via a dedicated telephone line or appropriate transmission media, i.e. radio transmission equipment.

D. Special fire suppression system (s) required: __ Yes, _____ No.

Describe type, location, and justification:

E. Fire extinguishers (manually operated) are required.

1. Government furnished: _____Yes, _____No.

2. Quantity and locations shall be based upon building design, NFPA, requirements, and coordinated with Installation's fire department.

3. Recessed cabinet mounted: _____Yes, _____No.

NOTE: The Contractor (Offeror) shall furnish and install the recessed fire extinguisher cabinets. The cabinets shall be at a minimum 24 1½"tall, 7" deep and 8 ½" wide w/glass doors.

F. All interior finish materials shall be per NFPA standards and Military Handbook 1008C.

G. Water supply lines: for the sprinkler system shall be black steel pipe.

H. The installation's standard fire alarm panels shall be specified for ease of maintenance and sustainability.

I. Emergency Lighting Requirements:

4.0 SECURITY REQUIREMENTS

A. Building physical security:

1. Intrusion detection system required: _____Yes, _____No.

   a) Type system to be installed.

   b) Desired location of detectors:

   c) Exterior door alarm requirements:

   d) Exterior window alarm requirements:

2. Duress alarm system (s) required: _____Yes, _____No.

   1. Type system to be installed.

   2. Location (s):

B. Safe (s) required: _____ Yes, _____ No.

1. Type and Number:
2. Size:
3. Location (s):
4. Secure to building: _____ Yes, _____ No, if yes, how:
5. Connect to main intrusion alarm system: _____ Yes, _____ No.

C. Remote transmission of the intrusion alarm system: to the installations master system required: _____ Yes, _____ No. If yes, provide and install the transmitter, all conduit, wiring, hookups from the intrusion alarm devices to the transmitter, as well as all exterior underground conduit, required wiring, panel boxes and all other ancillary equipment to bring the system to the existing communication transmission lines. The final connection at the communication line will be made by the government. All systems proposed shall be compatible with the existing system (s) installed at the installation. Point of coordination is Provost Marshall's Physical Security Officer. Specify the installation's standard intrusion alarm system if required.

D. Keying requirements:

1. Rooms requiring card readers:
2. Rooms requiring cipher locks:
3. Rooms requiring individual keys:
4. Rooms requiring master keys:
5. Exterior keying requirements:
6. At least six (6) keys shall be provided for each lock. An additional twelve (12) sub master and six (6) master keys shall be provided.
7. The Offeror shall provide fifty (50) key blanks in addition to the above keying requirements.

E. All exterior doors shall have irremovable hinge pins.

F. Panic hardware shall be in accordance with NFPA requirements.

G. Hardened secure area (s) required: _____ Yes, _____ No

Location (s):

H. Fencing Requirements:

1. Location:

2. Type and height:

3. Gate requirements:

I. Antiterrorism Requirements:

1. Blast resistant windows:

2. Setbacks:

3. Barriers:

4. Others:

J. Risk/Threat Analysis Requirements:

1.

2.

3.

5.0 COMMUNICATIONS REQUIREMENTS

A. Intercom system required: _____ Yes, _____ No.
Give a brief description of the requirements for the system:

B. Music/Paging system required: _____ Yes, _____ No.
Give a brief description of the requirements for the system:

C. Telephone system required: _____ Yes, _____ No.

Location:

Type:

Pay telephone required: _____ Yes, _____ No. If required, unit (s) will be wall hung. Contractor shall run wire and conduit from pay phone outlets to the main panel. Phones to be provided by Contractor.

NOTE: Contractor shall provide all conduit, wire, junction boxes and pull wires for the telephone system as required. Hookup of the telephone system will be performed by the Contractor. The Contractor shall coordinate all the telephone requirements with the installation's Directorate of Public Works (DPW) office and the local telephone company to determine requirements and provide space for communication equipment, panels, etc., in the mechanical room of where otherwise designed.

The basic telephone system shall be the "Centrax System" as provided by: _____

_____

They system functions shall include the following:

1. Direct in dialing, with restrictions on receiving collect calls.

2. Direct out dialing to local exchange number only.

3. Restrictions on placing chargeable calls outside the local exchange, except for calls charged to credit card or calls made with the charges reversed.

D. Television system required: _____ Yes, _____ No.

1. The technical and installation requirements of the television system shall be coordinated with _____ the local cable television provider.

2. Locations/number of internal outlets:

3. Wiring and grounding shall be in accordance with the National Electric Code.

E. Mass Notification System (Required per UFC 4-010-01, Standard 23: for New Inhabited Buildings and for Existing Buildings (Primary Gathering and Billeting), also for Existing Buildings, Recommended for all Inhabited Buildings)

Type of Mass Notification System Required:

6.0 SIGNAGE REQUIREMENTS

(Excluding those required by NFPA and OSHA)

D. Interior signage:

E. Exterior Signage:

All exterior signage shall conform with the Army Installation Design Guide and Post Wide Paint/Exterior Finish Standards and color charts.

7.0 OTHER COMMENTS

Links
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APPENDIX C INTERIOR DESIGN REVIEW CHECKLIST

C.1 The following checklist is optional and is designed for use on major projects.

INTERIOR DESIGN REVIEW CHECKLIST

1. Installation	**Project**	**Date**
Job Description		
Building No.	**Building Cost$**	
Evaluator	**Furnishing Cost$**	
Using Agency Coordinator	**Phone#**	
Designer	**Phone#**	

ITEM	YES	NO	N/A
2. Is the interior design integral to the facility design?			
- Interior design is specified by the using agency.			
- Scope of work includes building related interior design.			
- Scope of work includes furniture related interior design.			
- Design incorporates Army Installation Design Guide and Standards criteria.			
- DPW representative was a member of Pre-selection and/or Selection Boards.			
Preselection member:			
Selection member:			
3. Was the designer provided interior design criteria?			
- Designed Guide for Interiors DG 1110-3-122.			
- Design Guide for facility type designed.			
- Army Installation Design Guide and Standards.			
4. The design has been reviewed and the following are acceptable?			
<u>For building related interior design?</u>			
- Statement of Design Objective			
- Sketches			
- Color Board			
- Furniture Plan			

ITEM	YES	NO	N/A
- Exterior Materials and Finishes			
- Graphic Design			
Hand Drawn Sketches			
Digital image files (JPG, BMP, etc.)			
3D Model			
Animation (AVI, etc.)			
- Interior Design Finish Schedule			
- Government Furnished Material List			
Items for Installation of Furniture and Accessories			
-Predesign Evaluation:			
Maintenance Data			
Floor Systems			
Electrical Equipment and Task/Supplemental Lighting			
- Interior Element Specification			
Cost Estimates:			
Maintenance and Repair			
New Work			
Equipment-in-place and Furnishings			
For furniture related interior design:			
- Typical furniture layout			
- Furnishing, fabrics and finishes board			
- Furnishings plan			
- Sketch perspectives			
- Colored rendering			
- Photographs			
- Catalog Cuts			
- Furnishing illustration sheets			
- Furnishing placement lists			
- Furnishing order forms			
- Furnishing contract specifications			

ITEM	YES	NO	N/A
5. Does the interior design address the following functions?			
- Communications			
- Storage/filing			
- Display surfaces			
- Work surfaces			
- Conference Space(s)			
- Privacy			
- Lighting			
- Planting			
- Spatial considerations			
- Color/texture characteristics			
- Reflectance values			
- Acoustical considerations			
- Mechanical fixture placement			
- Electronic support			
- Furnishings/accessories			
- Work, training or paper flow			
- Hardware selection			
- Graphics/signage			
- Force Protection			
- Physical Security			
- Fire Safety			
6. Construction and installation phase			
- Positive first impression is created			
- Coordinated color scheme, interior reflecting exterior			
- Area & shape of spaces match function & support mission			
- Furnishings support function of space			
- Creative use of interior design spaces			
- Retained designer to review and approve contractor submittals			
- Retained designer to oversee the installation of furnishings			

ITEM	YES	NO	N/A
- Color boards were required and reviewed			
- Interior appearance policy is implemented			
Describe actions taken to ensure quality interior design to all negative responses on an attached sheet. Maintain a copy of this interior design review checklist and all negative responses in the DPW project file.			
I hereby certify that the information provided is in compliance with the guidelines of the installation or applicable IDG, except as justified as non-compliance.			
Designer of Record	**Date**		
Concur			
Deny (Explanation of denial is attached.)			
Master Planner	**Date**		
Accept			
Deny (Explanation of denial is attached.)			
Command Review (Where Applicable)	**Date**		

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APPENDIX D SUSTAINABLE DESIGN

D.1 WHAT IS SUSTAINABLE DESIGN?

D.1.1 Sustainable design and development is an integrated approach to planning, designing, building, operating, and maintaining facilities in a collaborative and holistic manner among all stakeholders (Fig. D.1). It is a systematic process and engineering practice with how to do it guidance, checklist, tools, and scoring systems. Sustainable design integrates the decision-making across the installation, basing every decision on the greatest long-term benefits and recognizing the interrelationship of installation actions with the natural environment. In the content of Army installations Sustainable Design is the design, construction, operation, and reuse/removal of the built environment in an environmentally and energy efficient manner (Fig. D.2). The basic objectives of sustainability are:

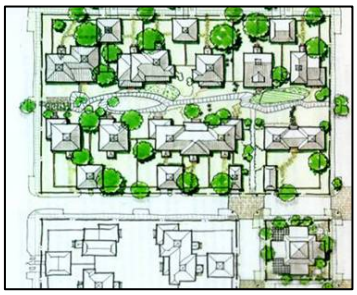

Fig. D.1 – Sustainable Site Design

D.1.1.1 Reduce the consumption of energy, land, materials, water, and other non-renewable resources.

D.1.1.2 Minimize the waste of energy, land, materials, water, and other limited resources.

D.1.1.3 Protect the natural environment that is the source of all resources.

D.1.1.4 Create livable, healthy, and fiscally productive manmade environments for existing and future generations.

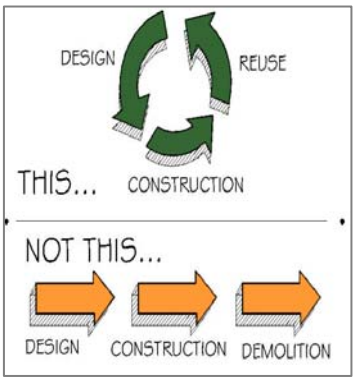

Fig. D.2 – Sustainable Design Process

D.1.2 Designing for sustainability ultimately increases quality of life through better resource protection and use. The design process must incorporate a change in mind-set that embraces less consumptive lifestyles. This mind-set change must include global interdependence, stewardship of the environment, social responsibility, and economic viability. The new design mind-set must change from the traditional approach to recognize the

impacts of every design choice on natural and cultural resources and on local, regional, and global environments.

Fig. D.3 - Energy Efficient Lighting Contributes to Sustainability

D.2 SUSTAINABLE DESIGN AND DEVELOPMENT

D.2.1 Practicing the principles of sustainable design in the planning, design, construction, and operation of infrastructure and facilities is a smart business practice. Protecting our natural resources and reducing our impact on the natural environment is achievable when we create energy efficient (Fig. D.3), healthy (Fig. D.4), high-performance (Fig. D.5), and safe buildings.

D.2.2 Integrated Design Process - Critical to the success of sustainable design and development is the organization and commitment of the team to engage in the Integrated Design Process. To effect change in building design and operation, the project delivery process itself must become a collaborative effort to integrate design strategies among all disciplines and all players in the project delivery process. Integrated design demands a more inclusive team, working closer together than is traditionally the case. Future building users and facility managers must be invited to join architects, engineers, and planners in developing the vision and goals for new facilities. (Adapted from the HOK Guidebook to Sustainable Design)

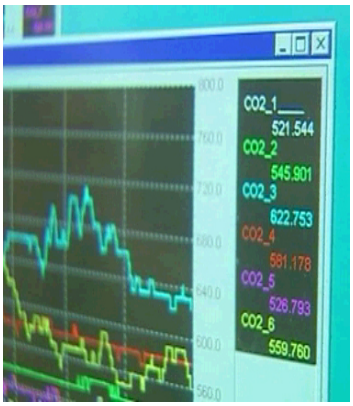

Fig. D.4 - CO2 Measurements of Indoor Air Quality Assisting in Creating a Healthy Environment

D.2.3 Sustainable Design concepts and applications will be used for all Army projects. Paragraph D.3 below discusses the Sustainable Project Rating Tool (SPiRiT) developed by the U.S. Army Corps of Engineers (USACE). Per the Assistant Secretary of the Army (Installation & Environment) Sustainable Design and Development Memorandum and the Assistant Chief of Staff for Installation Management (ACSIM) endorsement of Sustainable Design and Development initiative, the SPiRiT rating system will be used by design professionals in all new construction, additions, or renovation of Army facilities for rating sustainability.

Fig. D.5 - Efficient Water Usage Contributes to a High Performance Facility

D.2.3.1 The SPiRiT document (Appendix E) was derived from the U.S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System. See Website "SPiRiT Wizard" which outlines using SPiRiT, records and tracks rationale, generates SPiRiT rating and permits reuse of previous strategies for subsequent projects.

D.2.3.2 Army Rating Standard

D.2.3.2.1 The SPiRiT rating of "Silver" is the standard for all FY06 MILCON vertical construction projects currently under design (as of March 18, 2003). For all other FY06 and

future-year MILCON projects, the minimum SPiRiT rating requirement is "Gold". See Assistant Secretary of the Army Memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003.

D.2.4 Further information on sustainable design can be obtained at the following websites:

D.2.4.1 Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website This site provides information on the following topics: documentation and references; sustainable process, tools, products and materials; Sustainable Design and Development Training; and links to various sustainable design and development informational website.

D.2.4.2 U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website.

D.2.4.3 Whole Building Design Guide (WBDG) This site provides comprehensive and current information on sustainable design strategies and technologies.

D.3 SUSTAINABILITY AND THE FEDERAL GOVERNMENT

D.3.1 The Federal Government has led the nation in the energy efficient, resource-conserving building design, construction, and operation. Executive Order (EO) 13123, "Greening the Government through Efficient Energy Management" was issued June 3, 1999. This Order establishes that sustainable design principles shall be applied to all Federal projects in order to reduce pollution and other environmental costs associated with facility construction, operation, and eventual decommissioning. The principle of sustainable design for Federal Agencies established by EO 13123 include siting, design, and construction, as follows (Fig. D.6):

D.3.1.1 Site - Optimize site potential.

D.3.1.2 Energy – Minimize nonrenewable energy consumption.

D.3.1.3 Materials – Use environmentally preferable products.

D.3.1.4 Water – Protect and conserve water.

D.3.1.5 Indoor Environmental Quality – Enhance indoor environmental quality.

D.3.1.6 Facility Delivery – Holistic delivery of facility.

D.3.1.7 O&M – Optimize operational and maintenance practices.

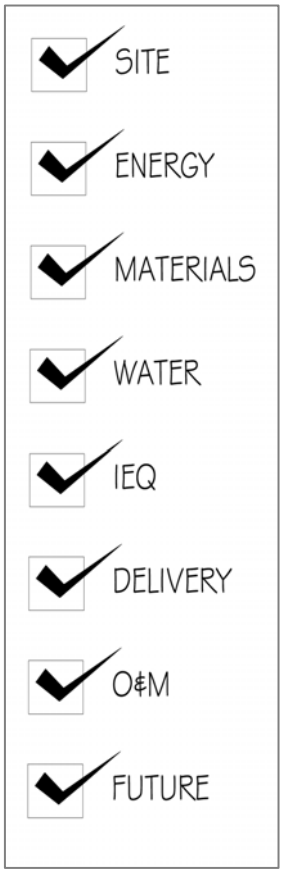

Fig. D.6 – Sustainable Design Principles

D.3.1.8 Future Missions – Functional life of facility and support systems.

D.4 SPiRiT

D.4.1 The U.S. Army Corps of Engineers (USACE) has developed a checklist for sustainability to be used by design professionals in all new construction, additions, or renovation of Army facilities. This checklist is the "Sustainable Project Rating Tool (SPiRiT)". The SPiRiT document was derived from the U.S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System.

D.4.2 SPiRiT is a rating tool that offers a checklist, strategies, and scores to provide sustainable facilities to the Army. SPiRiT allows environmentally responsible practices to be integrated into the process of facility delivery form the very beginning of the project. By using a "whole building" perspective, the SPiRiT rating tool (See Appendix E, SPiRiT Checklist) helps in preserving the environment and improving facility life-cycle management. SPiRiT is based on accepted energy and environmental principles.

D.4.3 The SPiRiT document includes eight (8) categories of design concerns (Fig. D.7). A facility's points summary is included at the end of the document. Points are achieved based upon the sustainable design issues addressed in the building, site and infrastructure design. The design is certified by the designer and design review personnel based upon the following certification levels.

D.4.3.1 SPiRiT Bronze 25 to 34 Points

D.4.3.2 SPiRiT Silver 35 to 49 Points

D.4.3.3 SPiRiT Gold 50 to 74 Points

D.4.3.4 SPiRiT Platinum 75 to 100 Points

Sustainable Sites	20 pts. max.
Water Efficiency	5 pts. max.
Energy / Atmosphere	28 pts. max.
Materials / Resources	13 pts. max.
Indoor Enrichment	17 pts. max.
Facility Del Prices	7 pts. max.
O & M	6 pts. max.
Future Mission	4 pts. max.
TOTAL	**100 pts. max.**

Fig. D.7 – SPiRiT Checklist Points Summary

D.5 ARMY STANDARDS

D.5.1 The cited Army Standards shall be met.

- The SPiRiT rating of "Silver" is the standard for all FY06 MILCON vertical construction projects currently under design (as of March 18 2003). For all other FY06 and future-year MILCON projects, the minimum SPiRiT rating requirement is "Gold". See Assistant Secretary of the Army Memorandum Subject: Sustainable Design and Development Requirements dated 18 March 2003.

D.6 REFERENCES

D.6.1 The following references are provided for guidance.

- Assistant Chief of Staff for Installation Management memorandum Subject: Sustainable Project Rating Tool, dated 21 December 2002
- Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website
- U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website
- Air Force Sustainable Facilities Guide
- Whole Building Design Guide

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APPENDIX E
SPiRiT CHECKLIST*
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**Note: LEED-NC Replaces SPiRiT Starting FY 2008*

Template IDG								
SUSTAINABILITY PROJECT RATING TOOL (SPiRiT)								
Facility Points Summary								**Maximum Points**
1.0		**Sustainable Sites (S)**		**Score**		**0**		**Max 20**
1.R1 *		Erosion/Sedimentation/Water Quality Control						[Required]
1.C1 *		Site Selection						2
1.C2 *		Installation/Base Redevelopment						2
1.C3 *		Brownfield Redevelopment						1
1.C4 *		Alternative Transportation						4
1.C5 *		Reduced Site Disturbance						2
1.C6 *		Storm water Management						2
1.C7		Landscape & Ext. Design to Reduce Heat Islands						2
1.C8 *		Light Pollution Reduction						1
*1.C9 **		*Optimize Site Features*						1
*1.C10 **		*Facility Impact*						2
*1.C11 **		*Site Ecology*						1
2.0		**Water Efficiency (W)**		**Score**		**0**		**Max 5**
2.C1		Water Efficient Landscaping						2
2.C2		Innovative Wastewater Technologies						1
2.C3 *		Water Use Reduction						2
3.0		**Energy and Atmosphere (E)**		**Score**		**0**		**Max 28**
3.R1 *		Fundamental Building Systems Commissioning						[Required]
3.R2 *		Minimum Energy Performance						[Required]
3.R3		CFC Reduction in HVAC&R Equipment						[Required]
3.C1 *		Optimize Energy Performance						20
3.C2 *		Renewable Energy						4
3.C3		Additional Commissioning						1
3.C5 *		Measurement and Verification						1
3.C6 *		Green Power						1
*3.C7 **		*Distributed Generation*						1

Template IDG								
SUSTAINABILITY PROJECT RATING TOOL (SPiRiT)								
4.0		**Materials and Resources (M)**		**Score**		**0**		**Max 13**
4.R1 *		Storage & Collection of Recyclables						[Required]
4.C1 *		Building Reuse						3
4.C2 *		Construction Waste Management						2
4.C3		Resource Reuse						2
4.C4 *		Recycled Content						2
4.C5		Local/Regional Materials						2
4.C6		Rapidly Renewable Materials						1
4.C7		Certified Wood						1
5.0		**Indoor Environmental Quality (IEQ)**		**Score**		**0**		**Max 17**
5.R1 *		Minimum IAQ Performance						[Required]
5.R2		Environmental Tobacco Smoke (ETS) Control						[Required]
5.C1 *		*IAQ Carbon Dioxide (CO2) Monitoring*						1
5.C2		Increase Ventilation Effectiveness						1
5.C3		Construction IAQ Management Plan						2
5.C4		Low-Emitting Materials						4
5.C5 *		Indoor Chemical and Pollutant Source Control						1
5.C6		Controllability of Systems						2
5.C7		Thermal Comfort						2
5.C8		Daylight and Views						2
*5.C9 ** *		*Acoustic Environment /Noise Control*						1
*5.C10 ** *		*Facility In-Use IAQ Management Plan*						1
6.0		**Facility Delivery Process (P)**		**Score**		**0**		**Max 7**
*6.C1 ** *		*Holistic Delivery of Facility*						7
7.0		**Current Mission**		**Score**		**0**		**Max 6**

Template IDG								
SUSTAINABILITY PROJECT RATING TOOL (SPiRiT)								
*7.C1 ***		*Operation and Maintenance*						3
*7.C2 ***		*Soldier and Workforce Productivity and Retention*						3
8.0		**Future Missions**		**Score**		**0**		**Max 4**
*8.C1 ***		*Functional Life of Facility and Supporting Systems*						2
*8.C2 ***		*Adaptation, Renewal and Future Uses*						2
				Total Score		0		Max 100
SPiRiT Sustainable Project Certification Levels								
		Army Standard - SPiRiT Bronze				**25 to 34 Points**		
		Army Goal - SPiRiT Silver				**35 to 49 Points**		
		SPiRiT Gold				**50 to 74 Points**		
		SPiRiT Platinum				**75 to 100 Points**		

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Update
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APPENDIX F LANDSCAPE MAINTENANCE SCHEDULE

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Landscape Maintenance Schedule

FUNCTION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mowing Turf Areas	Bi-weekly		Weekly									Bi-Weekly
Edge Walks	Monthly		Bi-weekly									Monthly
Line Trim	Bi-weekly		Weekly									Bi-weekly
Tree Trimming	Major pruning in dormant season; as Necessary											
Shrub Trimming	Major pruning in dormant season; as Necessary											
Manual Weed Beds	As Necessary											
Fertilize Turf	Twice a Year (April & October)											
Fertilize Trees	Once a Year (February)											
Fertilize Shrubs	Twice a Year (February & early June)											
Weed/Grass around tree wells/ signs/ etc.	As Necessary											
Pre-emergent (Herbicides)	Once a Year (by September 15th)											
Annual Color	Monthly (Fertilize, deadhead, pest management)											
Irrigation Checks & Adjustments	As Necessary											

Update 7/30/2006

APPENDIX G CAPITAL IMPROVEEMNTS

G-1. Fort Sam Houston Capital Improvements are contained in the FSH Capital Investment Strategy, an extensive 2030 Plan. Only portions of renovation, demolition, and construction projects are included in this appendix. These projects illustrate the dynamic approach taken by FSH to support its current missions. Projects are listed in the following tables are shown by desired Fiscal Year.

Figure G1 – Fire Station

G-2. Capital Improvement Projects

- Table G1 – FYDP Projects
- Table G2 – Disposal Program
- Table G3 – BRAC Projects
- Table G4 – Add / Renovate Projects

TABLE G1 – FYDP PROJECTS

INSTALLATION	FY	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE	PGM TYP
FY 05							
Fort Sam Houston	2005	F17120	57225	General Instruction Bldg - NAVY BRAC	SF	54,750	MCA
FY 07							
Fort Sam Houston	2007	F60000	12253	HQ Bldg - Fifth USA	SF	100,000	MCD
FY 08							
Camp Bullis	2008	F17898	18165	M-UAC Training Facility	FP	1	MCA
Camp Bullis	2008	F17122	18165	M-UAC Training Facility OPS/ STORAGE BLDG	SF	796	MCA
Camp Bullis	2008	F21410	18166	Vehicle Maint Shop (Camp Bullis)	SF	20,200	MCA
Camp Bullis	2008	F21410	18166	Vehicle Maint Shop (CB)-Oil STOR BLDG	SF	300	MCA
Camp Bullis	2008	F55000	17153	MED HEALTH CLINIC	SF	15,888	MED
Fort Sam Houston	2008	F74028	15332	Physical Fitness Facility	SF	44,347	MCA
FY 09							
Camp Bullis	2009	F12300	16950	Fuel Station	OL	4	DESC
Camp Bullis	2009	F12450	16950	VEH FUEL STOR-MOGAS	GA	20,000	DESC
Camp Bullis	2009	F12450	16950	VEH FUEL STOR -DIESEL	GA	20,000	DESC
Fort Sam Houston	2009	F14182	57097	Special Purpose Facility	SF	34,496	MCA
Fort Sam Houston	2009	F17120	53341	Medical Instructional Facility	SF	39,032	MED
Fort Sam Houston	2009	F60000	56100	Physical Evaluation Board Facility	SF	6,250	UMCA
FY 10							
Camp Bullis	2010	F72121	62524	Photovoltaic System BLDG 1350	SF	0	ECIP
FY 11							
Camp Bullis	2011	F72200	52036	Dining Facility (Camp Bullis) (18,500SF)1050PN	SF	18,500	MCA
FY 12							
Fort Sam Houston	2012	F72114	15320	Site Spt Fac-FSH	SF	196,650	MCA
Fort Sam Houston	2012	F14183	15320	Site Spt Fac-FSH-AT BN HQ BLDG	SF	4,840	MCA
Fort Sam Houston	2012	F14185	15320	Site Spt Fac-FSH-AT CO HQ BLDG	SF	13,915	MCA
Fort Sam Houston	2012	F72114	15320	Site Spt Fac-FSH - MAINT (2) SHELTER	SF	4,400	MCA
Fort Sam Houston	2012	F72114	15320	Site Spt Fac-FSH - DETACHED LATRINE	SF	19,500	MCA
Fort Sam Houston	2012	F21410	5034	Veh. Maint. Shop - MED TOE Unit	SF	13,632	MCA
Fort Sam Houston	2012	F21410	5034	Veh. Maint. Shop-MED TOE Unit-OIL STOR BLDG	SF	120	MCA
Fort Sam Houston	2012	F44224	5034	Veh. Maint. Shop-MED TOE Unit-ORG STOR BLDG	SF	5,250	MCA

TABLE G1 – FYDP PROJECTS (CONT.)

INSTALLATION	FY	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE	PGM TYP
Fort Sam Houston	2012	F72181	47338	Student Barracks, AIT (283,000SF)(1200PN)	SF	283,000	MCA
Fort Sam Houston	2012	F73010	23274	Fire Station - SAMMC	SF	7,400	MCA
Fort Sam Houston	2012	F73017	64766	Chapel Center - 600	SF	32,900	MCA
Fort Sam Houston	2012	F74014	56234	2 Motor Skill Dev Areas-BLDG 1720 ADDN	SF	2,450	MCA
Fort Sam Houston	2012	F74014	56234	2 Motor Skill Dev Areas-BLDG 2530 ADDN	SF	3,024	MCA
Fort Sam Houston	2012	F74028	64454	Physical Fitness Center	SF	44,347	MCA
Fort Sam Houston	2012	F85210	64290	Tractor Trailer Parking - Org Veh Pkg	SY	3,000	MCA
Fort Sam Houston	2012	F85215	64290	Tractor Trailer Parking-Non-Org Veh Pkg	SY	1,600	MCA
Fort Sam Houston	2012	F85100	17139	EXTEND JADWIN ROAD	SY	18,700	MCA
Fort Sam Houston	2012	F85100	17140	SCHOFIELD ROAD	SY	20,000	MCA
Fort Sam Houston	2012	F85100	17152	SCOTT ROAD	SY	20,000	MCA
Fort Sam Houston	2012	F85220	17152	SCOTT ROAD-SIDEWALK(30,000SF)	SY	3,333	MCA
FY 13							
Fort Sam Houston	2013	F14161	66029	470th MI Complex	SF	20,736	MCA
Fort Sam Houston	2013	F14182	66029	470th MI Complex	SF	10,528	MCA
Fort Sam Houston	2013	F14183	66029	470th MI Complex	SF	14,764	MCA
Fort Sam Houston	2013	F14185	65310	HHC ARNORTH CO HQ BLDG	SF	22,336	MCA
Fort Sam Houston	2013	F17119	66029	470th MI Complex	SF	4,585	MCA
Fort Sam Houston	2013	F60000	66029	470th MI Complex	SF	68,234	MCA
Fort Sam Houston	2013	F73017	64194	Chapel Facility	SF	17,900	MCA

TABLE G2 – DISPOSAL PROGRAM

LOCATION	FY	FAC NO	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE
FY 06							
BULLIS	2006	6111	F73075	17154	GEN INST BLD - BULLIS	SF	521
BULLIS	2006	5906	F60000	18165	MOUT-BULLIS	SF	570
BULLIS	2006	5046	F73075	18165	MOUT-BULLIS	SF	347
FSH	2006	2657	F17135	43770	APP INST-ANIMAL CARE	SF	7,589
FSH	2006	2785	F17131	47506	MEDICAL APPL INST FAC	SF	3,426
CL	2006	34	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	35	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	36	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	37	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	38	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	39	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	40	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	41	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	42	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	43	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	44	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	45	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	46	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	47	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	48	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	49	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	50	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	51	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	52	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	53	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	54	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	55	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924

TABLE G2 – DISPOSAL PROGRAM (CONT.)

LOCATION	FY	FAC NO	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE
CL	2006	56	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	57	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	58	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	59	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	60	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	61	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	62	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
CL	2006	63	F74036	LEASE	IN-GRANT EXPIRES - 3P -REC BILLETS	SF	924
BULLIS	2006	5122	F17120	R10910	USARC 136 STORAGE FC-GEN INST BLDGS	SF	3,602
BULLIS	2006	5123	F17120	R10910	USARC 136 STORAGE FC-GEN INST BLDGS	SF	2,596
BULLIS	2006	5903	F60000	R10910	USARC 136 STORAGE FC	SF	5,200
BULLIS	2006	5907	F73056	R10910	USARC 136 STORAGE FC	SF	570
FSH	2006	189	F74036	STRU	ALL FAC W/STRUCTURAL PROBLEMS	SF	10,607
FSH	2006	1640	F74051	STRU	ALL FAC W/STRUCTURAL PROBLEMS	SF	822
BULLIS	2006	5110	F44210	SURPLU	FACILITY REDUCTION PROGRAM	SF	880
BULLIS	2006	5902	F44210	SURPLU	FACILITY REDUCTION PROGRAM	SF	1,271
FSH	2006	20	F44210	SURPLU	FACILITY REDUCTION PROGRAM	SF	891
BULLIS	2006	5108	F60000	SURPLU	FACILITY REDUCTION PROGRAM	SF	512
CL	2006	306	F89100	WATER1	PRIVATIZE W-WW CANYON	SF	140
FY 07							
FSH	2007	4190	F13115	2912	TRAINING AIDS CENTER	SF	614
FSH	2007	4190	F13115	2912	TRAINING AIDS CENTER	SF	4,416
FSH	2007	4190	F13115	2912	TRAINING AIDS CENTER	SF	4,399
FSH	2007	4190	F13185	2912	TRAINING AIDS CENTER	SF	4,400
FSH	2007	4190	F44210	2912	TRAINING AIDS CENTER	SF	62,807
FSH	2007	4190	F60000	2912	TRAINING AIDS CENTER	SF	17,165
BULLIS	2007	6252	F17122	17153	CLINIC-BULLIS	SF	401
BULLIS	2007	6256	F17122	17153	CLINIC-BULLIS	SF	401
BULLIS	2007	B5107	F44210	17153	CLINIC-BULLIS	SF	441
BULLIS	2007	C5105	F44210	17153	CLINIC-BULLIS	SF	579

TABLE G2 – DISPOSAL PROGRAM (CONT.)

LOCATION	FY	FAC NO	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE
BULLIS	2007	5121	F60000	17153	CLINIC-BULLIS	SF	210
BULLIS	2007	5142	F60000	17153	CLINIC-BULLIS	SF	210
FSH	2007	2430	F14163	57225	CONSTRUCT GIB	SF	1,473
FSH	2007	1151	F17135	57225	CONSTRUCT GIB	SF	6,484
FSH	2007	1154	F17135	57225	CONSTRUCT GIB	SF	6,448
FSH	2007	1158	F17135	57225	CONSTRUCT GIB	SF	6,448
FSH	2007	2432	F44222	57225	CONSTRUCT GIB	SF	3,634
FSH	2007	2430	F60000	57225	CONSTRUCT GIB	SF	4,608
FSH	2007	1152	F72114	57225	CONSTRUCT GIB-73PN	SF	6,448
FSH	2007	1153	F72114	57225	CONSTRUCT GIB-106PN	SF	6,448
FSH	2007	1159	F72114	57225	CONSTRUCT GIB-120PN	SF	6,448
FSH	2007	1160	F72114	57225	CONSTRUCT GIB-120PN	SF	6,448
FSH	2007	1161	F72114	57225	CONSTRUCT GIB-120PN	SF	6,448
FSH	2007	590	F72121	57225	CONSTRUCT GIB	SF	21,823
FSH	2007	591	F72121	57225	CONSTRUCT GIB	SF	24,344
BULLIS	2007	5101	F44210	CS020	CB-CS020-7J PWBC MAINT SHOP	SF	18,792
BULLIS	2007	6214	F71300	CVI-2	SALE OF AFH - 1FA-TRAILER SITE		
BULLIS	2007	B6201	F71420	CVI-2	SALE OF AFH	SF	378
FY 08							
BULLIS	2008	6101	F14163	18166	EQUIPMENT MNT TRNG CENTER	SF	400
BULLIS	2008	6008	F14955	18166	EQUIPMENT MNT TRNG CENTER-1EA WASH PLAT		
BULLIS	2008	6104	F21410	18166	EQUIPMENT MNT TRNG CENTER	SF	15,410
BULLIS	2008	6106	F21410	18166	EQUIPMENT MNT TRNG CENTER	SF	2,460
FSH	2008	2265	F14185	47251	BARRACKS-HQ BLDG,CO	SF	47,218
FSH	2008	2265	F17119	47251	BARRACKS-ORG CLSRM	SF	2,629
FSH	2008	2265	F72122	47251	BARRACKS	SF	50,711
FSH	2008	2265	F72200	47251	BARRACKS	SF	9,143
FSH	2008	1379	F17119	47338	REPLACE BARRACKS - B1375-ORG CLSRM	SF	7,440
FSH	2008	1380	F17119	47338	REPLACE BARRACKS - B1375-ORG CLSRM	SF	11,400
FSH	2008	1379	F72121	47338	REPLACE BARRACKS - B1375	SF	104,008
FSH	2008	1380	F72121	47338	REPLACE BARRACKS - B1375	SF	104,008
FSH	2008	A0605		DERF	ALL FAC W/SEVERE CONTAMINATION	SF	2,418
FSH	2008	A0606		DERF	ALL FAC W/SEVERE CONTAMINATION	SF	2,418
BULLIS	2008	6202	F71100	STRU	ALL FAC W/STRUCTURAL PROBLEMS	SF	1,479
BULLIS	2008	6203	F71100	STRU	ALL FAC W/STRUCTURAL PROBLEMS	SF	1,381
BULLIS	2008	6204	F71100	STRU	ALL FAC W/STRUCTURAL PROBLEMS	SF	1,454
FSH	2008	259	F44210	SURPLU	FACILITY REDUCTION PROGRAM	SF	1,650
FSH	2008	291	F44210	SURPLU	FACILITY REDUCTION PROGRAM	SF	324

TABLE G3 – BRAC PROJECTS

LOC	FY	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE
FSH	2007	F51000	64169	BROOKE ARMY MEDCEN PH 1 (ADDN/ALTER & 5000 SP PARKING GARAGE & FIRE STN	LS	
FSH	2007	F74066	64174	YOUTH CENTER	SF	23,000
FSH	2007	F51000	64179	BROOKE ARMY MEDCEN **INCR 1** - CLINIC/ ADMIN ADDN	SF	305,532
FSH	2007	F51000	64179	BROOKE ARMY MEDCEN **INCR 1** - ED/ BED TOWER ADDN	SF	149,237
FSH	2007	F51000	64179	BROOKE ARMY MEDCEN **INCR 1** - SPECIAL FOUNDATION	SF	92,500
FSH	2007	F51000	64179	BROOKE ARMY MEDCEN **INCR 1** - ALT TO MED CNTR	SF	514,609
FSH	2007	F51000	64179	BROOKE ARMY MEDCEN **INCR 1** - IM/ IT SWITCH ROOM	SF	4,000
FSH	2007	F53070	64179	BROOKE ARMY MEDCEN **INCR 1** - AMBULANCE GARAGE	SF	5,370
FSH	2007	F85218	64179	BROOKE ARMY MEDCEN **INCR 1** - PARKING GARAGE	SY	194,444
FSH	2007	F54000	64189	BUDGE DENTAL CLINIC ADDITION	SF	2,057
FSH	2007	F72200	64192	STUDENT SUPPORT COMPLEX -2 DINING HALLS (2400 PN * 2)	SF	80,000
FSH	2007	F14183	64200	STUDENT BARRACKS COMPLEX 1 - PH 1 -BATTALION HDQTRS BLDG	SF	14,560
FSH	2007	F72121	64200	STUDENT BARRACKS COMPLEX 1 - PH 1 (AIT - 1200 PN)	SF	341,235
FSH	2007	F17120	64203	INSTRUCTION FACILITY PH-1	LS	0
FSH	2007	F17136	64206	MED TRNG FACILITY - PH 1- AUTOMATN-AIDED INSTRL BLDG	SF	0
FSH	2007	F85210	64209	VEHICLE PARKING AND ROADS	SY	68,808
FSH	2007	F31060	64210	BATLFLD HEALTH & TRAMA BIO LAB I**NCR 1**-MED RES LAB, NEW BLDG	SF	102,700
FSH	2007	F31060	64210	BATLFLD HEALTH & TRAMA BIO LAB **INCR 1**-MED RES LAB/ VIVARIUM	SF	30,400
FSH	2007	F31060	64210	BATLFLD HEALTH & TRAMA BIO LAB **INCR 1**-MED RES VIVARIUM	SF	52,210
FSH	2007	F31060	64210	BATLFLD HEALTH & TRAMA BIO LAB **INCR 1**-MED RES LAB	SF	52,210
FSH	2007	F60000	64218	REPAIR BLDG 2264 (110, 235 SF)	SF	0
BULLIS	2007	F17140	64463	ARMED FORCES RESERVE CENTER(BRAC FY07)	SF	197,169
BULLIS	2007	F21409	64463	ARMED FORCES RESERVE CENTER-VEH MAINT SHOP	SF	30,693
BULLIS	2007	F44224	64463	ARMED FORCES RESERVE CENTER-ORG UNIT STORAGE	SF	9,427
BULLIS	2007	F21410	64472	ARMED FORCES RESERVE CENTER-VEH MAINT SHOP	SF	4,188

TABLE G3 – BRAC PROJECTS (CONT.)

FSH	2008	F13115	16488	INFORMATION SYSTEMS FACILITY (MCA)	SF	32,544
FSH	2008	F51000	64180	BROOKE ARMY MEDCEN **INCR 2** - CLINIC/ ADMIN ADDN & ED/ BED TOWER ADDN & SPECIAL FNDN & ALT MED CNTR & IM/IT SW RM & PARKING GARAGE + SPEC FDN & AMBUL GAR - **SEE PN 64179**	SF	0
FSH	2008	F55000	64184	MCWETHY HEALTH CLINIC - ADDITION 1.0	SF	7,989
FSH	2008	F55000	64184	MCWETHY HEALTH CLINIC - ALTERATION	SF	0
FSH	2008	F14161	64185	TRI-SERVICE RESEARCH FACILITY - SCIF	SF	208,982
FSH	2008	F31000	64185	TRI-SERVICE RESEARCH FACILITY - PHYSICS LAB	SF	89,806
FSH	2008	F31000	64185	TRI-SERVICE RESEARCH FACILITY - SPEC FOUNDATION	SF	208,982
FSH	2008	F31060	64185	TRI-SERVICE RESEARCH FACILITY - MED RESEARCH LAB	SF	59,362
FSH	2008	F31060	64185	TRI-SERVICE RESEARCH FACILITY - MED RESEARCH ANIMAL VIVARIUM	SF	55,414
FSH	2008	F32100	64185	TRI-SERVICE RESEARCH FACILITY - PRECISION MACH SHOP	SF	1,200
FSH	2008	F39000	64185	TRI-SERVICE RESEARCH FACILITY - A/C CARRIER DECK MOCK UP	EA	1
FSH	2008	F55000	64188	HEALTH CLINIC	SF	84,158
FSH	2008	F72100	64191	ENLISTED UPH (PP) - 90 PERSON	SF	32,490
FSH	2008	F14185	64201	COMPANY OPNS FACILITIES - STUDENT BARRACKS CMPLX 1 -PH 2	SF	20,135
FSH	2008	F17119	64201	ORGANIZATION CLASSROOM STUDENT BARRACKS - CMPLX 1 -PH 2	SF	7,500
FSH	2008	F72121	64201	(1200-PN) AIT BARRACKS - STUDENT BARRACKS CMPLX 1 -PH 2	SF	341,235
FSH	2008	F17120	64205	MED INSTRUCTION FACILITY **INCR 2**- GEN INSTR BLDG	SF	
FSH	2008	F17136	64205	MED INSTRUCTION FACILITY **INCR 2**- AUTOMATION-AIDED INSTRUCTL	SF	0
FSH	2008	F60000	64212	CONVERT 2266 TO ADMIN	SF	114,538
FSH	2008	F72121	64212	CONVERT 2266 TO ADMIN-AIT BARRACKS (100 PN)	SF	28,500
FSH	2008	F60000	64213	REPAIR BUILDING 2263, 2000, 2001(158,188 SF) - 2007, 2008 (-11,623)	SF	0

TABLE G3 – BRAC PROJECTS (CONT.)

FSH	2009	F51000	64181	BROOKE ARMY MEDCEN **INCR 3** - CLINIC/ ADMIN ADDN & ED/ BED TOWER ADDN & SPECIAL FNDN & ALT MED CNTR & IM/IT SW RM & PARKING GARAGE + SPEC FDN & AMBUL GAR - **SEE PN 64179**	SF	0
FSH	2009	F14183	64202	BATTALION HDQTRS BLDG - STUDENT BARRACKS 2 - PH 1	SF	14,560
FSH	2009	F72121	64202	(1200-PN) AIT BARRACKS - STUDENT BARRACKS 2 - PH 1	SF	341,235
FSH	2009	F17120	64207	MED INSTR FACILITY - **INCR 3** - GEN INSTR BLDG	SF	0
FSH	2009	F17136	64207	MED INSTR FACILITY - **INCR 3** - AUTOMATN-AIDED INSTRUCTL	SF	0
FSH	2010	F17119	64182	REPAIR BUILDING 2270	SF	14,692
FSH	2010	F51000	64186	BROOK ARMY MEDCEN **INCR 4** - CLINIC/ ADMIN ADDN & ED/ BED TOWER ADDN & SPECIAL FNDN & ALT MED CNTR & IM/IT SW RM & PARKING GARAGE + SPEC FDN & AMBUL GAR - **SEE PN 64179**	SF	0
FSH	2010	F85218	64186	BROOK ARMY MEDCEN **INCR 4** - PARKING GARAGE 2	SY	194,444
FSH	2010	F17120	64208	MED INSTR FACILITY - **INCR 4** - GEN INSTR BLDG	SF	480,000
FSH	2010	F17136	64208	MED INSTR FACILITY - **INCR 4** - AUTOMATN-AIDED INSTRL	SF	270,000
FSH	2010	F14183	64212	CONVERT 2266 TO ADMIN-BATTALION HDQTRS BLDG	SF	14,560
FSH	2010	F14185	64212	CONVERT 2266 TO ADMIN-COMPANY OPERATIONS BLDG	SF	4,027
BULLIS	2011	F17120	64183	MEDICAL FIELD TRAINING - FIELD TRAINING CLASSROOMS	SF	21,700
BULLIS	2011	F17998	64183	MEDICAL FIELD TRAINING - ACFT/ VEH STATIC PAD	EA	23
BULLIS	2011	F21700	64183	MEDICAL FIELD TRAINING - MED EQPT REPAIR SHOP	SF	5,500
BULLIS	2011	F21700	64183	MEDICAL FIELD TRAINING - LIVE TISSUE LAB/ MOULAGE	SF	1,000
BULLIS	2011	F44100	64183	MEDICAL FIELD TRAINING - STORAGE FACILITY	SF	25,000
BULLIS	2011	F60000	64183	MEDICAL FIELD TRAINING - ADMIN	SF	10,000
BULLIS	2011	F72520	64183	MEDICAL FIELD TRAINING - TENT PAD	SY	17,615
FSH	2011	F17120	64221	MWR ACADEMY	SF	20,000
FSH	2011	F13115	65543	INFORMATION SYSTEMS FACILITY (BRAC)	SF	15,838
FSH	2013	F73017	64194	CHAPEL FACILITY & SPT FAC(MCA)	SF	17,900

TABLE G4 - ADD/ RENOVATE PROJECTS

LOC	FY	FCG	1391 PROJ NO	PROJECT DESCRIPTION	UM	SIZE
FSH	2005	F74025	63702	SOLDIER & FAMILY ASSISTANCE CENTER (8000 SF)	SF	13,948
Camp Bullis	2006	F72212	52036	DINING FACILITY - REVITALIZE BLDG 5101(18,500 SF)	SF	11,000
FSH	2007	F74053	64746	EXCHANGE BRANCH (320,043 SF)	SF	7,383
FSH	2008	F14129	2912	TRAINING AIDS CENTER (37,673 SF)	SF	42,161
Camp Bullis	2008	F14184	23273	BN HQ, TRANS - (3,564 SF)	SF	6,300
FSH	2008	F74046	64171	CATERING & CONFERENCE CENTER (80,000 SF)	SF	43,454
FSH	2008	F17200	66824	BATTLE COMMAND TRAINING CENTER, PHASE I (7,000 SF)	SF	7,000
FSH	2013	F17200	67194	BATTLE COMMAND TRAINING CENTER, PHASE II (39,060 SF)	SF	7,738
Camp Bullis	2015	F44210	49955	WAREHOUSE (20,000 SF)	SF	20,000
FSH	2015	F72122	64219	TRANS UPH AST (0 SF)	SF	501,480
Camp Bullis	2019	F21900	18170	FAC ENG SHOP (8,700 SF)	SF	8,700
FSH	2020	F21900	50083	MULTI-PURP SUP STO MNT FAC (59,117 SF)	SF	59,117
FSH	2022	F14186	58380	CO HQ, TRANS (0 SF)	SF	15,950
FSH	2022	F14163	58396	OPERATIONS SUPPOT FACILITY (0 SF)	SF	6,273
FSH	2029	F17135	43773	LAB INST BLDG (0 SF)	SF	9,333
FSH	2030	F44210	5035	WAREHOUSE (96,658 SF)	SF	96,658
FSH	2030	F74036	18093	RECREATION BILLETS (38,327 SF)	SF	38,327
FSH	2030	F44222	41866	STR SHED GP INS - Covered Storage Shed (28,022 SF)	SF	28,022
FSH	2030	F44210	47582	DOL WHSE (120,000 SF)	SF	120,000
FSH	2030	F74055	64215	EXCHANGE WAREHOUSE (6,100 SF)	SF	72,086
FSH	2030	F73018	67482	RELIGIOUS ED. FACILITY (0 SF)	SF	14,930
FSH	2035	F74068	193	RECREATION CENTER (27,800 SF)	SF	21,030

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APPENDIX H SELF-HELP PROJECT CHECKLIST

Due to significant Historic Preservation requirements, Self-Help projects are not authorized at Fort Sam Houston.

