White Sands Missile Range

IDS Format - Final Submittal

The Army Installation Design Guide for White Sands Missile Range

Prepared By:
US Army Corps of Engineers
Fort Worth District

Project Management By:
Master Planning, IDG Coordinator
Rich Willard, R.A., WSMR Architect

Date:
September 2005

The Army Installation Design Guide for *White Sands Missile Range*

Prepared By:
US Army Corps of Engineers
Fort Worth District

Date:
September 2005

Project Management By:
Master Planning, IDG Coordinator
Rich Willard, R.A., WSMR Architect

White Sands Missile Range
Installation Design Guide
Review and Approval Certification

The signatures below are acknowledgements of the updated Installation Design Guide (IDG) submission, review, and recommendation for approval of the contents as submitted herein, by responsible and pertinent parties of White Sands Missile Range in accordance with the Army's Installation Design Guide (IDG) requirements. AR 210-20 requires an IDG, and with the contents developed in the standard template format as provided herein. The developers, reviewers, and approval authorities of this IDG acknowledge the inherent IDG intent for ongoing amendment capability as needed.

"Guidance Memorandum #13-Master Planning" from the Installation Management Agency (IMA) Southwest Regional Office (SWRO) dated 23 February 2004 requires completion of an updated IDG in the proper format by the end of FY05. Submission of this initial edition of the WSMR IDG to IMA is in conformance with the Army intent.

The Army's IDG standard template paragraph 1.8.1.3 requires development and enforcement of this IDG and its standards by the Garrison Commander (GC).

The Army's IDG standard template paragraph 1.8.1.4 requires review and approval of this IDG by the Senior Mission Commander (GC).

The DPW Division of Master Planning was designated as the responsible garrison office for developing this IDG. The POC for project management, reviewing, maintaining, enforcing, and updating this IDG is the "IDG Coordinator", Installation Architect.

	12 Sep 05
Senior Mission Commander (CG)	**Date**
	8/25/05
Garrison Commander (GC)	**Date**
	8/22/05
Director, DPW	**Date**
	8/17/05
Chief, Master Planning Division	**Date**
	17 AUGUST 05
IDG Coordinator, Installation Architect	**Date**

Summary of Changes

Date of Change	Change Number	Synopsis of Change	Revision Date	Detailed Description
NOTE: *Click* "Details" *below to view the detailed description of the change*				

TABLE OF CONTENTS

MODEL ARMY INSTALLATION DESIGN GUIDE (IDG)

The following Table of Contents is interactive. Click on the hyperlink to directly access the Section or Sub-section. To return to the Table of Contents use the back button on your browser.

Suggested Improvements: Submit comments and suggested improvements on the comment form provided to Facilities Policy Division, Assistant Chief of Staff Installation Management **(**Comment Form**)**.

USERS GUIDE

The Army Installation Design Guide (IDG) is a hyperlinked document. A hyperlink is specially formatted text that contains an address (in the document, within another document, or on the internet) that when "followed" or "clicked on," takes the reader to that link. Hyperlinks are shown in the color blue and may or may not be underlined in blue depending on the format of a particular document. Hyperlinks within the IDG link to other documents, reference tables, appendices, graphics and maps, and the Internet for further reference or in-depth study on a particular issue.

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.

Click on the hyperlinks to the right to enter the IDG table of contents.

Links

Go to Table of Contents

Go to Executive Summary

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.

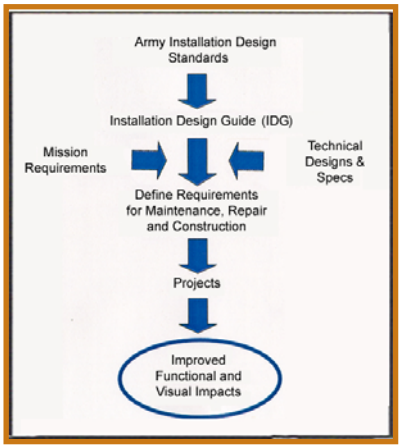


Figure ES.1 - The Army Installation Design Guide is a tool to implement army standards.

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 Guides were also reviewed for their application of procedures, examples, and benchmarks for IDG implementation Army-wide.