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APPENDIX I INTERIOR FINISHES STANDARDS

Paragraph 8.13.10

Note: Interior finishes include flooring (carpet, tile, resilient flooring, and recessed walk off mats, concrete), walls (wall base, paint, vinyl wall covering, and ceramic tile), counter and surface material (restrooms, cabinetry), doors, ceilings, and lighting. Include pictures where possible and cross-reference materials to a "Finish Materials Listing for Products Specifications".

I-1. INTERIOR DESIGN CONCEPTS. Exterior design guidelines set standards that establish the overall visual theme for the installation. This visual theme is the face of the installation seen by the public. The interior appearance of the individual facilities is the most significant factor affecting the day to day living and working conditions of the people who make up the installation. Improving these conditions is a primary Army Communities of Excellence (ACOE) objective.

a. Appearance Factors. The total interior appearance is made up of several different factors. These include:

(1) Visual. The visual factor addresses those aspects of a facility interior that appeal to the sense of sight. The visual factor is the most obvious factor in the makeup of the interior appearance.

(2) Tactile. The tactile factor addresses those aspects of a facility interior that appeal to the sense of touch. This factor is less obvious than the visual factor in defining the total interior appearance. It is not, however, insignificant in forming the total interior appearance.

(3) Durability. The durability factor addresses those aspects of a facility interior that resist ware and damage. The durability factor is less obvious but, over an extended period of time, is perhaps the most important factor in defining the total interior appearance. An interior appearance that looks good and feels good when it is first installed but deteriorates rapidly will neither look good nor feel good in a short period of time. Only in an environment of unlimited resources for maintenance and repair of facilities is the durability factor insignificant.

(4) Maintainability. The maintainability factor addresses those aspects of a facility interior that affect the ability to restore the interior after ware or damage. The maintainability factor does not directly contribute to defining the total interior appearance. It is a recognition of the fact that no matter how good an interior looks, no matter how good an interior feels, and no matter how durable an interior is, the interior is subject to ware and damage. The maintainability factor is extremely complex and not easy to define. For example:

(a) A wall surfaced with wallpaper may present a very good visual and tactile appearance. It may be a very durable surface. But when the surface is worn or damaged or the underlying structure is damaged or must be removed to provide access to embedded utilities, there may be very little choice other than to resurface the entire wall. A painted will surface may, on the other hand, be spot painted to a close match with the original surface.

(b) The ability to replace a damaged toilet seat in a timely manner is, in part, related to the availability of a replacement toilet seat in bench stock. Having 35 different styles of toilet seats, none of which are interchangeable, adversely affects maintainability.

b. Objectives. Interior design objectives are to:

(1) Provide facility interiors that enhance the living and working conditions on the installation. This is achieved by providing interiors that: Present an appealing visual appearance; present an appealing tactile appearance; are durable; are maintainable.

(2) Reduce operating costs by reducing the design and planning costs incurred by "reinventing the wheel" each time a new facility is built or rehabilitation of an existing facility is accomplished.

c. Common Guidelines. Interior design guidelines are, for the most part, independent of the visual zone a facility is located in. The maintainability factor is enhanced by utilization of the maximum number of common elements. This is not, however, the over-riding consideration in the development of common guidelines. The common guidelines apply to all facilities unless:

(1) An exemption is contained in this IDG.

(2) An exemption to the use of IDG standards is granted. See paragraph 1-1.B (4) for exemptions to IDG standards.

d. Historic Guidelines. The primary area of exemption to the use of common interior design guidelines is in the area of historic structures where required to conform to the provisions of the NHPA. The exemptions to common guidelines contained in this IDG are general in nature. Work done to the interiors of historic structures must be done only after consultation of the HPMP and compliance with the historic review procedures identified in Appendix D.

I-2. CEILINGS.

a. Concept.

(1) Types.

(a) Acoustical panel ceilings (lay-in)

(b) Acoustical tile ceilings (concealed spline and adhesive applied)

(c) Monolithic ceilings (plaster or gypsum board)

(d) Decorative ceilings (not generally recommended)

(2) Functions.

(a) Visual. A ceiling is primarily installed in a space for visual reasons to conceal unfinished structure, wiring, piping, and HVAC ducts. Buildings or spaces, which do not require concealment of these components, will often have no ceiling.

(b) Acoustic. A ceiling will often be installed in a space to control the noise levels and reverberation within the space or to assist in reducing sound that may travel between rooms.

(c) Energy. A ceiling will often be installed in a room to contain cooled or heated air within the space. This often occurs when there is considerable attic or open space above an occupied area that does not require temperature control. The ceiling systems themselves have little insulating value and are usually used in conjunction with traditional insulating materials if they are performing this energy conserving function.

(d) Return air plenum. A ceiling is often a vital component of some mechanical HVAC systems that do not use ducts to return conditioned air back to the air unit for recirculation. In these cases, the ceiling defines a space called a plenum between the conditioned rooms that it covers and the building structure. Return air travels efficiently and inexpensively through this space back to the HVAC system.

(e) Fire Separation. A ceiling can be a part of a required fire separation between two areas of a building. The fire separation is never achieved with the ceiling alone but is a component of an assembly of building components, which normally includes the floor or roof deck above it.

(3) Selection Criteria.

(a) Cost. The plaster ceiling is the most costly of these ceiling systems. Gypsum board and the lay-in acoustical ceiling are the least costly with the gypsum board being slightly more expensive. The cost of the concealed spline ceiling is in between that of plaster and the others.

(b) Appearance. Generally, the visual design objective in selecting a ceiling system is to make the ceiling a visually neutral element to which minimal visual attention is called. A monolithic ceiling will do this best and the lay-in ceiling the least. The concealed spline ceiling or adhesive applied acoustic tiles is close behind the monolithic for visual subtlety.

(c) Accessibility. The ability to gain access to the space above the ceiling to maintain equipment located there may be an important selection criterion. The lay-in ceiling permits the easiest accessibility while the monolithic ceiling prohibits it without destroying the ceiling. The concealed spline ceiling does permit accessibility to the plenum space though with some difficulty and certain damage to a small percentage of the ceiling tiles.

(d) Maintenance. Ceiling systems usually require maintenance only when they have been handled to gain access to the space above. Lay-in ceilings are the easiest to maintain since the removal of the tiles is simple and seldom causes visible damage when the tile is replaced. Damage to the tiles in concealed spline ceilings is not able to be concealed and usually requires the replacement of the tile. The monolithic ceiling requires extensive and costly repair if it is damaged.

(e) Damage resistance or sanitary considerations. In areas that are subject to heavy use or where cleanliness is a concern such as kitchens, ceilings may be subject to impact or require periodic washing. Tiles or panels, which are faced with metal, polyvinyl chloride or mylar, are good choices. Gypsum board or plaster may serve well in these areas as well if coated with an appropriate washable, durable paint.

(f) Acoustics. There are two different types of acoustic criteria to consider when selecting a ceiling system: Room-to-room acoustics and control of sound within a space.

1 Room-to-room acoustics. Mass of material is required to prevent sound transmission between spaces and, while the ceiling can help, the walls and floors must be properly constructed also. The monolithic ceiling does the best job of controlling room-to-room sound transmission since it is the densest material and has greatest continuity and is sealed against the walls. Lay-in ceilings are poor controllers of room-to-room acoustics because sound can travel easily between the loosely jointed components of the system that is not composed of dense materials. Concealed spline ceilings are only slightly better than lay-in ceilings for this purpose.

2 Control of sound within a space. Soft, absorptive material is required for noise and reverberation control within a space. Lay-in and concealed spline ceiling tiles are good at this job. Monolithic ceilings are poor sound absorbers since they are hard surfaced and reflective.

(4) Historic zone deviations.

(a) Interior construction or renovation projects, which will be carried out in any of the Post's historic zones must be done in a manner consistent with the Post's Historic Buildings Maintenance Guideline.

(b) The Post's historic zones are the Quadrangle Area, Infantry Post, Staff Post, Artillery/Cavalry Post and New Post. (Figure 1-1)

b. Acoustical Panel Ceilings.

(1) Characteristics. This type of ceiling is composed of acoustical panels laid into an open metal grid.

(a) Dimensions. Most commercial lay-in ceilings are designed on a 24" module and commonly are manufactured to fit a 2' x 4' ceiling or a 2' x 2' ceiling grid. Some lay-in ceiling systems are designed around a 20" x 60" module that will work with a 5' grid but this is not commonly found at military installations.

(b) Ceiling panels. Mineral fiber and fiberglass are the two most common ceiling panel materials for lay-in systems. Mineral fiber panels are most often produced for standard commercial applications in thickness of ½" to ¾" with 5/8" being the most common. Fiberglass panels range from ¾" to 3" in thickness.

1 Acoustics. Sound absorption. This important criterion in lay-in ceiling governs the quality of sound inside a room since absorbed sound will not echo or reverberate. Sound absorption is measured by Noise Reduction Coefficient (NRC) criteria and ranges from a poor absorption level of 0.50 in some of the mineral fiber panels to a good absorption level of 1.05 in some of the thicker fiberglass panels. The average range is 0.50 to 0.60.

2 Acoustics. Sound transmission. This criterion governs the ability of a ceiling panel to prevent sound from going from one room to another and is measured by Sound Transmission Class (STC) criteria. STC levels range from a very poor level of 15 in some of the fiberglass panels to an appreciably better level of 44 in some of the mineral panels. STC criteria is not critical in lay-in ceiling panel selection since this kind of ceiling is generally poor, at best, in preventing sound transmission because there are no tight joints in the system. Ratings of 35 to 39 are considered average.

3 Appearance. Ceiling panels are available in many colors, profiles, and textures. Colors range from white to a variety of pastel shades. Textures are available in heavily fissured, deeply recessed configurations to very subtle finely textured patterns. Profiles range from flat panels to dramatic shaping that create strong geometric patterns in a completed ceiling. The design of the edge condition can vary from square, which is concealed by the grid, to rabbeted, which exposes a portion of the panel edge to view.

4 Light reflectance. Light reflectance is important from an energy-conserving standpoint since lower reflectivity will normally require more intensive lighting. Most white or off-white ceiling panels will reflect 75% of the light that strikes them. The reflectance of colored and textured panels is reduced significantly from this standard.

5 Thermal insulating value. This criterion may be important if it is determined that the ceiling alone must be the insulating barrier. Mineral fiber panels have an R-value of 1.0 to 1.6 while fiberglass panels of the same thickness have an R-value of 2.0 to 2.6 and are, therefore, better insulating material. Should the ceiling panel have to have an

even greater insulating value, fiberglass panels are available in thickness up to 3" with an R-value of 12.0. Added insulation value for mineral fiber panels can also be accomplished with the addition of standard fiberglass batts laid on top of the ceiling tiles. This common practice provides only minor problems when seeking access to the ceiling space.

6 Flame spread. All ceiling panels must have a flame spread rating of 0-25 (Class A). This rating is readily available from all reputable panel manufacturers.

7 Fire rating. Ceiling systems alone are not rated. Rated systems are available only when combined with specific floor or roof deck construction as identified by agencies such as Underwriters Laboratories Inc.

(c) Suspension systems. There are three different classifications of ceiling suspension systems: Light duty, intermediate duty, and heavy duty. These classifications refer to the ability of the main runners to support a uniformly distributed load.

1 Light duty systems are used primarily for residential and light commercial structures where ceiling loads other than acoustical tile or lay-in panels are not anticipated. Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 5.0 lbs per linear foot.

CEILING LOCATION MATRIX

LEGEND	
Preferred	1
Acceptable	2
Not Acceptable	3

	LAY-IN	CONCEALED SPLINE	MONOLITHIC
ADMINISTRATIVE FACILITIES			
Lobbies, public spaces	2	1	3
general admin. areas	1	3	3
offices	1	3	3
senior staff offices	2	1	3
conference rooms	2	1	3
support areas	1	3	3
MEDICAL FACILITIES			
Lobbies, public spaces	2	1	3
general admin. areas	1	3	3
patient rooms	2	1	3
laboratories	2	2	1
clinics	2	2	1
surgerys, operatorys	2	2	1
TRAINING FACILITIES			
Lobbies, public spaces	2	1	3
general admin. areas	1	3	3
offices	1	3	3
classrooms	1	3	3
auditoriums	3	2	1
RESIDENTIAL - TROOP HOUSING			
Lobbies, public spaces	1	2	3
barracks sleeping areas	1	2	2
bedrooms	1	2	2
dining rooms	1	2	3
RESIDENTIAL - SINGLE FAMILY HOUSING	3	3	1
COMMUNITY FACILITIES			
Retail sales areas	1	2	2
gymnasiums	3	3	3
Clubs	2	2	2
KITCHENS	3	3	1
TOILET ROOMS	3	3	1
LOCKER AND SHOWER ROOMS	3	3	1

Figure I-1.

2 Intermediate duty systems are sued primarily for ordinary commercial structures where some ceiling loads due to light fixtures and air diffusers are anticipated.

Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 12.0 lbs per linear foot.

3 Heavy duty systems are used primarily for commercial structures in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for an ordinary commercial structure. Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 16.0 lbs per linear foot.

4 Suspension system material. The primary material for commercial grade suspension systems is steel although aluminum suspension systems are available.

5 Suspension system appearance. The suspension system is available in a reasonable range of colors and metallic finishes. They are also available in widths varying from 9/16" to 15/16'", with the 15/16" being most common.

(2) Special situations.

(a) Damage resistant ceiling panels are available covered with protective films of polyvinyl chloride and are appropriate for use in high abuse areas such as corridors, and industrial facilities.

(b) Moisture resistant panels are available covered with high-density ceramic material making it effective in high moisture areas, such as swimming pools, kitchens, and some outdoor applications.

(c) Sanitary surfaces are available for kitchens, hospitals, and laboratory applications. Vinyl or mylar faced panels are often used for these areas since they are highly washable. They are even available for clean rooms.

(d) Metal panels, perforated and non-perforated, are available for heavy use areas. Non-perforated metal panels are available for USDA approved spaces.

(e) Decorative ceilings are made of a wide variety of materials such as wood, metal, and plastic, and are infrequently used. Some decorative ceilings are found in existing historic structures. Their preservation may be an essential historic maintenance action.

(3) Design and construction considerations.

(a) As a general rule, lay-in ceilings should be contained, visually, within the space that they cover. They should not abut other ceilings of different materials or other lay-in ceilings with the grid running in a different or unaligned direction. Where possible, ceilings of two different materials should be separated by an opaque partition (not a glass partition) or at least a significant change in plane with some intervening change of material. (Figure I-3.)

(b) Edge conditions. The lay-in ceiling must always terminate with a metal angle of the same material as the grid where it abuts a solid partition. If the ceiling must terminate at a window (as in renovation), a well should be constructed around the window to provide an appropriate termination for the ceiling.

(4) Locations for use. The primary locations for lay-in acoustical ceilings are in administrative buildings, classroom buildings, troop housing, and some medical and commercial structures. There will be limited use of this ceiling type in single-family residential structures or in historic structures. See matrix (Figure I-1) for preferred locations.

(5) Cost. The fiberglass lay-in ceiling panels are generally more expensive than the mineral fiber panels by a factor of about 5% for panels of equivalent dimension and thickness. Panel material cost can vary greatly, however, according to panel size, facing material, texture, and color. The cost of the grid suspension system does not vary greatly.

(6) Analysis and recommendations.

(a) Module. The all-purpose lay-in ceiling will use a 2' x 2' ceiling grid. This type of ceiling will meet the requirements of all types of building modules. The 2' x 2' grid is preferred over the 2' x 4' grid because the larger tiles have a tendency to sag when air conditioning and heating systems are not operating in early spring and in late fall in accordance with energy conservation directives. (Figure I-2.)

(b) Panel characteristics. The most commonly used ceiling panel shall be a faced mineral fiber of 5/8" thickness with an NRC range of 0.60 to 0.70 or greater, an STC rating of 30 to 40 and a light reflectance coefficient of 70$ or greater.

(c) Panel pattern and color. The panel pattern shall be a flat, non-directional, finely fissured design with a square edge. Unless there are special circumstances, no colored, heavily textured or patterned panels will be used nor will the panel have any sculptural design or any edge detail that permits the panel to drop below the ceiling grid. Elaborate patterns, colors, and textures tend to call unwanted visual attention to a building element that should remain anonymous.

(d) Suspension system. A standard intermediate duty steel (not aluminum) suspension system should be employed in most instances. Lighter weight systems are too subject to damage and the heavy-duty systems are not necessary in most environments. The standard width of the exposed flange will be 15/16". Narrower flange widths are not recommended for ceilings where frequent access may be required. The grid color shall always match the color of the ceiling tile.

c. Acoustical Tile Ceilings.

(1) Characteristics. This type of ceiling is composed of acoustical tiles suspended by a concealed spline system or directly applied to an appropriate surface.

(a) General. Acoustical tile ceilings are designed on a 12" module and commonly are manufactured as a 12" x 12" ceiling tile or a 12" x 14" ceiling tile. These

dimensions have reduced over the years from 20" square and 16" square. The tiles either are applied with adhesive to some appropriate substrate, such as concrete or gypsum board, or are designed as part of an accessible ceiling system in which the ceiling grid is fully concealed.

(b) Ceiling tiles. Acoustical tiles are most frequently made of mineral fiber and are produced for standard commercial applications in thickness of ¾". The mineral fiber tiles are either cast or molded or they may be felted either dry or with water. Fiberglass is not available for this application.

1 Acoustics. Sound transmission. This important criterion in an acoustical tile ceiling governs the quality of sound inside a room since absorbed sound will not echo or reverberate. Sound absorption is measured by Noise Reduction Coefficient (NRC) criteria. The NRC for acoustical ceiling tile ranges from a mediocre absorption level of 0.50 to a better absorption level of 0.70. The average range is 0.55 to 0.60.

2 Acoustics. Sound transmission. This criterion governs the ability of a ceiling tile to prevent sound from going from one room to another and is measured by Sound Transmission Class (STC) criteria. Acoustical tile STC levels range from a very poor level of 25 to an appreciably better level of 44 in some of the mineral tiles. Ratings of 35 to 39 are considered average. This kind of ceiling tile is better than lay-in ceiling panels at reducing sound transmission because it fits more tightly together; however, it is not as effective as monolithic ceilings. Of course, where the tile is applied with adhesive to a dense substrate, the substrate may be adequate to reduce sound transmission.

3 Appearance. Ceiling tiles are available in many colors and textures. Colors range from white to a variety of pastel shades. Textures are available in heavily fissured, deeply recessed configurations to very subtle, finely textured patterns. All are available in directional or non-directional patterns. The design of the edge condition can vary from a square, sharp-cut edge to beveled or eased edges. The square edge tiles are more likely to conceal the joints but fail to do so when the light striking the ceiling does so at a low angle of incidence. The eased or beveled edges minimize the incidence-of-lighting problem and also are more durable to handle.

4 Light reflectance. Light reflectance is important from an energy-conserving standpoint since lower reflectivity will normally require more intensive lighting. Most white or off-white ceiling tiles will reflect 75% of the light that strikes them. The reflectance of colored and heavily textured tiles is reduced significantly from this standard.

5 Thermal insulating value. This criterion is of little significance in selecting ceiling tiles since their insulating value is relatively low. Mineral fiber tiles have an R-value of 1.0 to 1.6 and must be accompanied by some other insulating material if the ceiling space is to be used for this purpose.

6 Flame spread. All ceiling tiles must have a flame spread rating of 0-25 (Class A). This rating is readily available from all reputable tile manufacturers.

7 Fire rating. Ceiling systems alone are not rated. Rated systems are available only when combined with specific floor or roof deck construction as identified by agencies such as Underwriters Laboratories Inc.

(c) Suspension systems. There are three different classifications of ceiling suspension systems: Light duty, intermediate duty, and heavy duty. These classifications refer to the ability of the main runners to support a uniformly distributed load.

1 Light duty systems are used primarily for residential and light commercial structures where ceiling loads other than acoustical tile or lay-in panels are not anticipated. Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 12.0 lbs. per linear foot.

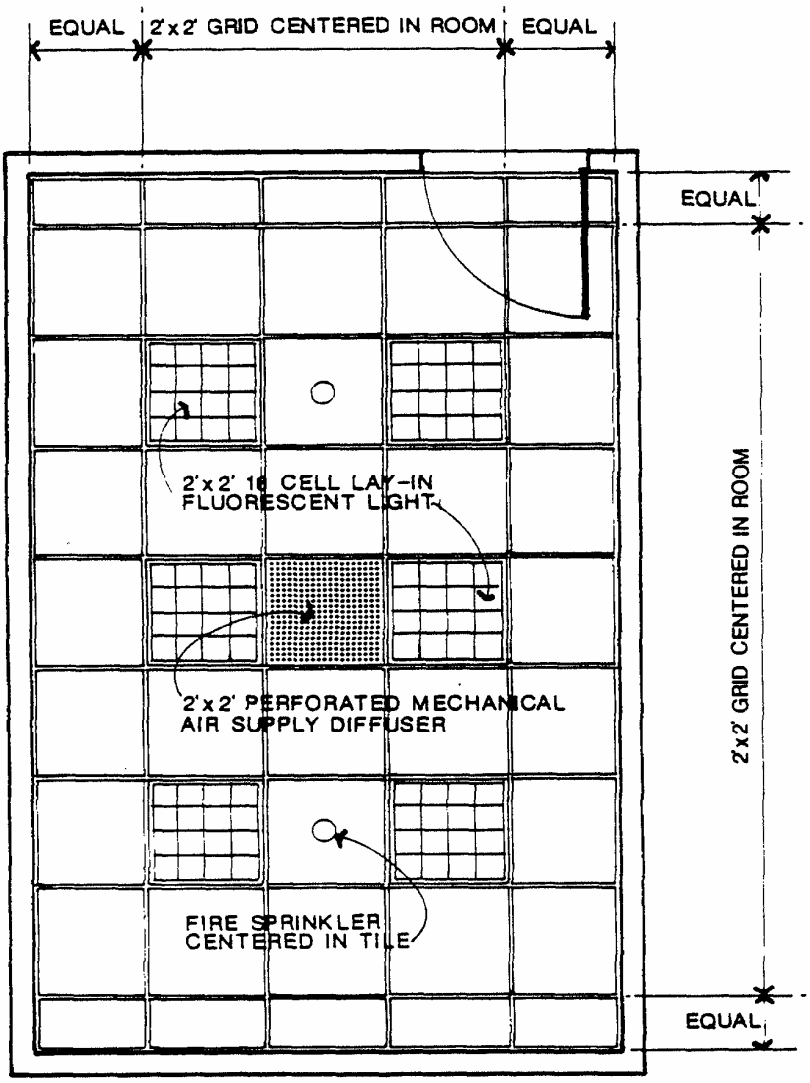
2 Intermediate duty systems are used primarily for ordinary commercial structures where some ceiling loads due to light fixtures and air diffusers are anticipated. Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 12.0 lbs. per linear foot.

3 Heavy duty systems are used primarily for commercial structures where the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for an ordinary commercial structure. Minimum load carrying capability of the main runner members for loads hung directly from the members for this system is 16.0 lbs. per linear foot.

4 Material. The primary material of commercial grade suspension systems is steel.

5 Appearance. Since the suspension systems for all acoustical tile ceilings are concealed, appearance is not a factor.

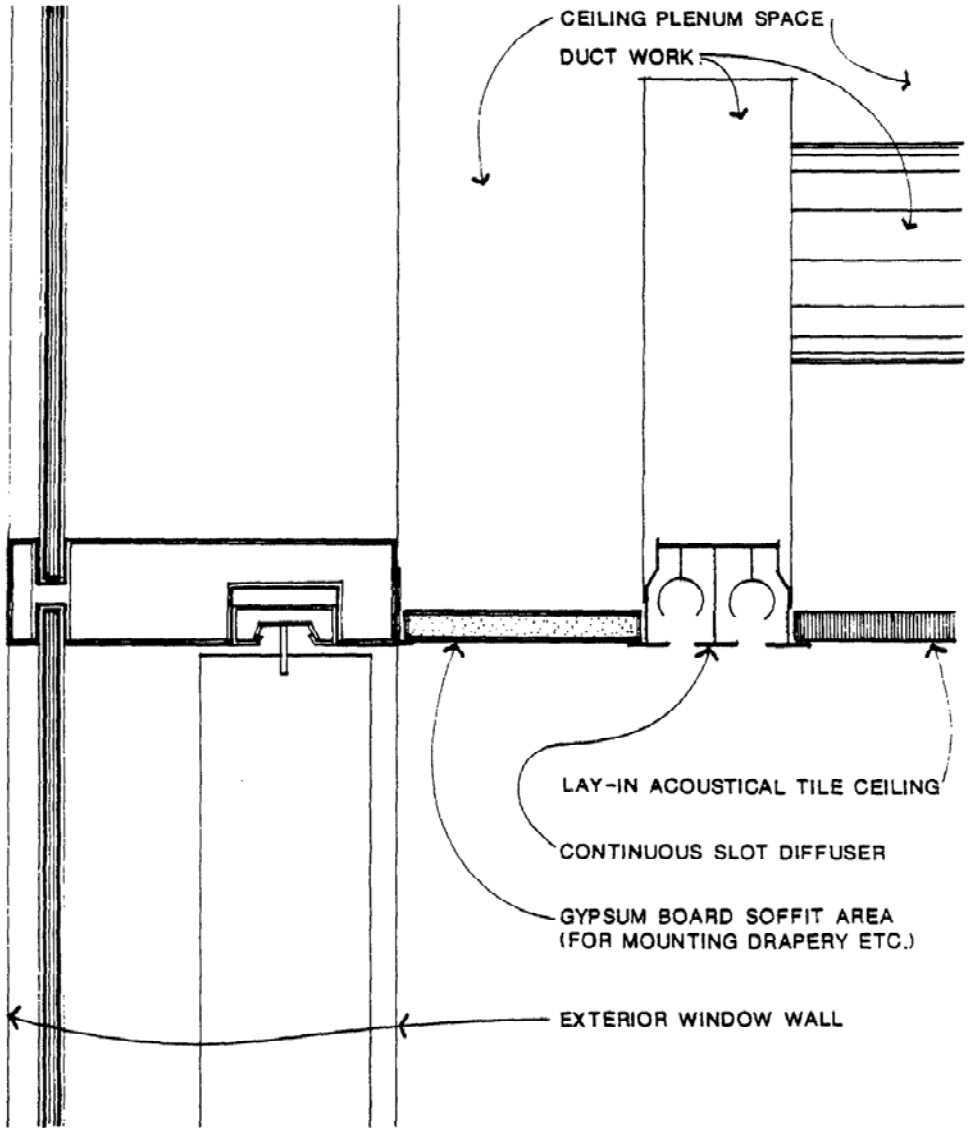
6 Accessibility. While the suspension systems made for allowing access to concealed spline acoustical tile ceilings are effective, they require tools and skill to provide access to the ceiling plenum. It is much more difficult to access this kind of ceiling than to access a lay-in ceiling.



EXAMPLE OF STANDARD
2'x2' LAY-IN ACOUSTICAL TILE CEILING

Note that the ceiling in the room is arranged so that the maximum number of full 2' X 2' panels are placed symmetrically in the room and that short panels of equal dimension are used when no full panel is possible. Items such as fire sprinklers, loud speakers, and smoke detectors should always be located in the center of a panel. This arrangement will not always be possible, particularly if the ceiling extends over the top of the room's partitions. Care should be taken to ensure the greatest symmetry possible, however.

Figure I-2.



SECTION AT EXTERIOR GLASS WALL
SHOWING CONTINUOUS SLOT DIFFUSER

This detail demonstrates an attractive means of terminating a lay-in ceiling at an exterior wall. If there is a need for perimeter air distribution, the linear air diffuser provides a good visual stop for the lay-in ceiling, and the small gypsum board strip between the diffuser and the exterior wall provides a good surface for mounting drapery or other window treatment. The diffuser serves to make a visual transition between the two dissimilar ceiling materials.

Figure I-3.

(2) Special situations.

(a) Damage resistant ceiling tiles covered with protective films of polyvinyl chloride are available and are appropriate for use in high abuse areas, such as corridors and industrial facilities.

(b) Moisture resistant tiles are available covered with high-density ceramic material making it effective in high moisture areas, such as swimming pools, kitchens, and some outdoor applications.

(c) Sanitary surfaces are available for kitchens, hospitals, and laboratory applications. Vinyl or mylar faced tiles are often used for these areas since they are highly washable. They are even available for clean rooms.

(d) Metal tiles, perforated and non-perforated, are available for heavy use areas. Non-perforated metal panels are available for USDA approved spaces.

(3) Design and construction considerations.

(a) As a general rule, concealed spline acoustical tile ceilings should be contained visually within the space that they cover. They should not abut other ceilings of different materials. Where possible, ceilings of two different materials should be separated by an opaque partition or at least a significant change in plane, some intervening change of material, or both.

(b) Edge conditions. The concealed spline acoustical tile ceiling must always terminate with a metal angle of the same material as the grid where it abuts a solid partition. If the ceiling must terminate at a window (as in a renovation), a well should be constructed around the window to provide an appropriate termination for the ceiling.

(4) Locations for use. The primary location for concealed spline acoustical tile ceilings will be in a few administrative buildings, lobbies, and finely finished public spaces. There will be limited use of this ceiling type in historic structures. See matrix (Figure I-1) for preferred locations.

(5) Cost. Mineral fiber ceiling tiles vary considerably in cost according to face material, texture, pattern and configuration. Ceiling installations using tiles adhered with adhesive are considerably less costly than those requiring a metal suspension system permitting access to the plenum above.

(6) Analysis and recommendations.

(a) Feasibility. There are only limited instances where concealed spline acoustical tile ceilings will be permitted since their cost is so much higher than the lay-in acoustical panel ceiling. Adhesively applied acoustical tile ceilings may be applied anywhere there is an appropriate substrate for attachment and there is a requirement for noise control.

(b) Tile characteristics. The ceiling tile shall be a faced mineral fiber of ¾" thickness with an NRC range of 0.60 to 0.70 or greater, an STC rating of 30 to 40, and a light reflectance coefficient of 70% or greater.

(c) Tile pattern and color. The tile pattern shall be a flat, non-directional finely fissured design with a slightly beveled edge if the ceiling is to be accessible. If the ceiling tiles are to be adhesively applied, they may have square edges if the design intent is to minimize visible joints. Beveled edges are also permitted in this instance. Unless there are special circumstances, no colored, heavily textured or patterned tiles will be used. Elaborate tile patterns, colors and textures tend to call unwanted visual attention to a building element that should generally remain anonymous.

(d) Suspension system. A standard intermediate duty steel suspension system should be employed in most instances. Lighter weight systems are subject to damage and the heavy-duty systems are not necessary in most environments.

d. Monolithic Ceilings.

(1) Characteristics. The monolithic ceiling is either a plaster or gypsum board ceiling.

(a) General. Gypsum drywall and gypsum or Portland cement plaster are frequently used as ceiling materials for their ability to stop the transmission of sound and for their fire rating. They also have some application in moist areas and are durable.

(b) Acoustics. Sound absorption. Plaster or gypsum board ceilings are hard surfaced and have no sound absorbing qualities at all. Acoustical tiles must be applied to these surfaces if this criterion is important.

(c) Acoustics. Sound transmission. Plaster or gypsum board ceilings excel in the prevention of sound from going from one room to another, because the base material is so dense. This quality is measured by Sound Transmission Class (STC) criteria. The STC levels range from 45 to 60 for ceiling and floor assemblies using ½" to ¾" of plaster or gypsum board beneath wood or concrete slab floors.

(d) Appearance. Plaster or gypsum board ceilings are smooth, unbroken planes that can be quite handsome.

(e) Fire Rating. Plaster or gypsum board ceilings excel in stopping the spread of fire. While the material is rated in tests on combinations of systems, ceiling and floor assembly fire ratings of one hour are simple to achieve using ½" of plaster or gypsum board in most conventional construction assemblies. Three hour and four hour ratings are only slightly more difficult to achieve.

(f) Suspension and furring systems. Plaster or gypsum board ceilings are suspended from the building structure with a wide variety of metal or gypsum type sub-structures.

(2) Special situations.

(a) Damage resistance. Plaster ceilings are harder surfaces than gypsum board ceilings and can withstand considerable abuse.

(b) Moisture resistance. Plaster ceilings, when made with Portland cement are effective on ceilings in high Moisture areas, such as swimming pools, kitchens, shower rooms, and some protected outdoor soffit applications.

(3) Design and construction considerations.

(a) As a general rule, monolithic ceilings should be contained visually within the space that they cover. They should not abut other ceilings of different materials. Where possible, ceilings of two different materials should be separated by a solid partition (not a glass partition) or at least a significant change in plane with some intervening change of material (FigureI-3.).

(b) Edge conditions. No special edge conditions are required for these ceilings that terminate at solid partitions without any transition piece required.

(4) Locations for use.

(a) Primarily visual. The primary location for plaster or gypsum board ceilings installed for visual reasons will be in single-family residences. In a few cases monolithic ceilings will be appropriate for a few administrative buildings, lobbies, and finely finished public spaces, and selected historical facilities. See matrix (Figure I-1).

(b) Primarily functional. The primary location for plaster or gypsum board ceilings will be in lobbies, restrooms, toilets, and kitchens. See matrix (Figure I-1).

(5) Cost. Plaster ceilings are more costly than gypsum board ceilings due to the multiple applications of plaster coats.

(6) Analysis and recommendations.

(a) Feasibility. Gypsum board ceilings are found most often in single-family residences. Single family residences are expected to be the predominant location for this ceiling type in the future except for restroom and toilet rooms or other rooms requiring a sealed environment from adjacent rooms for reasons of odor, air pressure, or cleanliness.

(b) Finish. All monolithic ceilings will be finished with paint. The paint should be flat paint in all situations except where washability is important. Then it should be semi-gloss. The use of sand texture is not recommended anywhere because of the difficulty of making a good repair if it is damaged.

I-3. WALL TREATMENTS.

a. Concept.

(1) Types.

(a) Paint

(b) Wall covering (vinyl, plaster on a roll, and fabric)

(c) Wood paneling (wood and laminate veneers)

(d) Ceramic tile

(e) Special situations. Other types of wall treatments may be occasionally used but are not standard and will be considered only on a case-by-case basis. Special application wall treatments include:

1 Brick Masonry

2 Marble and Granite

3 Metal

4 Glass

5 Acoustic panels

(2) Functions.

(a) As a barrier. A wall serves as a barrier to separate spaces within a building for privacy, security, fire separation, acoustic, or visual reasons. This chapter discusses the surface or finish treatments of interior partitions, which will be predominantly either gypsum, board on metal or wood studs or concrete masonry units.

(b) Visual. Wall treatments are most often chosen for their appearance since the basic construction of the wall is selected to solve privacy, security, fire separation, and acoustic problems. Wall treatments, which satisfy visual criteria, must also be tested against durability criteria since some walls, which must look good, are also subject to considerable wear and since many handsome wall treatments will not wear well.

(c) Acoustic. Some wall treatments are selected because they can contribute to the absorption of sound within a space or because they contribute to the reduction of noise transmission from space to space.

(d) Fire Separation. A wall can be a required fire separation between two areas of a building. Walls are often rated from one to four hours depending on the type of construction. The wall treatments on these walls will normally have very little effect on the separation criteria but some may be combustible and constitute a fire or smoke hazard. Some

wall materials must be chemically treated to provide acceptable flame spread ratings. The minimum flame spread rating for any wall treatment other than paint is Class B.

(3) Selection criteria.

(a) Cost. Generally, the most expensive of the wall treatments considered for general use is wood paneling. The least expensive is paint, followed by vinyl wall-covering, ceramic tile, and then fabric.

(b) Maintenance. Ceramic tile is the most easily cleaned. Paint, however, is a very easy material to patch and touch up. Vinyl wall covering can be cleaned but is quite difficult to patch and it must be more carefully cleaned than ceramic tile. Fabric and wood paneling are the most difficult and the most costly to maintain.

(c) Durability. Ceramic tile is the most durable and fabric the least durable of all the treatments considered for general use. Wood Paneling, vinyl wall covering, and paint are easily damaged; but, among these three, paint is the most easily repaired and wood paneling is the least easily repaired.

(d) Appearance. All of the wall treatments considered are acceptable from an appearance criteria depending upon the location for their proposed use. Paint is generally considered the most utilitarian and least attractive of the materials with wood paneling and fabric wall-covering being almost purely decorative. Ceramic is considered a special use material for most areas. Vinyl wall covering as a fine all-purpose material has good decorative maintenance, and durability characteristics.

(e) Acoustics. There are two different types of acoustic criteria to consider when selecting a wall treatment: They are room-to-room acoustics and control of sound within a space.

1 Room-to-room acoustics. Mass of material is required to prevent sound transmission between spaces and, while the wall treatment can help, the walls themselves must be properly constructed to do the basic job. A wall must be constructed of sufficient mass (concrete masonry and multiple layers of gypsum board do well) and be designed to minimize the openings around and through the wall. For best sound transmission control, the wall should extend from floor to structure, be well sealed at the top, and have no openings between the spaces (even electrical outlets). The only wall treatments that can contribute to noise reduction between rooms are wood paneling. All of the others have insufficient mass to aid in this effort.

2 Control of sound within a space. Soft, absorptive material is required for this purpose. Commercially available fabric covered, absorptive wall panels are available which, when attached to a hard wall surface, work very well to absorb sound. Fabric wall covering, by itself, it is of little value in sound absorption unless it is heavy, hung loose and draped. It can, however, be effective as a covering for acoustically absorptive material and be a handsome facing material (Figure I-5.). None of the other wall-coverings are at all effective at sound absorption.

(4) Historic zone deviations.

(a) Interior construction or renovation projects, which will be carried out in any of the Post's historic zones must be done in a manner consistent with the Post's Historic Buildings Maintenance Guideline.

(b) The Post's historic zones are: The Quadrangle Area, Infantry Post, Staff Post, and Artillery/Calvary Post.

b. Paint.

(1) Characteristics.

(a) General. Paint includes organic coating materials, such as fillers, primers, sealers, emulsions, enamels, lacquers, stains, and varnishes. Generally, the definitions of the main products are as follows:

1 Paint refers to products that are easy to apply by brush, roller, or spray and are used on large areas, such as walls and ceilings.

2 Enamel refers to products that are fast drying, that level out to a smooth, hard finish with sheen, and are used on small areas or smooth substrates.

3 Lacquers are quick-drying, film forming solutions that may be clear or pigmented. They are commonly thought of as being for automobiles or furniture, but any coating that dries by evaporation of solvents may be classified as a lacquer.

4 Varnishes are mixtures of chemicals that give a transparent or translucent film.

(b) Paint ingredients are divided into four groups: Vehicles, solvents, pigments, and additives.

1 Vehicles. The paint vehicle carries the paint's film-forming ingredients to the surface to be coated. It contains the film former or binder, gives the paint film continuity, and provides adhesion to the substrate. The performance characteristics of the coating depend primarily on the type of binder used.

2 Solvents. These are low-viscosity, volatile liquids used to improve the coating's application properties by reducing the solution to the proper viscosity for good application and controlling the coatings rate of evaporation.

WALL TREATMENT LOCATION MATRIX

LEGEND	
Preferred	1
Acceptable	2
Not Acceptable	3

	PAINT	VINYL WALL COVERING	FABRIC	WOOD PANELING	CERAMIC TILE
ADMINISTRATIVE FACILITIES					
Lobbies, public spaces	2	1	3	1	3
general admin. areas	2	1	2	2	3
offices	2	1	2	2	3
senior staff offices	2	1	2	1	3
conference rooms	2	1	2	1	3
support areas	2	1	3	3	3
MEDICAL FACILITIES					
Lobbies, public spaces	3	2	3	3	3
general admin. areas	3	2	3	3	3
patient rooms	3	2	3	3	3
laboratories	3	3	3	3	1
clinics	3	2	3	3	3
surgerys, operatorys	3	3	3	3	1
TRAINING FACILITIES					
Lobbies, public spaces	2	1	3	3	3
general admin. areas	2	1	3	3	3
offices	2	1	2	2	3
classrooms	2	1	3	3	3
auditoriums	2	1	2	2	3
RESIDENTIAL - TROOP HOUSING					
Lobbies, public spaces	2	1	3	3	3
barracks sleeping areas	2	2	3	3	3
bedrooms	2	2	3	3	3
dining rooms	2	1	3	3	3
RESIDENTIAL - SINGLE FAMILY HOUSING	1	2	3	3	3
COMMUNITY FACILITIES					
Retail sales areas	2	1	3	2	3
gymnasiums	2	2	3	3	1
Clubs	2	2	2	2	2
KITCHENS	2	1	3	3	2
TOILET ROOMS	3	2	3	3	1
LOCKER AND SHOWER ROOMS	3	3	3	3	1

Figure I-4. Wall Treatment Location Matrix

3 Pigments. These are solid particles that are permanently insoluble in the vehicle which provide the capacity, gloss, and color of the paint film. Characteristics of pigments include opacity, gloss, and color.

a Opacity is the ability of the paint to "hide" or cover and obscure the substrate to which the coating is applied.

b Gloss categories include high-gloss, semi-gloss, eggshell, flat paints, and flat enamel.

c Color is the quality most frequently associated with pigments.

4 Additives. These are ingredients included in the paint formula to modify properties of the vehicle, pigment, or both. They include plasticizers and can adjust drying speed and can make the material easier to apply.

(c) Binder types. The types of binders used in the paint formula describe most paints.

1 Alkyd binders. These are oil-modified resins that are the most common enamels in general use. They are available in a wide range of colors and in flat, semi-gloss, and high-gloss finishes. They provide good color and gloss retention in interior and exterior applications where not exposed to corrosive environments.

2 Cement binders. These form a breathable, porous film that permits easy flow of water vapor and are used primarily on rough concrete, masonry, and stucco.

3 Latex paints. Paints with latex binders dry by the evaporation of water and are odorless and easy to apply. Interior latex paints are used as primer or finish coats on plaster or drywall (gypsum board) because they do not raise the nap. They are nonflammable, economical, and have good color retention. They are as durable in normal environments as oil paints but require careful surface preparation. Because of their advantages, they are probably the most widely used of the various paint types available.

4 Oil paints. These paints are linseed oil as the binder. Their use has been declining steadily for many years and is being replaced with latex paints. They dry slowly so have limited application as interior paints.

5 Rubber-base binders. Not to be confused with latex binders, these are fast drying lacquer type coatings that are used frequently in wet, humid areas, such as shower and washrooms, kitchens, and laundry rooms.

6 Urethane finishes. These are available as clear or pigmented finishes. Paints with urethane builders perform the same function as alkyd paints but perform them better; however, they are more expensive and do not retain a gloss when used in the exterior.

(d) Paint systems. A single cost of paint will rarely do everything needed. A paint system is a combination of two or more coats of paint that are selected to perform whatever specific functions are required. All components of the paint system must be compatible with one another. Paint systems consist of primers, sealers, fillers, and topcoats, oil stains, and transparent finishes (varnishes).

1 Primers. These are special paints that are applied directly to bare substrate and are intended to provide adhesion for subsequent coats of paint. Some paints such as high-binder-content latex paints are self-priming. There are also corrosion resistant primers used over metals.

2 Sealers. There are used to seal a porous substrate, such as wood, to keep them from sucking up subsequent coats of paint. They may also prevent natural dyes from migrating to the surface leaving unsightly stains.

3 Fillers. These are made for both wood and concrete block and are used before the application of a primer or subsequent paint material. They further serve to seal and close porous surfaces that will absorb paint.

4 Topcoats. These are the principal barriers to the environment. They protect the substrate and the primers and produce the desired finish appearance. They contain the components that provide resistance to weather, handling, chemicals, dirt, scrubbing, and staining and provide the needed color, gloss, and opacity not usually supplied by the primers.

5 Oil Stains. These consist of color pigments in oil that is thinned to allow maximum penetration into wood surfaces, such as paneling, doors, or wood trim for coloration. They require oiling or a clear finish to protect the substrate.

6 Transparent finishes (varnishes). These are used to protect the substrate but allow the natural finish to show through. For this reason, they are normally applied over fine wood paneling but may be applied over metal surfaces as well. Normally at least three coats of varnish are applied as a finish coat.

(2) Special situations.

(a) Epoxy resin coatings. These provide durable coatings for industrial applications.

(b) Polyester coatings. These are highly abrasion resistant coatings which are used in high-traffic corridors on floors and walls.

(c) High performance architectural coatings. These have high moisture resistance and compare with ceramic tile. They can be used in shower rooms and wet areas, such as kitchens.

(d) Fire retardant coatings. These have flame spread ratings of 0-25.

(3) Design, construction and safety considerations.

(a) Surface preparation. The surface condition of a substrate is of the utmost importance. The coating will only be as good as its associated surface preparation. More coating failures are the result of poor surface preparation than any other single element. Surfaces must be free of dirt, oil, grease, rust, scale, and efflorescence. Glossy surfaces must be sanded or roughened.

(b) Application. Temperature and humidity are of primary consideration in the application phase of paint. Low temperatures thicken a paint making it difficult to apply and increasing its drying time. High temperatures make paint set too rapidly and not cover as well. High humidity can cause poor adhesion and blistering of the paint film.

(c) Environmental considerations. Many paints and coatings have hydrocarbons and photochemical reactive solvents in them that are dangerous to the environment and restricted for use by many federal, state, and local regulations. These regulations are changing frequently and becoming more restrictive. Care should be taken that all paint products conform to regulations in force.

(d) Safety. Flammable solvents are present in most coatings, and vapor build-up can occur when they are used in closed spaces. Adequate ventilation is vital in any application of paint.

(e) Health. Inhalation of paint solvent vapors over prolonged periods can be harmful. Once again, adequate ventilation is vital in any application of paint.

(4) Locations for use. Paint can be an acceptable wall treatment in almost any situation. See the matrix (Figure I-4.) for preferred locations.

(5) Cost. Paint is the least expensive of the entire wall treatments described. Some of the coatings described under “Special situations” can be quite costly, however. Paint cost can vary according to quality, which will affect durability, color retention, and quantity required to cover a given area. Generally, the top-of-the-line paint from any paint manufacturer is the best one to use since its life-cycle cost will be the lowest.

(6) Analysis and recommendations.

(a) Paint systems. Total systems, including primers, undercoating, sealers, fillers, and topcoats, should always be used as opposed to single applications of topcoats.

(b) Concrete masonry units, flat finish. Use two finish coats of latex interior flat painter over latex block filler. Most applications of paint on concrete masonry units will require a flat finish.

(c) Concrete masonry units, semi-gloss finish. Use one finish coat of alkyd enamel over a coat of interior enamel undercoat over latex block filler. A semi-gloss finish will be used where frequent cleaning will be required.

(d) Plaster or gypsum drywall, flat finish. Use one coat of latex interior flat paint over a coat of latex interior white primer. This system will be the predominant interior coating system since most painted walls will be gypsum board. No texture will be used in the paint since the texture is very difficult to patch if damaged.

(e) Plaster or gypsum drywall, semi-gloss finish. Use two coats of interior semi-gloss odorless alkyd enamel over a coat of latex interior white primer. This system will be used when the wall surfaces require frequent cleaning or are subject to wear.

(f) Painted woodwork and hardboard, semi-gloss finish. Use two coats of interior semi-gloss odorless alkyd enamel over a coat of interior enamel undercoat. This system will be used when the wall surfaces require frequent cleaning or are subject to wear.

(g) Painted woodwork and hardboard, full-gloss finish. Use two coats of alkyd gloss enamel over a coat of interior enamel undercoat.

(h) Clear finished woodwork, stained-varnish rubbed finish. Use two finish coats of oil rubbing varnish over paste wood filler, over cut shellac, over oil-type interior wood stain. Wipe filler before applying first varnish coat. This finish will be the preferred finish for all clear finish wood. If a natural wood finish is required, omit the stain from the steps outlined above. Waxed wood finishes will be used only in a very few instances in some historical buildings.

c. Wall coverings.