ES.3 IDG METHODOLOGY

ES.3.1 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

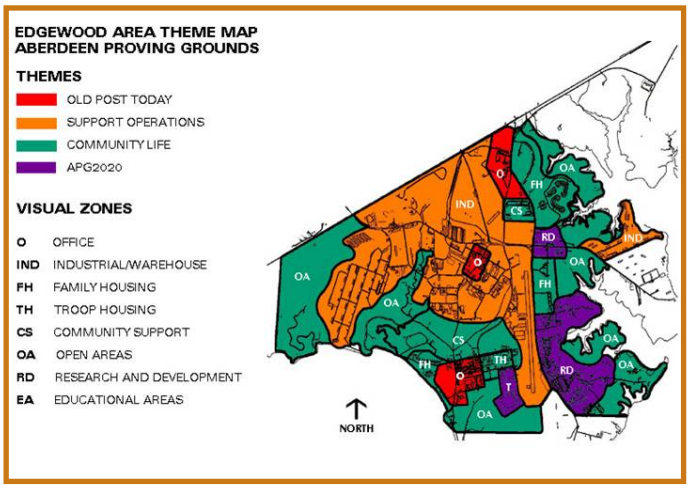


Figure ES.2 - Example of themes and visual zones.

installation. The second survey documents the liabilities and assets within each visual zone.

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.

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.

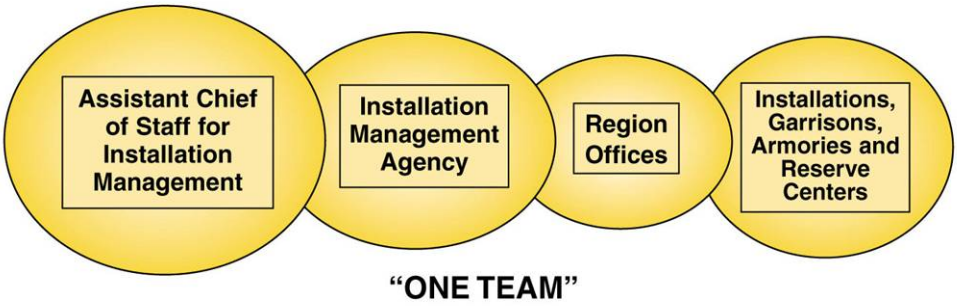
ES.4.4 Senior Mission Commander:

- 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 / Team WSMR Functional Member:

- 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.



Links
Go to Section 1
Go to Table of Contents

SECTION 1

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 design guidance for standardizing and improving the quality of the total environment of the installation. 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.

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 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 (Fig. 1.2).

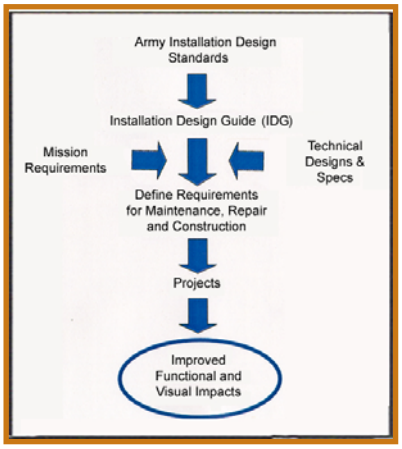


Figure 1.2 - The army installation design guide is a tool to implement army standards.

1.3 OBJECTIVES

The objectives of the IDG 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/USERS

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

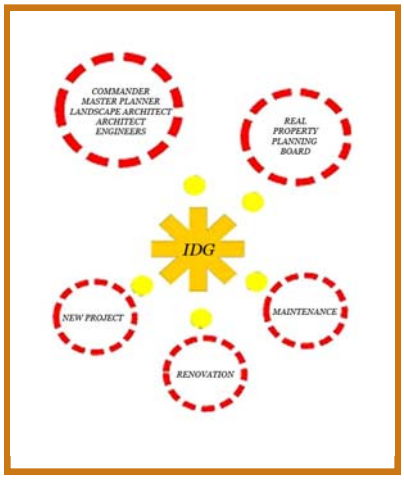


Figure 1.4.1 - Design guide audience

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, Team WSMR Functional Members, 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 and WSMR-specific provisions.

1.5 ORGANIZATION

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. (See the "**White Sands Missile Range IDG Review and Approval Certification**" insert prior to this SECTION 1 as the installation's documented evidence of effort to upgrade this IDG in conformance to the new format template standards of the Army, and pertinent needs of WSMR.)

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 ten (10) 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 DPW office of Master Planning through the IDG Coordinator, Installation Architect will be responsible to coordinate, document, distribute, maintain, review, advise, and update any provisions for the IDG. Contact the Chief of Master Planning at (505) 678-1126 or Installation Architect at (505) 678-6805 for any proposed update requirements, waivers, or inquiries.