(1) General characteristics.

(a) Overview.

1 Wall coverings have primarily a decorative function. Some may also have a protective function (typically vinyl); others are relatively fragile and require considerable skill for proper installation (fabrics).

2 Wall coverings include vinyl, textile, and wood veneer wall-coverings, in addition to wallpaper. Heavy-duty synthetic textile wall-coverings and other specialty items, such as polished metals, leather tiles, and plastic laminates, are not included in this category. Vinyl wall covering will be the predominant wall-covering to be used. Fabric and wallpaper will hardly ever be employed.

(b) Classifications. Industry standard classifications of all vinyl and fabric wall-coverings and wallpaper, by durability characteristics, are as follows: Classification of all:

1 Category I, Decorative only.

2 Category II, Decorative with limited serviceability.

3 Category III, Decorative with medium serviceability.

4 Category IV, Decorative with high serviceability.

5 Category V, Medium Commercial serviceability.

6 Category VI, Full Commercial serviceability.

(c) Appearance. Variations in color, pattern, texture, and sheen are almost numberless, especially when all materials used as wall-coverings are taken into account. Other considerations, such as lighting reflectivity and visual warmth, should be taken into account when choosing wall-coverings.

(d) Durability. Resistance to staining, abrasion, and mildew is important. Typically the vinyl wall-coverings are much more durable than the fabric wall-coverings. Mildew inhibitors must be added to wall-covering products and their adhesives since they are not part of a standard product. Application of a mildew inhibitor applies to vinyl as well as to fabrics.

(e) Burning characteristics. UL labels are available on most vinyl wall-coverings attesting to their low surface burning characteristics. Fabrics may be treated to achieve this performance. The minimum flame spread for treated fabric is 0-25, Class A.

(2) Vinyl wall-coverings.

(a) Grades. Federal specifications establish three categories of vinyl wall-coverings, which are defined as follows:

1 Type I (light duty). These vinyl wall-coverings are comparable to Category IV wall covering. Weight is 7 to 14 ounces per square yard. Backing is cotton sheeting or scrim. Applications are wall areas not subject to wear and tear. These products can be thought of as a paint substitute where additional decorative effect is needed.

2 Type II (medium duty). These vinyl wall-coverings are comparable to Category V wall covering. Weight is 14 to 22 ounces per square yard. Backing is usually cotton polyester, or a tough drill fabric. These products are considered the workhorses of the industry and are specified for commercial and institutional wall areas where more than ordinary traffic and abrasion are anticipated.

3 Type III (heavy duty). These vinyl wall-coverings are comparable to Category VI wall covering. Weight is 22 ounces per square yard minimum. Backing is usually a broken twill fabric. These products are specified for areas that receive extremely hard use, such as hospital corridors, elevator lobbies, and food service areas. Heavy Duty, Type III vinyl wall coverings are not available off-the-shelf as are Types I and II. Type III will require longer lead times to order and is more limited in color and texture.

(b) Dimensions. Vinyl wall covering is usually produced in 54-inch wide lineal yard goods sold in bolts of 100 to 200 lineal yards or in 27-inch wide single rolls, 36 square feet to a roll.

(c) Stain resistance. Vinyl wall-coverings are excellent products for resisting stains. Most surface dirt can be removed with commercially available cleaners of it has not been allowed to remain in place for too long. While some vinyl will absorb dirt more readily than others, a polyvinyl fluoride coating can be applied to the vinyl to prevent absorption. DuPont's "Tedlar" is such a coating.

(3) Fabric wall coverings.

(a) Grades. Generally, fabric wall-coverings fall into Categories I to IV. When selecting a fabric wall covering, it is important to consider the wear to which the wall covering will be exposed. Issues such as acoustics, light reflectance, and visual warmth should also be considered.

(b) Installation. Fabric wall-coverings may be difficult to install because they lack dimensional stability. Even with experienced, skillful installers, matching patterns is difficult, or even impossible because of fabric stretching.

(c) Dimensions. Fabric wall-coverings are produced in a wide variety to widths, lengths of bolts, and quantities. There are no standards.

(d) Durability and maintenance. Fabric wall-coverings can be treated by a number of proprietary processes for flame retardance, abrasion resistance, and clean-ability. Some manufacturers' limitations may exist.

(4) Special situations.

(a) Wallpapers. These provide purely decorative wall treatments have only limited durability and maintenance characteristics. They fall into Category I and II.

(b) Wood veneer wall covering. These products are flexible enough to be tightly rolled and are not to be confused with plywood paneling or vinyl wall covering printed to look like wood. The same trades who hang vinyl or wallpaper do installation, but more skill is required. Finishing usually consists of sealing, sanding, varnishing, or lacquering. These products will have limited or no application.

(c) Gypsum impregnated fabric. This product type uses a textured fabric that is impregnated with gypsum plaster. When applied to a wall surface with the proper adhesive, the plaster crystallized creating a durable finish. The products best use is for remodeling and renovation of wall surfaces that have been subjected to abuse and are chipped, pitted or scored. Because of the plaster impregnation, the best wall surfaces to apply this product are masonry, plaster or gypsum board.

1 If the wall covering is intended for use to hide the joints in a tile or masonry block wall, only the heaviest fabrics with a coarse texture and weave will serve. These heavy fabrics are appropriate, visually, only for utilitarian spaces.

2 If the existing wall surface is in good condition, a more conventional wall covering which is not so heavily textured is recommended.

(5) Design, construction and safety considerations.

(a) Surface preparation. The surface condition of a substrate is of the utmost importance. Moisture content is important and substrates such as plaster or concrete must be sealed before application. If a wall covering exists on the surface, it may have to be removed prior to installation of the new material or a special adhesive employed. Extensive preparation may be required.

(b) Application. Wall coverings must be applied by skilled individuals due to the need to match seams and patterns and avoid waste. Proper adhesives must be used as directed by manufacturers.

(c) Environmental considerations. No concerns exist.

(d) Safety – no concerns exist.

(e) Health – no concerns exist.

(6) Locations for use. Vinyl wall coverings can be an acceptable wall treatment in almost any situation other than industrial areas. Fabric wall coverings will have only the most limited uses. See the matrix (Figure I-4.) for preferred locations.

(7) Cost. Fabric wall coverings are significantly more expensive than vinyl wall coverings and require more expert installation. While vinyl wall coverings are more costly than paint, they will last considerably longer.

(8) Analysis and recommendations.

(a) Vinyl vs. Fabric. Vinyl wall covering will be used almost exclusively when wall covering is to be specified. Fabric will have only the most limited uses since it is almost exclusively decorative and its good acoustic properties can be accommodated in other ways.

(b) Vinyl grades. The different grades of vinyl wall covering will be used as follows:

1 Type I (light duty). This is only used for single-family residential buildings.

2 Type II (medium duty). All areas of the installation where vinyl wall covering is appropriate except those noted below for Type III.

3 Type III (heavy duty). Areas that receive extremely hard use, such as classroom and hospital corridors, entry and elevator lobbies, and food service areas.

(c) Appearance. With almost a limitless array of colors, patterns, textures and designs to choose among, choice can be bewildering.

1 Non-residential wall treatments are not typically building elements to which attention should be called. It is important, therefore, that vinyl wall coverings be subtle, almost monochromatic in color, and have only a very finely stippled texture. Pattern should be avoided with the exception of some subtle designs that have a dense and finely dotted array of tiny points of varying colors.

2 Vinyl with wood grain patterns is not to be used.

(d) Installation. The widest possible vinyl wall covering should always be used in order to minimize the number of visible vertical joints.

d. Wood Paneling.

(1) Characteristics. Custom fabricated wood and laminate paneling involves complex drawing and specification requirements and will be used in only a few situations. Only plywood or hardboard based paneling will not be covered. The minimum acceptable flame spread rating for paneling is Class A or B.

(2) Flush wood paneling.

(a) General. Custom designed and stock sets of pre-manufactured panels are used in interior panel construction. Stock sets are generally less expensive than custom fabricated panels and are readily available. Pre-manufactured ¼" thick wood paneling is unsuitable for use at any of the installations covered by this IDG.

(b) Matching. Stock sets are produced in standard sizes, not to exact custom sizes. Although sequence matched from one flitch to another, they cannot be matched to other elements. Normally, smaller logs are used for stock panels and, therefore, the quantity or matching panels can be somewhat limited.

(c) Quality. Investigation is required to determine the quality, color, and availability of proper stock panels. The specifier cannot assume that a specification alone will generate the proper results.

(d) Factory finishing. It is recommended that stock panels be factory finished. Unfinished panels are subject to moisture pickup and damage by soiling and handling.

(e) Opaque finishes. Most wood paneling has fine hardwood veneers that are finished with transparent coatings. Fine opaque finishes, such as multiple coats of rubbed lacquer, can also be accomplished. Obviously, in this case the choice of the wood veneer need not be as critical.

(f) Transparent finishes. Panel fabrication, which will receive transparent finishes, involves the most expensive and complex selection in the entire paneling field and is usually specified for only the most important areas.

(3) Stile and rail paneling.

(a) General. This type of paneling is more intricate in design than flush wood paneling and is always custom fabricated to exact sizes and profiles detailed on architectural drawings. The basic unit frame is composed of solid wood stiles and rails with infilling of relatively small veneered plywood panels.

(b) Appearance. Panels may be flat or carved and set in relatively simple or elaborately profiled rims or frames. Finishes may be transparent or painted.

(c) Application. This type of paneling will be found in some historic facilities on FSH. Its use will be required for the restoration of historic facilities.

(4) Hardwood veneers.

(a) Species and cuts. There are almost a limitless combination of species of wood, cuts, and matching in custom fabrication of flush plywood paneling. Due to the high cost of this kind of wall treatment, the veneer flitches are almost always pre-selected by the designer prior to the fabrication of the panel. This is the only sure way to get good matches of color and grain. Pre-manufactured stock panels are usually constructed of more common varieties of oak, maple, or mahogany veneers and are usually not carefully matched.

(b) Matching. Veneer flitches are usually matched in sequences referred to as “book match,” “slip match,” or “balance, center, or running match.” These matches affect grain, appearance, and color of the wood panels as they are compared with one another in sequence. Expert knowledge is usually required to specify and choose these combinations of elements.

(5) Laminate clad paneling.

(a) Appearance. High-pressure decorative laminates are available in a variety of colors, patterns, and finishes and some subtle textures. Some heavily textured laminates are available, but these are not recommended for use.

(b) Durability. Laminates are extremely durable products and are acceptable for use in environments where fine appearance and durability, resistance to stain, and washability are required. No coating of laminate panels is required for the final finish.

(6) Special situations. Fire-retardant paneling. Wood and laminate paneling is available in treated configurations that retard the spread of flame. These are significantly more expensive than untreated materials.

(7) Design, construction and safety considerations.

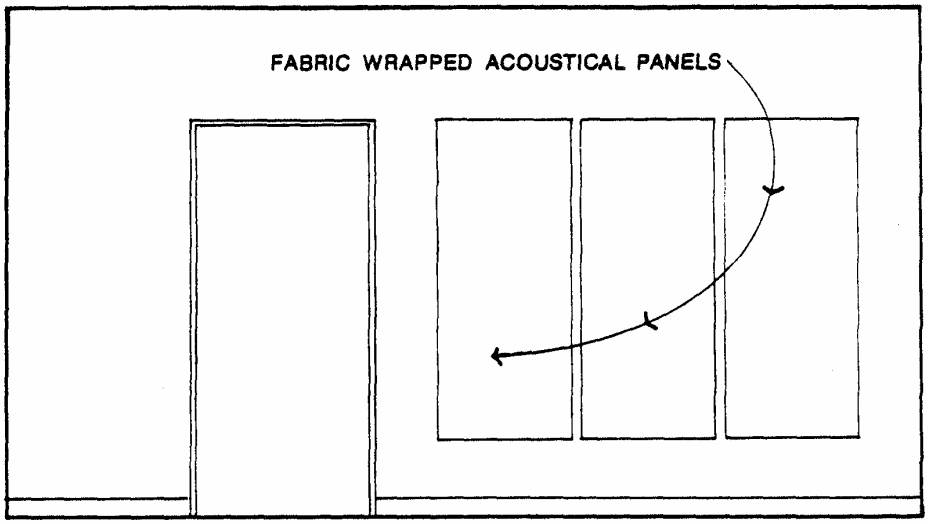
(a) Surface preparation. The wall to which paneling is attached must be prepared with grounds and attachments designed to receive the paneling and assist in its leveling once the paneling is installed. (Figure I-6.)

(b) Application. Skilled carpenters must install paneling.

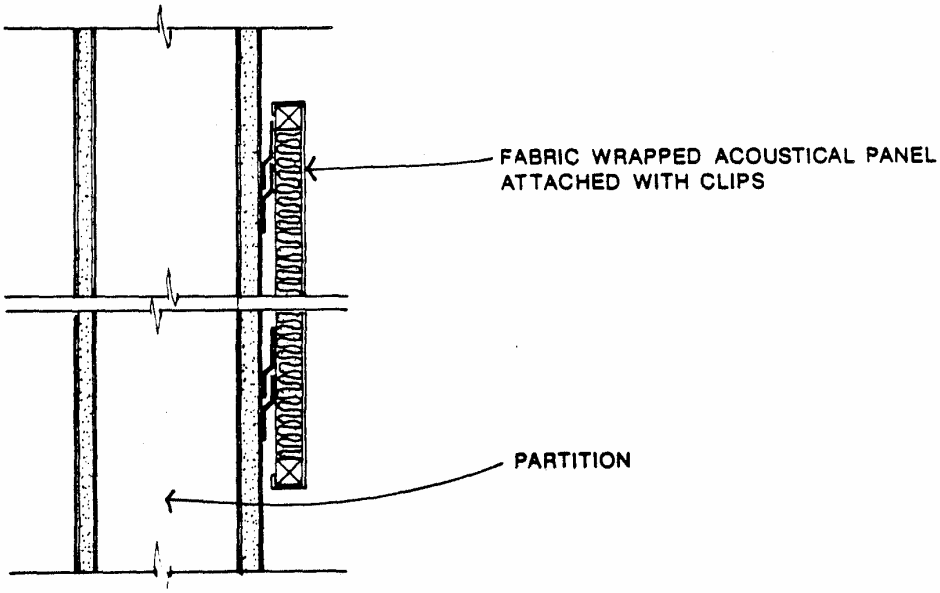
(c) Environmental consideration. No concerns exist.

(d) Safety. The minimum acceptable Flame spread rating is 25 to 50 Class .

(e) Health. No concerns exist.



FABRIC WRAPPED ACOUSTICAL PANEL - WALL ELEVATION



SECTION DETAIL AT FABRIC WRAPPED ACOUSTICAL PANEL

This detail demonstrates the use of fabric wrapped around acoustically absorbent material to form wall panels for noise control. The panels can, of course, be designed to extend from baseboard to ceiling as well as separate smaller units as shown above.

Figure I-5. Fabric Covered Acoustic Wall Panels

8) Location for use. Wood paneling will have only the most limited uses as a result of its high cost and difficulty of installation. Some historic structures will be appropriate for the use of this material. See the matrix (Figure I-4.) for preferred locations.

(9) Cost. Stile and rail wood paneling with exotic veneers and a transparent finish is the most expensive of all the paneling applications. Flush wood paneling is second and laminate paneling is the least costly of all the paneling types.

(10) Analysis and recommendations.

(a) Wood vs. Laminate. Wood paneling is the most expensive of the two and is usually specified for only the most important areas. Laminate paneling is costly also but is likely to be more appropriate for use.

1 Flush paneling, whether wood or laminate, is likely to be most appropriate for use in new construction. Whether clear finished or coated, the use of exotic wood veneers is not recommended. (Figure I-6.)

2 Stile and rail paneling, whether clear finished or coated, is likely to be only appropriate for use in selected historical structures. If it is used, the paneling configuration should match existing historical patterns. The HPMP must be consulted in selecting the paneling configuration.

(b) Appearance.

1 Wood. Transparent finishes are recommended for wood paneling in new structures. If wood paneling is to be used at all, the warmth and texture of the wood should be emphasized rather than concealed.

2 Laminate. With almost a limitless array of colors, patterns, textures, and designs of laminates to choose among, choice can be bewildering. Laminates chosen for use on paneling should be subtle, almost monochromatic in color and have, at most, only a very finely stippled texture. Glossy laminates are handsome and can be used where they will not be subject to wear and tear. Pattern should be avoided with the exception of some subtle designs that have a dense and finely dotted array of tiny points of varying colors.

e. Ceramic Tile.

(1) Characteristics. Ceramic tiles are ceramic surfacing units which are thin in relation to their facial area, made from clay or other ceramic materials and having a glazed or unglazed face. Only glazed wall tiles will be employed.

(a) Glazed wall tiles.

1 These are units with an impervious glazed finish usually fused to a non-vitreous body of soft white-ware bisque with average water absorption not exceeding 18%. This tile is not intended to withstand excessive impact or exposure to freezing and thawing.

Glazed tiles have limited ability to withstand abrasion and resist food acids and should be used only on walls or non-traffic horizontal surfaces, such as counter tops.

2 Finishes. Finishes available include high gloss, matte, semi-matte and crystalline glazes. High gloss finishes tend to show scratch and wear marks more quickly than matte finishes.

3 Color and pattern. Many colors, designs, and patterns are available.

4 Shapes and sizes. Typical standard dimensions for glazed wall tiles are 4-1/4" x 4-1/4", and 6" x 6". Nominal thickness is usually 5/16". Tiles will have modified square edge or a cushion edge. Other dimensions and thickness are available, but the standards are recommended.

(b) Unglazed ceramic mosaic tiles.

1 These are units with a facial area less than 6 square inches and that are of porcelain or natural clay composition. They are available with abrasive content for slip resistance. They are classified as impervious with average water absorption not exceeding 0.5%. This tile is a very durable tile that has much greater use for floors but can be placed on walls.

2 Finishes. The finish is homogeneous with no surface coating, so abrasion will not affect it durability.

3 Color and pattern. Few colors are available because of the integral coloring of the tile.

4 Shapes and sizes. Typical standard dimensions for unglazed ceramic mosaic tiles are 1" x 1", 1" x 2", and 2" x 2". Nominal thickness is usually ¼". Tiles will have a plain face with a cushion edge. Other dimensions and thickness are available, but the standards are recommended.

(c) Glazed ceramic mosaic tiles.

1 These are units identical to the unglazed units described in (b) above except that they have a glaze applied to them. When glazed, the slip resistance and abrasion resistance characteristics are dramatically lowered.

2 Finishes. The finishes available are provided by the glaze and include high gloss, matte, semi-matte, and crystalline glazes. High gloss finishes tend to show scratch and wear marks more quickly than matte finishes.

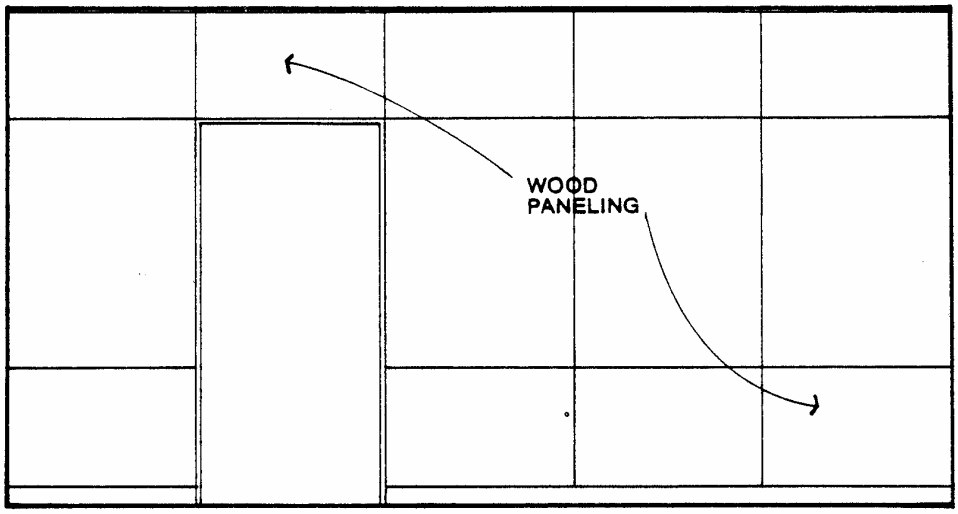
3 Color and pattern. Many colors and patterns are available.

4 Shapes and sizes. Typical standard dimensions for glazed ceramic mosaic tiles are 1" x 1", 1" x 2", and 2" x 2". Nominal thickness is usually ¼". Tiles will have a plain face with a cushion edge. Other dimensions and thickness are available.

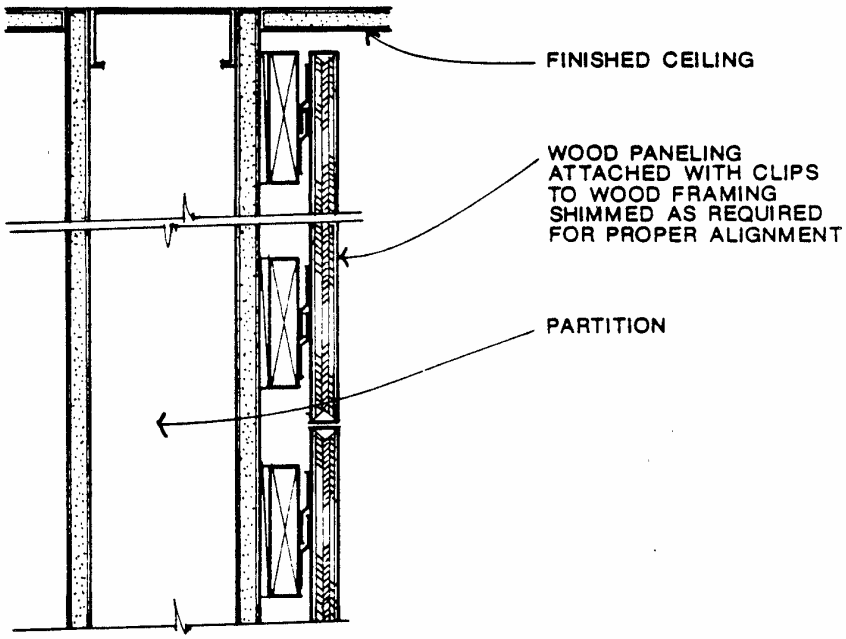
(2) Special purpose tiles.

(a) Foreign made tiles. More than 50% of the ceramic tile sold in the United States is imported. There are many variations of quality, dimension, color, pattern, and textures available; and some foreign made tiles will not meet all of the criteria stipulated in

the ANSI A 137.1 standard. "Buy America" requirements should be verified before using foreign made products.



WOOD PANELING – WALL ELEVATION



SECTION DETAIL AT WOOD PANELING

This detail demonstrates the preferred method for attaching wood paneling to a wall. It is supported on separate wood ground with "Z" clips. Note the symmetrical joint pattern in the elevation. It is important to organize the joints of the paneling so that there is some repetition in the sizes of the panels. This detail is equally applicable to plastic laminate paneling and stile and rail paneling.

Figure I-6. – Flush Wood Paneling

(b) Variety. Many different tiles are made in a bewildering array of shapes, sizes, thickness, and finishes. These will all vary according to abrasion resistance, slip resistance, resistance to staining, frost, water absorption, and hardness.

(3) Design and construction considerations.

(a) Thin-set vs. Thick-set. Traditionally, tile has been set in a thick bed of Portland cement mortar on metal lath creating an installation almost 1" thick. With the onset of finer quality grouts and waterproof adhesives, tile on walls is now more often set in a thin bed of adhesive and has its joints sealed with one of a variety of high performance grouts which prevents ware penetration to the substrate, which is usually drywall.

(b) Design. Tile has been laid on walls for years up to wainscot height, terminating in a bull nose cap and requiring other trim pieces because of the extreme thickness of the mortar bed. Two different wall materials in different planes has often created maintenance problems and reduced visual appeal. Currently, full walls of ceramic tile set in adhesive are considered standard and more appealing.

(4) Locations for use. Ceramic wall tile has limited uses in locations other than toilet rooms, kitchens, and other areas subject to moisture. See the matrix (Figure I-4.) for preferred locations.

(5) Cost. Ceramic wall tile has been established as high in cost compared with vinyl wall covering, which may be used in some locations served by ceramic tile. Some exotic tiles, considerably more expensive than standard tiles made in the United States, are available but should not be considered for use. Applying tiles with adhesive rather than with mortar can reduce tile wall costs. The use of tiles other than those manufactured in the United States may be prohibited by the "Buy America" act.

(6) Analysis and recommendations.

(a) Tile type. The standard wall tile will be a glazed ceramic tile rather than the glazed or unglazed ceramic mosaic units. The increased imperviousness to water, the slip resistance characteristics, or the integral color of the mosaic units are not of particular value to the standard application of ceramic wall tiles.

(b) Dimensions. Smaller square tile is preferred over rectangular. The 4-1/4" x 4-1/4" is an appropriate standard. Larger tiles can cause waste. If a rectangular tile is used, it should be applied vertically.

(c) Finish. A glossy or semi-gloss sheen will be appropriate for ceramic wall tile. The glossy tiles, however, will show dirt and imperfections in construction more readily.

(d) Color. Colors for ceramic tile should be light in hue and neutral. Do not use primary, dark, or bright colors for large wall surfaces. Different colored accent tiles in patterns or designs are discouraged.

(e) Grout. Grout color for all wall applications should be white.

(f) Wall size. Wall tile will be applied to the entire surface of the walls on which they are placed. No wainscot applications are recommended.

I-4. DOORS AND FRAMES.

a. Concept.

(1) Types.

(a) Wood doors and frames.

1 Flush wood doors (wood, hardboard, and laminate).

2 Panel wood doors.

(b) Steel doors and frames.

(c) Special situations. Other types of doors may be occasionally used as interior wall treatments but are not standard and will be considered only on a case-by-case basis. Special type doors include:

1 Glass doors.

2 Aluminum Entrances and Storefronts.

3 Access doors.

(2) Functions.

(a) Access. A door is provided primarily to facilitate access from one space into another.

(b) Acoustic. A door will often be required to control the sound that may travel between rooms. If so it may have to be specially constructed or require special hardware to serve this function properly.

(c) Security. A door may require special frames, hardware, and construction to serve as a secure barrier between two spaces.

(d) Fire separation. A door may have to serve as a fire barrier between two spaces or areas.

(3) Selection criteria.

(a) Cost. Steel doors are generally slightly more expensive than solid core wood doors and wood panel doors. Steel doors are considerably more expensive than hollow

core wood doors. Some face veneers can add significant cost to wood doors. Generally, oak veneers are equivalent to plastic laminate veneers when finishing is taken into consideration.

(b) Appearance. It is generally considered that naturally finished panel or flush wood doors with a fine quality wood veneer are the most attractive. Plastic laminate veneers are next followed by opaque finished wood doors. Metal doors are considered the least attractive.

(c) Durability. Extra heavy duty Steel doors and frames are the most durable. Solid core wood doors are next, followed by panel doors, and last, hollow core doors.

(d) Maintenance. Maintenance on doors is an issue only on the surface finishes. Wood doors with transparent finishes are the most difficult to maintain. Opaque, painted finishes on wood or steel doors are next easiest, and plastic laminate doors are the easiest to maintain under normal use. If, however, the laminate face on a plastic laminate door is broken or chipped, it becomes the most difficult and costly to repair.

(e) Fire rating. Only steel doors are able to achieve a Class A rating of 3 hours. Steel and wood doors are available with 1-1/2 and 1 hour (B) ratings and ¾ hour (C) rating and below. Requirements for fire ratings are obtained by consulting the fire protection plan for the facility or building in question. In general, only Class B rated doors are acceptable for doors opening into a fire evacuation route. Where rated doors are required, the integrity of the door and frame assembly must not be violated by the addition of louvers or glass lights.

(f) Security. Steel doors and frames are the most secure combination, with solid core wood doors and steel frames close behind. Panel doors and hollow core wood doors are not secure. A door is only as secure as its weakest link. Hardware, frame construction, and the presence of louvers or glass lights must be considered when determining the degree of security required. Structural criteria for doors required to protect most government-owned material is defined in AR 190-51. This reference should be consulted in defining all door systems forming part of a security barrier. Some items, such as firearms, ammunition, classified materials, etc., may require more stringent structural criteria. The appropriate regulations or criteria must be consulted.

(g) Acoustics. The presence of a doorway between two rooms is normally the easiest passage for sound transmission to occur. Both steel and wood doors are built specially to help reduce this sound transmission. Devices used are lead sheeting in the core, separated core faces filled with sound absorbent material, gasketing of the frames, and seals which drop from the door bottoms to a threshold. These techniques can be effective but must be planned for during the specification stage.

(h) Insulating value. Insulating value is rarely an important criterion for an interior door. Should it be a factor, solid core wood doors are somewhat more effective

insulators than ordinary hollow metal doors; but metal doors can be insulated with a urethane core which makes them excellent thermal insulators.

(4) Historic zone deviations.

(a) Interior construction or renovation projects, which will be carried out in any of the Post's historic zones must be done in a manner consistent with the Post's Historic Buildings Maintenance Guideline.

(b) The Post's historic zones are: The Quadrangle Area, Infantry Post, Staff Post, Artillery/Cavalry Post and New Post

b. Flush wood doors.

(1) Characteristics.

(a) Dimensions. Flush wood doors are available in standard widths of 2' –4" to 2' -6" in 2" increments. Standard heights are 6' -8" and 7' -0". Custom dimensions are never a problem, but a premium is paid. Door widths are either 1-3/8" or 1-3/4". The 1-3/8" door is considered strictly a residential door.

(b) Grades. The Architectural Woodwork Institute grades wood doors as Premium, Custom, and Economy. These grades refer to the quality of the face veneer for transparent finished doors and do not take into account the type and quality of edge banding, matching of transom panels, louver openings, and workmanship.

(c) Core construction. Flush wood doors are available in either hollow core construction or solid core construction.

1 Solid core. This type of construction is recommended for interior doors with plastic laminate faces and all interior doors where optimum stability and strength are needed. Solid core construction is available with either a particleboard core or staved lumber core (wood blocks). Cores are either built as a solid glued unit or they rely on the face plies to bond them together. Either is acceptable.

2 Hollow core. This type construction is lighter in weight than solid core construction. It is available in two grades, Institutional and Standard. The cost of the Institutional grade is equivalent to solid core construction. Hollow core construction is not generally recommended even in single-family residences. If hollow core construction is used, Institutional Grade is the minimum acceptable.

3 Plastic laminates. These are normally 1/8" thick and can act as an important structural component of the door if the core is not bonded to rails and stiles.

4 Hardboard panels. These are industrial grade quality doors designed for paint finishes and have veneers a minimum 1/8" thick.

(d) Lights and louvers. Lights, louvers, and hardware must be located in such a way that they do not reduce stiles and rails beyond certain minimum widths or occur too close together. If these are violated, the manufacturer will not warrant the door. Industry standards recommend 5" as the minimum width required between door edge and cutouts and from cutout to cutout. This may have to be increased to 10" for doors with high-pressure plastic laminate faces.

(2) Special situations.

(a) Sound retardant doors. These doors are rated as to their sound transmission class (STC) and are generally constructed of two faces separated by either an unfilled air space or a space filled with a sound dampening compound that acts to prevent the two faces from vibrating in unison. These doors are usually furnished as a package that includes special stops, gaskets, and automatic thresholds. They must be combined with wall and frame construction that is equally effective in reducing sound transmission through them.

(b) Lead lined doors. These doors are used in medical facilities to stop x rays.

(c) Electrostatic shield doors. These doors are manufactured with a wire mesh in the center of the core and are grounded with braided pigtails through the hinges to the frame. These doors may be required in "TEMPEST" and other hazard areas.

(3) Design and construction considerations.

(a) Shop priming. Wood doors are subject to moisture infusion and soiling due to handling after they are manufactured. Shop primed doors will prevent this during the time they are waiting to be field finished.

(b) Pre-fitting and pre-machining. Most manufacturers are equipped to pre-fit doors to frames and to pre-machine for hardware. Pre-fitting and pre-machining cost much less than they would in the field but are usually only economical if doors are purchased in quantity (usually 75-100). Plastic laminate doors must be pre-machined and pre-fitted.

(4) Locations for use. Flush, solid core wood doors will be the most often used door in all facilities. The choice of panel (transparent finished wood, opaque finished wood, hardboard, or plastic laminate) will vary according to the type of facility and the designer's preference. Generally, hardboard panels will be used in maintenance or industrial type facilities; opaque, painted doors in single family residences; laminate and natural finished doors (or painted doors), in all other non-historic facilities. Panel doors, faithful to the historic design are generally recommended for the historic buildings; but the HPMP must be consulted prior to selecting any door for the historic zones.

(5) Cost. Plastic laminate doors are generally slightly more expensive than naturally finished wood doors. Hardboard doors are slightly less costly than the wood veneers.

(6) Analysis and recommendations.

(a) Dimensions. All flush wood doors will be 1-3/4" thick. The 1-3/8" doors are too flimsy for use on the post. Standard 3' -0" x 7' -0" doors are the recommended sizes for most interior applications. Oversize doors (wider than 3' -0") will have some application in special circumstances. In no case should any door be less than 2' – 10" wide unless it is a facility intended for use only by able-bodied personnel.

(b) Panels. The most commonly used naturally finished wood veneer panel shall be an oak (white or red), birch, Douglas fir, or several varieties of pine. For opaque finished doors, the manufacturer's standard will suffice.

(c) Frames. The frames of all flush wood doors in new construction should be hollow metal for their durability (Figure I-7.). These frames should be painted to match the walls if the door is naturally finished and to match the door if the door has an opaque finish. Frames for single-family construction should be wood and painted to match the doors.

(d) Construction. Flush wood doors will only have solid core construction. Hollow core, even industrial grade hollow core, should not be used. If for some reason hollow core construction door must be used, Institutional Grade is the minimum standard.

c. Food Panel Doors.

(1) Characteristics.

(a) Dimensions. Wood panel doors are available in standard widths of 2' -4" to 3' -6" in 2" increments. Standard heights are 6' -8" and 7' –0". Custom dimensions are never a problem, but a premium is paid. Interior door widths are 1 -3/8".

(b) Grades. Wood panel doors are graded as Premium or Select for natural finished doors and Standard for opaque finishes.

1 Premium or Select grades prohibit mixing of wood species within the door and limit blemishes.

2 Standard grade calls for all exposed wood surfaces to be sound with defects and discoloration permitted provided a surface suitable for opaque finish is presented.

(c) Warp tolerances. Maximum warp allowed is ¼" for panel doors under 3' -6" x 7' – 0" in size.

(d) Panel thickness.

1 Raised panels – 7/16" minimum thickness

2 Flat panels – ¼" minimum thickness

(e) Appropriate woods. The Woodwork Institute of California (WIC) recommends that only certain species of softwoods are suitable for solid stile and rail construction. Most hardwoods are not recommended because they tend to warp and twist

regardless of conditions. For that reason, appropriate woods for consideration are: Idaho White, lodge pole, ponderosa or sugar pine, Douglas fir, or western hemlock.

(f) Door frames. Wood frames of material to match the doors are recommended for use with all wood panel doors. Metal frames are not recommended since they are visually incompatible.

(g) Fire rating. Fire rated doors with maximum rating of 20 minutes are available in wood panel door construction. Where the fire protection plan requires a higher rating, an alternate door must be used.

(2) Special situations.

(a) Glazed openings. Many manufacturers offer doors glazed with decorative glass products, including leaded, etched, and sand carved glass.

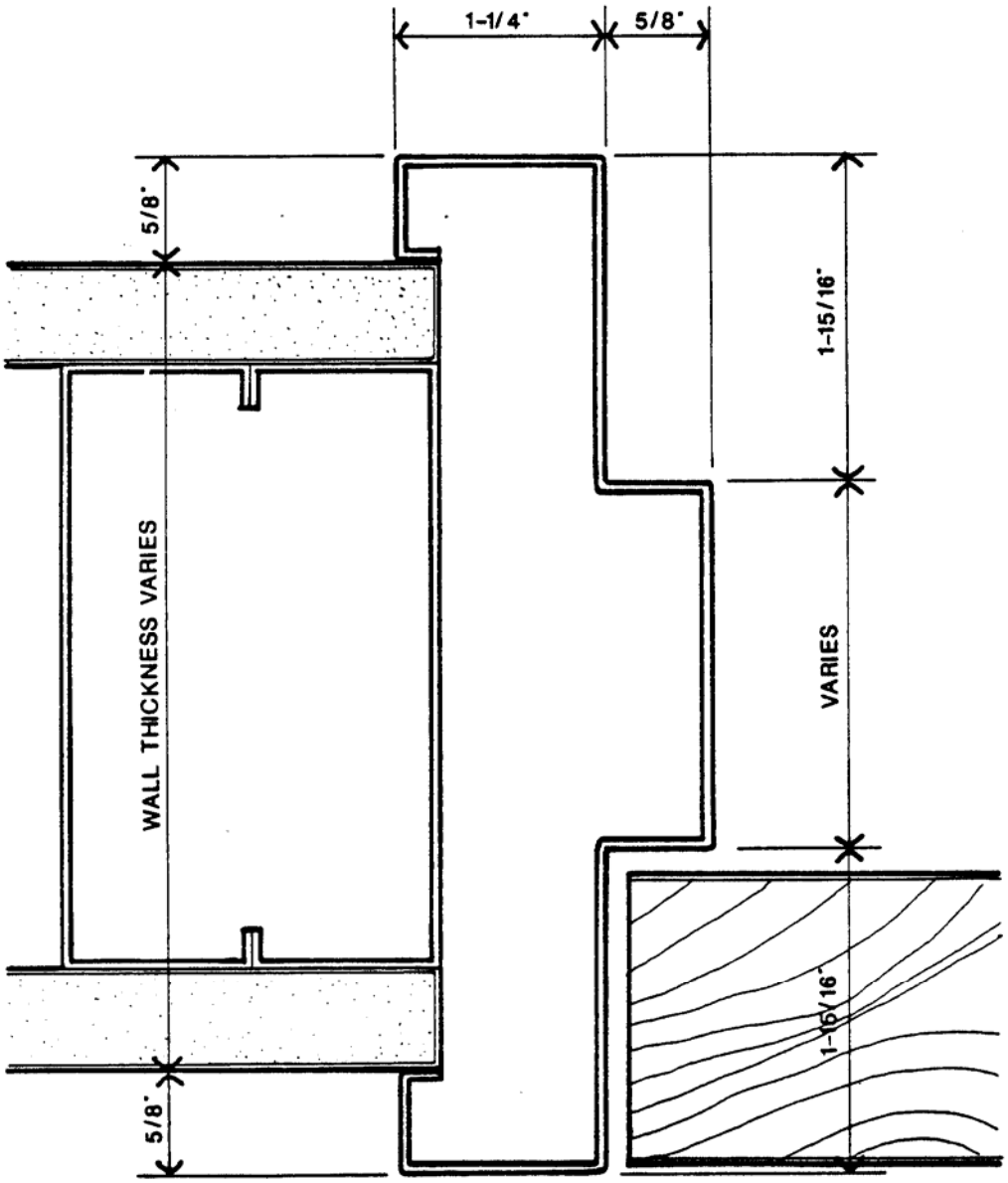
(b) Carved doors. Many designs are available but are not likely to be appropriate for use other than in historic areas.

(3) Design and construction considerations.

(a) Shop finishing. These doors are not generally available with factory or shop finishes.

(b) Pre-fitting and pre-machining. Most manufacturers are not equipped to pre-fit wood panel type doors to frames and to pre-machine for hardware. Pre-fitting and pre-machining could be done in a local millwork house.

(4) Locations for use. Wood panel doors will be most often used in the renovation of historic buildings. No other use will be considered.



PROFILE OF TYPICAL PRESSED STEEL DOOR JAMB

Figure I-7. Steel door frame

This detail demonstrates the preferred door frame dimensions for new construction. The important dimension is the 1-1/4" width of the door frame. It is the narrowest frame which is commonly manufactured that will be given a B label. Narrow frames are preferred visually to wider ones of 2" ±. The 5/8" door stop width is also important for the B label rating.

(5) Cost. Cost is not an issue in the determination of wood panel doors once the decision has been made to use this type of door.

(6) Analysis and recommendations.

(a) Dimensions. All interior wood panel doors will be 1-3/8" thick. Standard 3' -0" x 7' -0" doors are the recommended sizes for most interior applications. Panel doors greater than 3' -6" wide will not be used.

(b) Door design. Wood panel doors should come from manufacturers' standard designs (Figure I-8.). If the door is being used in renovation of historical structures, it should conform to the HPMP and match the original door design as closely as possible.

(c) Wood selection. Use manufacturer's recommend softwoods for opaque finished doors and match existing woods for new doors with transparent finishes.

(d) Frames. The frames of all wood panel doors shall be wood. These frames should be painted to match the door if the door has an opaque finish. Frames should be of the same wood as the door and finished transparently if the door has a transparent finish.

d. Steel Doors.

(1) Characteristics.

(a) Dimensions. Steel doors are available in standard widths of 2' -0" to 4' -0" in 2" increments. Standard heights are 6' -8", 7' -0", 7' -2", 7' -10", and 8' -0". A premium is paid for custom dimensions. Standard door widths are either 1-3/8" or 1-3/4". The 1-3/8" door is considered strictly a residential door.

(b) Grades. Steel doors are graded as: Grade I, Standard Duty; Grade II, Heavy Duty; and Grade III, Extra Heavy Duty.

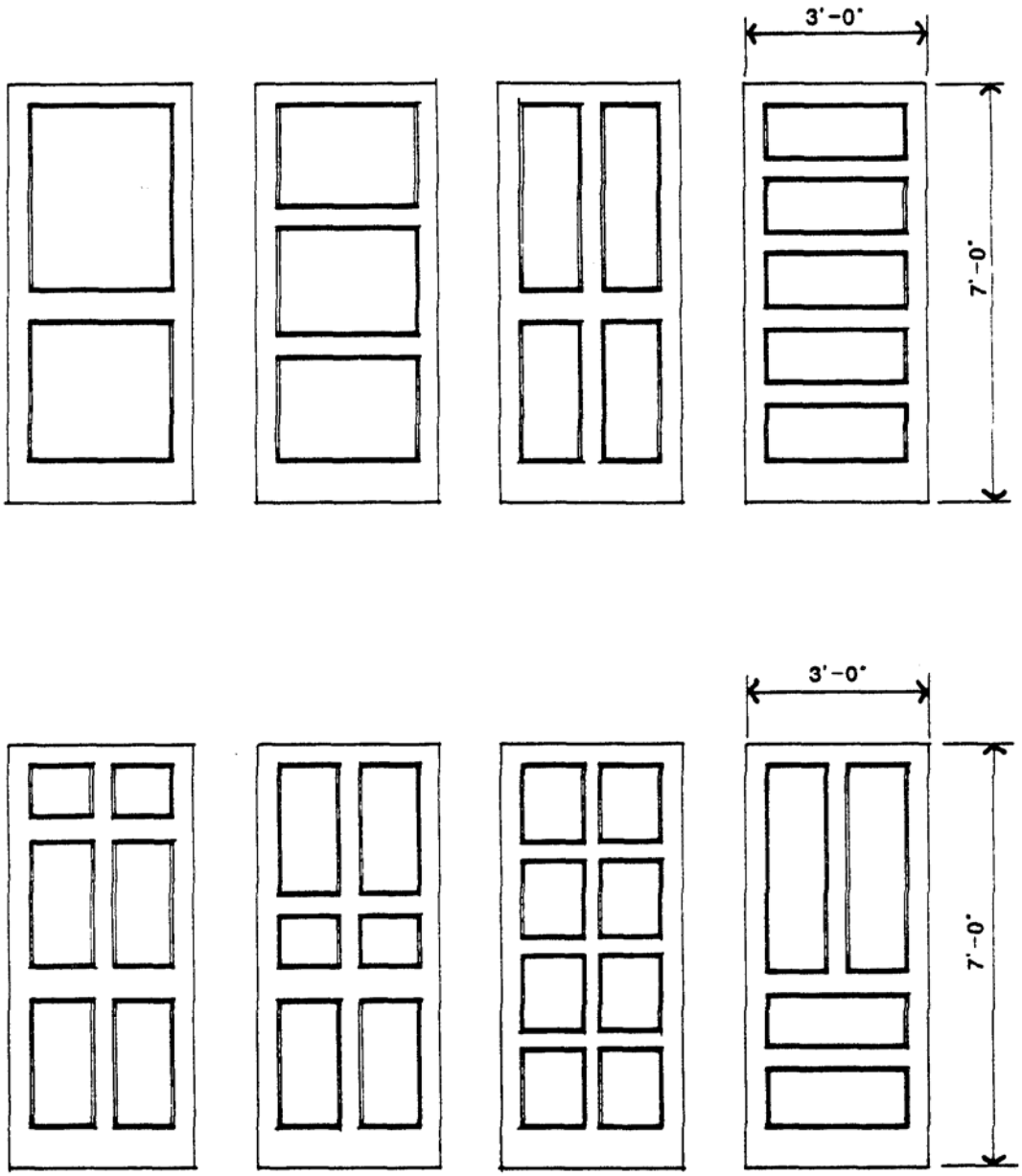
1 Grade I. Standard Duty 1-3/4" and 1-3/8" thick (20 gauge face sheets)

a Model 1 – Full flush. Hollow steel construction doors have face sheets formed from one sheet of minimum 20 gauge metal. No seams occur on the door face but they do exist on the vertical door edge. The top and bottom of the door are closed with recessed channel end closures of flush end closure treatment.

b Model 2 – Full flush. Composite construction same as Model 1 except face sheets are bonded to and supported by a solid core.

c Model 3 – Seamless. Hollow steel construction doors have face sheets formed from one sheet of metal with no seams on the door faces or vertical edges. The top and bottom of the door are closed with recessed channel end closures or flush end closure treatment.

2 Grade II. Heavy Duty 1-3/4" thick (18 gauge face sheets). Same styles as Grade 1.



A SAMPLING OF THE MANY TYPES OF PANELED WOOD DOORS

Figure I-8. Common wood panel doors.

3 Grade III. Extra Heavy Duty 1-3/4" thick (16 gauge face sheets). Same styles as Grade 1.

(c) Nonmenclature. The following are standard door designs identified by specific terms: (Figure I-9.)

1 Flush doors. This type of door refers to a door without lites or louvers.

2 Half-glass doors. A minimum 5" rail at the top and sides of the lite and a minimum 42" dimension from the bottom of the lite to the finished floor.

3 Full glass doors. A maximum 6" rail occurs at the top and sides of the door and a minimum 8" dimension rail occurs at the bottom of the door.

4 Narrow lite doors. The glass opening in these units occurs near the lock stile. The width of the lite varies between 5" and 8", and the length varies from 10" to 60".

5 Vision lite doors. The industry standard is a 10" x 10" lite on the vertical centerline of the door. The horizontal centerline on the lite will vary from 60" to 66" from the finished floor.

6 Louvered doors. A variety of louvers and grilles are available. The actual type and size are determined on functional, aesthetic, and economical grounds. If sight-proof louvers are needed, they must be so specified.

7 Insect screens. These are available on any of the doors and must be specified.

8 Fusible link louvers. These are used in areas where flames and intensive heat passage must be controlled. The link release temperature recommended by UL is 135 degrees F.

9 Full louvered doors. Sizes noted on the glass units apply to these doors.

10 Dutch doors. Sizes noted on the glass units apply to these doors.

(2) Special situations.

(a) Sliding metal fire doors. These doors are rated as either 1-1/2 or ¾ hour doors by UL. Openings are limited to a maximum of 120 square feet with a maximum dimension of 12' -0". Glass panels are not permitted in 3-hour and 1-1/2 hour doors. Single slide and center parting doors are available.

(b) Insulating security doors.

1 These doors are designed to be theft resistant, flat sill, fire resistance rated, insulated steel door and frame assemblies complete with hardware and factory finish. They are hollow steel construction with minimum 1/8" thick face plate. Frames are minimum

1/8" thick sides and top on the exterior side; jamb is not less than 18 gauge; sill is ¼" thick flat plate.

2 underwriters Laboratories Inc. can certify insulating security doors as Vault Doors, Class 350 Insulated with ratings of 2, 4, and 6 hours. They are factory finished with baked on paint or a textured vinyl. Brushed stainless steel is also offered. Such doors must be Class 5 and as defined by military specifications if they are used in security applications.

(3) Design and construction considerations. Doors and frames are pre-fitted and pre-machined and are purchased as a unit which is drilled and tapped to receive mortised hinges, locks, latches, flush bolts, and concealed door closers as required.

(4) Locations for use. Steel doors can be used in all locations where wood doors are employed but will generally be located in service areas or areas requiring security, in fire rated situations, and in stairwells. Grade II, Heavy Duty, will be usable on stairwell and storage doors; and Grade III, Extra Heavy Duty, will be used primarily in high use service or industrial areas.

(5) Cost. Of the standard grades, Grade I doors are the lease expensive; Grade III, the most costly. Insulating security doors are more expensive than Grade III doors.

(6) Analysis and recommendations. All steel doors will be 1-3/4" thick. Standard 3'-0" x 7'-0" doors are recommended for most interior applications. Doors wider than 3'-0" will have some special applications. In no case will any door be used which is less than 2'-10" wide unless it is in a facility occupied solely by able bodied personnel.

e. Special Doors.

(1) Safety Glass Doors. Overview:

(a) Safety glass doors are fabricated of float glass that has been tempered by a process of reheating and rapid cooling leaving it three to five times stronger than normal float glass.

(b) Manufacturers offer ½" and ¾" thick safety glass doors with the ¾" available in clear finish only. Fittings and rails are generally available in bronze, aluminum, or stainless steel, in a choice of finishes in each metal. These are available in either continuous (full door width) fittings (rails) or corner (abbreviated or patch) fittings. Locks or bolts, as well as floor checking hinges and top pivots, may be inserted into these fittings. (Figure I-10.)

(c) These doors will have limited use.

(2) Aluminum entrances and storefronts. Overview:

(a) These doors are traditionally considered as exterior doors but will have some application in administrative areas where vision into a suite of offices is desired from a corridor.

(b) They are available in packages with frames and sidelights. The come with butt or pivot hinges, closers, and locksets. Finishes are available in all of the aluminum-anodized finishes.

(c) These doors are available in three styles: Narrow, medium, and wide stile (Figure I-10.). These categories refer to the width of the stile of the doors. The most appealing in appearance is the narrow stile; the least appealing, the wide stile. Narrow stile doors are the most expensive and the most subject to maintenance problems. Medium stile doors are the recommended all-purpose doors of this type.

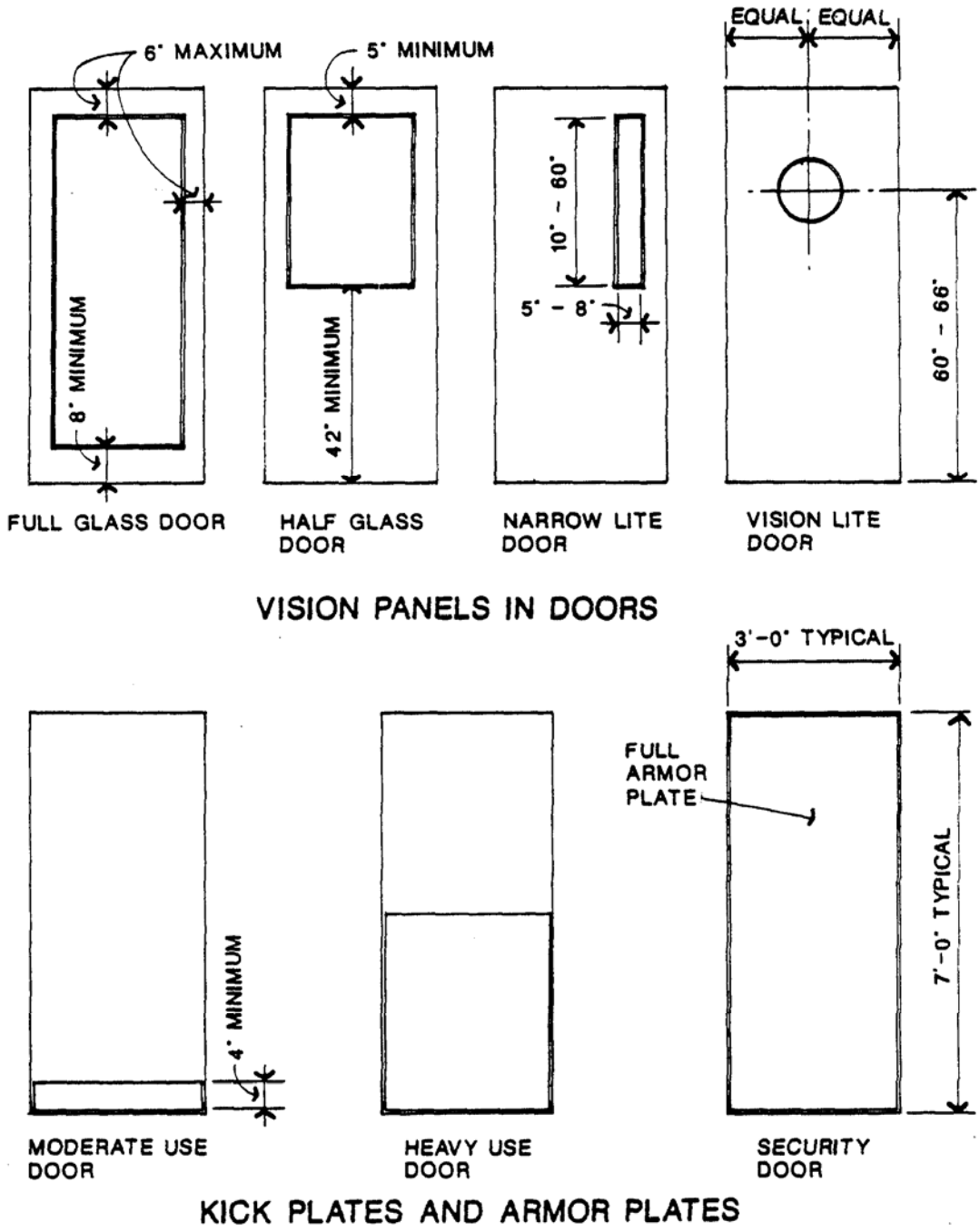


Figure I-9. Steel doors. Vision lites and kick plates.

(3) Access doors. Overview:

(a) These doors will have many applications and should be located to assist maintenance personnel in gaining access to plumbing and mechanical equipment concealed behind walls or ceilings. Unobtrusiveness of these doors is of critical importance, and color and finish should match surrounding surfaces as closely as possible.

(b) Metal access doors are available to suit almost any type of wall and ceiling construction. They are adaptable to openings in masonry, concrete, drywall, and plaster as well as in acoustical ceilings. The standard products are manufactured to be as unobtrusive as possible and are designed either to be placed flush with the adjacent surfaces and painted to match or they are recessed with provision for application material to match adjacent surfaces.

(c) Fire rated assemblies are available from 1-1/2 hour to ¾ hour. Fire rated units are limited to openings of 48” to 50”.

I-5. HARDWARE.

a. Concept.

(1) Components

(a) Hinges

(b) Locksets

(c) Pulls

(d) Closers

(e) Exit devices

(f) Kick plates

(g) Stops

(h) Special purpose hardware

1 Silencers

2 Door bottoms (acoustical)

(2) Selection criteria

(a) Cost

1 Quality. As a guideline, the highest quality level of hardware, while the most expensive, is usually the best value. The highest quality of hardware is made of the best materials, is the best construction, and functions the best.

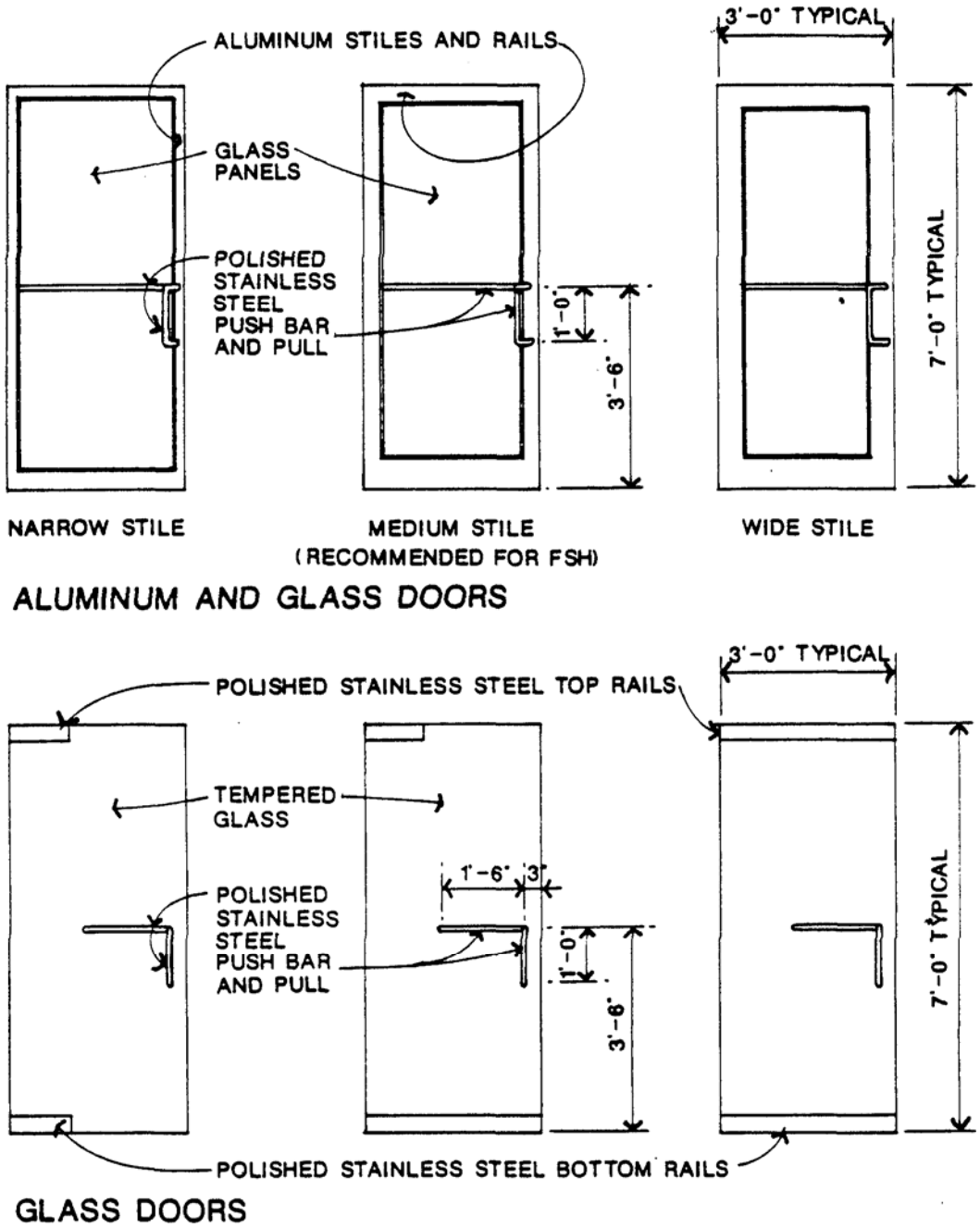


Figure I-10. Aluminum and glass doors.

2 Quantity. Hardware is least expensive when purchased in quantity. Therefore, any hardware item that is an installation standard and is stocked in quantity should benefit from cost savings.

(b) Maintenance. Many hardware items that have moving parts (closers, panic devices, hinges, pivots, locksets) require some periodic maintenance. The best quality hardware requires the least maintenance.

(c) Durability

1 Durability is also a function of quality. Generally, the better the hardware quality the more durable it will be.

2 Finish is a major component of hardware durability. Any plated hardware (chrome or brass plating) that is subject to frequent handling (pulls or door knobs) will eventually wear away, exposing the base metal.

(d) Appearance. Repetition of hardware style and finish creates a visual cohesiveness that would provide a sense of unity to new construction.

(e) Historic zone deviations. Generally, hardware used in the Post's historic zones should match, as closely as possible the original hardware provided for the building. Careful review of the HPMP is required for all work in these areas.

b. Hinges.

(1) Considerations for use

(a) Code requirements based on the size and use of the door determines hinge size and number.

(b) The finish on the hinges could be plated because the hinges are not subject to handling. Solid stainless steel or brass hinges will be very costly and are not necessary.

(2) Analysis and recommendations.

(a) Assuming a 3' -0' x 7' -0' door is the standard door, the number of hinges required would be three per door minimum.

(b) Hinges should be mortised steel, ball bearing, five knuckle 4-½" x 4", 0.134 gage, with a US 26D finish.

(c) Pivot hinges will rarely be used in interior doors.

(d) For security doors, use hinges with non-removable pins.

c. Locksets.

(1) Consideration for use.

(a) Lock systems: Lock systems shall be removable core, six pin type systems, such as Best, Arrow, or equivalent. The interchangeable lock cylinders shall fit the lockset without adapters. Locks provided by contract shall be provided with three keys for each lock and the cylinder pin setting record for each lock. All keys will be tagged to identify the room and door to which they correspond.

(b) Locksets are either mortised or bored.

(2) Special keying requirements.

(a) Mechanical rooms.

(b) Electrical rooms.

(c) Communications rooms.

(3) Analysis and recommendations.

(a) Mortised locksets are the more sophisticated, better looking, and more secure.

(b) The design of the operating mechanism can be either knobs or levers. Levers are preferred.

(c) Historic zones should have hardware matching or compatible with the original. Refer to the HPMP for specific guidance.

d. Push/Pulls.

(1) Considerations for use.

(a) Use on doors that do not have latch sets or locksets.

(b) Determine if push should be a plate or a bar. Designer preference is the determining factor here.

(2) Analysis and recommendations. For standardization, the push and pulls should be made of ¾” diameter stainless steel bar.

(a) The pull should be a 12” high vertical bar.

(b) The push should be a horizontal bar that stops 3” from the strike edge of the door and is 18” long.

e. Closers.

(1) Considerations for use.

(a) Locations where required.

1 On fire rated doors.

2 On highly used public doors.

3 On any door without a latch set.

(b) Types to use.

1 Overhead exposed.

2 Overhead concealed.

3 Floor mounted.

(2) Analysis and recommendations.

(a) Floor or concealed overhead closers should be used at glass doors or doors that have a high public image.

(b) Surface closers should have the closer located on the non-public side of the door.

(c) The closer design should be as visually unobtrusive as possible and match door and frame finish as closely as possible.

f. Exit Devices.

(1) Considerations for use.

(a) Location. Based on the need and UFC codes for panic opening situations.

(b) Types.

1 Push plate or push bar.

2 Concealed or exposed operating devices.

(2) Analysis and recommendations.

(a) In areas that the public uses routinely, use concealed operating devices because these are the most attractive.

(b) In areas that are emergency exits only, such as in fire stair enclosures, use more utilitarian models. (Figure I-11.)

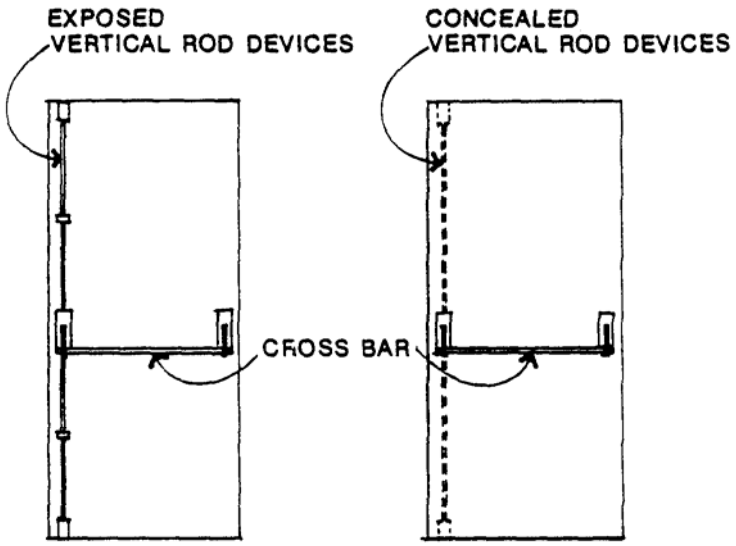
g. Kick Plates.

(1) Considerations for use. Used in areas where doors have a high level of abuse.

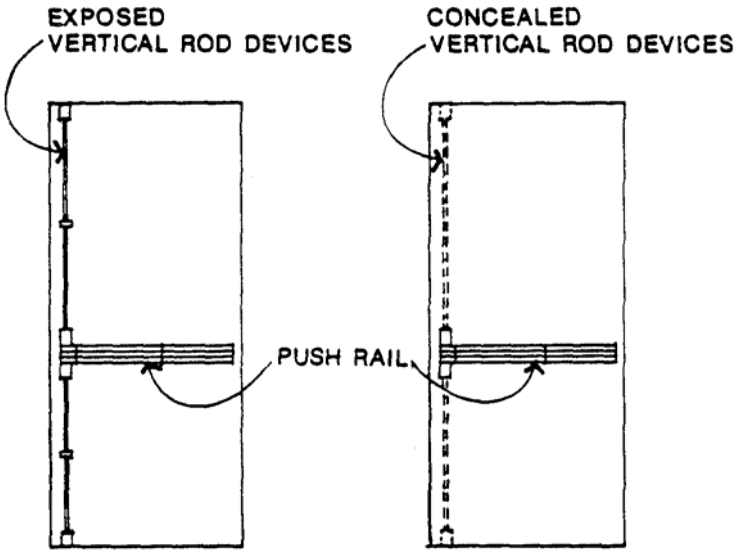
(2) Analysis and recommendations.

(a) High level abusive use is usually associated with service areas. Here the criteria for the size and attachment of the kick plate should be protection of the door.

(b) When the door needs to be protected in public areas the kick plate should be the minimum size required and concealed connections should be considered.



CROSS BAR TYPE PANIC DEVICE



PUSH RAIL TYPE PANIC DEVICE

Figure I-11. Exit devices, panic hardware.

h. Stops.

(1) Considerations for use.

(a) Floor mounted or wall mounted types

(b) Used to protect wall or other surfaces from door

(2) Analysis and recommendations.

(a) Floor mounted stops are less conspicuous than a wall mounted stops and should be used where possible.

(b) Door stops should only be used where necessary.

i. Special Purpose Hardware.

(1) Considerations for use. Special purpose hardware and its use will need to be considered on a case- by-case situation.

(2) Analysis and recommendations.

(a) Finish of hardware should match finish of other selected hardware.

(b) The technical nature of much of special purpose hardware will probably result in the necessity of technical assistance.

I-6. FLOORING.

a. Concept.

(1) Types.

(a) Resilient flooring.

1 Vinyl composition tile.

2 Sheet flooring.

(b) Carpeting.

1 Broadloom (rolled goods).

2 Carpet tiles.

(c) Wood.

(d) Tile.

1 Ceramic mosaic tiles.

2 Quarry tile.

3 Ceramic paver tiles.

(e) Accessories.

1 Floor Mats.

2 Wall base materials.

a Vinyl or Rubber.

b Wood.

c Tile.

(f) Special situations. Other interior flooring treatments may be occasionally used as interior flooring treatments but are not standard and will be considered only on a case-by-case basis. Special interior flooring treatments include:

1 Resinous flooring.

2 Fluid Applied Resilient flooring.

3 Access floors (for computer room applications).

(2) Functions.

(a) Wear resistance. A floor is the single interior building element most subject to use (and abuse). It must provide durable serviceability appropriate to the use of the space when it serves.

(b) Maintainability. A floor requires more maintenance than any other component of a building's interior. It must be easily maintained within the parameters of the function of the space that it serves.

(c) Acoustic. A floor will often be employed to control the sound which may be generated within a room. It can also help to control noise between floors of a building.

(d) Appearance. A floor serves an important function as a critical visual element of an interior space.

(e) Energy considerations. A floor treatment will have almost no effect on the consumption of energy in a building and should not be considered a function.

(3) Selection criteria.

(a) Cost. Of the floor treatments considered for general use, wood is the most expensive, followed closely by tile, then carpet, and finally resilient flooring. Concrete floors are even less expensive. Because of the critical requirements of durability, maintenance, stain resistance, and appearance, the cost of a particular floor treatment should not be considered as the single most important criteria for its selection.

(b) Durability. Hardened concrete and quarry tile are the most durable floors; resilient floors are next, followed by wood. Carpet is the lease durable.

(c) Maintenance. Hardened concrete and quarry tile are the most easily maintained floors; resilient floors are next, followed by wood. Carpet is the least easily maintained.

(d) Stain resistance. Hardened concrete and quarry tile are the most stain resistant floors; resilient floors are next, followed by wood. Carpet is the least stain resistant.

(e) Appearance. Carpet and wood flooring are generally considered the most attractive of the general use flooring materials. Tile floors are next, followed by resilient floors, and last, concrete.

(f) Acoustics. Carpet is able to absorb sound well and is considered good acoustically both in terms of its ability to reduce noise within a space, as well as its ability to reduce sound transmission between floors. All other floor materials are hard surfaces and have no acoustic absorption value. Concrete floors and all floors with concrete substrates have mass and therefore are able to reduce sound transmission between floors. Any floor treatment on wood sub-flooring (even carpet) will not do as well in reducing this sound transmission.

(g) Insulating value. Insulating value is rarely an important criterion for a floor treatment. No floor material except wood and carpet has very good thermal insulating capabilities and should always be used in conjunction with some other insulating material to achieve the desired R-values.

(4) Historic zone deviations.

(a) Interior construction or renovation projects, which will be carried out in any of the Post's historic zones must be done in a manner consistent with the Post's Historic Buildings Maintenance Guideline.

(b) The Post's historic zones are: The Quadrangle Area, Infantry Post, Staff Post, and Artillery/Calvary Post.

b. Resilient Tile Flooring.

(1) Characteristics.

(a) Dimensions. Resilient flooring tiles are available in a variety of sizes and shapes with the most common standard sizes of 9” x 9” and 12” x 12”. The 12” x 12” is more frequently specified. Thicknesses are typically 1/16”, 3/32” and 1/8”.

(b) Varieties. Resilient flooring tiles are available in a wide variety of colors, patterns, and textures. They have different degrees of resilience and resistance to stains and abrasion. Differences are noted below.

1 Asphalt tile. This type of tile has asphalt and bituminous materials as the principal binders although thermoplastic resins have begun to take their place. Cost is less than that of vinyl composition tile. Though durable, asphalt tile is not as durable as vinyl composition tile. It is also less stain resistant, less flexible, less tolerant to temperature extremes, and more porous.

FLOORING LOCATION MATRIX

LEGEND	
Preferred	1
Acceptable	2
Not Acceptable	3

	RESILIENT	CARPET	WOOD	CERAMIC TILE
ADMINISTRATIVE FACILITIES				
Lobbies, public spaces	2	1	2	3
general admin. areas	2	1	2	3
offices	2	1	2	3
senior staff offices	3	1	2	3
conference rooms	2	1	2	3
support areas	1	2	3	3
MEDICAL FACILITIES				
Lobbies, public spaces	2	1	2	3
general admin. areas	2	1	3	3
patient rooms	1	2	3	3
laboratories	1	3	3	3
clinics	1	2	3	3
surgerys, operatorys	1	3	3	3
TRAINING FACILITIES				
Lobbies, public spaces	2	1	3	3
general admin. areas	2	1	2	3
offices	2	1	2	3
classrooms	2	1	3	3
auditoriums	2	1	3	3
RESIDENTIAL - TROOP HOUSING				
Lobbies, public spaces	1	1	2	2
barracks sleeping areas	2	1	3	3
bedrooms	2	1	3	3
dining rooms	2	1	2	3
RESIDENTIAL - SINGLE FAMILY HOUSING	3	1	2	3
COMMUNITY FACILITIES				
Retail sales areas	2	1	2	2
gymnasiums	2	3	1	3
Clubs	2	1	3	2
KITCHENS	1	3	3	1
TOILET ROOMS	2	3	3	1
LOCKER AND SHOWER ROOMS	3	3	3	1

Figure I-12. Flooring location matrix

2 Vinyl composition tile. This tile is superior to asphalt tile in stain and grease resistance, durability, and ease of maintenance. The widest variety of colors, patterns, and gauges are available in this material if only those products suitable for commercial applications are considered.

3 Rubber tile. This product is more costly than either asphalt or vinyl composition tiles but less expensive than pure vinyl tile. Rubber is less resistant than vinyl composition tile to grease and alkalis and is somewhat higher in maintenance resistance, and resistance to cigarette burns.

4 Raised profile rubber tile. This product is available in a wide variety of profiles from many different manufacturers. Some profile shapes will adversely affect maintenance costs. Otherwise, characteristics are the same as those of rubber tile.

5 Vinyl tile. This is the most expensive tile in initial cost. Except for its low resistance to cigarette burns and lower resilience than rubber, vinyl tile is equal to or superior in all other characteristics when compared to the other tiles.

(2) Design and construction considerations.

(a) Adhesives. Manufacturer's recommended adhesives should always be used when applying tile to any surface.

(b) Patterns and color. Patterns, such as checkerboards and accent colored tile patterns, generally should be avoided and be used only with the assistance of a professional designer. Generally, colors should be neutral; and patterns, subtle and non-directional.

(c) Lay-out Tiles should be laid parallel to room walls and positioned so that perimeter trim pieces are equal to at least one half of a tile width.

(3) Locations for use. Resilient tile floors are acceptable for use in all administrative, classroom, barracks, and community facilities. See matrix (Figure I-12.) for locations.

(4) Cost. Pure vinyl tiles are the most expensive; rubber tiles and raised profile rubber tiles are next in cost. Vinyl composition tiles are third with the least expensive being asphalt tiles.

(5) Analysis and recommendations.

(a) Recommended product. The all purpose resilient tile will be a vinyl composition tile free of asbestos products.

(b) Dimensions. The standard tile dimension will be 12" x 12". Thicknesses for all applications will be either 3/32" or 1/8". The 1/16" thickness is a residential grade and will not be used.

c. Resilient Sheet Flooring.

(1) Characteristics.

(a) Product choices. Two choices exist: Vinyl or rubber. Vinyl sheet flooring, however, encompasses a wider variety of products, including no-wax finishes, cushioned construction, and seamless installation.

1 Rubber sheet flooring. This product has properties very similar to those of rubber tile and is superior to vinyl in burn resistance and resilience. Installation of rubber sheet flooring may be more difficult than vinyl not only because of the narrower rolls and greater number of seams but also because of the greater attention that must be paid to proper seam fabrication and adhesion.

2 Vinyl sheet flooring. This product includes a broad variety of products that are usually fabricated with a backing for added resilience. It is this resilience that provides the advantages of this material over the tiles. Only backed products should be used.

a Categories. Category I is for use on applications on, above, or below grade. Category II is limited to applications over sub-floor with 16" of cross ventilated space underneath them.

b Backings. These are in four groups. Group I is for organic fiber and is suitable for use with Category II (ventilated sub-floor) installations. The other three groups are suitable for use with either category.

c Wear-layers. These are the wearing surfaces of the vinyl sheet flooring and are the most important part of the flooring. They come in three types: Type I, II, and III. Type III is the most durable and heaviest with a thickness of 0.065". This type is recommended.

(2) Design and construction considerations.

(a) Adhesives. Manufacturer's recommended adhesives should always be used when applying sheet flooring to any surface.

(b) Patterns and color. Patterns and colors should be generally avoided and specified only by a professional designer. Generally, colors should be light and neutral; patterns, subtle and non-directional.

(c) Lay-out. Joints in flooring should be minimized.

(3) Locations for use. Resilient sheet floors are acceptable for use in all administrative, classroom, barracks, and community facilities. They may be used in all instances where resilient tile flooring are acceptable. Their primary advantage is that, with the backing, it is quite resilient and soft underfoot. See matrix (Figure I-12.) for locations.

(4) Cost. Vinyl sheet flooring is the most expensive; rubber, the least.

(5) Analysis and recommendations.

(a) Recommended product. The all purpose resilient sheet flooring will be vinyl, Category I or II, as appropriate to the sub-floor, with any backing appropriate to the category selected. Wear-layer Type III is the recommended surface.

(b) Appearance. The general use sheet flooring will be light neutral in color and have subtle non-directional patterns.

d. Rolled Carpeting.

(1) Characteristics.

(a) General.

1 The relative quality of carpet depends on the face weight of its fibers, the pile height, plies, twist, and density of construction. Pile height and density affect wear ability. A short, dense pile will wear better than a long deep pile, because pile tufts support one another and dense piles will bend less. Although resilience depends upon fiber construction, short piles tend to suffer less from compression. A hard, twist, bulk yarn will not loosen or deteriorate as easily as soft twist bulk yarn. Density relates to fiber thickness, the closeness of the fibers in each row, and the closeness of the rows.

2 The following are some of the important characteristics to be considered when selecting a carpet. Not all characteristics are included here since the selection of carpeting is based upon many subtle and not-so-subtle criteria. For large areas or quantities of carpet, it is recommended that a professional carpet specifier be involved.

(b) Fibers. The following are the fibers used in most commercially available carpet and their characteristics.

1 Wool fibers. Wool is warm, soft, resilient, and fire resistant. It sets the standard for appearance in the carpet industry. It does not attract dirt, has excellent resistance to aging and abrasions, and good color fastness to sunlight. Wool supports static and can be expensive. It must be treated for moth, insect, and mildew resistance. In low humidity conditions, static electricity will build up in wool carpet.

2 Nylon fibers. Nylon is a very tough fiber. Though it attracts dirt and can soil excessively, it can be easily cleaned. It can have static electricity problems but newer nylons have solved this problem. It blends well with other fabrics but will melt on direct contact with flames. The most advanced nylons have excellent resistance to mildew, aging, and abrasion. Minimal wear results from prolonged exposure to sunlight.

3 Acrylic fibers. Nylon fiber carpeting is replacing acrylic as a product of choice because nylon is closer in appearance to wool and the goal of all of the synthetic

carpet fibers was to approach the look and other qualities of wool. Acrylic soils easily but cleans quickly and it has a low flame resistance.

4 Polypropylene (Olefin) fibers. These fibers have high durability, good texture retention, and resistance, to static electricity. They show good soil resistance and are easy to clean. These are used where there is a need to have a tough carpet with low maintenance.

5 Polyester fibers. This is almost exclusively a residential product. Staining and color fading are the primary drawbacks for commercial use.

(c) Construction. The following are the normal types of carpet construction:

1 Tufted carpet construction. A needle instead of a weaving mechanism forces the yarn through a pre-woven backing. The tufted loops are secured by a coating of latex applied to the backing, and a secondary backing is applied to provide stability.

2 Woven carpet construction. These carpets are created by interlocking surface yarns and backing material. The carpet is the most dimensionally stable with the best wearing qualities of all carpet construction. Different weaves are available as velvets, Wiltons, and Axminsters.

3 Needle-Punched carpet construction. This carpet is produced by laying carpet fibers into webs that are passed through barbed needles that push the fibers through the web. By repeating this process, the fibers become so completely entwined and intermingled that the web is strengthened.

4 Knitted carpet construction. These carpets are produced on machines that are similar to those which produce textile knits.

5 Fusion bonded carpet construction. Carpet fibers are fused to a backing through a solution which binds the two together by means of a heat process.

(d) Carpet face types.

1 Level loop pile carpet face. Level loops of yarn form the carpet surface. Low, level-loop construction is usually selected for heavy use areas. The texture wears well, but shows dirt and lint readily.

2 Cut pile carpet face. All surface ends of the looped yarn are cut. Low, cut pile carpet presents a plush surface. Low, dense plush carpets stand upright to form an even surface. This carpet type in nylon fibers is extremely popular in commercial installations.

3 Other carpet faces are available, such as level tip shear, multi level loop, random shear, and sculptured and carved. These types of face treatments are not likely to be used except in very special circumstances.

(e) Face weight. The face weight of the carpet is the weight of the carpet yarn measured in ounces per square yard. It is the amount of the yarn used in the carpet excluding the backing. This measure is a good indicator of the quality of the carpet with the highest weight being usually better.

(f) Pile height. Pile height is the height of the loop or tuft measured in decimals of an inch from the backing to the top of the carpet. There are several guidelines to determine the appropriate pile height of the carpet. These include:

1 Level loop performs best in heavy use areas.

2 High pile gives a feeling of luxury.

3 Pile height is a determining factor in areas where pile may be crushed.

4 Single level pile wears better than multi-level pile.

(g) Backing.

1 Primary backing. This backing is the layer which holds the yarn. It should weigh a minimum of 13 lbs. per square yard for commercial grade carpet.

2 Secondary backing. Many choices are available, such as jute, synthetic woven, or non-woven materials.

(h) Padding or carpet cushion.

1 The use of appropriate carpet cushion will prolong carpet life between 17% and 50% depending on the type of carpet and area covered. It will also reduce impact noise by as much as 35%.

2 Classes. Three classes of padding are available:

a Class I, Moderate Traffic: Executive offices, administration areas.

b Class II, Heavy traffic: General office areas, auditorium classrooms.

c Class III, Extra Heavy traffic: Corridors, hospitals, restaurants, dining facilities.

3 Types of padding.

a Natural hair and jute blends.

b Foam and sponge rubber.

c Urethane cushion.

d Polyester mat cushion.

e The urethane and polyester padding types are highly durable and will not deteriorate or mildew. They are also resistant to slipping.

(i) Carpet weight. Carpet weight per square yard (with or without secondary backing) is another good guideline for quality.

(j) Static electricity. Some fibers are good at reducing static electricity, which can be an important criterion in computer room environments.

(k) Flame resistance. All carpet will comply with 16 CFR 1630 (reference 9-13). Carpet for corridors will also meet the acceptance criteria specified below when the carpet system (carpet and cushion) is tested in accordance with UL 992 (reference 9-14) or Federal Test Method Standard 372 (reference 9-15).

(l) UL 992. Flame-propagation index of less than 4.0 for corridor carpet will be required in all facilities. A flame spread rating of 0 to 25, Class A, shall be the minimum for all applications.

(2) Design and construction considerations.

(a) Adhesive installation. Carpet is glued directly to the substrate. In these installations there is never a padding or a cushion although some manufacturers are now producing a rolled carpet for glue-down installation which has an integral pad. Carpet should be glued when there are large open areas to be covered or where items will be frequently rolled over the surface.

(b) Stretch-in tackless installation. Carpet is stretched over a cushion between tackless carpet stripping located at room perimeters.

(c) Widths and seams. Generally, carpet is made in rolls that are 12 feet wide. Carpet seams should be planned for each room or area in advance to minimize seams and locate them out of areas of high wear.

(3) Locations for use. Rolled carpeting is acceptable for use in primarily in locations appropriate for carpet that will have furniture arrangements that are not likely to undergo frequent change. If frequent change will occur, carpet tiles are preferred. Appropriate locations will be some administrative facilities, dining facilities, barracks, and all single-family residences. See matrix (Figure I-12.) for locations.

(4) Cost. Generally, for rolled carpets of the same weight and construction, olenfin is the least expensive; nylon, second; and wool, the most expensive. Sponge rubber

padding is the most expensive padding; prime urethane, the least. Carpet tiles have a higher initial cost than rolled goods.

(5) Analysis and recommendations. The all-purpose recommended rolled carpet will have the following characteristics:

(a) Color. The carpet color should generally be dark, either warm or cool tones. Light colored carpet will show dirt and stain more readily and require more extensive maintenance.

(b) Fiber. The fiber should be either BASF Zeftron or Antron Nylon.

(c) Construction. Woven.

(d) Face type. Textured loop pile or loop and tip.

(e) Face weight. Minimum 28 ounces per square yard.

(f) Total weight. Minimum 63 ounces per square yard.

(g) Pile height. Minimum .156 inches.

(h) Glued or stretched. Most roll carpeting will be glued. Carpet stretched over padding will be limited to the areas requiring the finest quality finishes.

(i) Conform to the criteria for carpet contained in Chapter 9.d.EIM.

e. Carpet Tiles.

(1) Characteristics.

(a) Carpet tiles are modular square units of carpet which are laid on a smooth substrate, often requiring little or no adhesive or other mechanical bonding to the floor. They provide under floor accessibility, easy maintenance and replacement, open plan flexibility, minimum waste, and low life-cycle cost. Tiles can be rotated and replaced. They are very dimensionally stable.

(b) Fibers. The following are the fibers used in most commercially available carpet tiles and their characteristics.

1 Nylon. Nylon is a very tough fiber. Thought it attracts dirt and clan soil excessively, it can be easily cleaned. It can have static electricity problems but newer nylons have solved this problem. It blends well with other fibers but will melt on direct contact with flames. The most advanced nylons have excellent resistance to mildew, aging, and abrasion. Minimal wear results from prolonged exposure to sunlight.

2 Polypropylene (olefin). These fibers have high durability, good texture retention, and resistance to static electricity. They show good soil resistance and are easy to clean. These are used where there is a need to have a tough carpet with low maintenance.

(c) Construction. The following are the three normal types of carpet tile construction:

1 Tufted carpet tiles. A needle instead of a weaving mechanism forces the yarn through a pre-woven backing. The tufted loops are secured by a coating of latex applied to the backing and a secondary backing is applied to provide stability. Face pile can be either cut pile, loop pile, or a combination cut and loop. Tufted, loop pile carpet tiles have excellent appearance retention characteristics.

2 Needle-punched carpet tiles. This carpet tile is produced by laying carpet fibers into webs that are passed through barbed needles that push the fibers through the web. By repeating this process, the fibers become so completely entwined and intermingled that the web is strengthened. This construction is very durable and inexpensive. It is frequently used where application of carpet tile might otherwise be unfeasible, due to the rigors of the environment or budget considerations.

3 Fusion bonded carpet tiles. Carpet fibers are fused to a backing through a solution that binds the two together by means of a heat process. This process currently dominates the U.S. carpet tile market. These tiles have the densest face constructions.

(d) Carpet face types.

1 Level loop pile. Level loops of yarn form the carpet surface. Low, level-loop construction is usually selected for heavy use areas. The texture wears well, but shows dirt and lint readily.

2 Cut pile. All surface ends of the looped yarn are cut. Low, cut pile carpet presents a plush surface. Low, dense plush carpets stand upright to form an even surface. This carpet type in nylon fibers is extremely popular in commercial installations.

(e) Face weight. The face weight of the carpet is the weight of the carpet yarn measured in ounces per square yard. It is the amount of the yarn used in the carpet excluding the backing. This measure is a good indicator of the quality of the carpet with the highest weight being usually better.

(f) Pile height. Pile height is the height of the loop or tuft measured in decimals of an inch from the backing to the top of the carpet.

(g) Carpet tile backing. Carpet tiles require very good dimensional stability to perform properly, and the backings of some tiles are more dimensionally stable than others. PVC backing is the most common; urethane, the next most common. Newer backings have recently been developed on limited carpet tiles that improve on the smoke resistance and dimensional stability of these two materials.

(h) Padding or carpet cushion. Carpet tiles do not use separate padding or cushion. Instead, a cushioned backing is provided by the carpet tile manufacturer.

(i) Module size. The industry standard size for modular carpet tiles in the U.S. is 18” x 18”. Other modules are available: 24” x 24”, 30” x 30”, and 36” x 36”. The larger the tile, the greater the opportunity for waste. The 36” x 36” generates approximately 125% more waste than the 18” x 18” tile.

(j) Static electricity. Nylon fibers are good at reducing static electricity, which can be an important criterion in computer room environments.

(k) Flame resistance. Flame spread ratings for carpeting must be a minimum of 0.45 for corridors of hospitals and fire critical occupancies and 0.22 for other commercial occupancies.

(2) Microbial resistance. Additives are available that will reduce and inhibit bacterial and fungal growth, making carpet tiles appropriate for use in health care facilities or other clean environments.

(3) Design and construction considerations.

(a) Adhesive installation. Three types of installation are recommended depending on the type of tile chosen.

1 Total glue down. This installation is recommended when the tile has very limited dimensional stability or limited mass and weight. Every tile is anchored to the floor with releasable adhesive.

2 Partial glue down. This installation is recommended when the tile has moderate dimensional stability and moderate mass and weight. The tiles are installed in a grid system of anchored tiles with the remainder laid free.

3 Free-lay. This installation is recommended when the tiles have maximum dimensional stability and maximum mass and weight. The tiles are installed on the floor without adhesive.

(b) Module choice. As stated above, the 18” x 18” standard module will generate less waste than larger modules.

(4) Locations for use. Carpet tiles are acceptable for use primarily in locations appropriate for carpet that will undergo frequent change or have considerable wear and abuse. Appropriate locations will be administrative facilities, dining facilities, barracks, and some hospital locations. See matrix (Figure I-12.) for locations.

(5) Cost. Generally, olefin is the less expensive than nylon. Carpet tiles have a higher initial cost than rolled goods but create floor coverings that are much more easily maintained over a long period of time due to their ability to be replaced in small modules.

(6) Analysis and recommendations. The all-purpose recommended carpet tile will have the following characteristics:

(a) Color. The carpet tile color should generally be dark, either warm or cool tones. Light colored carpet will show dire and stain more readily and require some extensive maintenance.

(b) Fiber. BASF Zeftron or Antron Nylon.

(c) Backing. PVC or resin, fiberglass reinforced primary and secondary backing.

(d) Construction. Fusion Bonded.

(e) Face type. Tip sheared loop.

(f) Face weight. Should be 24 to 28 ounces per square yard.

(g) Total weight. Minimum 130 ounces per square yard.

(h) Pile height. Minimum 0.170 inches.

(i) Installation type. Partial glue-down with releasable adhesive.

(j) Conform to the criteria for carpet contained in Chapter 9.d. of the EIM.

f. Wood Flooring.

(1) Characteristics.

(a) General.

1 The three most common kinds of wood floor design are strip flooring (1-1/2" to 3" wide boards), random plank (3" to 12" wide boards), and parquet which comes standard in several different patterns. Parquet flooring is unlikely to be used.

2 Wood flooring is relatively easy to maintain, can be finished in a variety of ways, has warmth, color range, and individual textures which can distinguish the character of any space.

(b) The species used in most commercially available strip and random plank flooring are oak, maple, fir, southern pine and spruce.

(c) Grades. The grading designations of some of the several manufacturers associations that grade wood flooring products are not consistent with one another and are confusing. It is helpful to know that, except for the lowest grades (not recommended) the differences between grades are all visual.

(d) Cuts.

1 Cuts of wood used for flooring will affect the appearance of the floor and also its wearing ability. Among the hardwoods used for flooring, only oak is generally available as quarter sawn. This cut provides wood with the absolute minimum distance between growth rings and is therefore the hardest wearing cut since there is the least amount of springwood exposed.

2 Because it is relatively wasteful the quarter sawn cut is the most expensive.

3 For best service and appearance, the better grades of wood flooring should be specified in vertical grain or edge grain.

(e) Dimensions. Typical oak strip flooring is 25/32" thick. It and other hardwood species are available also in ½", 3/8", and 5/16".

(f) Finishing accessories. All base and other wood trim, such as thresholds, reducer strips, and quarter round moulding, should be of the same species of wood as the floor.

(2) Special situations.

(a) Gymnasium flooring.

(b) Parquet flooring.

(c) Design and construction considerations.

(3) Design and construction considerations.

(a) Finishes.

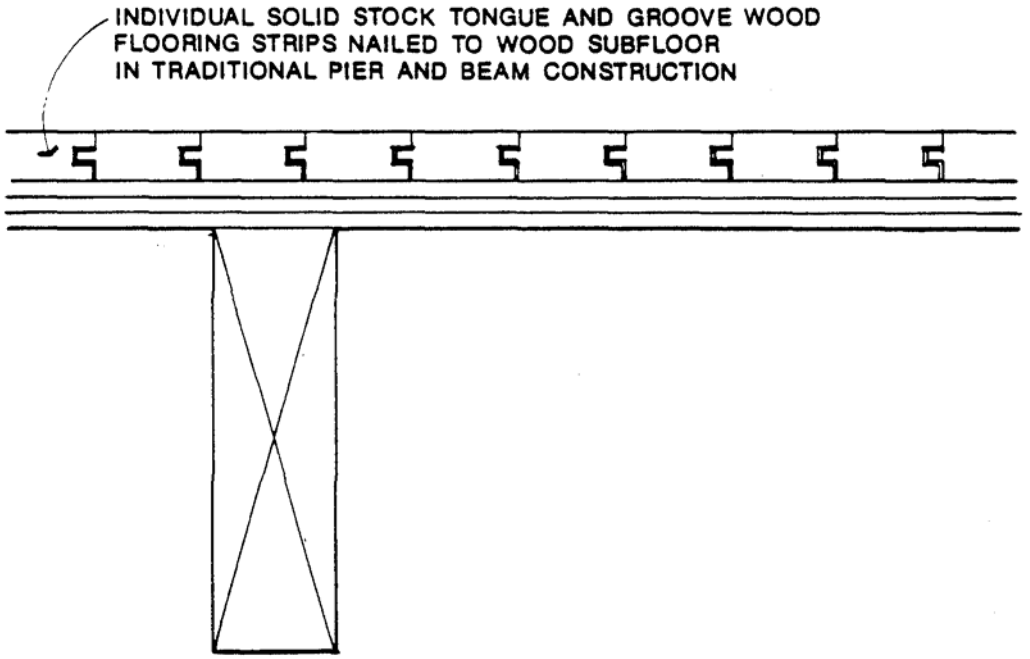
1 Alkyd resin varnishes and polyurethane varnishes provide hard durable coatings over stained or natural finished wood floors. They are usually installed over penetrating type floor sealers and stain if desired for color.

2 Plastic impregnated wood flooring is the hardest available finish for wood. It approaches the hardness of terrazzo or ceramic tile.

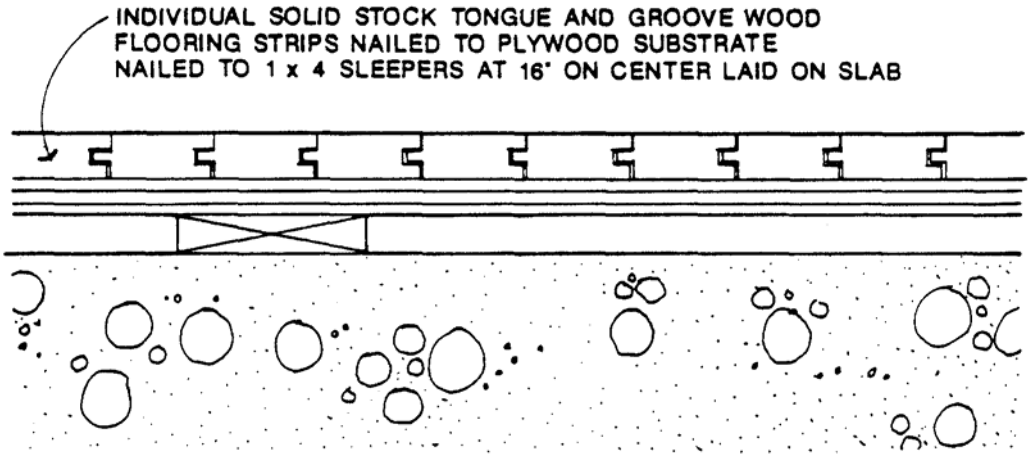
(b) Ventilation. If wood flooring is installed over wood sleeper systems on concrete or below grade, provisions should be made for adequate ventilation of the airspace between the sleepers. (Figure I-13.)

(4) Locations for use. See matrix (Figure I-12.) for locations.

(5) Cost. Parquet flooring is the most expensive and will have limited applications. Quarter sawn oak is the most expensive strip wood flooring.