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.

Figure 1.9.1a - Energy efficient lighting contributes to sustainability.

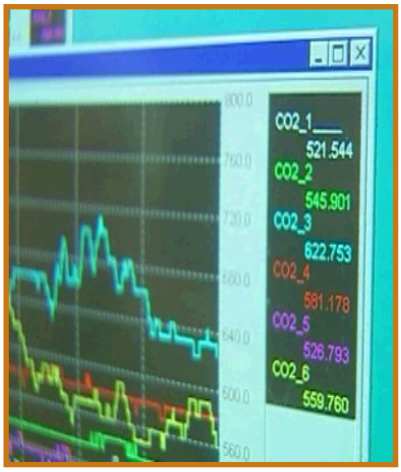


Figure 1.9.1b - CO2 measurements measure indoor air quality assisting in creating a healthy environment.

Figure 1.9.1c - Efficient water usage contributes to a high performance facility.

- 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 / Team WSMR Functional Member:

- 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, energy efficient (Fig. 1.91a, Fig. 1.9.1b and Fig. 1.9.1c), and safe buildings.

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)

1.9.3 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.

1.9.3.1 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.

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.

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.

Links
Go to Section 2
Go to Table of Contents

SECTION 2

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.

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 (Fig. 2.2.1.1).

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.

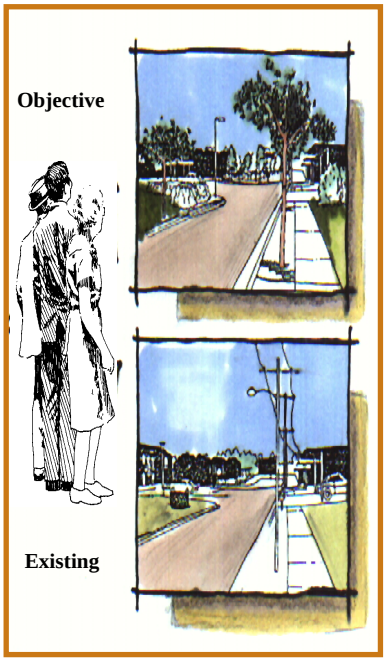


Figure 2.2.1.1 - Enhance the installation through design.

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. “Zones” are limited to the WSMR cantonment.

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 along with WSMR-specific provisions intended to be used in all maintenance, repair, renovation, and new construction projects. The IDG applies to all projects, regardless of the funding source.

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. 2.3.2):

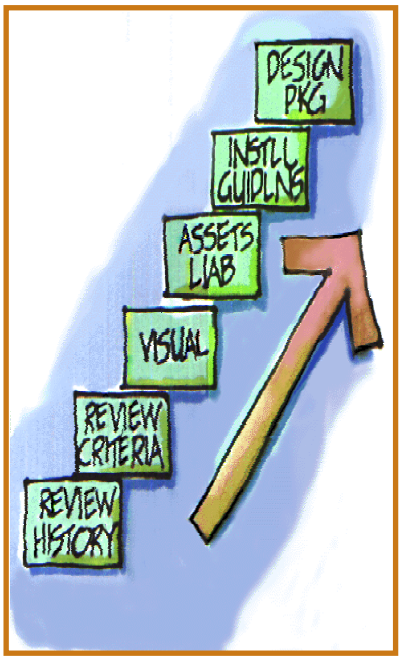


Figure 2.3.2 - Using the design guide

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 IDG coordinator/ Installation Architect through the DPW office of Master Planning will ensure review and approval of the IDG and its contents in its initial and ongoing amended forms by the installation CG and GC and other applicable authority entities. The Installation Architect will be responsible for review, waivers, interpretation, advisory and enforcement of the IDG relative architectural compatibility

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 to include a 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 Self-help Projects and Occupant Purchased and Installed Site Furnishings and Features Projects. If applicable and allowed, such projects shall be coordinated through the DPW and the RCI manager's office to ensure proper approvals prior to any action.

2.4.5 Request for Waiver

2.4.5.1 A request of waiver form 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.

Links

Go to Section 3

Go to Table of Contents

SECTION 3

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 (Fig. 3.1.1).

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 GOALS:

The following are IDG process goals to contribute to end result objectives for the new visual context of WSMR:

- Improve the function and appearance of facilities and sites, thus the quality of life for WSMR soldiers, civilians and their families.