TYPICAL WOOD FLOORING



WOOD FLOORING ON CONCRETE SLAB

Figure I-13. Wood flooring installations.

(6) Analysis and recommendations. When wood flooring is appropriate for use, it will be of the strip flooring type and have the following general characteristics.

(a) Appearance. Clear or first grades are the top grades for wood flooring and should be used in lieu of any second grade. Wood flooring is sufficiently expensive and will be used in such limited areas that the best material should be employed.

(b) Species. Oak and maple are the recommended woods to use for strip flooring since they are hard and durable.

(c) Dimensions. Boards for strip flooring should be between 1-1/2" to 3" in width and ½" to 25/32" thick.

(d) Finish. Alkyd resin or polyurethane varnish finishes should be used. The wood may be stained if it conforms to the color palette or the historic finishes that may require duplication.

(e) Historical considerations. The use of wood flooring is likely to be most prevalent in the buildings in the historic zones. If this is the case, adherence the HPMP is mandatory relative to species, dimensions, color, and finish.

g. Ceramic Tile.

(1) Characteristics. Ceramic tiles are ceramic paving and flooring units that are thin in relation to their facial area, made from clay or other ceramic materials, and having a glazed or unglazed face.

(a) Unglazed ceramic mosaic tiles.

1 These are units with a facial area less than 6 square inches that are of porcelain or natural clay composition. They are available with abrasive content for slip resistance. They are classified as impervious with average water absorption not exceeding 0.5%. This tile is a very durable tile that is primarily used for floors but can be placed on walls.

2 Finishes. The finish is homogeneous with no surface coating so abrasion will not affect its durability.

3 Color and pattern. Few colors are available because of the integral coloring of the tile.

4 Shapes and sizes. Typical standard dimensions for unglazed ceramic mosaic tiles are 1" x 1", 1" x 2", and 2" x 2". Nominal thickness is usually ¼". Tiles will have a plain face with a cushion edge. Other dimensions and thicknesses are available, but the standards are recommended for use.

(b) Glazed ceramic mosaic tiles.

1 These are units identical to the unglazed units described in (a) above except that they have a glaze applied to them. When glazed, the slip resistance and abrasion resistance characteristics are dramatically lowered, and their application on floors should be carefully considered before specifying them in this location.

2 Finishes. The finishes available are provided by the glaze and include high gloss, matte, semi-matte and crystalline glazes. High gloss finishes are inappropriate for floors and will not be used in this location.

3 Color and pattern. Many colors are available.

4 Shapes and sizes. Typical standard dimensions for glazed ceramic mosaic tiles are 1” x 1”, 1” x 2”, and 2” x 2”. Nominal thickness is usually ¼”. Tiles will have a plain face with a cushion edge. Other dimensions and thicknesses are available, but the standards are recommended for use.

(c) Quarry tiles.

1 General. These are glazed or unglazed units with a facial area usually exceeding 6 square inches and a thickness of ½” or ¾”. They are formed by the extrusion process from natural clay or shale and have a water absorption rate of 5% or less. Quarry tile is virtually unaffected by moisture, acids, oils, or chemicals and is intended for interior and exterior applications where tile with optimum performance characteristics is needed.

2 Slip resistance. For superior slip resistance characteristics, unglazed units are available with an abrasive aggregate embedded in the surface. Glazed quarry tile does not have good slip resistance and is not recommended for use.

3 Finishes. Quarry tile finishes are provided by the integral color of the tile itself in the unglazed configurations recommended for use.

4 Color and pattern. Few colors are available in quarry tiles because the color is an integral part of the tile. Typical colors are earth tones of reds, browns, and tans. Patterns are not available in quarry tile.

5 Shapes and sizes. Typical standard dimensions for quarry tiles are 3” x 3”, 4” x 4”, 6” x 3”, 6” x 6”, 8” x 4”, and 8” x 8”. Nominal thickness is usually ½” or ¾”. A 3/8” thick quarry tile is available but is not recommended for use.

(d) Paver tiles, glazed and unglazed.

1 General. These are glazed or unglazed units made of porcelain or natural clay with a facial area usually exceeding 6 square inches and a thickness of 3/8” or ½”. They are formed in a process similar to ceramic mosaic tiles.

2 Slip resistance. For superior slip resistance characteristics, unglazed units are the only paver tiles recommended for use.

3 Finishes. Paver tiles finishes are provided by the integral color of the tile itself in the unglazed configurations recommended for use.

4 Color and pattern. Few colors are available in the unglazed paver tiles because the color is an integral part of the tile. Typical colors are earth tones of reds, browns, and tans. Patterns are not available.

5 Shapes and sizes. Typical standard dimensions for quarry tiles are 3" x 3", 4" x 4", 6" x 6", 8" x 4", 8" x 8", and 12" x 12". Nominal thickness is usually 3/8" or ½". A ¼" thick paver tile is available but is not recommended for use.

(2) Special purpose tiles.

(a) Foreign made tiles. More than 50% of the ceramic tile sold in the United States is imported. There are many variations of quality, dimension, color, pattern, and textures available and some foreign made tiles will not meet all the criteria stipulated in the ANSI A 137.1.

(b) Variety. Many different tiles are made in a bewildering array of shapes, sizes, thickness, and finish. These will all vary according to abrasion resistance, slip resistance, resistance to staining, frost, water absorption, and hardness.

(3) Design and construction considerations.

(a) Thin-set vs. Thick-set. Traditionally, flooring tile has been set in a thick bed of Portland cement mortar on metal lath creating an installation 1" to 2" thick. Thick mortar beds will also permit floors to be more easily sloped to drains. The application of floor tiles using only adhesives is not recommended because uneven floor substrates will cause tiles to crack as they are walked upon.

(b) Chemical resistant mortars and grouts. Products are available which will resist chemicals and certain acids.

(c) Grouts. Appropriate grouts for flooring tiles include the following types:

1 Commercial Portland cement grouts. These are factory mixed formulations that combine Portland cement with other ingredients to produce a dense material that is water resistant and has uniform color. These grouts do not contain a retarder and are primarily intended for use on floors where the tiles are normally vitreous and thus have low absorption rates. Commercial Portland cement grouts must be damp cured

2 Sand-Portland cement grouts. These are job-site mixtures of sand and Portland cement and are intended for use with ceramic mosaic, quarry, and paver tiles. They also require damp curing.

3 Latex-Portland cement grouts. These are grouts similar to the above that include a latex additive either added at jobsite or in the factory. They eliminate the need for damp curing.

(4) Locations for use. Ceramic floor tiles have limited uses in locations other than toilet rooms, kitchens, and other areas subject to moisture. See the matrix (Figure I-12.) for preferred locations.

(5) Cost. Ceramic floor tiles have been established as high in cost compared with other floor treatments. Their fine moisture resistant characteristics and durability, however, require their use in certain areas. Ceramic mosaic tiles and some paving tiles are less costly than quarry tile installations, but the difference is not great.

(6) Analysis and recommendations.

(a) Tile type. The standard ceramic floor tile recommended for general use in bathrooms and shower rooms will be an unglazed ceramic mosaic tile. Quarry tile will be used in kitchen and service areas subject to high moisture.

(b) Dimensions. For the mosaic tiles, smaller square tile is preferred over rectangular. The 1” x 1”, or 2” x 2” units are an appropriate standard. For quarry tile, the 6” x 6” or other square units are recommended. Larger tiles can cause waste.

(c) Finish. Unglazed, slip resistant tiles are recommended for floors.

(d) Color. Colors for ceramic floor tile in bathroom and shower rooms should be light in hue and neutral. Do not use primary, dark, or bright colors. Different colored accent tiles in patterns or designs are discouraged. Quarry tile floors should generally be in darker hues since they receive so much more heavy service traffic than bathroom floors.

(e) Grout. Grout color for all wall applications should be dark to minimize discoloration due to heavy use. If possible, it should match tile color.

h. Flooring Accessories.

(1) Floor mats.

(a) General. Floor mats are typically provided at building entrances and serve to protect the finishes of building flooring material by permitting those entering the building to clean their shoes before walking on the floors.

(b) Surface mats are available with beveled edges that will serve to prevent stumbling.

(c) Recessed floor mats which have metal frames that contain the mats are available. The frames are set into the flooring material during construction so that the surface of the floor mat will be level with the finished floor.

(d) Floor mat types.

1 Roll-up linked tread mats. These are constructions of flexible aluminum hinged tread slats with top surface tread inserts of various absorptive or abrasive materials.

They are hinged to facilitate cleaning. They have rubber or vinyl cushions on the bottom of the slats to prevent moving while in place.

2 Link-type mats. These are 3/8" or 7/16" thick reversible vinyl link mats that have spaces that collect dirt. They can also trap some high-heeled shoes, although some heel-proof designs are made to prevent this.

3 One piece rubber mats. These are available in solid sheets with no perforations or are available perforated. Thicknesses vary from ¼" to ½". They should be provided with knob backs to permit air circulation to evaporate and vent any moisture collected under the mat.

4 One piece cocoa mats. These are made of cocoa fiber yarn bonded to polyvinyl chloride backing for dimensional stability and resistance to shedding. They are available in 5/8" and 3/4" thicknesses. They represent an increased tripping hazard when they are surface mounted unless they are provided with tapered vinyl edge frames. These mats are not dimensionally stable and expand when wet.

5 Carpet type mats. These require considerable maintenance. They are manufactured of standard nylon carpet bonded to 1/8" to ¼" thick flexible vinyl backing. They are available with tapered vinyl edge frames or with non-raveling edges for use in frames in a recessed application.

6 Rubber tile mats. These are 5/8" thick solid rubber molded tiles with concealed interlocking joint tabs. They are usually specified for whole-lobby, or whole-vestibule. Dirt does not pass through them and they must be cleaned in place.

(e) Cost. Rubber tile mats are the most expensive; roll-up link type next, followed by carpet and cocoa.

(f) Recommendations. The preferred mat for general use will be the roll-up link type, recessed and flush with the floor. Vinyl treads are preferred to carpet or metal.

(2) Wall base material.

(a) General. Wall base material serves to protect the base of walls from abuse due to foot traffic, furniture, and cleaning equipment. The wall base material often is the same material as the floor because the floor material is adjacent and is usually so much more durable than the wall material.

(b) Wall base types.

1 Wood. This material is appropriate for use whenever a wood floor is used. It may be naturally finished or painted to match the wall. Generally, wood is the appropriate base material in single-family residential construction. (Figure I-14.)

2 Vinyl and rubber. These are 1/8" thick, and 2-1/4", 4", or 6" tall. They are used most often with resilient flooring but are acceptable for use with carpeted

floors. They come with straight bases or cove bases and are available in limited color ranges, usually beige, gray, black, and white. The base is slender enough so as not to be visually obvious and should be chosen to match the wall color. Either vinyl or rubber is an acceptable base material. Vinyl is slightly more expensive but retains a luster that the rubber does not have. (Figure I-14.)

3 Ceramic tile. Ceramic tile bases, either coved or straight, are rediused on the top edge if tile does not extend on up the wall. Tile bases may either match the wall or the floor tile, but look better if they match the wall tile. (Figure I-14.)

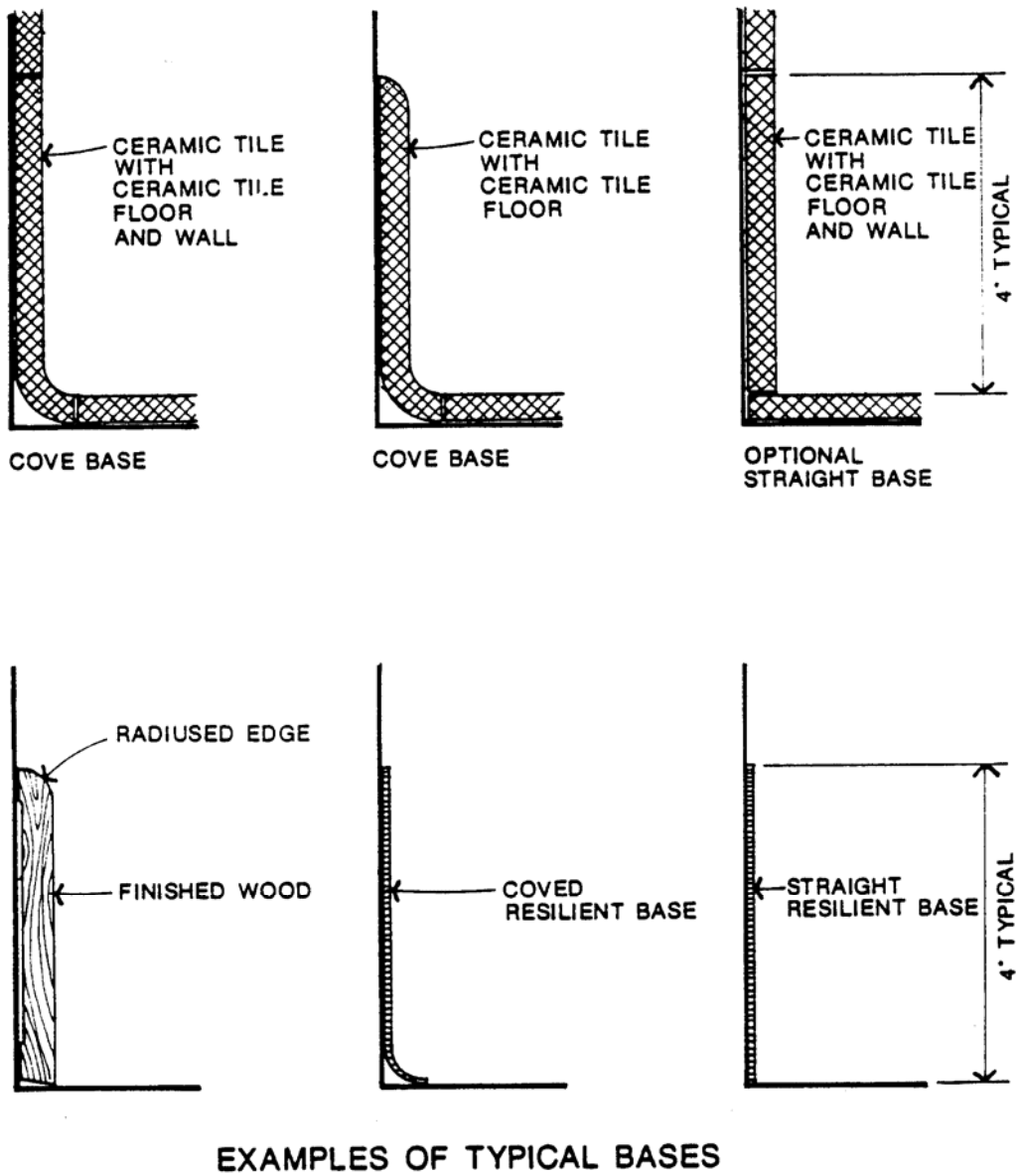


Figure I-14. Typical wall base construction.

i. Special Flooring Situations.

(1) Resinous flooring. These flooring materials are all resistant to chemicals, but the different types of floors are not all equally resistant to the same chemicals nor do they have the same abrasive, appearance, or wear resistant qualities. Some of these floors are specified because they resemble terrazzo and are installed because no grinding is required. These floors are more expensive than tile or resilient floorings and are used primarily where chemical resistance is important. Resinous flooring types are epoxy (marble and quartz chips), acrylic, chemical resistant epoxy and chemical resistant monolithic flooring.

(2) Fluid applied resilient flooring.

(a) These flooring materials are seamless and easily form cove bases and integral splashes. They have an infinite variety of colors. A major disadvantage is the reliance on skilled applicators. These floors are more expensive than conventional resilient flooring and are designed for application directly to concrete.

(b) They have epoxy resin or urethane base coats with embedded vinyl chips for color, and then are covered with a urethane or epoxy finish coat. Overall topping thickness of finish coat is not less than 1/16”.

(3) Access flooring.

(a) Access floors are normally installed where there is a requirement for significant under-floor cabling, wiring, telephone or communications, or under-floor ventilation systems to which convenient access is required.

(b) These systems are designed around steel or aluminum, concrete, composite panels which are supported on sturdy pedestals at distances above the sub-floor of 3” to 12”. The panels and systems are designed for a variety of structural characteristics and perform differently with respect to static electricity, acoustics, wear-ability, fire resistance, and thermal insulating qualities.

(c) These are expensive floors, costing more than any of the other flooring systems described here, and are normally used in computer rooms. They should be selected and specified by a professional designer.

(d) Access floors are equipment items obtained and provided by building users as equipment-in-place.

I-7. BUILDING SPECIALTIES.

a. Concept.

(1) Building Specialty Items.

(a) Toilet partitions and urinal screens.

(b) Lavatory and counter tops.

(c) Interior signage.

(d) Fire extinguisher cabinets.

(e) Telephone enclosures.

(f) Toilet accessories.

1 Grab bars.

2 Soap dispensers.

3 Toilet tissue dispensers.

4 Towel dispensers.

5 Waste receptacles.

6 Napkin/tampon venders.

7 Napkin disposal.

8 Hand dryer.

9 Mirrors.

(2) Selection criteria. Most building specialty items are manufactured while some are custom built or modified. As a rule, building specialties are items that require special attention but typically are not customized to the degree that furnishings are.

b. Toilet Partitions and Urinal Screens. All toilet partitions and urinal screens will be high-density solid polyethylene with integral color throughout. The method of attachment shall be an item of special design consideration. Acceptable product is Santana POLY-MAR HD or equivalent.

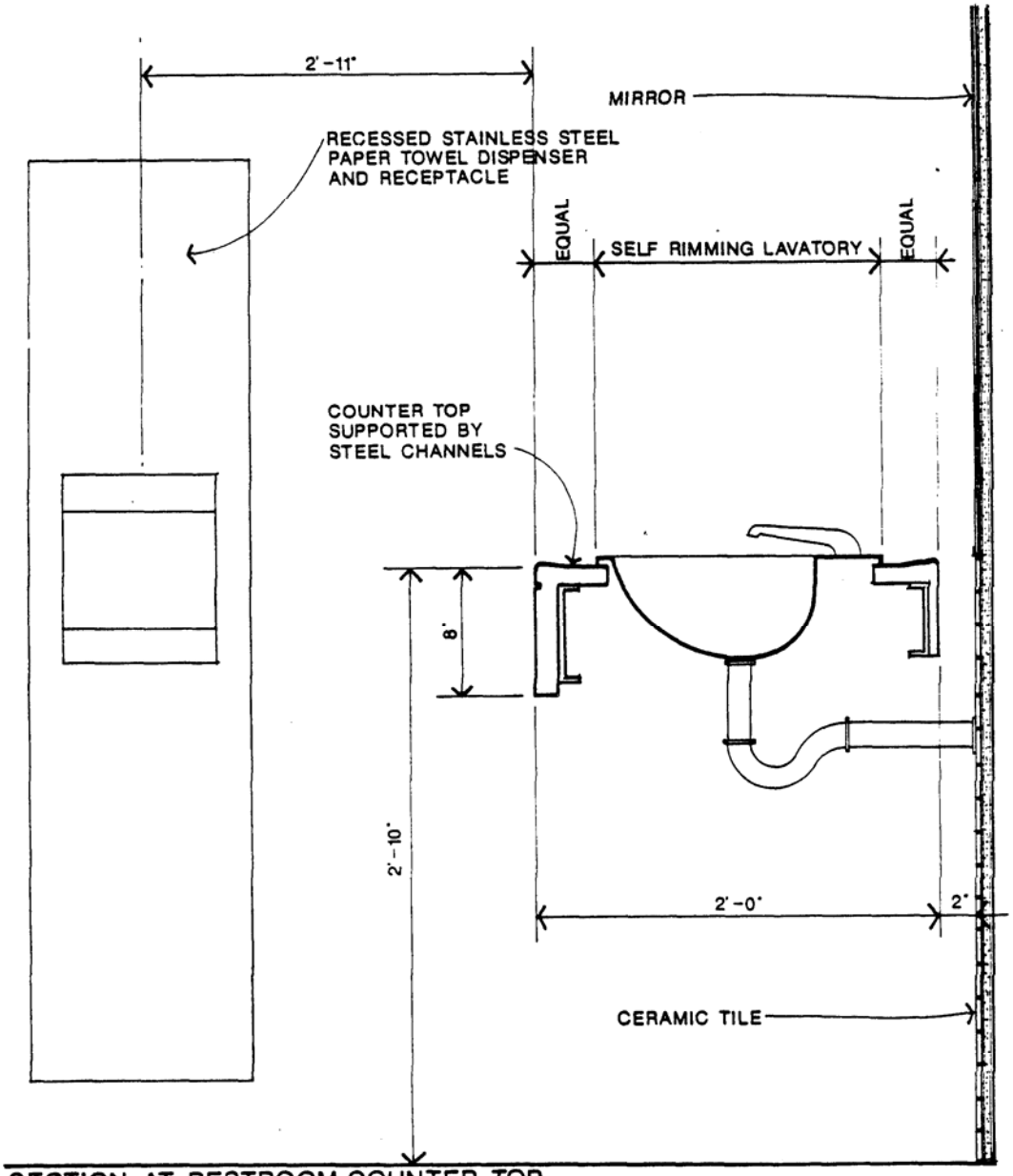
c. Lavatory and Counter tops.

(1) Considerations for use.

(a) Lavatory. Free standing or counter top model.

(b) Counter top. Assuming a counter top lavatory, the counter could be solid polyethylene, plastic laminate, marble, granite, or a cast agglomerate.

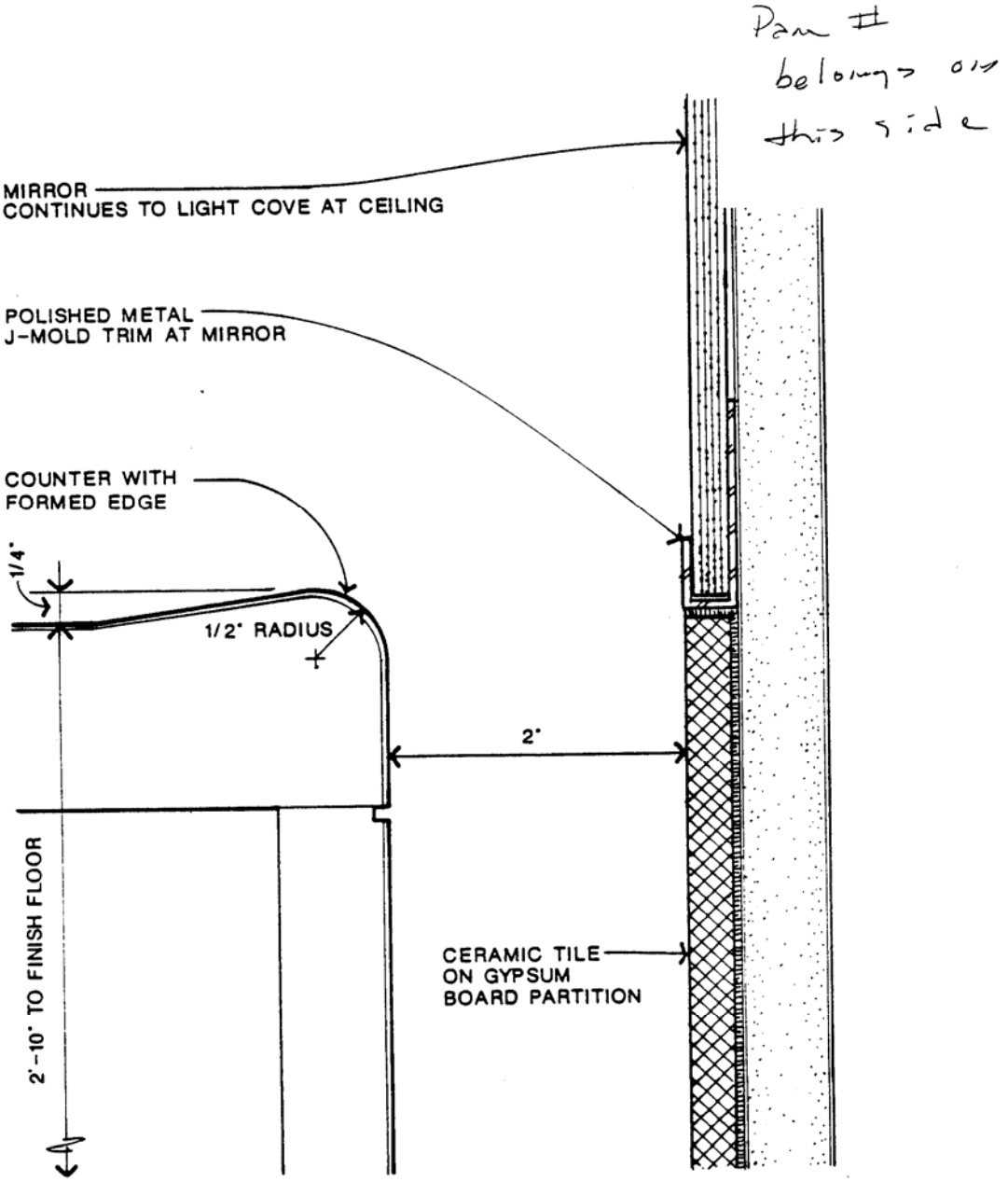
(2) Analysis and recommendations. Because of the need to mount a soap dispenser near the lavatory, plus the typical situation of the user needing to temporarily put down some object, the counter top is recommended. The solid plastic counter top is the most typically represented, with marble, granite, or cast agglomerate used in special areas with a high public image. (Figures I-15., I-16.)



SECTION AT RESTROOM COUNTER TOP
SHOWING LAVATORY AND PAPER TOWEL DISPENSER AND RECEPTACLE

Recommended lavatory, counter top, and recessed towel receptacle arrangement.

Figure I-15. Building specialties, lavatories.



RESTROOM LAVATORY COUNTER DETAIL

Note the 2" space between the counter top and the mirror. This prevents water from damaging the silvering on the mirror and permits ease of maintenance. Note also the raised and molded edges of the counter top to prevent water from getting on the floor.

Figure I-16. Building specialties, lavatories.

d. Interior Signage.

(1) Scope. The standards identified herein are applicable to all interior facilities signage in use on FSH and its sub-installations. Signage for training, special events, exercises, conferences, and other temporary signage is specifically excluded.

(2) Standards. All signage shall conform to the Army Standards as defined and described in Appendix L of this Installation Design Guide. For signs for facilities authorized as construction, standard brown will be used instead of standard black.

(3) Policy.

(a) All requirements for installation of new or replacement of existing deteriorated or missing signs shall be reviewed and approved by the DEH prior to accomplishment.

(b) All approved facility signs shall be listed in a Building Sign Inventory.

(c) Unauthorized facility signs shall be removed when found.

(d) Authorized facility signs which fail to conform to standards but which otherwise are serviceable shall not be replaced solely to conform to standards (AR 420-70).

(e) Signs for facilities authorized as construction shall be fabricated and installed solely by the DEH. As these type signs become unserviceable, they shall be replaced by the DEH as part of the normal maintenance and repair process.

(f) All other interior facility signs shall be fabricated and installed as Equipment in Place (EIP). If accomplished by the DEH, fabrication and installation shall be on a cost reimbursable basis. Requestors may, upon approval of the DEH, fabricate and install EIP facility signs. Regardless of the source for fabrication and installation, all interior signs shall conform to standards as identified on Appendix L of this Installation Design Guide. Facility signs provided as EIP shall not be replaced by the DEH as normal maintenance and repair. They shall be removed when they become serviceable and replaced only after receipt, review, and approval of a funded request from the user.

(4) Interior sign types authorized as construction are:

(a) Type BB-4, Room Number Sign. Mandatory for all facilities.

(b) Type BB-7, Restroom Sign. Mandatory for all facilities with a restroom.

(c) Type DD-1 or DD-2, Mandatory, Prohibitory Sign. Mandatory for fire extinguisher and fire system locations. This sign is also mandatory for identification of permanent non-smoking areas, such as corridors, public assembly areas, toilets, mechanical areas, stairwells, etc.

(d) Type AA-5 or AA-6, Directional Signs. These signs may be used to display room numbers only in facilities with complex floor plans.

(e) Type AA-1, Building Directory. One of these signs is authorized for multi-story buildings or for buildings with complex floor plans.

(f) Type AA-3, Area or small directory. This sign is optional for multi-story facilities and is limited to areas adjacent to locations of entry to the floor, such as stairwell and elevator doors. Only Sign Grid 2 is authorized.

(g) Type CC-1, Building Information Sign, Map. This sign is optional for buildings with complex floor plans, is limited to one per floor, and must reflect permanent type facility fixtures, such as areas separated by fire walls, toilets, mechanical rooms, etc.

(h) Type CC-2, Bulletin Board. This sign is limited to one per facility. If additional CC-2 signs are provided, they shall be provided as Equipment in Place (EIP).

(5) Room Schedules. For the purpose of locating the Type BB-4 signs, all projects that involve additional rooms or revisions to the size of existing rooms shall incorporate a room schedule as part of the design package. The room schedule shall incorporate, as a minimum, the following information.

(a) Room number. The following criteria shall apply to room numbers:

1 Each individual room shall be assigned a unique room number. The use of a pure numerical designation system is preferred to an alpha-numeric designation system.

2 Each individual room shall have a single function/purpose. Where there is an open or semi-open area that includes differing purposes, a separate room number shall be identified for each area and some form of structural or architectural demarcation shall be provided between the areas.

3 Where there is an existing room number system, the room number system utilized in the room schedule shall be an extension of the existing room number schedule. If the work is sufficiently extensive that an extension of the existing room number schedule is impractical, the project scope shall include a complete renumbering of all rooms in the facility and Type BB-4 signs for all rooms.

(b) Net square feet.

(c) Room function/purpose.

(d) Ceiling height at wall.

e. Fire Extinguisher Cabinets.

(1) Considerations for use.

(a) The cabinets can be flush mounted or recessed.

(b) The doors can be metal or glass.

(2) Analysis and recommendations.

(a) Location is probably the most important criterion because fire extinguishers are used in emergencies and do not need to be conspicuous but need to be easily located. A fire plan shall be developed and approved by the Fire Marshall showing proposed locations of all fire extinguishers.

(b) Recessed fire extinguisher cabinets will be used throughout except in warehouse or industrial facilities.

(c) Refer to Appendix I for further requirements regarding fire protection.

f. Telephone Enclosures.

(1) Considerations for use.

(a) These units can vary from simple stand-up wall mounted phones with side baffles for acoustics to a sit-down separately enclosed space.

(b) Telephone enclosures can be built-in or purchased. In general, telephone enclosures are provided by the commercial telephone company.

(2) Analysis and recommendations.

(a) If the telephones are for the public and are offered as an amenity, then they need only be stand-up and minimally private.

(b) If the telephones are for the public and visitors and the function of the building indicates a need for it, then the enclosure should offer more privacy and comfort.

(c) If the telephones are for the occupants of the building and no other phones are available, then the enclosures should offer privacy and comfort.

g. Toilet Accessories. (Grab bars, soap dispensers, toilet tissue dispensers, towel dispensers, waste receptacles, napkin/tampon dispenser, napkin disposal, hand dryer, and mirrors.)

(1) Considerations for use.

(a) All of the toilet accessories being considered are manufactured and most can be acquired in the same finish and style.

(b) Most of the items can be either surface mounted or recessed.

(2) Analysis and recommendations.

(a) For consistency, all toilet accessories when possible should be manufactured of brushed stainless steel.

(b) Mirrors should have a J mold trim of the same material as the rest of the toilet accessories. The mirrors themselves should be factory sized to avoid field cutting, which often results in desilvering. (Figure I-16.)

(c) Toilet tissue dispensers shall use jumbo rolls of toilet tissue to minimize changing of rolls. The dispenser shall be equivalent to the Generation II System, Model Number 580-50 as manufactured by the Fort Howard Company.

(d) Soap dispensers shall be of the counter mounted liquid soap type.

(e) Where possible, toilet accessories should be recessed in the walls because as a general rule toilets are minimally sized and surface mounted accessories further restrict the available space. (Figure I-15 and I-16.)

(f) Refer to Appendix Q, Standards and References, for additional dimensional data.

I-8. WINDOW TREATMENTS. Interior window treatments are not construction but do affect the interior appearance and working environment.

a. Functions of window treatments.

(1) Visual. Window treatments can be an important visual element in some interiors.

(2) Sun control. The primary functional characteristic of window treatments is control of daylight.

(3) Energy. By controlling sun, window treatments can have an important effect on the energy consumption of a building by reducing heat gain.

(4) Acoustic. Window treatments can soften the otherwise hard, reflective characteristics of a window and act as sound absorbers.

b. Selection criteria for window treatments.

(1) Cost. Drapery is the most expensive window treatment, and vertical and horizontal blinds are about equal through the vertical blinds are minimally more expensive. Both are considerably less expensive than drapery.

(2) Appearance. Generally, for new construction the visual design objective in selecting a window treatment is to make the treatment an unobtrusive element. Generally, the window itself and its view are significantly important elements in the composition of a space and its furnishing. Most window treatments will be light and neutral in color and have subtle textures and patterns if any at all.

(3) Sun control and energy conservation. The requirement of a window treatment to control solar energy and brightness from an energy saving standpoint is very important. All of the recommended window treatments will do this but heavy drapery will do a slightly better job since it can have some thermal insulating capability as well.

(4) Maintenance. All window treatments will collect dust and dirt and require cleaning periodically. The vertical blinds are more easily maintained since they present no horizontal surface for gravity born dust particles to cling to easily.

(5) Flame spread. All window treatments can be treated to control the spread of flame to acceptable limits.

(6) Acoustics. Drapery can have some sound absorbing qualities if it is heavy enough and if the drapery is closed. Normally window treatments are not an important part of the acoustical conditioning of a space.

c. Horizontal Blinds.

(1) Characteristics.

(a) Dimensions.

1 Slat widths offered by most reputable manufacturers are limited to ½", 1" and 2". Limitations exist on maximum lengths and are areas available for single units but vary with manufacturer.

2 Generally, manually operated horizontal blind units with ½" wide slats are limited to widths of 10 feet with a maximum area of 66 square feet. One inch wide slats are limited to widths of 12 feet and a maximum area of 100 square feet. Two inch wide slats are limited to widths of 16 feet with a maximum area of 375 square feet. Larger sizes are available.

(b) Appearance. Narrower slats are more attractive. The ½" and 1" slats are less obtrusive than the 2" slats and have slender cord ladders rather than broad and highly visible tape type ladders.

(c) Color. Color should be selected with heating and cooling criteria, as well as with visual and design reasons. Lighter colored blinds will reflect more solar energy and have a more positive effect on the energy consumption of the building.

(d) Acoustics. Horizontal blinds are always hard surfaced and have no acoustic value at all.

(e) Thermal insulting value. Horizontal blinds have no thermal insulating value.

(2) Special situations.

(a) Motor operated blinds

(b) Computer or solar controlled blinds

(3) Locations for use. Window treatments are recommended for all windows because of their energy saving and sun-controlling characteristics. Vertical blinds are preferred, minimally, over horizontal blinds because of the lower maintenance costs required of the vertical surfaces. Draperies will have very limited use and will be located primarily is some of the historical structures.

(4) Cost. Drapery is the most expensive window treatment, and vertical and horizontal blinds are about equal in cost though the vertical blinds are minimally more expensive. Both are considerably less expensive than drapery.

(5) Analysis and recommendations. The all-purpose horizontal blind will be a ½" or 1" slat of light, reflective color.

d. Vertical Blinds.

(1) Characteristics.

(a) Dimensions. Slat widths offered by most reputable manufacturers are normally 3-1/2" and thickness is 0.025". Limitations exist on maximum lengths and areas available for single units but vary with manufacturer.

(b) Materials.

1 Most vertical louvers are integrally colored PVC products in flat sheets or perforated with tiny holes that permit some limited day lighting to penetrate.

2 Some manufacturers make aluminum louvers with baked enamel finishes as well as fabric louvers and louvers with profiles.

(c) Color. Color should be selected with heating and cooling criteria, as well as with visual and design reasons. Lighter colored blinds will reflect more solar energy and have a more positive effect on the energy consumption of the building.

(d) Acoustics. Most vertical blinds have hard surfaces just like horizontal blinds and have no acoustic value at all. Some manufacturers produce a vertical blind which is a perforated PVC sandwich filled with a soft, absorptive insulating material. This product can be quite effective at reducing noise levels within a space.

(e) Thermal insulating value. The perforated PVC sandwich filled with a soft, absorptive insulating material has some thermal insulating qualities. Normally, the window treatment is not related on to add significantly to the U-value of the exterior wall.

e. Drapery. Drapery may be used in special situations in administrative office, in historical structures, and in single-family residences. It will not be a general-purpose window treatment of the Post. A professional designer should specify drapery. Drapery is

"equipment-in-place" (not construction) and must be provided by the user. Installation, but not provision, of the drapery hardware is a DEH responsibility.

f. Cabinetry.

(1) Characteristics.

(a) Cabinets will normally be custom built and manufactured locally or purchased as modular units from a cabinet manufacturer. They may be found in virtually all facilities with the exception of the storage and industrial facilities. With the exception of family housing and medical facilities, Army criteria in general prohibits the provision of cabinets as a construction item.

(b) Materials.

1 Most cabinets will be painted wood or hardboard covered with plastic laminate. Counter tops are almost always covered in high-pressure plastic laminate.

2 Some steel cabinets may be specified, but they will be in the minority.

3 Modular, prefabricated cabinet units are available in wood, steel, and plastic laminate.

(c) Design. Most modular cabinets are produced with exposed rail or overlay construction in which the rails are concealed from view.

(d) Hardware. Pulls, hinges, and drawer glides are the parts that receive the most wear and should be of the best quality.

(e) Finish. Finish is the designer's choice. Acceptable finishes for cabinetry are paint, naturally finished wood, or plastic laminate.

(2) Cost. Cabinet cost is directly related to the quality of the cabinet. More expensive cabinets made by major reputable manufacturers will have better material, better constructed joinery, and better hardware and finishes.

(3) Analysis and recommendations. There is no all-purpose cabinet recommendation or all-purpose cabinet material. Care should be taken to specify and purchase the best quality.

I-9. MECHANICAL EQUIPMENT.

a. Concept.

(1) Mechanical equipment items.

(a) Air diffusers, multidirectional (supply & return).

1 Lay-in ceiling.

2 Monolithic ceiling.

3 Walls.

(b) Air diffusers, linear (supply & return).

1 Lay-in ceiling.

2 Monolithic ceiling.

3 Wall.

(c) Thermostats.

(2) Selection Criteria - The functional requirements for mechanical equipment are specific and technical and will not be considered here. Only the visual aspects will be considered.

- (a) The cost of the mechanical equipment items considered here in relation to the total cost of the building's mechanical system is generally not considered to be one of the more significant issues unless the items are to be provided in large numbers.

(b) The manufacturers of these products have developed minor variations to the fairly basic list of products. Considering the visual issues, most of these product variations are in terms of overall size, trim, finish, and color.

b. Air Diffusers, Multidirectional (Supply & Return).

(1) Considerations for use.

(a) Multidirectional air diffusers accomplish their function by a configuration of fins that direct the air in a variety of directions. These fins can be fixed to conform to specific requirements or can be adjustable to conform to more varying requirements.

(b) The basic intent of multidirectional air diffusers is to reduce the size of the point of introduction of treated air into the space to be conditioned. The final size of the diffuser is based on noise criteria and other technical considerations.

(c) The basic visual variations in multidirectional air diffusers are:

1 Size of device required to perform the air distribution function.

2 Configuration, shape, and size of exposed fins that perform the air distribution.

3 A screen (generally perforated steel) that conceals the fins and still allows the air to continue on in it intended path.

4 Perimeter trim details that conform in various ways to the particular surface of application.

(2) Analysis and recommendations.

(a) Diffusers for Lay-in ceilings.

1 Perforated diffusers offer the distinct advantage of providing an exposed surface that can be standard in size, finish, and appearance while concealing varying size supply openings and directional control fins.

2 In a Lay-in ceiling situation a 2' x 2' perforated grill in the standard 2' x 2' ceiling grid typically accommodates all of the required air supply situations.

3 In addition, the perforated return air diffuser can be visually the same as the supply diffuser while eliminating the costly fins that are not necessary in the return air situation.

(b) Diffusers for monolithic ceilings.

1 Perforated diffusers offer the same advantage of uniformity of size and appearance, both in supply and return configurations, in a monolithic ceiling as they do in a lay-in ceiling.

2 In a monolithic ceiling the edge treatment of the diffuser is critical. It can be trimless, which is visually preferable; but it means that the success of the installation is dependent on the finish work of the ceiling. Alternately, the trim can have a flange to cover and conceal the edge condition of the ceiling opening.

(c) Wall diffusers.

1 As a rule, the use of wall diffusers is not preferred over ceiling diffusers. The proportion, scale, and quality of the device are more important than achieving some repetitive design.

2 Therefore, the size and proportion of the diffuser and careful consideration of its size, profile, orientation, and finish of the fins, along with it placement on the wall, are the critical items to consider.

3 Generally, the diffuser should be placed in a location which makes it as unobtrusive as possible. Its color should match, not contrast with, the wall on which it sits.

c. Air Diffusers, Linear (Supply & Return).

(1) Considerations for use.

(a) Linear air diffusers, by increasing their length in one direction, require directional control only at right angles to their length. Therefore, air distribution can be accomplished with fewer fins.

(b) In addition, by increasing the length of a diffuser and reducing its width, the visual appearance of the diffuser results in an entirely different and generally more pleasing, object to work with when compared to multidirectional air diffusers.

(c) The basic visual variations in linear diffusers are:

1 The size and number of slots required to disperse the air.

2 The length of the diffuser and whether the diffuser is linked end-to-end with another diffuser creating a visually continuous diffuser.

3 The material, finish, and configuration of the exposed fins.

4 Perimeter trim details that conform in various ways to the particular surface of application.

(2) Analysis and recommendations.

(a) Lay-in ceiling diffusers.

1 Linear diffusers when used in the middle of the ceiling interrupt the grid suspension system unless they are sized to fit the grid. However, when used at the perimeter of a ceiling grid, as often happens at an exterior window wall, they can be installed continuously and can be utilized as a handsome accent.

2 When used in a lay-in ceiling grid, the choice of a linear diffuser that utilizes an edge trim that matches the ceiling grid results in a neater and less conspicuous installation.

(b) Monolithic ceiling diffusers.

1 In a monolithic ceiling the installation of a continuous linear diffuser complicates the suspension system.

2 In a monolithic ceiling the edge treatment of the diffuser is critical. It can be trimless, which is visually preferable, with the success of the installation dependant on the finish work of the ceiling. Alternately, the trim can have a flange to cover and conceal the edge condition of the ceiling opening.

(c) Supply and return linear diffusers are visually the same and, in a ceiling situation, can be placed end to end to produce a continuous slot diffuser.

(d) Wall Diffusers. Continuous slot diffusers are very difficult to achieve at the wall surface because they interrupt the structural continuity of the wall. When the linear diffusers are reduced in length and consequently increased in height to achieve the same

opening size, their appearance and considerations become the same as multidirectional diffusers. Wall diffusers are not recommended for use.

I-10. PLUMBING FIXTURES AND EQUIPMENT.

a. Concept.

(1) Plumbing fixtures and equipment items.

(a) Sprinkler heads.

(b) Fixtures.

1 Water closets.

2 Lavatories.

3 Urinals.

4 Drinking fountains.

5 Water coolers.

(2) Selection criteria.

(a) The functional requirements for plumbing fixtures and equipment are specific and technical and will not be considered here. Only the visual aspects will be considered.

(b) The cost of the fixtures and items in relation to the total cost of the plumbing system is generally not considered to be one of the more significant issues unless the fixtures and items are provided in large numbers.

(c) The manufacturers of these products have developed minor variations to the fairly basic list of products. Considering the visual issues, most of the product selections are in terms of color and variations of style.

b. Sprinkler Heads.

(1) Considerations for use.

(a) Sprinkler heads come in three basic configurations: Exposed, concealed, and sidewall.

(b) Location of sprinkler heads is rigidly determined by code requirements.

(2) Analysis and recommendations.

(a) Concealed sprinkler heads are less conspicuous than surface mounted, and the cover plates on concealed sprinkler heads can be selected in a color that makes them even less conspicuous. Concealed sprinkler heads are the most expensive heads.

(b) Both concealed and surface mounted sprinkler heads can be located to dimensioned locations. In a 2' x 2' lay-in ceiling grid, for example, the sprinkler heads can be centered in the tile, providing a visual sense of order.

(c) Sidewall sprinklers can be used when the ceiling might not conveniently accommodate the sprinkler heads. However, the life safety considerations generally result in conspicuous wall applications for sidewall sprinklers.

c. Plumbing Fixtures.

(1) Considerations for use.

(a) Selection of fixtures, while not as technically limited as selection of mechanical equipment, still must be made in reference to specific plumbing system requirements.

(b) While the cost of plumbing fixtures in relation to the entire plumbing system may not be one of the more important considerations when it comes to the selection of water closets, lavatories, and urinals, some discretion is advised. While there are a large number of styles of these plumbing fixtures that fall within a standard price range, there are also a number of more unique and customized designs that are significantly more expensive.

(c) Drinking fountains provide straight tap water as opposed to water coolers, which offer water temperature controlled by a compressor that is either integral to the water cooler or remotely located.

(2) Analysis and recommendations.

(a) There is a little rationalization for making a design statement with basic plumbing fixtures, such as water closets, lavatories, urinals, etc. Access code regulations have emphasized functional and access aspects of toilet rooms. Construction costs have exerted pressure to reduce the size of toilet rooms. Maintenance costs have influenced material, fixtures, and equipment design. The basic emphasis on serviceability of toilet rooms, particularly public facilities, should be the guiding design direction.

(b) Standardization of plumbing fixtures would offer advantages in terms of costs, maintenance, and refinement of detail.

(c) The requirements of the entire plumbing system, the applicable codes, the costs, and the installation requirements all influence plumbing fixture selection, but some criteria should be determined prior to these considerations:

1 Public water closets should be wall mounted. The general maintenance benefits from this consideration are conclusive.

2 Toilet room fixtures should be white. Any rationalization for the selection of colored fixtures should be offset by the possibility of expansion or replacement coupled with the possibility that some special color might not be available in the future.

3 Exposed flush valves on urinals and water closets should be used because they afford easy access in terms of inevitable maintenance requirements.

(d) Water coolers are generally used as opposed to drinking fountains. The introduction of special equipment for drinking water is generally more of an amenity than a necessity and, in that context, the relative ease of addition of temperature control should be considered.

(e) Handicapped access requirements to water coolers are standardized manufactured equipment and must be considered when making selections.

(f) Brushed stainless steel recessed water coolers with integral compressors are offered by a number of manufacturers. These water coolers, when installed in public corridor situations, generally conform to access requirements while creating the least infringement problems. These coolers are recommended.

I-11. ELECTRICAL FIXTURES AND EQUIPMENT.

a. Concept.

(1) Electrical fixtures and equipment items.

(a) Lighting controls.

(b) Electrical receptacles.

(c) Audio speakers.

(d) Smoke and heat detectors.

(2) Selection criteria.

(a) The functional criteria for electrical fixtures and equipment is specific and technical and will not be considered here. Only the visual aspects will be considered.

(b) Lighting control and power supply devices are typical for almost all interior spaces. Standardization of these devices, while desirable, would need to be consistently monitored because of manufacturing and technological advancements.

(c) Audio speakers encompass a wide range of application variations from performance hall and auditorium speakers to simple paging annunciators. In all cases, selection is limited and based on function.

(d) Smoke and heat detectors. Location is determined by code. Battery, generator, line voltage, or special emergency circuits power detectors. They may have self-

contained sensors with alarms or be tied into a centralized system. They are all surface mounted. Concern for their visual appearance is secondary.

b. Lighting Controls.

(1) Considerations for use.

(a) Although the trend in lighting control is toward increasingly sophisticated devices that combine dimming and the activation of numerous pre-set conditions of varying lighting situations, along with the usual on-off functions, the majority of installations still require a simple on-off switch.

(b) Typical on-off switch with its accompanying cover plat is an item that should be considered for standardization.

(c) Visual compatibility of light control devices with other electrical fixtures and equipment is an important consideration, particularly in relation to standardization. (Figure I-17.)

(2) Analysis and recommendations.

(a) A brushed stainless steel standard cover plate with a gray plastic on-off switch is a specific switch that is easy to blend with a wide range of other electrical fixtures and equipment.

(b) In some instances where it is important to make the switch as unobtrusive as possible, plastic switch cover plates with finish and color matching the wall should be used.

c. Electrical Receptacles.

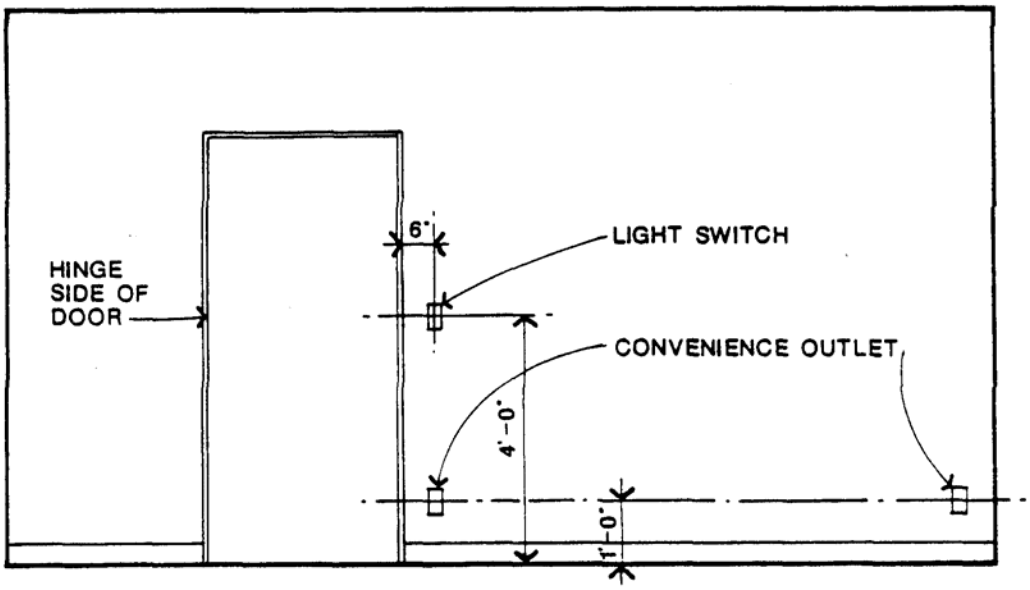
(1) Considerations for use.

(a) Electrical receptacles in addition to being specifically manufactured for their particular function often require graphic symbol identification as well. The symbol identification for electrical receptacles is typically in terms of color and shape of the device itself and not in terms of its cover plate.

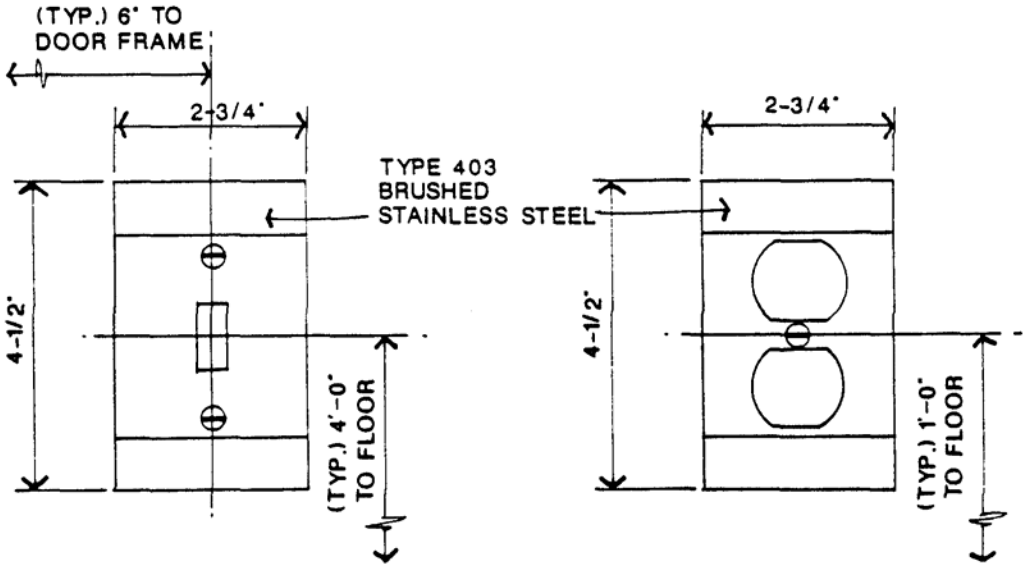
(b) Manufacturing tendencies have continued to try to accommodate the receptacle function into a housing that can be covered by a standard style cover plate.

(2) Analysis and recommendations.

(a) Careful consideration of the location of receptacles can add to the sense of visual order in interior spaces as well as satisfy functional and code problems. (Figure I-17.)



TYPICAL ELECTRICAL EQUIPMENT LOCATIONS



LIGHT CONTROL SWITCH CONVENIENCE OUTLET

Figure I-17. Electrical devices – switches and receptacles.

(b) The standardization suggested in the lighting controls section-a brushed stainless steel cover plate with gray plastic devices (where possible) -would continue a simple effective means of establishing order.

(c) The typical on-off receptacle with its accompanying cover plate is an item that should be considered for standardization.

d. Audio Speakers.

(1) Considerations for use.

(a) In major installations the configuration and disposition of audio speakers is determined by specialists. The opportunity for design control is generally limited to the housing of the speakers, but in large installations design control can be customized. Functional considerations, however, are primary and have the final impact on visual considerations.

(b) In more typical installations such as paging systems, background music, or life safety annunciators, even though the locaters are determined by specialists, there is generally some allowance for variation in terms of visual considerations.

(2) Analysis and recommendations.

(a) Successful resolution of visual considerations in major audio installations depends on early and effective communication between specialists, designers, and users. The possibility of customizing enclosures for speaker assemblies and the potential for molding or modifying, either the audio devices, the enclosures, or the space itself to create visual order is dependent on understanding and conforming to the impact that each has on the other where acoustical considerations are concerned.

(b) Ceiling speakers are the most common sound system installation. The cover plates for these speakers have evolved into the most readily available, economical, and controllable tool for designers. There is a wide range of manufactured speaker cover plates. Customized covers are usually feasible although they must be achieved in concert with the technical requirements.

(c) The design goal is to make the speakers as unobtrusive.

e. Smoke and Heat Detectors.

(1) Considerations for use.

(a) Necessity, configuration, and location of smoke and heat detectors are determined by code and life safety requirements.

(b) Smoke and heat detectors are relatively recent technological innovations that provide uniquely valuable early awareness of life and property threatening situations in relation to fire and smoke. The manufacturers of these items, while operating

on the leading edge of electronic technology, have responded to visual consideration in terse and eccentric ways. The typical response to the visual aspects of smoke and heat detectors has been a minimally sized molded plastic cover, with a strangely decorative approach to perforations and a filigree-like assortment of textures and patterns integral to the molded cover.

(2) Analysis and recommendations. Until manufacturing techniques produce a visually acceptable design or technological advancements allow customized modifications, there is little that the designer can do except refine as possible the visual aspects of the physical location of smoke and heat detectors.

I-12. LIGHTING FIXTURES.

a. Concept.

(1) Lighting fixture items.

(a) Fluorescent.

1 Lay-in ceiling, recessed.

a 2x2.

b 2x4.

c 1x4.

2 Surface mounted.

3 Pendant mounted.

4 Lensed and louvered.

5 Air handling.

(b) Incandescent.

1 Recessed.

2 Surface mounted.

(c) High intensity discharge (H.I.D.).

1 Recessed.

2 Surface mounted.

(d) Exit lighting.

(e) Emergency lighting.

(2) Selection criteria.

(a) The distribution of power to light fixtures, the required amount of light to be produced by light fixtures, and the number of fixtures required to distribute the light properly are specific and technical and will not be considered here. Only the visual aspects will be considered.

(b) The initial selection for general purpose light fixtures is the source of light—fluorescent, incandescent, or H.I.D. The choice of light source is based on the following:

1 Cost. In terms of energy required for amount of light produced, H.I.D. is the most economical; fluorescent, next; followed by incandescent, which is the most expensive.

2 Color. In terms of color created by the light source itself and in terms of the rendering of the color of the objects lighted, H.I.D. is generally conceived as creating the least desirable colors and rendering the least amount of color accuracy and variation in the objects lighted, with fluorescent more successful by these criteria, and incandescent far more successful than both of the others.

3 Physical characteristics of the source fixture.

a H.I.D. lighting is primarily a high output point source of illumination, concentrating its light so that it can be collected and reflected by the light fixture to its intended destination in concise or diffuse forms.

b Fluorescent lighting is primarily a linear and initially more diffuse source of light that is generally housed in a fixture that amplifies its diffuse qualities.

c Incandescent lighting is a lower output source of light than H.I.D. and a point source that is collected and reflected by the light fixture. It is also utilized for its visual appearance.

d After the selection of type of light source to be used for general lighting, then the specific lamp and the fixture to house it is selected.

e Exit lighting and emergency lighting fixtures are selected first for their ability to perform their specific function and then in terms of the criteria outlined for general lighting fixtures.

(3) Locations for use. All of the listed lighting fixture types will have an appropriate use. Refer to the matrix. (Figure I-18.)l

(4) Historic zone deviations.

(a) Interior construction or renovation projects, which will be carried out in any of the Post's historic zones must be done in a manner consistent with the Post's Historic Buildings Maintenance Guideline.

(b) The Post's historic zones are: The Quadrangle Area, Infantry Post, Staff Post, Artillery/Calvary Post and New Post.

b. Fluorescent Light Fixtures.

(1) Considerations for use.

(a) Lay-in fixtures in lay-in ceilings are one of the most common installations for fluorescent fixtures of all sizes. The 2' x 4' fixtures are the most common. The 1' x 4' fixtures require most fixtures to provide the same amount of light as the 2' x 4' fixtures but consequently disperse the light more evenly. The 2' x 2' fixtures require a slightly unusual U-shaped lamp but are excellent for use in the standard 2' x 2' lay-in grid ceiling.

(b) Surface mounted fixtures are generally used in areas that have monolithic ceilings and in areas where the added expense of recessing them is determined to be not cost effective.

(c) Pendant mounted fixtures are used to bring the source of light closer to the task or to allow the source of light to be directed up and then reflected down for a more diffused lighting installation. Warehouse and industrial applications will use this fixture type.

(d) Lensed fluorescent fixtures were for many years the fixture of choice. The development and increased use of parabolic louvered fixtures has changed the situation. The parabolic louvered fixture is a fixture which generates significantly less glare in the ceiling plane and has become an important consideration with the wide spread use of computers and their glare reflecting video monitors.

(e) Air handling capabilities are easily introduced into recessed lay-in ceiling grid fluorescent fixtures. Typically, however, it is expensive to configure the supply system for air conditioning systems to utilize these capabilities of fluorescent fixtures is for return air, which is routed into the plenum space created by lay-in ceilings.

(f) Locations for use. See matrix. (Figure I-18.)

(2) Analysis and recommendations.

(a) Once a fluorescent source has been selected, the specific type of fluorescent fixture to be used is determined by careful analysis of the function to be performed.

(b) The most typical function by far for fluorescent fixtures is for general lighting of an office or clerical type work situation.

(c) The preferred fluorescent fixture for the office or clerical type work situation is the low-brightness, parabolic louver fixture recessed in a lay-in ceiling grid.

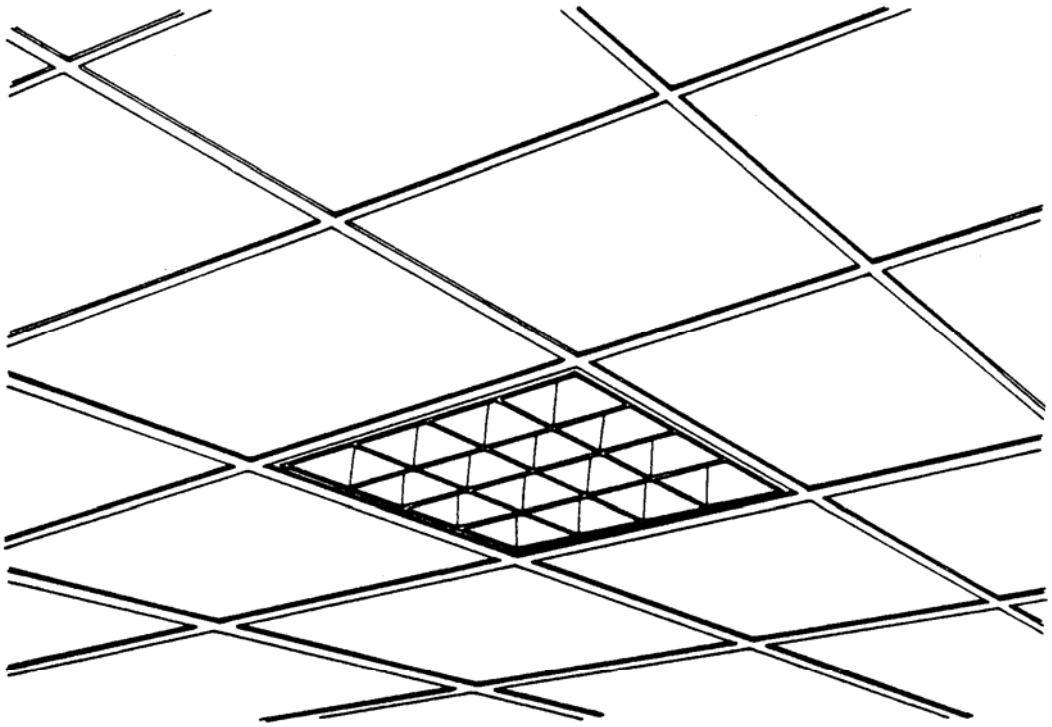
(d) A 2' x 2' lay-in fluorescent fixture with two 40 watt fluorescent lamps and a 16 cell 4" deep parabolic louver fixture should be the most typically used. The 16 cells are created by the grid intersection of the parabolic louvers. (Figure I-19.)

LIGHTING TYPE MATRIX

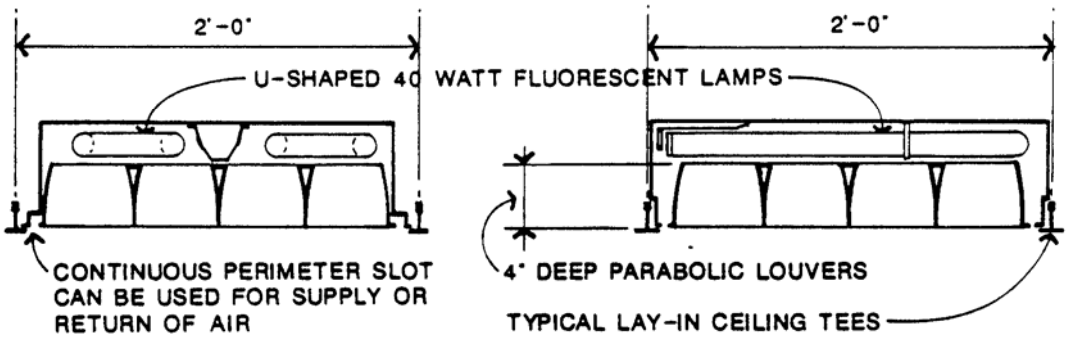
LEGEND	
Preferred	1
Acceptable	2
Not Acceptable	3

	INCANDESCENT	FLUORESCENT	H.I.D.
ADMINISTRATIVE FACILITIES			
Lobbies, public spaces	1	2	3
general admin. areas	1	2	3
offices	1	2	3
senior staff offices	1	2	3
conference rooms	1	2	3
support areas	3	1	2
MEDICAL FACILITIES			
Lobbies, public spaces	1	2	3
general admin. areas	2	1	3
patient rooms	1	2	3
laboratories	3	1	2
clinics	3	1	2
surgerys, operatorys	3	1	3
TRAINING FACILITIES			
Lobbies, public spaces	1	2	2
general admin. areas	2	1	3
offices	2	1	3
classrooms	2	1	2
auditoriums	1	2	2
RESIDENTIAL - TROOP HOUSING			
Lobbies, public spaces	1	2	3
barracks sleeping areas	1	3	3
bedrooms	1	3	3
dining rooms	1	3	3
RESIDENTIAL - SINGLE FAMILY HOUSING	1	3	3
COMMUNITY FACILITIES			
Retail sales areas	1	2	2
gymnasiums	3	2	1
Clubs	1	2	3
KITCHENS	2	1	3
TOILET ROOMS	1	2	3
LOCKER AND SHOWER ROOMS	2	1	2
MAINTAINANCE FACILITIES	3	2	1
MAINTAINANCE FACILITIES	3	2	1
MAINTAINANCE FACILITIES	3	2	1

Figure I-18. Lighting type matrix.



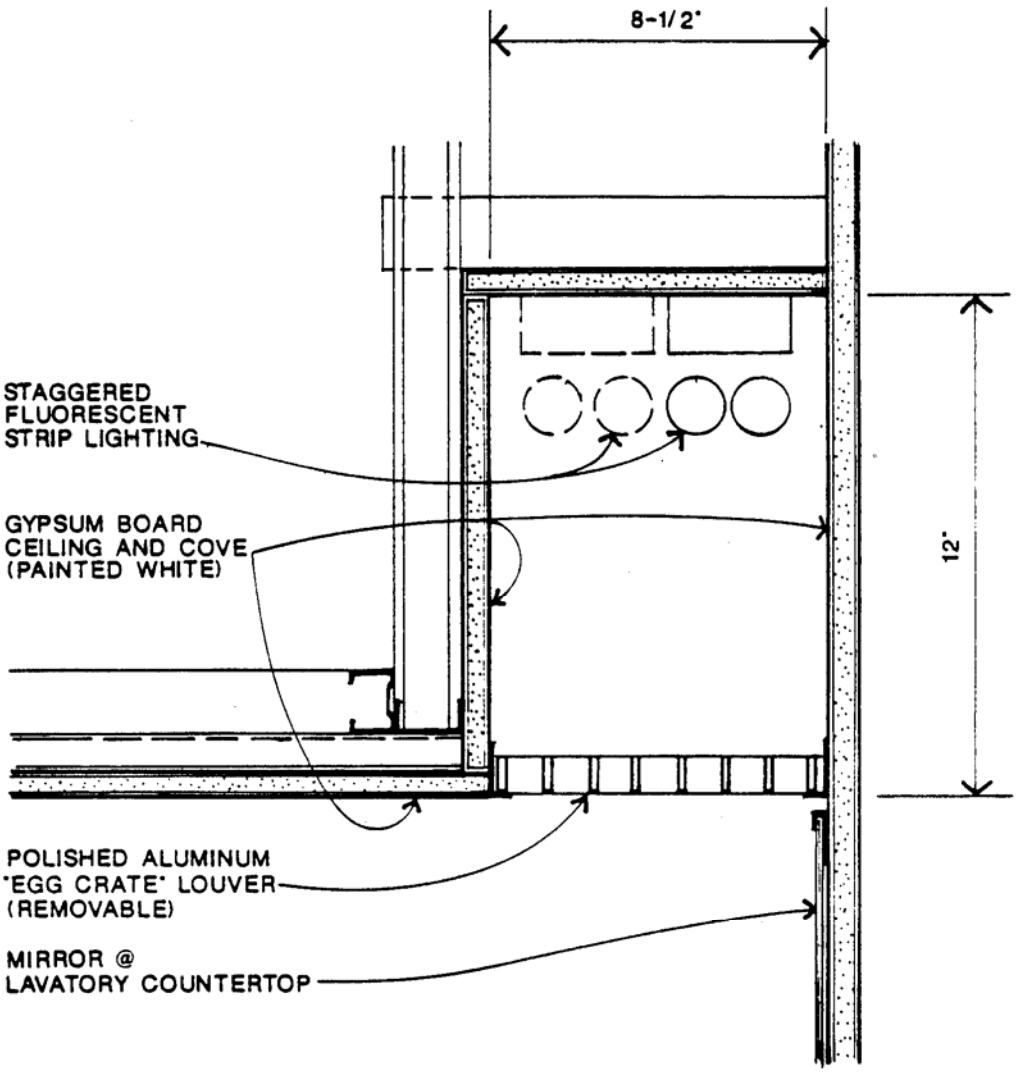
2'x2' – 16 CELL FLUORESCENT FIXTURE IN TYPICAL 2'x2' CEILING GRID



SECTIONS THROUGH TYPICAL 16 CELL FLUORESCENT FIXTURE

This fixture is the standard 2' X 2' light fixture and ceiling grid recommended for all new construction.

Figure I-19. Typical 2' X 2' lighting fixture.



COVE LIGHTING AT RESTROOMS

The detail shown above is appropriate for use in restrooms over both lavatories and toilet fixtures. It is attractive because it is concealed, relatively inexpensive, and energy saving because it is often the only lighting fixture needed in most restrooms.

Figure I-20. Restroom lighting detail.

(e) The 2' x 2' fixture should have air handling capabilities of the type that result in a black reveal around the perimeter of the fixture. This fixture is a commonly manufactured item and the reveal whether used for its air handling capabilities or not is visually successful.

(f) At restrooms, over either lavatories or toilets, the detail shown on Figure I-20. is recommended. It is attractive, relatively inexpensive, and energy conserving because no other toilet room fixtures need be used.

c. Incandescent Fixtures.

(1) Considerations for use.

(a) Incandescent fixtures, whether recessed or surface mounted, are typically selected because of color of the light source.

(b) A more subtle consideration concerning incandescent light source is its typical concentration of output resulting in shadows and shading that delineate three-dimensional objects.

(c) Typically, when an incandescent light is recessed, the obviousness of the light source is minimized and the space appears to be illuminated from almost hidden sources. Typically, as soon as an incandescent light is surface mounted, the fixture itself becomes an object to view and moves into the realm of decorative lighting and is selected for its visual attributes.

(2) Analysis and recommendations.

(a) Incandescent lighting is almost the exclusive source of illumination in single-family residences. The general illumination source is often ceiling surface mounted and decorative. Residential task lighting is typically in the form of individual and decorative table and floor lamps.

(b) In an office or classroom situation the use of incandescent lighting is generally limited because of energy costs and operating and maintenance considerations. Typically, public reception and circulation areas are determined to warrant the extra expense, followed by restrooms, coffee rooms, conference rooms, and lounges where the use of softer incandescent lighting is more relaxing.

(c) Decorative use of an incandescent light source is basically subjective and needs to be considered on a case-by-case basis. There will be limited use of decorative incandescent fixtures.

(d) Locations for use. See matrix. (Figure I-18.)

d. H.I.D. (High Intensity Discharge) Fixtures.

(1) Considerations for use.

(a) There are several general categories of H.I.D. lamp types to consider: High and low pressure sodium, mercury vapor, and metal halide.

(b) Low pressure sodium has the least attractive color of light and is the most economical in terms of operating and maintenance costs. Metal halide is the best in terms of color, and mercury vapor the best in terms of lamp life.

(c) Surface mounted fixtures are generally used in areas that have monolithic ceilings and in areas where the added expense of recessing them is determined not to be cost effective.

(d) Pendant mounted H.I.D. fixtures are used to bring the source of light closer to the task or to allow the source of light to be directed up and then reflected down for a more diffused lighting installation.

(2) Analysis and recommendations.

(a) Because of their economy of operation and their availability in high wattages, H.I.D. illumination sources are frequently used in large spaces with high ceilings.

(b) Generally, metal halide is the H.I.D. source of choice in interior situations because it is the best of the H.I.D. sources in terms of color and is second in terms of economy.

(c) Locations for use. See matrix. (Figure I-18.)

e. Exit Lighting.

(1) Considerations for use. Exit lighting must conform to a wide range of specific functional requirements that are related to life safety. Basically, however, the function of exit lighting is to indicate means of egress in case of an emergency.

(2) Analysis and recommendations.

(a) There is a wide variety of standard exit fixtures in terms of function and appearance.

(b) The recommended exit light is of the type that is self-illuminating and accommodates its control equipment in a mounting canopy, allowing the illuminating portion of the fixture to be minimal in size (approximately 8” x 12” x 1-1/2”).

(c) The preferred illuminated face of an exit light is stenciled aluminum, backed with a red or green plastic sheet that allows only the letters in “EXIT” to be illuminated. Red lettering is recommended for use at all installation governed by this IDG.

f. Emergency Lighting.

(1) Considerations for use. Emergency lighting must conform to a wide range of specific functional requirements that are related to life safety. Basically, however, the

function of emergency lighting is to provide enough illumination in an emergency situation to allow occupants to follow the exit path to the exterior of the building.

(2) Analysis and recommendations.

(a) Emergency lighting goes into operation when the basic interior lighting fails.

(b) Emergency lighting is powered by an integral battery system that is generally kept charged by the basic electrical system, or is powered by a remote generator or battery system. The remote power sources are preferred.

(c) Emergency lighting is provided from either separate specification fixtures or from selected fixtures from the general lighting of the building.

(d) Special emergency light fixtures that are manufactured specifically for emergency light situations are visually obtrusive during normal lighting times. These are not recommended unless integrated lighting is not possible.

(e) Emergency light fixtures that are existing general lighting fixtures operated in an emergency situation by a remote generator or a concealed battery pack are visually more successful.

I-13. COLOR.

a. General.

(1) The colors and color guidelines described herein are extracted from those included in Army Standard Colors for Buildings. In this IDG, colors are identified exclusively for paint. While paint is usually the predominant source of color in interiors, it is not the only one. These color standards should also be applied to the selection of other major interior treatment systems that are not painted, such as vinyl wall coverings.

(2) Guidance is provided here for basic colors for large interior surfaces, primarily walls.

(3) Accent colors are not included in this guide because too many design and visual decision criteria must be evaluated before selecting any accent color and its location for application. Caution and restraint must be urged in the selection and use of accent colors by anyone other than a professional interior designer.

b. Selection Criteria.

(1) Warm or cool.

(a) Warm colors (yellow, oranges, reds) tend to be visually exciting colors and, in a minimal way, increase the blood pressure. These colors should be used where action and diversion are to be stimulated.

(b) Cool colors (greens, aqua, and blues) tend to be visually and physically relaxing. These colors should be used where there is a desire for ease and comfortable repose.

(2) Soft or bright.

(a) Soft colors (greens, aqua, and beiges) will attract attention less than bright colors and therefore tend to improve concentration and work performance. Colors in these hues should reflect between 50% and 60% of light.

(b) Cool colors (greens, aqua, and blues) may be desirable for warm climates and for rooms having south and west exposures, as they will appear psychologically fresh and cool.

c. Colors for large surface areas.

(1) The numbers indicated with each color name refer to the system of identification given in Federal Standard 495a, Colors.

(2) Light tints. These colors have wide application to Army interiors of all types.

(a) SNOW WHITE 378886.

(b) SHELL WHITE 37778.

(c) OYSTER WHITE 37722.

(d) LIGHT CORAL 31669.

(e) LIGHT YELLOW 33798.

(f) LIGHT GREEN 34666.

(g) LIGHT BLUE 35550.

(h) LIGHT BEIGE 36642.

(i) LIGHT GRAY 36628.

(3) Soft Base Colors. These colors are recommended for areas in which work tasks are to be performed, such as offices and classrooms. They are also appropriate to living and other spaces having traditional decoration.

(a) SOFT BEIGE 22563.

(b) BUCKSKIN 33578.

(c) SOFT GREEN 34583.

(d) SOFT AQUA 34414.

(e) SOFT BLUE 35526.

(f) SOFT GRAY 36559.

d. Analysis and recommendations.

(1) Colors of the majority of the interior architectural systems described in this design guide should be subtle so that they do not become interesting visual elements by themselves. The important aspects of an interior environment are always the people who inhabit it and the work or activity that is occurring in the space. It is these elements to which attention should be drawn and not the static elements of the spaces: Walls, ceilings, and floors.

2) Army regulations require the use of Snow White and Shell White colors on the interiors of family housing. Regulations also exist for the exterior colors of family housing.

(3) Exclusive of family housing, colorful visual accents are appropriate in some spaces though not in all. These accents can adequately be introduced by means of plants, graphics, furnishings, and furniture. The view through a window is often an excellent visual accent for an interior space.

(4) In family housing areas, because they are private and appropriately the domain of their occupants, more latitude can be taken with visual accents and accent colors chosen to the taste of the occupants.

(5) Use accent colors very sparingly, if at all, since these colors are bright, strong, and dominating. Considerably more visual harm can be done to an environment with an overuse of these accent colors than with an under-use. Extreme caution is recommended.

e. COLOR Tables.

(1) Figures I-21. and I-22 list some combinations of colors that are appropriate for use in administrative, medical, morale, recreation, and welfare facilities; troop housing facilities; and family housing facilities. These combinations of colors are grouped to provide pleasing combinations of colors for the body (main) colors contrasting colors and accent colors for several different color palettes.

(2) These tables do not represent all of the color combinations that may be permissible or appropriate for the facilities for which they have been chosen. They do identify combinations that, if used together, will have pleasing and lasting value.

(3) To use the tables, select a color from the “Body” color column and combine it with any color from the adjacent “Contrast” color column. Any of the “Accent” colors in the same table can be used with the selected Body and Contrast colors.

(a) Body Colors. Body colors represent the majority of the color to be used in the environment. This can be as little as 75% to 80% of the color or as much as 100%.

(b) Contrast Colors. Contrast colors, if they are used, should represent not more than 15% to 20% of the color in an environment. The contrast colors selected in the

tables are generally of the same color palette or color range as the Body color and are slightly deeper in hue or darker in color.

(c) Accent Colors. These should be used very sparingly and in small proportions relative to the other colors. Accent colors should rarely exceed 5% of the total color in an environment. If there is a desire to use more than 5% accent Color, professional guidance should be enlisted.

ADMINISTRATIVE FACILITIES

Body		Contrast		Accent	
37722	Oyster White	36559	Soft Gray	30257	Old Gold
		33578	Buckskin	30252	Terra Cotta
		30219	Mocha Brown	30219	Mocha Brown
				10080	Chestnut Brown
				36118	Charcoal
33578	Buckskin	30257	Old Gold	34258	Avocado
		30252	Terra Cotta	34227	Pine Green
		30219	Mocha Brown	34300	Jade Green
				10080	Chestnut Brown
				36118	Charcoal
36559	Soft Gray	34300	Jade Green	15090	Royal Blue
		35193	Turquoise	35185	Sea Blue
		35190	Sapphire Blue	36118	Charcoal
				10080	Chestnut Brown
35526	Soft Blue	34300	Jade Green	15090	Royal Blue
		35193	Turquoise	35185	Sea Blue
		35190	Sapphire Blue	36118	Charcoal
				10080	Chestnut Brown

MORALE, WELFARE, RECREATION FACILITIES

Body		Contrast		Accent	
37722	Oyster White	33617	Sandstone	35185	Sea Blue
36642	Light Beige	36495	Pearl Gray	36118	Charcoal
		30219	Mocha Brown	10080	Chestnut Brown
				30215	Nutmeg Brown
				11140	Crimson Red
35550	Light Blue	33617	Sandstone	35185	Sea Blue
36628	Light Gray	36495	Pearl Gray	36118	Charcoal
		35190	Sapphire Blue	15187	Vivid Blue
		35466	Bright Blue	35275	Sky Blue

Figure I-21. Color Tables, Administrative and MWR facilities.

TROOP HOUSING FACILITIES

Body		Contrast		Accent	
37722	Oyster White	33617	Sandstone	30215	Nutmeg Brown
36642	Light Beige	30252	Terra Cotta	36118	Charcoal
		30219	Mocha Brown	10080	Chestnut Brown
		30257	Old Gold	32246	Orange

35550	Light Blue	33617	Sandstone	35185	Sea Blue
36628	Light Gray	35466	Bright Blue	36118	Charcoal
		35190	Sapphire Blue	15187	Vivid Blue
				35275	Sky Blue

33798	Light Yellow	33617	Sandstone	33696	Bright Yellow
		30257	Old Gold	32555	Goldenrod
		30252	Terra Cotta	33434	Rich Gold
				30215	Nutmeg Brown

FAMILY HOUSING FACILITIES

Body		Contrast	Accent
37886	Snow White	None	None
37778	Shell White		

MEDICAL FACILITIES

Body		Contrast		Accent	
37722	Oyster White	33617	Sandstone	30215	Nutmeg Brown
37778	Shell White	36495	Pearl Gray	36118	Charcoal
		35526	Soft Blue	35190	Sapphire Blue
		33578	Buckskin	35185	Sea Blue

36642	Light Beige	30252	Terra Cotta	36118	Charcoal
		30219	Mocha Brown	10080	Chestnut Brown
		30257	Old Gold		

Figure I-22. Color tables, Troop housing, Family housing and Medical facilities

Links
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APPENDIX J INTERIOR FURNISHINGS STANDARDS

J. FURNISHINGS. Furnishings are not construction but affect interior appearance.

J1. Historic zone deviations.

J1.1 Interior construction or renovation projects which will be carried out in any of the Post's historic zones must be done in a manner consistent with the FSH's Historic Preservation Master Plan (HPMP) and will be coordinated with the Fort Sam Houston DPW.

J1.2 FSH's historic areas include: the Quadrangle Area, the Infantry Post, the Staff Post, the Channel Pastures, the Artillery/Cavalry Post and the New Post.

J2. Window Treatments.

J2.1 Functions of window treatments.

- Visual. Window treatments can be an important visual element in some interiors.
- Sun control. The primary functional characteristic of window treatments is control of daylight.
- Energy. By controlling sun, window treatments can have an important effect on the energy consumption of a building by reducing heat gain.
- Acoustic. Window treatments can soften the otherwise hard, reflective characteristics of a window and act as sound absorbers.

J2.2 Selection criteria for window treatments.

- Cost. Drapery is the most expensive window treatment, and vertical and horizontal blinds are about equal though the vertical blinds are minimally more expensive. Both are considerably less expensive than drapery.
- Appearance. Generally, for new construction the visual design objective in selecting a window treatment is to make the treatment an unobtrusive element. Generally, the window itself and its view are significantly important elements in the composition of a space and its furnishing. Most window treatments will be light and neutral in color and have subtle textures and patterns if any at all.
- Sun control and energy conservation. The requirement of a window treatment to control solar energy and brightness from an energy saving standpoint is very important. All of the recommended window treatments will do this but heavy drapery will do a slightly better job since it can have some thermal insulating capability as well.
- Maintenance. All window treatments will collect dust and dirt and require cleaning periodically. The vertical blinds are more easily maintained since they present no horizontal surface for gravity born dust particles to cling to easily.
- Flame spread. All window treatments can be treated to control the spread of flame to acceptable limits.
- Acoustics. Drapery can have some sound absorbing qualities if it is heavy enough and if the drapery is closed. Normally window treatments are not an important part of the acoustical conditioning of a space.

J2.3 Horizontal Blinds.

J2.3.1 Characteristics. Slat widths offered by most reputable manufacturers are limited to 1/2", 1" and 2". Limitations exist on maximum lengths and areas available for single units but vary with manufacturer. Generally, manually operated horizontal blind units with 1/2" wide slats are limited to widths of 10 feet with a maximum area of 66 square feet. One inch wide slats are limited to widths of 12 feet and a maximum area of 100 square feet. Two inch wide slats are limited to widths of 16 feet with a maximum area of 375 square feet. Larger sizes are available.

J2.3.2 Appearance. Narrower slats are more attractive. The 1/2" and 1" slats are less obtrusive than the 2" slats and have slender cord ladders rather than broad and highly visible tape type ladders.

J2.3.2 Color. Color should be selected with heating and cooling criteria, as well as with visual and design reasons. Lighter colored blinds will reflect more solar energy and have a more positive effect on the energy consumption of the building.

J2.3.3 Acoustics. Horizontal blinds are always hard surfaced and have no acoustic value at all.

J2.3.4 Thermal insulating value. Horizontal blinds have no thermal insulating value at all.

J2.3.5 Special situations: Motor operated blinds; Computer or solar controlled blinds.

J2.3.6 Locations for use. Window treatments are recommended for all windows because of their energy saving and sun controlling characteristics. Vertical blinds are preferred, minimally, over horizontal blinds because of the lower maintenance costs required of the vertical surfaces. Draperies will have very limited use and will be located primarily is some of the historical structures.

J2.3.7 Cost. Drapery is the most expensive window treatment, and vertical and horizontal blinds are about equal in cost though the vertical blinds are minimally more expensive. Both are considerably less expensive than drapery.

J2.3.8 Analysis and recommendations. The all-purpose horizontal blind will be a 1/2" or 1" slat of light, reflective color.

J2.4 Vertical Blinds.

J2.4.1 Characteristics. Slat widths offered by most reputable manufacturers are normally 3-1/2" and thickness is 0.025". Limitations exist on maximum lengths and areas available for single units but vary with manufacturer.

J2.4.2 Materials. Most vertical louvers are integrally colored PVC products in flat sheets or perforated with tiny holes which permit some limited day lighting to penetrate. Some manufacturers make aluminum louvers with baked enamel finishes as well as fabric louvers and louvers with profiles.

J2.4.3 Color. Color should be selected with heating and cooling criteria, as well as with visual and design reasons. Lighter colored blinds will reflect more solar energy and have a more positive effect on the energy consumption of the building.

J2.4.4 Acoustics. Most vertical blinds have hard surfaces just like horizontal blinds and have no acoustic value at all. Some manufacturers produce a vertical blind which is a perforated

PVC sandwich filled with a soft, absorptive insulating material. This product can be quite effective at reducing noise levels within a space.

J2.4.5 Thermal insulating value. The perforated PVC sandwich filled with a soft, absorptive insulating material has some thermal insulating qualities. Normally, the window treatment is not relied on to add significantly to the U-value of the exterior wall.

J2.4.6 Special situations. Motor operated blinds. Computer or solar controlled blinds.

J2.4.7 Locations for use. Window treatments are recommended for all windows because of their energy saving and sun controlling characteristics. Vertical blinds are preferred, minimally, over horizontal blinds because of the lower maintenance costs required of the vertical surfaces. Draperies will have very limited use and will be located primarily is some of the Historical structures at FSH.

J2.4.8 Cost. Drapery is the most expensive window treatment, and vertical and horizontal blinds are about equal though the vertical blinds are minimally more expensive. Both are considerably less expensive than drapery. The blinds filled with insulating material are considerably more expensive than flat vertical blinds and approach the cost of some draperies.

J2.4.9 Analysis and recommendations. The all-purpose vertical blind will be a 3-1/2" PVC unit of light, reflective color. It may be either flat or perforated. Some instances will require sound control from the window treatment. In these cases, the filled, perforated blinds should be considered.

J2.5 Drapery. Drapery may be used in special situations in administrative offices, in historical structures, and in single family residences. It will not be a general purpose window treatment of the Post. Drapery should be specified by a professional designer. Drapery is "equipment-in-place" (not construction) and must be provided by the user. Installation, but not provision, of the drapery hardware is a DEH responsibility.

J3. Cabinetry.

(1) Characteristics.

(a) Cabinets will normally be custom built and manufactured locally or purchased as modular units from a cabinet manufacturer. They may be found in virtually all facilities with the exception of the storage and industrial facilities. With the exception of family housing

and medical facilities, Army criteria in general prohibits the provision of cabinets as a construction item.

(b) Materials.

1 Most cabinets will be painted wood or hardboard covered with plastic laminate. Counter tops are almost always covered in high pressure plastic laminate.

2 Some steel cabinets may be specified, but they will be in the minority.

3 Modular, prefabricated cabinet units are available in wood, steel, and plastic laminate.

(c) Design. Most modular cabinets are produced with exposed rail or overlay construction in which the rails are concealed from view (Figures 4-18, 4-19).

(d) Hardware. Pulls, hinges, and drawer glides are the parts that receive the most wear and should be of the best quality.

(e) Finish. Finish is the designer's choice. Acceptable finishes far cabinetry are paint, naturally finished wood, or plastic laminate.

(2) Cost. Cabinet cost is directly related to the quality of the cabinet. More expensive cabinets made by major reputable manufacturers will have better material, better constructed joinery, and better hardware and finishes.

(3) Analysis and recommendations. There is no all-purpose cabinet recommendation or all-purpose cabinet material. Care should be taken to specify and purchase the best quality.

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APPENDIX K EXTERIOR MATERIALS CHARTS (See Historic Bldg M&R Plan in Attachments)

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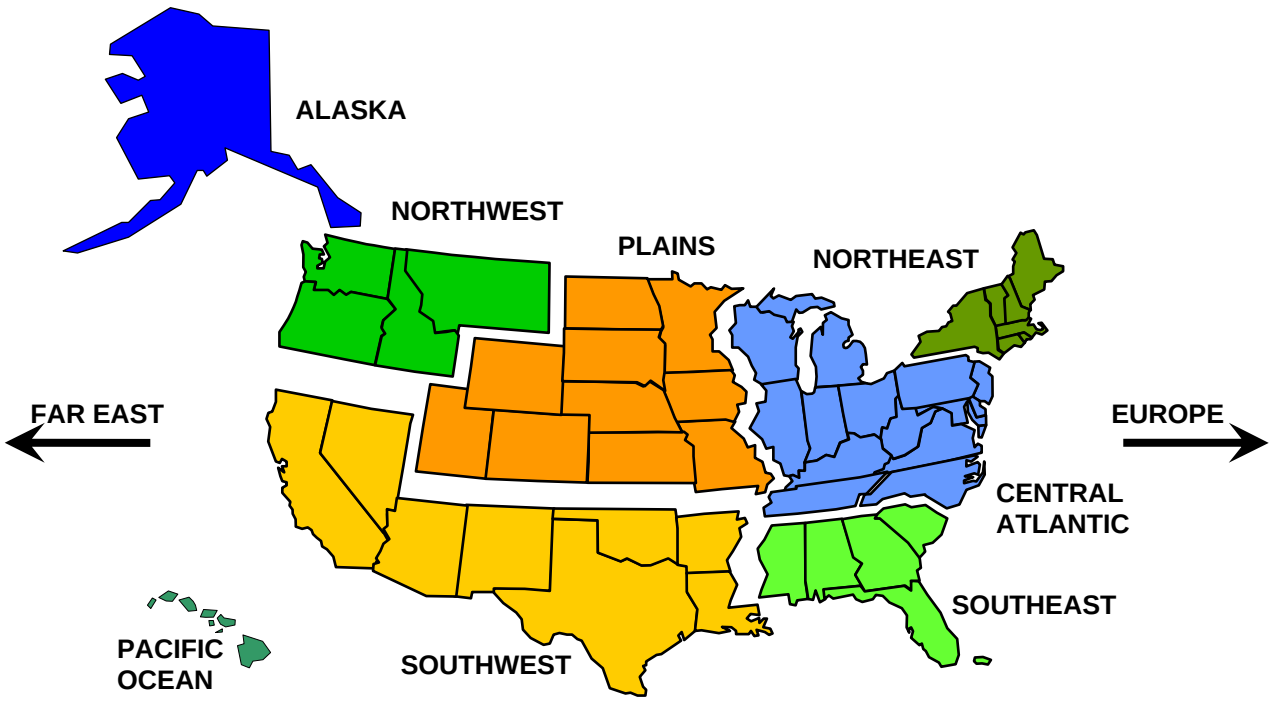
APPENDIX L
EXTERIOR COLOR CHARTS

EXTERIOR COLOR REGIONS

Page	Area	Page	Area
L7-8	Southeast USA	L17-18	Northwest USA
L9-10	Northeast USA	L19-20	Pacific Ocean
L11-12	Central Atlantic USA	L21-22	Alaska
L13-14	Southwest USA	L23-24	Far East (Japan & Korea)
L15-16	Plains USA	L25-26	Europe



L.1 EXTERIOR COLOR CHARTS for INSTALLATION BUILDINGS

Colors schemes and building materials are critical design elements in relating adjacent buildings and creating a compatible visual environment within an installation. Related Army Standards are found in Army Installation Design Standards, Chapter 3, Paragraph 3.5.5 Color, 3.5.5.2 Historic Buildings, 3.5.6 Texture, 3.5.7 Material, and 3.11 Renovations and Additions (See Notes 1 and 2). This section identifies the Army standard palette of colors that will unify installations. A sufficient color palette range is provided to allow for variety. General direction on the use and application of materials and their colors follows:

- Avoid cluttered, cosmetic application of a number of different colors on a facade. The exterior color scheme should consist of a wall color, trim color, and an accent color, all of which should work together with the choice of roofing to provide a harmonious appearance compatible with adjacent structures and environs.
- Select colors from the following Exterior Color Chart based upon their appropriateness to the building type, desired appearance, material to be painted, and prevailing architectural design and landscape character of the installation. Sustainability and ease of maintenance should also be considered.
- Avoid garish colors. Strong or vibrant colors should be used with restraint and should be limited to accents or focal points such as entrance doors where appropriate.

L.2 PANTONE® COLORS

The six-digit color designations found in the Exterior Color Charts are numbers taken from the **PANTONE for architecture and interiors color guide**, which have been cross-referenced to the **PANTONE process guide coated**. The colors in the **PANTONE process guide coated** are intended for viewing on a color monitor and for printing on a four-color process printer (CMYK) using ISO 2846-1 inks. With proper calibration, colors viewed and printed should accurately represent the specified color.

- Calibration for Dell FP E171 and 1800FP Monitor is per manufacturer's recommendation.
- Calibration for Hewlett Packard Color 4500 is per manufacturer's recommendation.
- For calibration of equipment other than the above, contact Pantone, Inc. at (201) 935-5500.

L.3 COLOR VALIDATION

L.3.1 Due to calibration and other technical problems, the color of paint to be used should be based on manufacturer's correspondence to the six-digit **PANTONE** Number and shall not be predicated on matching a computer-generated sample as seen in the Exterior Color Charts.

L.3.2 "White" when given without a number shall be construed as generic and is intended to cover those manufacturer's paints and finished materials called "white". Some slight variance may be discernible from one manufacturer to another.

L.4 COLOR NAMES

Names given for colors are not those assigned by Pantone, Inc., but are the generic names used by the Army for general color identification only. Always use the six-digit **PANTONE for**

architecture and interiors color guide number instead of the generic name when specifying a color.

L.5 SUPPLEMENTAL COLOR BOARD

L.5.1 Included in this Appendix is a Color Board (Page L-4) containing squares with a simulation of each color used in the Exterior Color Charts. The electronic reproduction of this Color Board is, however, subject to some distortion and the color will be inaccurate to a greater or lesser degree depending on the printer used, and must, therefore, not be used in an attempt to accurately match or select paint samples.

L.5.2 A hard copy is available which contains accurate representations of all of the Army's standard exterior colors. This hard copy is the supplemental **COLOR BOARD for the IDS APPENDIX L: HARD COPY VERSION** (Supplemental Page L-4a, intended to be inserted immediately following Page L-4 as a supplement to that page).

L.5.3 The hard copy version of the color board may be requested by E-mail at:

Baxter.Lawrence@mantech.com with a copy to Dannie.Fason@mantech.com

If the E-mail is not acknowledged within three business days, call (703) 378-1030 to verify the request. Provide the following information: quantity of color boards requested; name, title, and telephone number of person placing the order; mailing address; and the name of the installation.

L.6 FACTORY FINISHED MATERIALS

Colors given for surfaces that will be factory finished during manufacturing are intended for guidance and are not intended to constitute a directive for a custom color or finish. Colors shall be selected from standard manufacturer colors with the exception of those products, which can be finished with a custom color at no additional cost or that would not result in diminishment of the standard material guarantee or serviceability.

L.7 SPECIALTY FINISHES

Site Elements, addressed in Chapter 6, are painted one of the colors used in the Color Charts and shown on the Color Board. Fire Hydrants (see Paragraph 6.6.6.5) which shall be Nutmeg Brown in color shall be finished in a standard manufacturers paint, suitable for this application, to which glass beads or other suitable reflective material has been added so as to create a light reflective finish meeting NFPA standards.

L.8 WATER STORAGE TANK FINISHES

Water storage tank finishes shall be in accordance with guidance provided in Chapter 6, paragraph 6.6.6.4.

COLOR BOARD for the Army Installation Design Standards / Appendix L

The color squares shown here are approximations of the **PANTONE® for architecture and interiors color** numbers indicated. They have been simulated using RGB values and are intended to be reproduced electronically. Color quality may vary with printer. **PANTONE** colors are a standard. In order to accurately reproduce the specified colors on these sheets and meet the required US Army standard, you must use the actual **PANTONE** swatch of the color indicated. A hard copy supplemental sheet with accurate color representations is available. See Paragraph L.5 for details.

PANTONE
11-0604 TPX
SHELL

PANTONE
11-0907 TPX
ALMOND

PANTONE
12-0910 TPX
CUSTARD

PANTONE
12-4607 TPX
PASTEL SKY

PANTONE
13-1009 TPX
TAN

PANTONE
13-1013 TPX
ALLSPICE

PANTONE
13-1107 TPX
BEIGE

PANTONE
14-4506 TPX
BLUEGRAY

PANTONE
15-1306 TPX
TAUPE

PANTONE
15-1309 TPX
NATURAL

PANTONE
15-5704 TPX
GRAY

PANTONE
16-1210 TPX
MOCHA

PANTONE
16-1221 TPX
BROWN

PANTONE
16-6216 TPX
METAL GREEN

PANTONE
18-1027 TPX
DARK BROWN

PANTONE
18-1444 TPX
SALSA

PANTONE
19-1540 TPX
MAROON

PANTONE
14-4318 TPX
SKY BLUE

PANTONE
18-1222 TPX
NUTMEG BROWN

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LISTING OF ORIGINAL SOURCE FEDERAL OR COMMERCIAL MANUFACTURER'S DESIGNATION WITH NEW IDS NAME & ACCEPTABLE PANTONE® DESIGNATIONS						
Source	**Old Federal Color Name and/or Number**	**Other Name and/or Number**	**IDS Name (Generic)**	**PANTONE Color Number**	**Process Number**	**(C-M-Y-K)**
Federal Paint Number	Tan 23578		TAN	**PANTONE** 13-1009 TPX	24-7 C	0-10-25-10
Federal Paint Number	Tan 23717		CUSTARD	**PANTONE** 12-0910 TPX	22-8 C	0-5-15-0
Federal Paint Number	Gray 26492		GRAY	**PANTONE** 15-5704 TPX	329-9 C	0-0-3-30
Federal Paint Number	White 20372		TAUPE	**PANTONE** 15-1306 TPX	31-8 C	5-10-20-20
Federal Paint Number	Metal Green 24373		METAL GREEN	**PANTONE** 16-6216 TPX	285-7 C	25-0-30-25
Federal Paint Number	Brown 20313		BROWN	**PANTONE** 16-1221 TPX	76-8 C	0-25-25-20
Federal Paint Number	Mocha 20372		MOCHA	**PANTONE** 16-1210 TPX	48-9 C	10-15-25-15
Federal Paint Number	Gray 25526		BLUEGRAY	**PANTONE** 14-4506 TPX	213-9 C	20-03-03-15
Federal Paint Number	Ochre 31643		ALLSPICE	**PANTONE** 13-1013 TPX	36-8 C	0-15-25-0
Duron	Oyster White 921	(Oyster White) Almond 5910W	ALMOND	**PANTONE** 11-0907 TPX	32-9 C	0-5-10-0

Duron	Alcazar Brown 8306N	Dark Brown 5225N	DARK BROWN	**PANTONE** 18-1027 TPX	318-1 C	70-80-100-30
Duron	Shell White 917	White 5770W	SHELL	**PANTONE** 11-0604 TPX	No Match	0-3-3-0
Generic (no mfg. ref.)	Chocolate		DARK BROWN	**PANTONE** 18-1027 TPX	318-1 C	70-80-100-30
ICI	Dusty Trail # 425		NATURAL	**PANTONE** 15-1309 TPX	44-7 C	20-20-30-5
ICI	Sand Motif # 422		MOCHA	**PANTONE** 16-1210 TPX	48-9 C	10-15-25-15
ICI	Bisque # 436		BEIGE	**PANTONE** 13-1107 TPX	43-9 C	10-10-15-0
ICI	Salsa # 123		SALSA	**PANTONE** 18-1444 TPX	83-3 C	30-75-75-0
ICI	Liberty Red # 159		MAROON	**PANTONE** 19-1540 TPX	69-2 C	20-75-80-30
Generic (no mfg.ref.)	Pastel Sky		PASTEL SKY	**PANTONE** 12-4607 TPX	247-8 C	20-0-5-3
			SKY BLUE	**PANTONE** 14-4318 TPX	229-7 C	40-5-5-0
SHERMAN WILLIAMS		JAVA SW6090	NUTMEG BROWN	**PANTONE** 18-1222 TPX	322-9 C	50-55-55-0

NOTE: Please refer to Appendix L (Supplemental Page L-4a) for accurate representations of the **PANTONE for architecture and interiors** color numbers indicated. The suffix TPX indicates that the color is shown on paper. **PANTONE**® and other **Pantone, Inc**. trademarks are the property of **Pantone, Inc**., 2004. All rights reserved.

EXTERIOR COLOR CHART			*Southwest USA*	
Building Design Element		**Required Color Standard**	**Color Sample** (See Note 4)	**Notes** (Hyperlinked)
Walls	Base (primary) Material	Tan Brick or native stone		
	Secondary Material	For Almond use PANTONE® 11-0907 TPX or for Custard use PANTONE 12-0910 TPX		
		For Mocha use PANTONE 16-1210 TPX		
Roof	Sloped Areas	Metal Bronze or Terracotta		
		Clay Terracotta		
		Fiberglass Shingle Gray/White		
	"Flat" Areas	White		
Fenestration	Doors	Wood: For White use PANTONE 11-0604 TPX		
		Steel: For Dark Brown use PANTONE 18-1027 TPX		
	Storm Doors	White		
	Door & Window Frames	For Brown use PANTONE 16-1221 TPX		
	Storm Window or Sash	White		
	Window	White		
Trim Items	Fascia	White		
	Soffit	White		
	Gutters and D.S.	For Brown use PANTONE 16-1221 TPX		
	Awnings and Canopies	For Tan use PANTONE 12-0910 TPX		

	Stair or Balcony Railings, Balusters, and related Trim	For Dark Brown use PANTONE 18-1027 TPX		
	Handrails	For Brown use PANTONE 16-1221 TPX		

Building Design Element		Required Color Standard	Color Sample (See Note 4)	Notes
Trim Items	Fire Escapes	For Dark Brown use PANTONE® 18-1027 TPX		
	Grilles and Louvers	For Brown use PANTONE 16-1221 TPX		
	Coping	For Brown use PANTONE 16-1221 TPX		
	Roof Ventilators	Blend to match roof		
Related Site Structures	Courtyard Enclosure Walls, Retaining Walls, Fences, Dumpster Enclosures	Red Brick or For Dark Brown use PANTONE 18-1027 TPX		
	Porch Crawl Space Enclosure	White		

NOTES:	
Note 1	For Historic Buildings, Refer to the Fort Sam Houston Historic Preservation and Maintenance Plan (HPMP).
Note 2	The HPMP defines detailed maintenance, standards, practices, and procedures which must be complied with within the National Landmark Register District and the National Historic Conservation District to comply with the provisions of Section 105 of the National Historic Preservation Act (NHPA).
Note 3	Identify type, color, and texture of local brick and stone, to include mortar color and joint style.
Note 4	Color samples are electronic approximations of colors, which should not be construed as accurately representing the color standard. Paint shall match the PANTONE color number.

Note 5	The colors shown here and throughout these guidelines, except as shown in Appendix L (supplemental Page L-4a), have not been evaluated by Pantone, Inc. for accuracy and may not match the PANTONE Color Standards. Consult current **PANTONE for architecture and interiors** color publications for accurate color. PANTONE® and other Pantone, Inc. trademarks are the property of Pantone, Inc.

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APPENDIX M HISTORIC PRESERVATION GUIDELINES

M.1 INTRODUCTION

M.1.1 Military Planning and Design

M.1.1.1 Most of the history and literature about the military does not deal with the topic of Army facility planning and design processes. However, to plan for the future development of an Army installation, it is necessary to go back and attempt to understand what has taken place there in the past.

Fig. M.1 - Facility Planning & Design Document FSH History

M.1.1.2 In the development of its policies, the Army had to deal with the question of how buildings relate to one another by both use and layout and by architectural characteristics. At least in its earliest phases, this development was not always a conscious formulation of policy; so much as it was the immediate response to a given situation. Over the years, there have been different forces affecting the process of military planning in this country as illustrated by the various zones on Fort Sam Houston.

M.2 HISTORIC PRESERVATION REGULATIONS

M.2.1 The Army's management of historic properties is pursuant to the duties and responsibilities established by Congress under the National Historic Preservation Act (NHPA) of 1966 and its subsequent amendments. This act committed Federal agencies to a program of identification and protection of historic properties on the land they own. The NHPA established the Advisory Council on Historic Preservation (ACHP) to "advise the President and the Congress on matters relating to historic preservation; (and to) recommend measures to coordinate activities of Federal, State, and local agencies." (16 U.S.C. 470j)

M.2.2 The NHPA also created the National Register of Historic Places to designate publicly or privately owned resources and to encourage identification and planning which promotes the compatible use of these properties. The National Register is the official listing of the nation's historic and cultural resources considered worthy of preservation. It includes "districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture". (16 U.S.C. 470a)

M.2.3 The NHPA has established a number of procedural steps, which Federal agencies must meet in order to comply with the intent of the law. This is set forth in Section 106 of the NHPA which requires that: "the head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, buildings, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such Federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking." (16 U.S.C. 470f)

M.2.4 Pursuant to its authority in overseeing the nation's historic preservation programs, the Department of the Interior has developed regulations which amount to a set of acceptable standards for work on properties listed in or eligible for listing in the National Register. The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation act as a guide to the Advisory Council and State Historic Preservation Offices in their procedural review of Federal undertakings. These guidelines should also act as standards for all Federal agencies as they commence planning for any undertaking, which has the potential to trigger Section 106 review, thus assuring that all proposed projects would meet Advisory Council and NHPA requirements.

Fig. M.2 - Many FSH Properties Are Listed on the National Register of Historical Properties

M.2.5 Federal agencies must comply with the NHPA by following a series of steps detailed in 36 CFR 800. The Army further explains its policies and procedures in Army Regulation (AR) 200-4, *Cultural Resources Management* and Department of the Army Pamphlet (DA PAM) 200-4, *Cultural Resources Management*. This Installation Design Guideline is intended to be used in conjunction with the above regulations as well as with the Fort Sam Houston Integrated Cultural Resources Management Plan (ICRMP).

M.2.6 The recently developed Army Alternate Procedures (AAP) provide a new method for managing historic properties. The AAP, a streamlined approach to Section 106 of the National Historic Preservation Act, now allows installations to manage historic properties programmatically rather than on a project-by-project review. These procedures also enable installations to leverage existing Army and DoD program requirements while internally managing historic properties in a more efficient and cost effective manner.

M.3 STANDARDS AND GUIDLELINES

M.3.1 **Rehabilitation of Historic Properties.** Design and renovation guidelines for historic districts, such as those within Fort Sam Houston are of necessity much broader than design guidelines for single structures. Such guidelines must not only address the, appropriate architectural image (style, material, etc.) for proposed new buildings, they must also address

how a proposed action within the historic district will impact its integrity. By this it is meant, how any new work will affect the original design intent of the given historic area.

M.3.1.1 New work should not:

M.3.1.1.2 Conflict with the existing architectural character. For example, it should not:

- Be larger in mass or taller than the existing historic structures.
- Be of a color or material that conflicts visually with the predominant historic material used in the area.
- Destroy the historic fabric of any existing structures or landscape features, which are essential character defining elements within the district.
- Destroy the spatial relationship between or among historic buildings designed as a grouping; this includes the regular spacing of buildings within a group, as well as views from one to the other or into the grouping as a whole.

M.3.1.2 New work should:

M.3.1.2.1 Seek to enhance and protect the historic quality and existing resources. For example:

- Conduct a survey examining the level of use existing facilities prior to determining the need for new construction.
- Follow the Standards and Guidelines for Historic Preservation as recommended by the Secretary of the Interior.

M.3.1.2.2 Provide necessary modern conveniences as unobtrusively as possible. For example, it should:

- Site new construction so that it does not destroy existing building relationships or configurations.
- Scale new buildings down so as to minimize their visual impact.
- Place parking to the rear of historic buildings.
- Landscape parking areas and modern mechanical equipment so as to screen them from view.

M.3.1.2.3 Phase out (gradually eliminate) existing intrusions. For example, it should:

- Demolish structures designated, as intrusions on the National Register Inventory when they are no longer needed.

- Restore buildings, which have been altered by inappropriate color schemes, replacement windows, porch enclosures, etc.

M.3.2 **Treatment of Historic Fabric**. The most effective way to preserve historic properties is to keep them in use and to consistently maintain them. When buildings and grounds are consistently used for their intended purposes and regular maintenance is conducted, there is rarely a need for extensive preservation work. Only when they are misused, underused or left vacant for long periods of time does large-scale rehabilitation become necessary. It follows that if a regular maintenance program is put into effect once a property has been appropriately renovated, another major rehabilitation will rarely be required.

Fig. M.3 - Use of Historical Structures as Originally Intended Challenges Planners

M.3.3 **Standards for Historic Preservation Projects**

M.3.3.1 **Compatible use of historic sites and structures.** Every reasonable effort should be made to use a historic structure or site for its originally intended purpose or to provide a compatible use. The use should be compatible in the sense that it involves minimal alteration to the property and/or has no adverse effect upon its historic integrity. Use of the site and structure should be regulated to prevent alterations that are potentially damaging to historic fabric and/or cultural context (Fig. M.3).

M.3.3.2 **Retention of character defining features.** Distinguishing stylistic or character defining features and examples of skilled craftsmanship should not be destroyed, altered, or removed from a historic site or structure. All such fabric should be treated with sensitivity and preserved in its original context and form (Fig. M.4).

M.3.3.3 **Treatment of deteriorated historic fabric.** Deteriorated historic fabric should be repaired rather than replaced whenever possible. When replacement is unavoidable, new material, whether man-made or natural, should match the existing fabric in composition, design, color, texture, and other visual/structural qualities.

Fig. M.4 - Retain Distinguished Stylistic or Character Defining Features

M.3.3.4 **Documentation of missing historic elements.** Replacement of missing historic elements should be based on the accurate duplication of features known to have existed and substantiated by historic pictorial and/or physical evidence and not on conjecture, nor simply on the example of similar treatment found on other structures or sites of the same period or region.

M.3.3.5 **Retention of historic alterations.** Changes to a historic structure or site, which have occurred over the course of time, may provide evidence of important social or cultural processes. As such they should be respected and their potential significance carefully evaluated.

M.3.3.6 **Unacceptable alterations.** Historic sites and structures should be recognized as products of their own time and as part of an important cultural process. Alterations which have no historical basis or which destroy the authenticity of the place are discouraged.

M.3.3.7 **Acceptable alterations and additions.** When possible, alterations and new additions to historic structures or sites should be done in such a manner as to leave the essential form and integrity unimpaired.

M.3.3.8 **Contemporary design in a historic context.** Contemporary design for additions to existing historic sites or districts should not be discouraged if such design is compatible with the massing, proportions, scale, materials, color, views, and general contextual relationships of the place.

M.3.3.9 **Surface cleaning methods.** Surface cleaning of structures or buildings should be undertaken with the gentlest possible means, and only when cleaning is essential to the preservation of the buildings. Cleaning methods, such as sand blasting, which could damage historic material or speed their deterioration, are discouraged.

M.3.3.10 **Archaeological resources.** All treatment work, which potentially affects surface or sub-surface pre-historic or historic archaeological resources, should be coordinated with an archaeologist.

M.3.3.11 **Historic preservation and maintenance**. The guidelines contained within this IDG are general in nature. The IDG must be utilized with the Historic Buildings Maint. & Repr. Plans FSH HBMRP and Camp Bullis HBMRP.

M.3.4 **Guidelines for Historic Preservation Projects.**

M.3.4.1 **Roof Guidelines**

- Preserve existing historic roofing. Repair and patch with matching materials.
- All roofs should receive an annual inspection. Repair and patch all materials as needed and clean out all gutters and drains.
- When full replacement of the roof becomes necessary, replace or restore with historic materials.
- Roof details. Retain and/or maintain all existing chimneys, ventilators, vents, louvers and decorative elements such as brackets, dentils, and cornices. When possible, restore missing decorative elements.

M.3.4.2 **Wall Guidelines**

- Limestone and brick masonry.
    - Clean only when necessary using the gentlest possible means.
    - Repair or replace deteriorated or missing units as needed.

- Stucco.
    - Repair damaged or deteriorated stucco.
    - Repaint only when necessary with appropriate color based on analysis of historic paint.
- Wood.
    - Retain or repair wood siding; where replacement is necessary, match existing clapboards in width and species.
    - Repaint only as need to maintain moisture protection.
    - Use color scheme based on analysis of existing paint layers.

M.3.4.3 Porch Guidelines

- Retain or maintain existing original porches.
- Remove historically inappropriate porches.
- Where possible, restore original porches that have been removed or enclosed.

M.3.4.4 Window Guidelines

- In most historic districts or buildings, windows constitute a highly visible design element as they make up a large percentage of façades.
- If building an addition or altering the building, maintain height configuration of windows.
- Retain window size and fenestration pattern when replacing windows or altering the building.
- If replacing windows, preserve frame material or use historically accurate reproductions. Avoid replacing original frames with aluminum frames.
- Restore historic windows where non-historic replacement windows have been used.
- The window manufacturing industry can replicate and/or reproduce most all types and sizes of windows to match existing historic windows. In many cases, matching replacement windows are available as stock items.

M.3.4.5 Door Guidelines

- Although not usually as visually overpowering as windows, main entrance doorways are also important façade details. As a design element, decorative doors have stylistic features that belong to the particular era for which they were designed.

- Retain or maintain existing historic doors.
- If replacing doors, preserve frame material or use historically accurate reproductions.
- If building an addition or altering the building, maintain the size of the door opening.
- Restore all main entranceways by reinstalling appropriate frames.

M.3.4.6 Color Guidelines

- If historic buildings must be repainted before an accurate color scheme is developed, a very conservative approach should be followed. Repaint to match the existing colors or colors that can be documented to have been used on that building.
- Utilize a qualified historic paint color specialist for an inventory and analysis of the paint layer sequences for all building groupings.
- Establish a rotating schedule for the painting and cleaning of each building.

M.3.4.7 Painting Guidelines

- Do not undertake a paint job until any problems with leaking water have been solved. All gutters and downspouts should be repaired and be in good operating condition.
- Only repaint when existing coat is no longer performing, as excessive coats of paint create a thick film, which obscures detail.

M.3.4.8 Handicap and Safety Access Guidelines

- As a general rule, buildings listed in or determined eligible for listing in the National Register may receive special consideration for meeting safety and accessibility requirements. Any modifications required bringing a historic structure in compliance with safety and accessibility codes should be carefully planned and undertaken so that they do not adversely affect the design of main entrances or principal facades.
- Where possible, avoid alterations to the main façade and principal doorways.
- Place or install new ramps, lifts, and any added fire escapes on secondary building facades such as, to the side or rear of the building.
- Locate new doorways at the rear or side of the building.
- Required protective railings on ramps, stairs, steps, and lifts should match existing porch railings.

M.3.4.9 **Mechanical Equipment Guidelines**

- In many cases within historic districts, mechanical equipment is located outside of the building. When historic structures are renovated and mechanical systems are upgraded, equipment placement should be planned in order to make the least visual impact.
- Where possible, locate mechanical equipment within the building.
- Screen necessary surface equipment with vegetation.
- When large groups of buildings are upgraded as one project, consider the use of a remote system.

M.3.4.10 **Guidelines for Additions**

- In general, additions should follow all of the guidelines for new construction within historic districts; but, because their proximity makes the potential for damage to historic fabric even greater, there are additional principles that should be followed.
- Avoid changes that impact primary facades.
- Note that some highly visible freestanding buildings may not have a secondary facade, and thus additions are not advisable.
- Scale down additions so that it makes the least visual impact.
- Design should establish a clear and obvious difference between the existing historic structure and the new addition.

M3.4.11 **Force Protection.** These guidelines should be used in conjunction with the *UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings* and the Force Protection Design Standards of this Army Installation Design Guide and Standards.

M.4 ARMY STANDARDS

- Army Regulation (AR) 200-4, *Cultural Resources Management*
- Department of the Army Pamphlet (DA PAM) 200-4, *Cultural Resources Management*
- The Secretary of the Interior's Standards for the Treatment of Historic Properties

M.5 REFERENCES

- Advisory Council on Historic Preservation

  United States Army Environmental Center

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APPENDIX N
HOUSEKEEPING RULES

INTRODUCTION

N.1 The following set of housekeeping rules consists of a list of general and public rules that are applicable to the administrative office work areas throughout the installation. Organizations should make every effort to assure that all personnel are familiar with the facilities housekeeping rules. An organized, well kept working area that is neat and clean contributes to the visual harmony of the work area and fosters work efficiencies.

N.2 Additional Housekeeping Rules for specific buildings or organizations may be established, maintained and enforced by the designated Building Manager if necessary..

GENERAL RULES:

1. Alterations: Employees shall not mark, paint, drill, damage, string wires within, or in any way deface any part of the building. Employees will not install or permit the installation of any awnings, shades, Mylar films or num filters on windows. Employees will not obstruct, alter, or in any way impair the efficient operation of the heating, ventilating, air conditioning, electrical, fire safety, or lighting systems, nor shall the employee tamper with or change the setting of any thermostat or temperature control valve in the building. Employees shall not cover or block air ducts or vents.

2. Cleanliness: Employees shall exercise their best efforts to keep workstations and common areas, i.e., hallways, corridors, team rooms, etc., clean and free form rubbish. No employee shall cause any unnecessary labor on the part of cleaning personnel due to carelessness or indifference in the preservation of good order and cleanliness. It is highly recommended that employees use covered cups when transporting liquids to and from the coffee bars. Employees shall not bring any substance into the building that might add an undue burden to the cleaning or maintenance of the premises, or the building.

3. Carpet: Carpet stains and/or damage should be reported to the designated Building Manager.

4. Energy Conservation: Turn off systems furniture lighting, conference room lights, private office lights and equipment, etc. when not in use, especially at the end of the day. During non-business hours, employees shall limit the use of lighting and equipment to areas occupied.

5. Lighting: Do not move and /or modify any overhead lighting fixtures above workstations. One task light may be placed in a workstation.

6. Vertical and Venetian Blinds: Blinds are to be left in fully extended position at all times. Blades shall be positioned so as to permit a good level of natural lighting and shall only be closed for the purposes of sun control and at night for privacy. Only the wands will be used for adjustments. Items shall not be placed or stored on windowsills other than small plants as described hereinafter.

7. Signage: No signs, advertisements or notes shall be painted or affixed on or to any window, door, restroom conference/team room or other part of the building unless approved by the Building Manager. Bulletin boards for posting of unofficial material are restricted to communal areas such as break rooms and coffee bars.

8. Bicycles: Employees shall not bring bicycles or motorcycles into the office environment, but shall be left secured in an upright position in areas designated for that purpose.

9. Aerosol Sprays: The use of aerosol products such as air fresheners, hair sprays, etc., in the work environment should be avoided.

10. Maintenance: All requests for maintenance on furnishings, or building systems or components should be reported to the Building Manager.

11. Smoking: The use of tobacco products inside any Army facility is strictly prohibited. Smoking of tobacco products may only occur in designated areas where proper ash receptacles, which are kept free of trash and debris, are located.

PUBLIC SPACES:

1. Eating in Work Areas: Eating in work areas can contribute to pest infestation and an unsightly appearance. If eating at your desk, please ensure trash is discarded daily. Perishable food items should not be stored in the employees' work area. Perishable foods are to be kept refrigerated.

2. Appliances (e.g., Heaters/Refrigerators/Microwaves/Coffee Pots): Refrigerators and microwaves are not permitted in work areas. One personal fan, not to exceed 8" in diameter may be placed in a workstation. Exceptions to accommodate health problems may be submitted to the Building Manager for review and approval by the USAG Safety Office.

3. Centralization: Copiers, faxes, scanners, printers, etc., will be centralized and networked to the maximum extent possible. Personal office equipment will be provided on an exception basis only.

4. Office Accessories: All office equipment and other devices of any electrical or mechanical nature shall be placed on an area of the work surface that best accommodates the prevention/elimination of any vibration, noise or annoyance to others. Employees shall not construct, maintain, use or operate any equipment of machinery that produces music, sound, noise, pictures, or lighting which is audible or visible beyond their workstation.

5. Office Wall Mountings: Only framed items shall be hung on walls. No artwork or other displays may be placed or hung on fixed or temporary walls/partitions, other than in private offices, without approval by the Building Manger. The use of tape, pushpins, or other devices to affix items to walls is prohibited.

6. Plants: Plants must be contained in appropriate leak-proof non-corroding containers such as ceramic jardinières or flower pots with saucers and shall be kept within workstations and not affixed in any way to the workstation, partitions, floors, or ceiling as outlined in the guidance detailed elsewhere in this document; this prohibition extends to trailing vines. Small plants that do not interfere with the normal operation of window blinds may be placed on windowsills. Watering of plants shall not subject any government equipment to risk of damage.

7. Speakerphones: The use of speakerphones is discouraged and should be restricted to those occasions when absolutely necessary. Concerted efforts must be made to utilize team rooms when speakerphone conversations are required.

8. Trash: The janitorial contractor will discard only items in wastebaskets or items clearly labeled "TRASH". Do not place trash in the corridors, hallways, stairwells, or other common areas.

9. Workstation Reconfiguration: Workstations will not be reconfigured, modified, or altered in any way by the occupant.

10. Workstation Guidelines: Every employee shall make a concerted effort to keep workstations clean, uncluttered, and professional in appearance. Avoid placing papers and other "hard copy" materials on the wall of the workstation and the accumulation of excessive pictures/cartoons/mementos. The storage of papers, boxes, and files on floors is prohibited. Materials are not to be hung on the outside panels of workstations.

a. **Above the Panels:** Nothing will be placed above the panel height of the workstations or hung from the ceiling. Nothing will be stacked on the tops of flipper doors, map files, filing cabinets, towers, etc.

b. **Cabling:** No temporary cabling for electrical, information technology or communications is allowed. Requests for alterations must be submitted to DPW or DOIM. This prohibition includes extension cords; surge protectors are permitted. Wiring is to be contained in cable trays and off the floors.

11. Care of Furniture and Furniture Systems

a. **Laminate Surfaces –** To clean laminate tops, use a soft cloth or non abrasive sponge dampened in a solution of mild detergent and warm water. Remove residue of cleaning solution with a soft cloth wrung out in clean water. Dry with a soft cloth.

b. **Steel and Painted Metal Surfaces –** Panel trim, panel poles, painted flipper doors, and other parts of flipper doors should be cleaned with a soft damp cloth

and thoroughly dried with a soft dry cloth. For soiled areas a mild detergent solution in warm water may be used.

c. **Fabric –** For information on how to remove spots from fabric panels on workstations, contact the Building Manager.

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APPENDIX O
PLANT PALETTE

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TABLE O-1

PLANTING DISTANCES FOR TREES

Mature Size	Min. Dis. From Each Other	Min. Dis. From Buildings	Min. Dis. From Intersections	Min. Dis. From Utility Poles
Large Deciduous Trees	35-50 Feet	20-25 Feet	40 Feet	25 Feet
Small Deciduous Trees and Broad Crowned Evergreen Trees	20-25 Feet	10-15 Feet	30 Feet	20 Feet
Columnar Trees and Narrow Crowned Evergreen Trees	8-10 Feet	6-8 Feet	30 Feet	20 Feet

TABLE O-2

PLANTING DISTANCES FOR SHRUBS

Mature Site	Min. Dis. From Each Other	Min. Dis. From Buildings
Large (12 Ft. Spread) Shrubs	8-10 Feet	6-8 Feet
Medium (6 Ft. Spread) Shrubs	4-5 Feet	3-4 Feet
Small (3 Ft. Spread) Shrubs	2 Feet	2.5 Feet

TABLE O-3

LEGEND FOR PLANT PALETTES

CHARACTERISTICS.

a. Height: 0=Tall Height; X=Medium Height; *=Small Height.

b. Habit: R=Regular Habit; I=Irregular Habit; U=Upright Habit; S=Spreading Habit.

c. Leaf: C=Coarse Leaf; M=Medium Leaf; F=Fine Leaf.

d. Rate: FS=Fast Rate; MD=Medium Rate; SL=Slow Rate.

e. Shade: LT=Light Shade; ME=Medium Shade; HV=Heavy Shade.

SEASON INTEREST.

a. Fall Color: R=Red Leaf; Y=Yellow Flower.

b. Flower Color: WH=White Flower; PI=Pink Flower; RD=Red Flower; YE=Yellow Flower; PU=Purple Flower.

c. Season: WI=Winter Season; SP=Spring Season; SU=Summer Season.

d. Fruit: RE=Red Fruit; OR=Orange Fruit; BR=Brown Fruit; NU=Nut; PD=Pod; BY=Berry.

USE.

a. HS=Historical Areas;

b. ST=Shade Tree;

c. SP=Specimen Tree;

d. VS=Vegetative Screening.

TABLE O-4

FORT SAM HOUSTON PLANT PALETTE-DECIDUOS TREES

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Catalpa speciosa Western Catalpa	X	I, U	C	FS	ME	Y	WH	SP	PD HS, ST1
Cercis canadensis texensis Texas Redbud	*	I	M	MD	ME	Y	PI, PU	SP	BR, NU HS, SP
Chilopsis linearis Flowering Willow	*	I	F	MD	LT		WH, PU	SU	BR, NU SP
Cotinus coggyria Smoke Tree	*	I, U	M	FS	ME	R, Y	PI	SU	SP
Diospyrus kaki Persimmon, Tana Nashi		*	I, S	M	MD	ME	Y	WH	SP RE
Diospyrus texana Native Persimmon		X		R	F	SL	ME	Y	OR SP
Firmiana simplex Varnish Tree		X	U	C	FS	ME	Y	WH	SP
Lagerstroemia indica Crape Myrtle		*	R	M	MD	ME	R, Y RD, PU	WH, PI,	SU HS, SP
Liquidambar styraciflua Sweet Gum	X	U	M	MD	ME	R, Y			BR, BA ST
Magnolia soulangiana Saucer Magnolia	*	I, U	M	MD	ME	Y	WH, PU	SP	SP
Parkinsonia aculeata Retama	*	I, S	F	FS	LT		YE	SU	SP

TABLE O-4

FORT SAM HOUSTON PLANT PALETTE-DECIDUOUS TREES (CON'T)

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Platanus Occidentalis Sycamore	O	R	C	FS	HV	Y	WH	SP	BR, PD SP
Prosopis juliflora glandulosa-Mesquite	*	I, S	F	FS	LT	Y	WH	SP	BR, PD SP
Prunus persica Peach	*	I, S	M	FS	ME	Y	PI	SP	RE HS, SP
Prunus cerasifera, Pissardi Purpleleaf Plum	*	R	M	MD	HY	WH		SP	HS, SP
Prunus mexicana Mexican Plum	X	I, U	M	MD	ME	Y	WH	SP	RE HS, SP
Salix nigra lindheimeri Texas Black Willow	X	I, S	F	FS	LT	Y			
Salix babylonica Weeping Willow	X	I, U	F	FS	ME	Y			BR HS, SP
Ulmus crassifolia Cedar Elm	X	R, U, S	F	MD	ME	Y			HS, ST
Ungnadia speciosa Mexican Buckeye	*	I, S	M	FS	LT	Y	PI	SP	BR, PD SP
Vitex agnucsastus Lilac Chastetree	*	I, S	M	FS	ME	Y	WH, PU	SU	SP
Quercus shumardii Shumard Red Oak	O	R	C	MD	ME	R			ST, SP

TABLE O-5

FORT SAM HOUSTON PLANT PALETTE-EVERGREEN TREES

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Acacia smallii Huisache	X	R, S	F	FS	LT	•		YE	SP HS, SP
Cedrus deodara Deodar Cedar	O	R, U	F	FS	ME				CO SP
Cupresses sempervirens Italian Cypress	O	R,U	F	FS	LT				CO SP, VS
Eriobotrya japonica Loquat	X	R	C	MD	ME		WH	WI	Y HS, SP, VS
Juniperus virginiana Eastern Red Cedar	O	R, U	F		HV			•	BL, BY HS, VS
Magnolia grandiflora Southern Magnolia	X	R, U	C	MD	HV		WH	SU	RE, PD HS, SP, VS
Phoenix canariensis Canary Island Date Palm	X	R, U	C		LT				RE, BY, Y HS, SP
Pinus halepensis Aleppo Pine	X	R, U	F	FS	ME				CO SP, VS
Prunus caroliniana Cherry Laurel	X	R, U	M	FS	HV		WH	SP	BL HS, ST, SP, VS
Quercus virginiana Live Oak	X	I, S	M	SL	HV				AC HS, ST, SP, VS
Thuja orientalis Arbor-vitae	*	R, U	F	FS	ME				CO HS, SP, VS
Washingtonia robusta Royal Palm	X	R, U	C		LT				HS, SP

TABLE O-6

FORT SAM HOUSTON PLANT PALETTE-DECIDUOUS SHRUBS

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Anisacanthus wrightii Wright's Anisacanthus	X	U	F	FS	SU	OR	SU		HS, SP
Berberis thunbergil Barberry	X	R	F	MD	SU, LT	YE	SP	RD	F, VS
Berberis thunb. atropurpurea Red Barberry	X	R	F	MD	SU	YE	SP	RD	F, VS
Buddleia davidii-Pink Pearl Pink Pearl Butterflybush	O	U, S	M	FS	SU	WH, PI, RD, PU	SU		SP
Callicarpa americana French Mulberry	X	I, S	M	FS	SU, LT, SH		WH	SP	YE PU F
Cassia corymbosa Senna	O	I	M	FS	SU, LT	YE			HS, SP
Cephalanthus occidentalis Buttonbush	O	I	M	FS	SU, LT	WH, YE	SU	RD	RD SP
Chaenomeles lagenaria Common Flowering Quince	X	I, U	M	FS	SU, LT	WH, PI, RD	WI, SP		YE GR SP, VS
Cyperus alternifolius Umbrella Flatsedge	*	I, U	F	FS	SU, LT	WH	SU		SP
Hibiscus syriacus Althea	O	U	M	MD	SU, LT	WH, PI, RD, PU	SU	YE	HS, SP
Hydrangea macrophylia Blue or Pink Hydrangea	*	R	C	FS	LT, SH	PI, BL	SU		HS, SP, F
Ilex decidua Deciduous Yaupon	O	I, U	M	FS, MD	SU, LT	WH	SP	YE	RD HS, SP

TABLE O-6

FORT SAM HOUSTON PLANT PALETTE-DECIDUOUS SHRUBS (CON'T)

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Lonicera fragrantissima Fragrant Bush Honeysuckle	X	R, S	M	MD	SU	WH	WI, SP		RD HS, VS
Musa rosacea Banana	O	U	C	FS	SU, LT	RD, YE	SU		HS, SP
Philadelphus coronarius Fragrant Mock-orange	O	U	M	MD	SU	WH	SP		SP, VS
Poinciana gillesi Bird-of-Paradise	X	I	F	FS	SU	RD, YE	SU		HS, SP
Prunus glandulosa Flowering Almond	X		F		LT, SH	WH, PI	SP		SP
Punica granatum Pomengranate	O	S	M	MD	SU	WH, OR	SU	YE	RD HS, SP
Rhus lanceolata Lance-leaf Sumac	O	R, S	F	FS	SU	WH	SU	YE, RD	RD HS, SP
Spiraea cantoniensis Reeve's Bridalwreath	X	U	F	MD	SU	WH	SP	YE	HS, SP, F
Symphoricarpus orbiculatus Coralberry	*	I, S	F	F, S	LT, SH	PI, PU	SU		RD HS, FD
Syringa persica Persian Lilac	X	U	M	FS	SU, LT	PU	SP		HS, SP
Tecomaria capensis Cape Honeysuckle	X	I, U		MD	SU	OR	SU		SP
Weigela florida Old-fashioned Weigela	X	I, U, S	C	MD	SU	WH, PI, PU	SP, SU		YE HS, SP

TABLE O-7

FORT SAM HOUSTON PLANT PALETTE-EVERGREEN SHRUBS

	CHARACTERISTICS				SEASONAL INTEREST				USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Abelia grandiflora "Edward Goucher" Pink Abelia	X	S	F	MD	SU, LT	PI	WI, SP		VS
Abelia Grandiflora Glossy Abelia	X	U	F	MD	SU, LT	WH	SP, SU		HS
Agave americana Century Plant	X	R	C	MD	SU, LT	WH	SU		HS, SP
Bambusa nana Dwarf Bamboo	X	U, S	F	FS	SU, LT				VS
Buxus mycrophylla japonica Oriental Boxwood	X	R	F	MD	SU, LT				HS, F, VS
Cortaderia selloana Pampas Grass	X	U, S	F	FS	SU	WH	FA		SP, VS
Cotoneaster horizontals Rock Cotoneaster	*	I, S	F	SL	SU, LT	PI	SP		RD VS
Dasylirion texanum Sotol	*	R, U	F	MD	SU	WH	SU		SP
Elaeagnus pungens simoni Simon's Russian Olive	X	I	M	MD	SU, LT	WH	FA		HS, VS
Feijoa sellowiana Pineapple Guava	X	I, S	M	FS	SU, LT	WH, RD	SP, SU		RD HS, VS
Garrya Lindheimer Silk Tassel Bush	X	I, U	F	SL	SU, LT	WH	SP		BL VS

TABLE O-7

FORT SAM HOUSTON PLANT PALETTE-EVERGREEN SHRUBS (CON'T)

	CHARACTERISTICS				SEASONAL INTEREST				USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Hesperaloe parviflora Red Yucca	X	U	M	MD	SU	PI	SP, SU		SP, F
Hypericum hypericoides St. John's Wort	*	S	F	FS	SU, LT	YE	SP		RD HS, F
Ilex cornuta "Burfordii Nana"-Dwarf Buford Holly	X	R, U	M	FS	SU, SH				RD F, VS
Ilex vomitoria "Nana" Dwarf Yaupon Holly	*	R	F	MD	SU, SH				F, VS
Jasminum floridum Italian Jasmine	X	S	F	MD	SU, LT	YE	SP, SU		F, VS
Jasminum mesnyl Primrose Jasmine	X	S	M	FS	SU, LT	YE	SP		F, VS
Juniperus sp. Juniper	O, X, *	R, T, U, S	F	MD	SU				BL F, VS
Leucophyllum texanum Cenizo	X	I, U	F	FS	SU	PU	SU		HS, SP, VS
Ligustrum japonicum Waxleaf Ligustrum	X	U	M	FS	SU, LT	WH	SP		BL HS, F, VS
Ligustrum lucidum Common Ligustrum	O	U	M	FS	SU	WH	SU		BL HS, SP, VS
Mahonia bealei Beale's Mahonia	X	I, U	C	SL	LT, SH	YE	SU		BL SP

TABLE O-7

FORT SAM HOUSTON PLANT PALETTE-EVERGREEN SHRUBS (CON'T)

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Mahonia trifoliata Algerita Berry	X	I,S	M	MD	SU, LT	YE	SP		RD F, VS
Myrica cerifera Southern Wax Myrtle	X	I	M	FS	SU, LT	BR	SP		F
Nandina domestica Heavenly Bamboo	X	U	M	FS	SU, LT	WH	SP		RD HS, F, SP, VS
Nandina domestica nana, "Harbor Dwarf Gulfstream" Dwarf Heavenly Bamboo	*	U	M	FS	SU, LT				F
Nerium oleander Oleander	O	U	M	FS	SU	WH, PI RD, YE	SU		HS, SP, VS
Opuntia stricta Spineless Cactus	*	I	C	MD	SU, LT	Y	SU		RD SP
Photinia fraseri Red-tip Photonia	O	U	M	FS	SU	WH	SP		F, VS
Pittosporum tobira Green Pittosporum	X	R	M	FS, MD	SU, LT	WH	SP		HS, F, VS
Pittosporum tobira varieg. Variegated Pittosoorum	X	R	M	FS	SU, SH	WH	SP		RD HS, F, VS
Pyrancatha sp. Firethorne	O	U, S	F	FS	SU	WH	SP		RD HS, F, SP, VS
Rhus virens Evergreen Sumac	X	I	F	SL	SU, LT	WH	SU		RD SP, VS

TABLE O-7

FORT SAM HOUSTON PLANT PALETTE-EVERGREEN SHRUBS (CON'T)

	CHARACTERISTICS					SEASONAL INTEREST			USE
	HEIGHT	HABIT	LEAF	RATE	SHADE	FALL	FLOWER COLOR	SEASON	FRUIT
Rosmarinus officinalis Rosemary	*	U	F	FS	SU	BL	SP		HS, F
Santolina chamaecyparissus Lavender Cotton	*	R, S	F	MD	SU	YR	SU		HS
Sophora secundiflora Texas Mt. Laurel	O	I	M	SL	SU, LT	PU	SP		RD HS, SP
Viburnum odoratissimumm Wax Viburnum (Sweet)	O	I, U	C	FS	LT	WH	SP		SP, VS
Viburnum Suspensum Sandankwa	X	R	M	MD	SU, LT	WH, PI	SP		RD HS, F, VS
Viburnum tinus Laurestinus	X	R, U	M	MD	SU, LT	WH, PI	SP, WI		BL HS, F, VS
Yucca aloifolia Spanish Dagger	X	U	C	MD	SU	WH	SP		HS, SP, VS
Yucca filamentosa White Yucca (Adam's Needle)		O	U	M	SL	SU	WH	SP	HS, SP
Yucca recurvifolia Soft Yucca	*	U	C	SL	SU	WH	WI		HS, SP
Yucca torryi Torrey Yucca	O	U	C	SL	SU	WH	SP		SP
Yucca treculeana Spanish Bayonet	O	U	C	SL	SU	WH	SP		SP

TABLE O-8

FORT SAM HOUSTON PLANT PALETTE-GROUNDCOVERS AND VINES

	CHARACTERISTICS				SEASONAL INTEREST				USE
	HABIT	HARDY	TEXTURE	LOC.	RATE	FLOWER COLOR	SEASON	FALL	BERRY
Antigonon leptopus Coral Vine	VI	DE	C	SU, LT	FS	PI	SU		HS, ES
Gelsemium sempervirens Carolina Yellow Jessamine	VI	EV	M	SU, LT	FS	YE	WI		HS, ES
Hedera helix English Ivy	VI, GR	EV	M	SH	MD				ES, MA
Liriope muscari "Big Blue" Liriope	GR	EV	M	SU, SH	MD	BL	SU		MA, BO
Lonicera japonica "Halliana" Hall's Honeysuckle	VI, GR	SE	M	SU, LT	FS	YE	SP		ES, MA
Mimosa biucifera Cat's Claw Mimosa	VI		F	SU	FS	PI	SU		ES
Ophiopogon quinguefolia Monkey Grass	GR	EV	F	SU, SH	MD	PU	SU		MA, BO
Parthenocissus quinguefolia Virginia Creeper	VI	SE	M	SU, LT	FS			RD	HS, ES
Rosa banksiae Lady Bank's Rose	VI	SE	M	SU	FS	YE	SP		HS, ES
Rosa laevigata Cherokee Rose	VI	SE	M	SU	MD	WH	SP		HS
Trachelopspermum asiaticum Asian Jasmine	GR	EV	M	SU, LT	MD				MA
Trachelospermum jasminoides Confederate Jasmine	VI	EV	M	SU, LT	FS	WH	SP		ES
Verbena peruviana Peruvian Verbena	GR	EV	M	SU	FS	WH, PI, RD	SU		HS, MA
Wisteria megasperma Wisteria	VI	EV	C	SU	FS	PU	SU		HS

TABLE O-8

FORT SAM HOUSTON PLANT PALETTE-GROUNDCOVERS AND VINES (CON'T)

	CHARACTERISTICS				SEASONAL INTEREST				USE
	HABIT	HARDY	TEXTURE	LOC.	RATE	FLOWER COLOR	SEASON	FALL	BERRY
Canna generalis									
Canna	X		C	SN		PI, YE			
							OR, RD	SU	HS, MA, BO
Lantana camara (texana)									
Native Lantana	X		M	SN		PI, YE			
							OR, RD	SP, SU	HS, MA
Lantana sellowiana									
Trailing Lantana	*		F	SN		PU	SP, SU		PB, MA, BO
Plumbago capensis									
Cape Plumbago	X		M	SN		BL	SU		PB, MA, BO

O-1. IRRIGATION SYSTEM DESIGN STANDARDS.

a. A licensed landscape irrigator should design all irrigation systems.

b. As an economic and resource conserving measure grey water or collected storm water may be used to irrigate portions of the landscape. Grey water is the untreated or partially treated water generated by the non—toilet plumbing fixtures, i.e., sinks, tubs, washers. Consult with sanitary engineer and hydrologist to set up facilities, schedules and selection of tolerable plant materials. Prior to implementing the system a thorough soil survey should be conducted to determine soil and geological suitability. Regular soil samples will determine if and when periodic soil amending or leaching with fresh water is required.

c. Alternatives to tapping the Edwards Aquifer should be explored, such as water recycling.

d. Meter the irrigation system separately from domestic water to prevent waste water charges.

e. Install backflow prevention assemblies in accordance with Army Standards and manufacturer's recommendations.

f. Sprinkler heads should be located to effectively water areas intended with minimum overthrow onto pavement, walks, etc., and to affect 100% overlap insuring effective and even coverage.

g. Use hi—pop risers in shrub and groundcover beds next to walks and driveways, keeping rigid risers away from street and driveway curbs to prevent damage by traffic.

h. Locate quick coupler valves on pressure line approximately within 100" of all newly planted trees.

i. Utilize separate valve sections for plant types which have different water requirements.

j. Avoid pipe trenching within dripline of existing trees.

k. Circuits should not be designed for more than 75% of maximum pressure.

l. Separate sections according to plant material type:

(1) Turf and groundcover/shrubs shall be valved separately.

(2) Separate sloped areas from flat areas.

(3) Use bubbler head or drip irrigation emitter on all large trees.

O-2. IRRIGATION SYSTEMS MATERIAL STANDARDS.

a. Circuit Pipe. Class 200 PVC plastic pipe downstream from circuit valve.

b. Main Line Piping. Schedule 40 PVC.

c. Valves. Cast bronze bodies; automatic circuit valves with Globe valves operated by low power solenoid, normally closed, manual flow adjustment.

d. Backflow Preventer. Meet Army standards.

e. Sprinkler Heads. Flush Surface: Fixed pattern with screw—type flow adjustment.

f. Shrub Sprinkler Heads. Fixed pattern with screw-type flow adjustment. Brass nozzles with copper risers only.

g. Pop-up Spray. Fixed pattern with screw-type flow adjustment and stainless steel retraction spring.

h. Valve Box. Plastic.

i. Valve Cover and Frame. Plastic Automatic Control System.

j. Variable Circuit Control. 5 to 60 minutes. Adjustable, 24 hour and 7 or 14 day clocks operable at any time of day in a 7 or 14 day period.

k. Minimum Water Coverage. Turf Areas – 100%.

l. Minimum Water Coverage Other Planting Areas – 100%.

m. Controller Location. In location screened from view and protected from vandalism.

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APPENDIX P
ARMY FACILITIES STANDARDIZATION PROGRAM

CENTERS OF STANDARDIZATION

P.1 General. The various facility types are listed with contact information according to the Center of Standardization (COS) responsible for development of standards for that facility type.

P.2 Specific Contact Information. For more specific contact information, such as POC with email address and telephone number, refer to the IDS Newsletter (https://secureapp2.hqda.pentagon.mil/acsimnews/) under the heading "Standardization Program POCs". An Army Knowledge Online (AKO) account will be required to access the information which includes the Category Code, Army Proponent, ACSIM Proponent, HQUSACE POC, and HQIMA POC.

Army Facilities Standardization Program Centers of Standardization	
Assigned Center	**Facility Type**
U.S. Army Engineering and Support Center, Huntsville **Attn: CEHNC-ED-CS-A and IS** **P.O. Box 1600** **Huntsville AL 35807** **Telephone: 256-895-1673/1672/1535**	Child Development Center-Infant/Toddlers
	Child Development Center Playground
	Child Development Center – 6 to 10 Year Olds
	Physical Fitness Facilities
	Fire Station
	Hazardous Material Storage Facility
	Outdoor Sports Facility
	Close Combat Tactical Trainer (CCTT)
	Urban Assault Course (UAC) *replaces: Military Operations Urban Terrain (MOUT)*
	Training Range
	Youth Activity Center
	Bowling Center (RFP)
	Army Community Service Centers
	Consolidated Fire/Police/Safety Facility
U.S. Army Engineer District, Louisville **ATTN: CELRL-ED-D-A** **600 Martin Luther King Jr. Place** **Louisville, KY 40202 Tel: 502-315-6250**	Army Reserve Center
U.S. Army Engineer District, Norfolk **ATTN: CENAO-TS-EA** **803 Front Street** **Norfolk, VA 23510** **Telephone: 757-441-7702**	Classroom XXI
	Criminal Investigation Facility (CIDC)
	Enlisted Personnel Dining Facility
	Family Housing (RFP)
	General Instruction Building
	Information Systems Facility
	Troop Issue Subsistence Activity Facility (TISA)
	Central Issue Facility
	General Purpose Warehouse
U.S. Army Engineer District, Omaha **ATTN: CENWO-ED-DG/PM-M** **215 North 17th Street** **Omaha, NE 68102** **Telephone: 402-221-4552/443**	Army Chapel
	Chapel Family Life Center
	Religious Education Facility
	Small Site Chapel
	Access Control Points
	Airfields, Railroads, Pavements, Bridges, & Dams

Army Facilities Standardization Program Centers of Standardization	
Assigned Center	**Facility Type**
U.S.Army Engineer District, Mobile **ATTN:CESAM-PM-SI** **P.O. Box 2288** **Mobile, AL 36652-2288** **Telephone: 251-394-3600**	National Guard Armory
U.S. Army Engineer District, Savannah **ATTN: CESAS-EN-E** **P.O. Box 889** **Savannah, GA 31402** **Telephone: 912-652-5212**	Company Operations Facility (COF)
	Military Entrance Processing Station (MEPS)
	Tactical Equipment Maintenance Facility (TEMF)
	Unaccompanied Enlisted Personnel Housing (UEPH), New & Modernization
	One Station Unit Training (OSUT) Barracks
	Unaccompanied Officer / Sr. Enlisted / Quarters
	Unaccompanied Officer Quarters, Transient
	Brigade / Battalion HQ
	Operational Readiness Training Complex (ORTC)
	Deployment Facility
	*Advanced Individual Training (AIT) Barracks
	*Basic Combat Trainee (BCT)
U.S. Army Engineer District, Tulsa **ATTN: CESWT-EC-D** **1645 S. 101ST East Avenue** **Tulsa, OK 74128** **Telephone: 918-669-7033**	*Advanced Individual Training (AIT) Barracks
	*Basic Combat Trainee (BCT)
	Reception Barracks
*AIT & BCT to be transferred to Savannah, upon completion by Tulsa.	
CFSC **Telephone: 703-681-1506**	Army Lodging
	Clubs/FBE Facilities
	Golf Courses
	Recreational Lodging

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APPENDIX Q STANDARDS AND REFERENCES

Q.1 STANDARDS AND REFERENCES

Standards and References for the Army Installation Design Standards (IDS).

Q.1.1 Chapter 2, Site Planning Design Standards

Q.1.1.1 Army Standards

- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*
- Army Regulation (AR) 210-20, *Master Planning for Army Installations*
- Army Regulation (AR) 415-15, *Army Military Construction Program Development and Execution*
- Army Regulation (AR) 420-70, *Buildings and Structures*

Q.1.1.2 References

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 7
- Unified Facilities Criteria (UFC) *3-400-01,* Design: Energy Conservation
- Unified Facilities Criteria (UFC) *3-210-01A,* Design: Area Planning, Site Planning, and Design
- Unified Facilities Criteria (UFC) *3-210-06A,* Design: Site Planning and Design
- Unified Facilities Criteria (UFC) *3-230-15FA,* Design: Subsurface Drainage Facilities for Airfields and Heliports

- Unified Facilities Criteria (UFC) *3-230-16FA,* Design: Drainage and Erosion Control Structures for Airfields and Heliports
- Unified Facilities Criteria (UFC) *3-230-17FA,* Design: Drainage for Areas Other than Airfields
- Unified Facilities Criteria (UFC) *3-230-18FA,* Design: General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas
- Unified Facilities Criteria (UFC) *3-260-02,* Design: Pavement Design for Airfields
- Unified Facilities Criteria (UFC) *3-250-01FA,* Design: Pavement Design for Roads, Streets, Walks and Open Storage Areas
- Technical Instructions (TI) 800-01, *Design Criteria*
- Technical Instructions (TI) 801-02, *Family Housing*
- Master Planning Instructions (MPI)
- Whole Building Design

Q.1.2 Chapter 3, Building Design Standards

Q.1.2.1 Army Standards

- Army Regulation (AR) 200-4, *Cultural Resources Management*
- Army Regulation (AR) 420-70, *Buildings and Structures*
- Unified Facilities Criteria (UFC) 3-520-01, *Interior Electrical Systems*
- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*
- UFC 4-171-05, *Design: Guide for Army Reserve Facilities*
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Secretary of the Interior's Standards for the Treatment of Historic Properties
- Technical Manual (TM) 5-807-10, *Signage*
- Technical Instructions (TI) 809-04, *Seismic Design for Buildings*
- Technical Instructions (TI) 809-05, *Seismic Design Evaluation and Rehabilitation for Buildings*

- Technical Manual (TM) 5-809-10/Navy NAVFAC P-355/Air Force AFM 88-3, Chap 13, *Seismic Design for Buildings*
- Technical Manual (TM) 5-809-10-2/Navy NAVFAC P-355.2/Air Force AFM 88-3, Chap 13, Sec B, *Seismic Design Guidelines for Upgrading Existing Buildings*
- U.S. Army Corps of Engineers Engineering Technical Letter (ETL) 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide
- Standards of Seismic Safety for Existing Federally Owned and Leased Buildings
- Army Barracks Master Plan, Appendix I, Army Barracks Standards
- Memorandum Subject: Revised Barracks Construction Criteria, dated 1 May 2003
- Quality Standards for New and Replacement Residential Communities Initiative (RCI) Family Housing
- Army Lodging Standards
- Design Manual for Remoted Target Systems (RETS) Ranges, CEHCN 1110-1-23 Manual
- Unexploded Ordinance Considerations in the Planning, Design, and Construction of Ranges, Supplement to CEHNC 1110-1-23 Manual
- Revised Range Design/Construction Interface Standards
- Army Chapel Standard Definitive Design
- Army Standard for Chapel Construction – January 2004 and Memorandum for Record, subject: The Army Standards for Chapels, dated 21 January 2004.
- Army Standards for Company Operation Facility (COF)
- Army Standards for Child Development Center Construction (for school-age children) October 2004

Q.1.2.2 References

- Army Regulation (AR) 190-13, *The Army Physical Security Program*
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*
- Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*
- Army Regulation (AR) 200-4, *Cultural Resources Management*
- Army Regulation (AR) 210-20, *Master Planning for Army Installations*

- Army Regulation (AR) 210-21, *Army Ranges and Training Land Program*
- Army Regulation (AR) 405-45, *Real Property Inventory Management*
- Army Regulation (AR) 405-70, *Utilization of Real Property*
- Unified Facilities Criteria (UFC) 2-600-01, *Installation Design,* Chap 8
- Unified Facilities Criteria (UFC) 4-510-01, *Design: Medical Military Facilities*
- Unified Facilities Criteria (UFC) 1-200-01, *Design: General Building Requirements*, 31 July 2002
- Unified Facilities Criteria (UFC) *3-400-01,* Design: Energy Conservation
- Unified Facilities Criteria (UFC)3-130-07, Arctic and Subarctic Construction - Buildings
- Engineering Regulation (ER) 1110-345-122, *Engineering and Design, Interior Design*
- Department of the Army Pamphlet (DA PAM) 200-4, *Cultural Resources Management*
- U.S. Army Corps of Engineers, Design Guide (DG) 1110-3-122, *Design Guide for Interiors*
- Department of Defense (DoD) Interior Design Website
- Technical Instructions (TI) 800-01, *Design Criteria*
- Technical Instructions (TI) 811-16, *Lighting Design*
- Technical Manual (TM) 5-683, *Electrical Interior Facilities*
- Technical Manual (TM) 5-688, *Foreign Voltage and Frequencies Guide*
- Army Barracks Master Plan
- Air Force Sustainable Facilities Guide
- Air Force Interior Design Guides
- Office of the Assistant Secretary of the Army for Financial Management and Comptroller (OASA [FM&C]) Sales and Outlease of Army Assets - Installation Guide
- Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website

- U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website

- U.S. Army Corps of Engineers Engineering Technical Letter (ETL) 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide

- Whole Building Design Guide

- Unified Facilities Guide Specifications (UFGS), "Division 12 - Furnishings", Construction Criteria Base

- Engineering and Construction Bulletins

- Assistant Secretary of the Army memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003

Q.1.3 Chapter 4, Circulation Design Standards

Q.1.3.1 Army Standards

- Army Regulation (AR) 420-72, *Transportation Infrastructure and Dams*

- Technical Manual (TM) 5-811-1/Air Force AFJMAN 32-1080, *Electric Power Supply and Distribution*

- Technical Manual (TM) 5-850-2/Air Force AFJMAN 32-1046, *Railroad Design and Rehabilitation*

- Manual For Railway Engineering

- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*

- Unified Facilities Criteria (UFC) 3-210-02, Design: POV Site Circulation and Parking

- Unified Facilities Criteria (UFC) 3-230-18FA, Design: General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas

- Unified Facilities Criteria (UFC) 3-260-02, Design: Pavement Design for Airfields

- Americans with Disabilities Act Accessibility Guidelines (ADAAG)

- Uniform Federal Accessibility Standards (UFAS)

- Manual of Uniform Traffic Control Devices (MUTCD)

- Chicago's Bike Lane Design Manual (Provides a comprehensive series of technical drawings and design specifications for bike lanes).

Q.1.3.2 References

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 9
- U.S. Air Force, Landscape Design Guide, Parking Area
- U.S. Air Force, Landscape Design Guide, Walkways and Bikeways (Provides a comprehensive walkways and bikeways planning guide including sections on paving materials and gradients and curvature data).
- Illumination Engineering Society of North America (IESNA)
- Federal Highway Administration reference document "Accessible Sidewalks and Street Crossings – an informational guide".

Q.1.4 Chapter 5, Landscape Design Standards

Q.1.4.1 Army Standards

- Unified Facilities Criteria (UFC) *3-210-05FA,* Design: Landscape Design and Planting Criteria
- Army Regulation (AR) 420-70, *Buildings and Structures*
- Technical Manual (TM) 5-630, *Natural Resources Land Management*
- American Standard for Nursery Stock, ANSI Z60.1
- Overseas (Host Nation Standards)

Q.1.4.2 References

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 10
- USAF Landscape Design Guide
- C. Brickell and D. Joyce. Pruning and Training, 1996

Q.1.5 Chapter 6, Site Elements Design Standards

Q.1.5.1 Army Standards

- DoD 4525.8-M, DoD Official Mail Manual
- Army Regulation (AR) 420-49, Utility Services
- Army Regulation (AR) 420-70, Buildings and Structures
- Army Regulation (AR) 420-72, Transportation Infrastructure and Dams

- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Technical Manual (TM) 5-807-10, Signage
- Manual of Uniform Traffic Control Devices (MUTCD)
- MTMC Pamphlet 55-14, Traffic Engineering for Better Signs and Markings
- Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings

Q.1.5.2 References

- Unified Facilities Criteria (UFC) 2-600-01, Installation Design
- Unified Facilities Criteria (UFC) 2-600-01, Installation Design, Chap 11
- Army Regulation (AR) 1-33, Memorial Programs
- Army Regulation (AR) 840-1, Department of the Army Seal, and Department of the Army Emblem and Branch of Service Plaques
- Technical Instructions (TI) 811-16, Lighting Design
- Technical Manual (TM) 5-663, Child Development Center, Play Area Inspection and Maintenance Program
- Unified Facilities Criteria (UFC) 3-210-04, Design: Children's Outdoor Play Areas
- National Fire Protection Association (NFPA) 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants
- Advisory Circular AC 70/7460-1K, Obstruction Marking and Lighting

Q.1.6 Chapter 7, Force Protection Design Standards

Q.1.6.1 Army Standards

- Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*
- Unified Facilities Criteria (UFC) 4-010-10, *DoD Minimum Antiterrorism Standoff Distances for Buildings*. (This document is a "For Official Use Only [FOUO]" publication. Users may contact the Point of Contact posted at the noted website for inquires regarding this document).
- Uniform Federal Accessibility Standards (UFAS)

- Americans with Disabilities Act Accessibility Guideline (ADAAG)

- DoD Instruction 2000.16, DoD Antiterrorism Standards

Q.1.6.2 References

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 12

- DoD Handbook 2000.12-H, *Protection of DoD Personnel and Activities Against Acts of Terrorism and Political Turbulence*, February 1993 (This Handbook is a "For Official Use Only [FOUO]" publication. Users may contact the Point of Contact posted at the following website to obtain a copy of the Handbook). http://www.dtic.mil/whs/directives/corres/html/o200012h.htm

- Army Regulation (AR) 525-13, The Army Force Protection Program (Available only through the Army Knowledge Online web portal).

- UFC 4-010-02, *DoD Security Engineering Manual,* (This document is in draft form. See the Security Engineering Working Group website).

- U.S. Air Force, Installation Force Protection Guide: (Contains information on installation planning, engineering design, and construction techniques that will preclude or minimize the effect of a terrorist attack).

- Technical Manuals/Air Force Manual series TM 5-853/AFMAN) 32-1071, Security Engineering, 3 volume series: (Volumes 2 and 3 are "For Official Use Only [FOUO]" and are not available on the Army Corps of Engineers publications website. A copy of the manuals can be acquired via a standard publications account. The three volumes cover, Project Development, Concept Design, and Final Design respectively).

Q.1.7 Appendix D, Sustainable Design

Q.1.7.1 Army Standard

- The SPiRiT rating of "Silver" is the standard for all FY06 MILCON vertical construction projects currently under design (as of March 18 2003). For all other FY06 and future-year MILCON projects the minimum SPiRiT rating requirement is "Gold". See Assistant Secretary of the Army memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003.

Q.1.7.2 References

- Assistant Chief of Staff for Installation Management memorandum Subject: Sustainable Project Rating Tool, dated 21 December 2002

- Assistant Chief of Staff for Installation Management, Sustainable Design and Development Website

- U.S Army Corps of Engineers, Engineering Research and Development Center, Construction Engineering Research Laboratory (CERL), Sustainable Design and Development Website

- Air Force Sustainable Facilities Guide

- Whole Building Design Guide

Q.1.8 Appendix M, Historic Preservation Guidelines

Q.1.8.1 Army Standards

- Army Regulation (AR) 200-4, *Cultural Resources Management*

- Department of the Army Pamphlet (DA PAM) 200-4, *Cultural Resources Management*

- The Secretary of the Interior's Standards for the Treatment of Historic Properties

Q.1.8.2 References

- Advisory Council on Historic Preservation

- United States Army Environmental Center

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SUPPLEMENT O GEOTECHNICAL DATA

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Geological Structure | Soil Conditions | Topography

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Subsurface Hydrology | Surface Hydrology

Vegetation | Climate

SO.3 HISTORIC/ARCHEOLOGICAL ENVIRONMENT

Archeological | Historical

SO.1 GEOGRAPHICAL ENVIRONMENT.

Historical Geology. During the Cretaceous period (100,000,000 years before present), much of the North American continent was covered by advancing epiric (shallow) seas. The Gulf Sea advanced from the southeast, covering most of Texas, and eventually joined with the southern edge of the Arctic Sea covering the western interior of the United States. By the end of the Cretaceous period, the sea had retreated gulf wards, marking the end of the last great epiric marine invasion over the continental shelf. During this period of marine advancement and retreat, the distinct geological features of Cretaceous period seacoasts area found, including coastal river valley, seashore and lagoon deposits, as well as shallow sea floor and reef remains. In short, the edge of the Cretaceous sea included all the features that are found on the Gulf of Mexico coastal prairie and shallow water today. Locally, deposition was covered by the nearby Devils River Platform, as the San Marcos Platforms behind the Sturt City Reef, while the Kirschberg Lagoon lay to the north of these platforms. The Lower Cretaceous period depositional features are a result of local variations in shoreline and water depth along the margin and bottom of the Kirschberg Lagoon as it evaporated. During the Miocene period (11,000,000 to 25,000,000 years ago), the Gulf deposits and the Edwards Plateau area were separated by a zone of faulting. The Balcones Fault Zone extends from near Del Rio, Texas, in the west to Austin, northeast of San Antonio. This zone is part of a larger zone of regional faulting known as the Oachita Tectonic Belt. While it is commonly believed that faulting is due entirely to the downward settlement of the heavy thick Gulf deposits, recent contentions have been made that the Edwards Plateau has actually been uplifted by as much as 250 feet along its southern edge. Since the Plateau was formed, the fault scarp has been eroded by numerous small streams and has left a number of alluvial waterborne terrace deposits at the base of the escarpment derived from the Cretaceous formations in the Plateau. These vary in age from the Pliocene period to the present.

Geological Physiography. San Antonio and Bexar County are on the boundary between the Gulf Coastal and Great Plains physiographical provinces. Dividing these two provinces in this region of Texas is the Balcones Escarpment, part of the Balcones Fault Zone. The escarpment extends from near Del Rio, Texas, about 160 miles to the west, northwest through Bexar County between Fort Sam Houston (FSH) and Camp Bullis (BULLIS), to Austin about 70 miles to the northeast of San Antonio. Remnants of the escarpment extend as far north as Waco. The Balcones Escarpment rises approximately 1,000 feet above the coastal prairie to the south and east, creating a marked influence on the area's environment. Northwest of the escarpment lies the Edwards Plateau area of the Great Plains Province. Since the plateau's formation, it has eroded, becoming a rugged hilly region dissected by numerous small streams with elevations ranging from 1,100 to 1,900 feet. Southeast of the escarpment, and running along at the base lies the Blackland Prairie area of the Gulf Coastal Province, with its gently rolling hills. The San Antonio and Bexar county area are comprised of eight minor physiographic divisions. These are: the Glen Rose Hills, the Edwards Flint Hills, the Del Rio Hills, the Austin Hills, the Taylor-Navarro Plain, the Stream Terrace Plain, the Midway-Wilcox Hills, and the Sand Hills. Most of San Antonio lies on the Taylor-Navarro Plain that forms a wide belt passing through the center of Bexar County. The relatively nonresistant strata of the late Cretaceous and early Tertiary formations formed the plain. Overlaying the Taylor-Navarro Plain is the Stream Terrace Plain, an alluvial gravel terrace deposited by streams eroding the Edwards Plateau and Balcones Escarpment. The Austin Hills form a belt passing north of the Taylor-Navarro Plain and through the northern portion of the city of San Antonio. These hills pass to the northwest of Fort Sam Houston. North of the Austin Hills lie the Del Rio Plain, the Edwards Flint

Hills, and the Glen Rose Hills. The Del Rio Plain is located north of and adjacent to the Austin Hills division. The Edwards Flint Hills are located north of, and adjacent to, the Del Rio Plain division and along the northern extremity of San Antonio. The Edwards Flint Hills is a belt of hilly country in which the flint rock is extremely abundant in the soils and surface debris. The prevailing rock is the Edwards limestone from which the flints have been derived by weathering. The Glen Rose Hills are located north of, and adjacent to, the Edwards Flint Hills division, and north of San Antonio. The Glen Rose Hills division, being northwest of the Balcones Escarpment, forms the eastern margin of the Edwards Plateau. This area is of the maximum elevation for the county, approximately 1,900 feet above sea level. South of Taylor-Navarro Plain of San Antonio are the Midway-Wilcox Hills and the Carrizo Sand Hills. The Midway-Wilcox division forms a belt across the country which includes low hills together with level lands. The Carrizo Sand Hills division is located south of, and adjacent to, the Midway-Wilcox Hills division. The surface exposures of the Carrizo formation are characterized by low hills and very sandy soil.

(1) FSH: The northwest half of FSH, up to the beginning of the Salado Creek flood plain, lies in the Taylor-Navarro plain division. The southeast half of FSH, including the Salado Creek floor plain, lies in the Stream Terrace Plain division.

(2) Bullis: The installation lies in the Glen Rose Hills division.

Geological Stratigraphy. The formations exposed at the surface in the San Antonio area and Bexar County are those of the Mesozoic and Cenozic eras. The masozoic rocks of the county are those of the Lower and Upper Cretaceous (Comanchean and Cretaceous systems) series. The Cenozoic deposits are those of the Ecocene, together with terrace deposits of the Pleistocene. The geologic formations found in Bexar County are listed in Table SO.1.

(1) The Comanchean (Lower) Cretaceous and Upper Cretaceous series are of the Mesozoic Era. The formations of the Comanchean series are included on the Trinity, Fredericksburg, and Washita divisions. The Travis Peak Formation of the Trinity division is the lower most rock formation of the cretaceous series. The formation, in northern Bexar County, includes layers of limestone alternating with softer layers chiefly of marl clays. The Glen Rose Formation of the Trinity division is the oldest of the formations exposed at the surface in Bexar County. This formation is in the northern limits of the county and includes BULLIS. The formation includes chiefly alternating levels of limestone and marl clays. The Comanche Peak and Edwards Formations are on the Fredericksburg division and are chiefly limestone. The Georgetown Formation on the Washita division is of limestone and is very similar to the Edwards Formation. The Del Rio formation on the Washita division is largely clay. The Buda Formation of the Washita division is quite uniformly a close-grained, dense, hard limestone. The formations of the Upper Cretaceous series include the Eagleford, Austin, Taylor and Navarro, and are found mainly through the central portions of Bexar County and northern half of the San Antonio area. The Eagleford Formation includes a very characteristic series of calcareous and sandy shales. The Austin Formation includes a thick deposit of limestone, chalk and marl. The Taylor Formation of the Upper Cretaceous series includes mainly marls and calcareous clays. The Navarro Formation includes chiefly deposits of clay and marl, although in parts of the formation—particularly toward the upper limits—there are

layers of well indurated lime rocks and, in places, limestone ledges. The Taylor and Navarro Formations occur at FSH

TABLE SO-1. GEOLOGIC FORMATIONS IN BEXAR COUNTY, TEXAS

Era	Series	Division	Formation Name	Thickness (Feet)
CENOZOIC	Pleistocene		Flood plain deposits	100 ±
	Eocene		Carrizo	A*
			Wilcox	600 ±
			Midway	200 ±
MESOZOIC	Upper Cretaceous		Navarro	400 =
			Taylor	450 ±
			Austin	350
			Eagleford	35
			Del Rio	70
			Georgetown	50 ±
		Fredericksburg	Edwards	450 ±
			Comanche Peak	B*
		Trinity	Glen Rose	800 ±
			Travis Peak	1200 ±

A* - Included in the Wilcox Formation.

B* - May be included either with the Glen Rose or with the Edwards.

SOURCE: The Geology of Mineral Resources of Bexar County, E. H. Sellars, University of Texas, June 5, 1917.

(2) The Ecocene and Pleistocene series are of the Cenozoic Era. The formations of the Eocene series include the Midway, Wilcox, and Carrizo Formations, predominating generally in the southern half of the county. The Midway Formation of Bexar County includes chiefly arenaceous

clays in which are embedded many concretions of sandy or limey rocks. The Wilcox Formation is well developed in Bexar County and includes thinly laminated sands, sandstones, sand and limestone concretions, clays and lignites. The Carrizo Foundation consists of a belt of sand hills and sandstone that extend across the southernmost part of Bexar County south of San Antonio. The formations of the Pleistocene series consist of river flood plain deposits of the Uvalde, Leona and late Pleistocene alluvial deposits located through the west and central portions of the county and central and southwestern portion of San Antonio.

(3) Geologic maps of FSH and BULLIS indicate that the installations are situated on deposits of Mesozoic and Cenozic ages. The exposed stratigraphy at FSH is (in descending order): Quaternary Terrace Deposits, Cretaceous Undivided Navarro Group and Marlbrook Marl, Cretaceous Pecan Gap, and Austin Chalk. The exposed stratigraphy at CB is (in descending order): Quaternary Low Terrace Deposits, Cretaceous Edwards Limestone, and Cretaceous Glen Rose Formation.

(4) The bedrock that underlies FSH is mapped as being the Navarro Group and Marlbrook Marl, undivided, overlain with Quaternary (recent) stream deposits. This formation is composed of marl, clay, sandstone, and siltstone, with concretions of siderite and siliceous limestone. The stream deposits along Salado Creek consist largely of gravel, sand, and silt up to 45 feet thick. These stream terraces were formed during the Pleistocene age with recent alluvium forming the deposits in the present Salado Creek flood plain. BULLIS is underlain primarily by the upper member of Glen Rose Formation. The thickness of the formation in the BULLIS vicinity is estimated as 660 feet. The Glen Rose Formation consists of beds of moderately resistant massive chalky limestone alternating with beds of less resistant marly limestone. The Edwards Formation is exposed in the southern portion of BULLIS. The Edwards Formation consists of gray to white, dense, hard, semi-crystalline limestone of both calcium limestone and magnesium limestone. Surface water dissolves the limestone at a relatively rapid rate, forming cavities in the stone.

Geological Structure. The major structural feature in the Bexar County area is the Balcones Escarpment. This zone is approximately 15 to 20 miles wide and trends east-northeast through the Bexar County-San Antonio area. The average slope of the beds northwest of the fault zone is about 10 to 15 feet per mile, conforming very closely to the slope of the land surface. Where the county is high and hilly south of the fault zone, the slope exceeds 150 feet per mile. The faulting has displaced some beds as much as 3,000 feet in a span of 22 miles. Faulting is normal with the down throw generally to the southeast. Here, although the land is hilly in places, it is on the average much lower in elevation than northwest of the fault zone and has larger amount of level land and floor plains. Seismic Risk Zone 0, FSH and BULLIS are located in zones where no damage may be expected from earthquakes.

Soil Conditions. The San Antonio area and Bexar County are comprised of the nine general soil associations described in Table SO-2. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. Most of Bexar County's soils have, to varying degrees, properties which may present problems for development. The soils on the Edwards Plateau are generally very thin and rocky, often necessitating special practices, such as blasting for the construction of foundations, roads, and utility lines. The rest of the soils, except for the Eufaula association, contain varying amounts of clay; therefore, swelling when wet and shrinking when dry. Unless specially treated or reinforced, structures and roads on these clay soils may crack or settle.

(1) The western portion of FSH consists primarily of the Houston Black soil series. These soils are deep clayey soils and have slow water absorption, very high plasticity, and poor foundation suitability. The soils in the eastern portion of the installation are derived from various stream terrace deposits. These soils are characterized by moderate water absorption, low to high plasticity, and have fair to good foundation suitability. These soils are generally structurally sound and should not adversely affect construction activities at FSH.

TABLE SO-2 BEXAR COUNTY SOIL ASSOCIATIONS

ASSOCIATION	DESCRIPTION
Tarrant Brackett	These soils occur on undulating to hilly uplands. Slopes range from 1 to 30 percent. Drainage is very good with the runoff being rapid and the permeability moderately slow. These soils are used mainly for grazing and rangeland. Woody vegetation includes juniper trees, sumac, and widely spread live oak uplands.
Crawford-Bexar	These soils are found on uplands. Slope gradients are mainly less then 2 percent and range from 0 to 4 percent. The soil is found in a clay layer underlain by limestone. The soils are well drained, runoff is low to medium, and permeability is very slow when the soil is saturated, rapid when dry and cracked. They are used primarily for pasture and range. For the most part, these soils are nonarable and are best suited to native grass. Trees here include live oak, Spanish Oak, juniper and elm.
Austin-Tarrant	These are upland soils over undulating, usually gently sloping terrain. Slopes range from 1 to 30 percent, but are mainly 1 to 5 percent. These soils are easy to work and well drained. Water erosion may be a problem. Permeability is moderate. Much of their area is cultivated and grass land. Wood vegetation consists (primarily) of spiny hackberry, blackbrush acacia, mesquite guayacan, and whitebrush.
Houston Black-Houston	Houston Black soils are on nearly level to moderately sloping uplands and ancient steam terraces. Slopes range from 0 to 8 percent, but are mainly 1 to 3. These soils are moderately well drained, surface runoff is slow to rapid, water enters the soil rapidly when dry and cracked, slowly when moist. Nearly all land is cultivated and used for growing cotton, sorghum, and corn. Native vegetation consists of tall and mid-grass prairies of little bluestem, big bluestem, etc. Mesquite and hackberry trees abound.
Lewisville- Houston-Black	These soils are on nearly level to moderately sloping uplands and ancient steam terraces. Slopes range from 0 to 10 percent, but are mainly 1 to 3. These soils are moderate to well drained with a slow to moderate runoff. Permeability is moderate to rapid. Nearly all is cultivated and used for growing cotton, sorghum, and corn. Native vegetation consists of tall and mid-grasses. Woody plants consist of mesquite, hackberry, etc
Venus-Frio- Trinity	These soils are on nearly level to sloping steam terraces. Slopes are dominantly 1 to 5 percent but range from 0 to 8 percent. They are well drained with a medium to slow runoff and a moderate permeability. Mostly cultivated, mainly to small grains. Original vegetations were tall and mid grasses and widely spaced live oak and other trees.
San Antonio-Crockett	These soils are on nearly level to gently sloping terrain. Water erosion is a hazard. Drainage is moderate, but internal drainage is very slow. Much of these soils are cultivated or used for pastureland.
Hockley-Webb-Crockett	These soils are on broad, nearly level to sloping uplands. Slopes are mainly between 3 and 10 percent. These soils are well to moderately well drained. Runoff is slow to rapid. Permeability is very slow. These soils are used for growing cotton, grain, sorghum, and small grains, but more than half the acreage is now in unimproved pasture. Native grasses about with woody plants consisting of mesquite, scattered elm and hackberry.
Eufaula	These soils are found on sandy uplands or terraces. Slopes range from 0 to 25 percent. The terrain is gently rolling or undulating. They are excessively to moderately well drained, rainfall is absorbed rapidly and runoff is very slow; permeability is moderately slow to rapid

(2) Soils in the BULLIS area are very shallow and consist primarily of Tarrant and Brackett soil series. These soils have formed over limestone bedrock and exhibit good foundation suitability for construction. Krum and Crawford soils are found in low areas between the hills and in the streambeds. These soils are poorly suited for foundation construction.

Topography. Slope in Bexar County can exceed 25 percent. Nearly all the steeply sloped land occurs in north Bexar County on the Edwards Plateau. Steep slopes located off the plateau normally occur along major stream channels. Generally the major constraint steep slopes impose on development is their high potential for soil erosion. However, because of the very thin or non-existent soils on the Edwards Plateau, this may be a minor limitation.

(1) The topography at FSH is gently rolling with a ridge running generally north to south dividing the installation. Most of the buildings are located to the west of the ridge where slopes are not excessive for construction purposes. Areas not bordering the creek exhibit slopes of generally 10 to 15 feet per mile. Elevations on the installation range generally from 625 feet mean sea level (MSL) at Salado Creek to 795 feet MSL in the vicinity of Building 1000.

(2) BULLIS lies within the Edwards Plateau region situated northwest of the Balcones Escarpment. The surface configuration of BULLIS, generally the result of the dissection of several intermittent streams that drain to the south and east, create an area of mildly rugged hills. Elevations in the area on BULLIS range from approximately 1,100 to 1,500 feet MSL. Slopes in the area are generally 10 to 15 feet per mile.

SO-2. NATURAL ENVIRONMENT.

Subsurface Hydrology. The Comanche Peak, Edwards, and Georgetown limestone formations comprise a hydrologic unit known as the Edwards Underground Reservoir, or Edwards Aquifer. This aquifer extends along the Balcones Fault Zone from Kinney County through Uvalde, Medina, Bexar, and Comal counties, terminating in Hays County. Seventeen cities and communities are dependent on the Edwards Aquifer for their domestic water supply, with San Antonio being the largest city in the United States that obtains its entire water supply from underground sources. Where these formations exist on the Edwards Plateau, they form an extensive, percolated water table from which the residents derive their water. In places where the Edwards Aquifer outcrops to the south, numerous springs and seeps issue forth forming the base flow for several of the perennial steams in the area. In the area below the escarpment where the Edwards outcrops, water reenters the formation through solution cavities that have developed along fractures in the limestone. At various places down slope from the recharge zones, water reaches the surface under hydraulic pressure through faults that reach the surfaces. The water sources have formed some of the more famous of Texas springs and artesian wells. Hill and Vaughn listed 40 artesian wells in San Antonio while six major springs are present in Bexar County along with countless small springs and seeps. Recharge to the aquifer is primarily from streams that flow across its outcrop in the Fault Zone, although some recharge is from direct precipitation on the outcrop. Tritium studies have shown that most water flows from west to east rather than north to south. Recharge from runoff from BULLIS does not mix with the water flowing from Medina County into Bexar County, but rather discharges in Hueco Springs and San Marcos Springs to the east. The City of San Antonio derives almost all its water from recharge occurring to the west. The regional specific yield of the aquifer is estimated to be about 0.025. The average annual recharge for the period of record has been calculated at about 500,000

acre-feet per year. Bexar County contributes about 11 percent of the recharge for the entire aquifer system. Since 1962, discharge has exceeded the average recharge of the aquifer, indicating a depletion situation. Considering the increasing water needs of the area, several agencies are presently looking for solutions to this problem, including the Bureau of Reclamation, the U.S. Geological Survey, the Edwards Underground Water District, the U.S. Army Corps of Engineers, and San Antonio City Water Board, and the Texas Department of Water Resources.

Surface Hydrology. Bexar County and the San Antonio area are located in the San Antonio River Basin. Major streams of the basin, all of which flow through Bexar County, include the Medina River, Leon Creek, Salado Creek, Cibolo Creek, and the San Antonio River. Drainage is southward and southeastward off the Balcones Escarpment. Salado Creek has its headwaters within the boundaries of BULLIS, with Cibolo Creek passing through the northern extremity of BULLIS. Salado Creek passes through FSH and converges with the San Antonio River south of the city limits of San Antonio. The San Antonio River passes through the CBD of the City of San Antonio and is a major feature of the city. The Medina River flows eastward and to the south of San Antonio converging with the San Antonio River in the southeastern portion of Bexar County.

(1) Bullis. Five small intermittent streams collect the major drainage from BULLIS, all of which are constituents of the San Antonio River Basin. All streams, with the exception of Cibolo Creek, generally have their headwaters within the reservation boundaries. Three of the streams flow in a southeasterly direction, collecting drainage from the west central and southeast sections of the reservation. These streams, from west to east, include Salado Creek, an unnamed creek, and Panther Springs Creek. Cibolo and Meusebach Creeks drain the extreme northern sections and segments of the northeast. Both BULLIS and FSH are drained primarily by Salado Creek. The headwaters of Salado Creek are located adjacent to the northwestern part of BULLIS, primarily in Camp Stanley. The stream is intermittent, derived principally from precipitation in the area. To reduce the severity of flooding as it increases downstream, a series of water retention structures have been built on the reservation by the Soil Conservation Service to store heavy runoff. This has been done under jurisdiction of the Flood Control Program of the San Antonio River Authority for the City of San Antonio. Because the meteorological and physiographic characteristics of the Balcones Escarpment area, it is well known for its high flood peak discharges compared to similar size basins elsewhere. Panther Spring, where perennial flow provides the base flow of Panther Creek, travels about 500 feet before disappearing into a small cavern. Lewis Creek, a tributary of Salado Creek, flows continuously from an unnamed spring for about 3,000 feet before it, too, disappears underground. Several stock tanks have been constructed, but only a few hold water. This is due to the porous nature of the underlying limestone. Much of the flow of Cibolo Creek is lost to the Edwards Aquifer as it passes over the recharge zone.

(2) FSH. Salado Creek flows from north to south through the eastern portion of FSH. Base flow for Salado Creek entering the reservation is primarily from runoff, but within the confines of the reservation an isolated parcel of land contains an artesian well which adds considerably to the volume of water in the stream. Major flooding occurs on the average of once every 4 to 5 years. During flood conditions, a large portion of the training area is flooded. A small tributary of the San Antonio River drains the western part of FSH, and no flooding problems have been reported. The southern and central portions of the installation are drained by the city's storm drainage system.

(3) Designers and planners should consult floor plain maps for both FSH and Bullis prior to beginning design. For Bullis, no permanent construction will be undertaken below the dam break line for all areas downstream of the water retention dams. For both Bullis and FSH, no permanent construction will be undertaken within the flood plain without environmental impact analysis with accompanying environmental impact statement (EIS).

Vegetation. Bexar County lies in parts of three major physiographic regions: the Edwards Plateau, the Blackland Prairie, and the south Texas Plains portion of the Gulf Coastal Plain. The three physiographic regions roughly correspond to three biotic provinces. The concept of a biotic province generally includes plant and animal species common to a given geographic area. Major vegetative species on the Edwards Plateau include juniper, (cedar), oak, mesquite trees and savannah grasses. The area is, in its natural or climax state, heavily wooded with stands of live oak and large and dense area of juniper. In the Blackland Prairie, mesquite trees and savannah grasses are more frequent than on the Edwards Plateau. Large oak, hickory, and pecan trees occur particularly along watercourses. The south Texas Plain contains oak-hickory forests. Table SO-3 indicates the major vegetative associations in more detail.

(1) FSH. The majority of the vegetation type (approximately 70 percent) that makes up FSH is urban lawns consisting mainly of Bermuda grass with some St. Augustine grass. Tree species planted on the installation for shade and aesthetics include ash, live oak, pecan, elm and palm. The remaining vegetation at FSH is located along the Salado Creek floodplain. Vegetation adjacent to the creek is bottomland hardwoods and includes such species as live oak, pecan, juniper, hackberry, honeylocust, palm and crepe myrtle. Areas that have not been disturbed back from the creeks consist mainly of mesquite brushland with a few open areas of blackland prairie.

(2) Bullis. The vegetation at BULLIS consists of juniper/oak woodlands and grasslands, with grasses consisting of little bluestem, Texas wintergrass, sideoats grama and Indian grass. In the cantonment area, the principal vegetation is Bermuda grass, curly mesquite, and buffalo grass with scattered live oak.

TABLE SO-3. MAJOR VEGETATIVE ASSOCIATIONS IN THE SAN ANTONIO AREA

VEGETATIVE TYPE	VEGETATIVE ASSOCIATION	MAJOR TREES	MAJOR SHRUBS	MAJOR GRASS/HERBS	COMMENTS
URBAN	Commercial and Residential	Live Oak, Pecan, Mesquite, Sycamore, Lombard Poplar	Crepe Myrtle, Arborvitae, English Ivy	St. Augustine, Bermuda	
	Parks	Cedar Elm, Live Oak, Spanish Oak, Pecan, Mesquite,	Crepe Myrtle, Oleander	St. Augustine, Bermuda, Floratam	City of San Antonio attempts to plant native trees in city parks.

		Hackberry			
EDWARDS PLATEAU	Oak-Juniper Savannah	Cedar Elm, Live Oak, Juniper (“cedar”) Mesquite, Hackberry	Algerita, Mountain Laurel, Prickly Pear, Yucca, Poison Ivy	Needlegrass, Texas Grama. Three-awn, Little Bluestem	Canyon bottoms alluvial fans at canyon mouths
	Juniper-Oak Woodland	Live Oak, Shin Oak, Juniper, Hackberry	Algerita, Yucca, Mountain Laurel, Scrubby Juniper, Persimmon	Needlegrass, Three-awn, Panic Grass, Curly Mesquite, Croton Milkweed, Verbena	Northern and eastern slopes exhibit larger trees and more brush; southern slopes have more, smaller junipers
BLACKLAND PRAIRIE	Old Field	Hackberry fence, Mesquite rows	Prickly Pear, Bee Bush, Moonseed	Johnson grass, Sunflowers, Evening Primrose, Verbena, Prickly Poppy	Old fields are once cultivated areas undergoing vegetative succession and are sometimes grazed.
	Cultivated Field			Milo, Maize, Mexican Hat, Sunflower, Prickly Poppy, Sunflower, Johnson Grass	These species are invaders between growing seasons.
	Mesquite Savannah	Live Oak, Hackberry, Cedar Elm, Mesquite	Texas Holly, Prickly Pear, Bee Bush	Three-awn, Needle Grass, Grass Burr, Horehound, Silver Nightshade	Originally an Oak-Elm-Hackberry Savannah; overgrazing has permitted invasion by brush and mesquite
TRANSITION ZONE	Balcones Escarpment Zones	Live Oak, Scrubby Juniper, Cedar Elm, Mesquite	Persimmon Algerita, Squaw Bush, Snakewood, Mount	Needle Grass, Fluff Grass, Buffalo Grass, Bitterweed, Phlox	Oaks and Junipers on shallow soils close to Edwards Plateau; Mesquite on deeper soils nearer

			Laurel		Blackland Prairie
	Blackland Prairie/ South Texas Plains Zone	Live Oak, Blackjack Oak, Post Oak, Pecan, Mesquite, Hickory	Huisaache, Whitebush, Prickly Pear	Arizona Cotton-top, Grassburr, Buffalo Grass, Curley Mesquite	Clayey soils of Blackland Prairie become sandy and more permeable in this zone.
BOTTOMLAND FOREST	Riparian (Streamside, Pond, Lake, Ephemeral Pool, Springs, Seeps)	Bald Cypress, Spanish Oak, Live Oak, Ash, Cottonwood, Pecan, Walnut, Mex. Buckeye	Greenbriar, Poison Ivy, Algerita, Persimmon, Bee Bush, Boneset	Sedges, Muhly, Purple Cliff Brake, Stinging Nettles, Ragweed, Pigweed, Vine Mesquite, Bacchais, Pennywort,	

Climate. The San Antonio area is in the south central climatic division of Texas. Bexar County can be described as a modified subtropical climate, predominately continental during the winter months and marine during the summer months.

(1) Temperature. Normal means temperatures range from 51 degrees F in January to a high of 85 degrees F in July. The summer is hot, with daily maximum temperatures above 90 degrees F over 90 percent of the time. Extremely high temperatures are rare, the highest on record being 108 degrees in August 1986. Mild weather prevails during much of the winter months, with below freezing temperatures occurring on an average of 20 days each year. The record low was 0 degrees recorded in January 1940.

(2) Precipitation. San Antonio and Bexar County are situated between a semi-arid area to the west and the coastal area of heavy precipitation to the southeast. The normal annual rainfall of 27.65 inches is sufficient for the normal production of most crops. Precipitation is fairly well distributed throughout the year with the heaviest amounts during May and September. Precipitation from April through September usually occurs as thunderstorms with fairly large amounts falling in short periods of time. Most of the winter precipitation occurs as light rain or drizzle. Moisture-laden air from the Gulf of Mexico crossing the Balcones Escarpment is orographically lifted, causing severe rainfall intensities. Because of its proximity to the Gulf, storms of a tropical nature also occur bringing high winds and prolonged rainfall. Thunderstorms and heavy rainfalls have occurred in all months of the year. Hail of damaging intensity seldom occurs, but light hail is frequent in connection with the springtime thunderstorms. Measurable snow occurs only once in 3 or 4 years with the greatest single 24 hours event of 13.2 inches on 12 January 1985. Relative humidity averages above 80 percent during the early morning hours most of the year, dropping to near 40 percent in the late afternoon. Annual growing season is approximately 265 days.

(3) Wind. Northerly winds prevail during most of the winter, while southeasterly winds from the Gulf of Mexico prevail during the summertime and may be experienced for long periods during the winter near the surface. However, winds in the upper levels (1,000 meter) are primarily from the south. Rather strong northerly winds occasionally occur during the winter months in connection with "northers." No tornadoes were experienced in the immediate area prior to September 1988. At this time the effects of Hurricane Gilbert were felt in the San Antonio area and an estimated ten to twelve tornadoes touched down in the San Antonio area. The mean annual wind speed for the 1941-1970 period was 9.4 miles per hour.

(4) Cloud Cover. Though low stratus clouds of orographic origin are common in the evening in San Antonio, the sun burns off these clouds during the daytime hours. San Antonio receives about 50 percent of the possible sunshine in the winter and over 70 percent in the summer months. Skies are clear about 35 percent of the time. Average annual evaporation for the period 1907-1030 was 68.60 inches.

SO.3 HISTORIC/ARCHEOLOGICAL ENVIRONMENT. A survey was made of FSH and its associated properties for archaeological and historical resources. Since BULLIS is the larger, less developed property and is in a relatively unmodified state, the most intense survey for archaeological sites was made at this location. The three levels of analysis were the artifact and artifact assemblages; site types and functions, and site distribution. The resources discerned at BULLIS include obscured resources that may be presented at FSH.

Archeological. The archeological evidence discovered during this survey indicated extensive use of ridges and terraces along the Cibolo and Salado Creek drainages. The sites were utilized during four different periods: Paleo Indian, 10400-6900 years B.C.; Per-archaic, 6800-2800 years B.C.; early archaic, 2800-21 years B.C.; and middle archaic 2100-600 years B.C. The latter period is evidenced throughout the Bullis area, but not with very distinctive quality sites. Most of the sites that were located indicated a series of base camps and auxiliary function sites (e.g., knapping, initial core reduction of chert, temporary hunting camp) that occurred repeatedly along the two streams. The majority of the sites were located within 100 meters to one kilometer of a water source. One such site was discovered by FSH personnel in the surface inventory conducted in anticipation of the Combat Assault Landing Strip Construction (CALS) in Northern Bullis. For this reason the specific CALS location was moved.

Historical.

(1) FSH. Several facilities at Fort Sam Houston are included in the National Register of Historical Places—the Quadrangle, which includes Building 16 and the Clock Tower, Bldg 40; Pershing House, Staff Post No. 6; Eisenhower House, 179 Artillery Post Road; and Memorial Chapel, Bldg 2200. On 11 November 1976, a large section of the lower west and southwest part of the post was dedicated as the Fort Sam Houston National Historic Landmark.

(2) Bullis. In addition to the prehistoric (archeological) sites, nine historical sites were encountered from the European occupation period (1850-1930). Six hundred ceramic, glass and metal artifacts were recovered from these sites. Most of the nine structures demonstrated little, if any, uniformity of design, subsistence, or family/community ties. The Schmidt houses (1900-1930) are located on the eastern portion of Camp Bullis and were the only ones that indicated any

concerted development in design or purpose. However, even these houses did not exhibit any design characteristics or artifact selection that would imply a central European cultural bias. The complete survey report is on file at Fort Sam Houston, Texas. The conclusion then must be that the inhabitants of these sites were as diverse in outlook and subsistence pattern as the sites they left behind. The cultural background seems to be that of generally Anglo-American middle class farmers and ranchers.

(3) Designer should verify that, as a minimum, a preliminary and archaeological assessment with a finding of no impact has been made for each project

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