- Ensure cost effective sustainability, reliability and efficiency in WSMR installation functions and appearance.

- Ensure the WSMR IDG mirrors the Department of Army IDS template that provides common standards on all Army installations.

- Identify, verify, amplify and maintain visual zones on WSMR by implementing consistent design applications.

- An IDS-compliant WSMR IDG

- Ensure WSMR reflects the "One Army" uniformity by establishing a level of facility standardization, but also expresses the unique WSMR function, mission, heritage and New Mexican architectural vernacular.

- Foster a sense of community order, tradition, dignity, pride and quality of life environment.

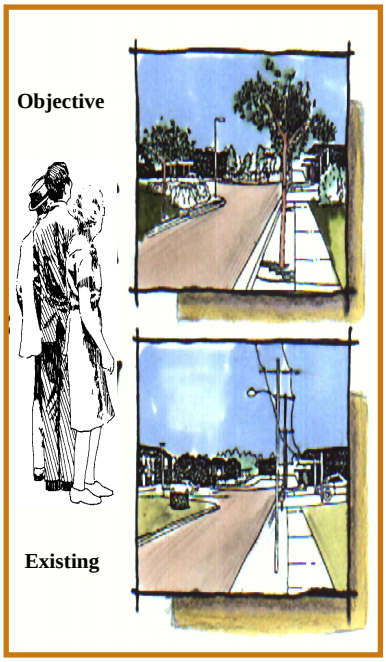


Figure 3.1.1 - Include positive visual elements.

3.2.2 OBJECTIVES:

The following are end objectives as a result of IDG process goals:

- Implement IDG priority improvement projects to improve overall quality of life for WSMR personnel.

- Adhere to standards and criteria set forth in Installation Design Standards.

- Maintain and update IDG periodically to stay current with Army Standards, policies and regulations regarding the planning, design and construction of facilities and the built environment.

- Utilize checklists, tables, design criteria, processes and procedures prescribed in the IDG.

3.2.3 RECOMMENDATIONS:

The following are specific conceptual recommendations to determine the improved visual character of the WSMR Installation in conjunction with goals, objectives and design principles:

- Create distinct quality standards and visual image for each identified WSMR visual zone by use of architecture and landscaping by application of "Design Principles" per paragraph 3.4 below.

- In the design of new, sometimes unique architecture of significance and high exposure, seek creative, varied geometry and massing. Emphasize and define the geometric massing variations by use of approved, discrete combinations of colors for wall fields from colors in APPENDIX L, EXTERIOR COLOR CHART, *Southwest USA*: "Almond" 11-090907 TPX, Custard12-0910 TPX, "Mocha" 16-1210 TPX, tan brick or native stone. However, normal course projects shall typically avoid wall color schemes that are "cluttered" and shall consist of an overall single wall field color, and different color trim and accent color scheme. Design entities shall consult with the WSMR Installation Architect to determine applicability and conformance to the IDG and approval for each project.

- For new architecture at remote locations of low exposure or buildings of utilitarian function, exterior walls should be of one field color and another color for trim elements from the approved palette mentioned above.

- To reflect the heritage of historic massive concrete test structures at WSMR, discrete use of exposed concrete architectural elements for accent and massing elements is allowed under appropriate circumstances and as approved.

- In new "public" architecture, encourage the use of soft, rounded corners and edges in coordination with the original "boxy" massings found in existing buildings to pay homage to the New Mexican adobe architectural vocabulary.

- In new "public" architecture, discrete innovative use of "form follows function" round or curved geometries in conjunction with, and in contrast to "boxy" rectilinear massings is allowed as approved to encourage creativity and new standards of architectural interest.

- Pursue the "Xeriscaping" theory of landscaping with drought-resistant plants for functional shade, creative use of boulders, rock, gravel, at AT/FP barriers and esthetic site enhancement scenarios.

- Pursue a functional and "minimalist" architectural vernacular to portray a dignified and modern abstract image along with a "New Mexican" influence as approved.

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.

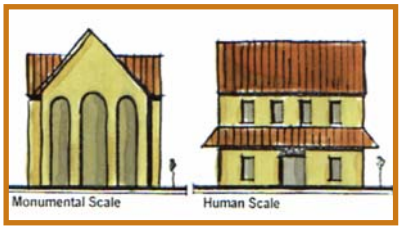


Fig 3.4a - Monumental & human scale

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 comfortable relationship for the user and will vary as space, size and activities vary (Fig. 3.4a).

- **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.

- **Axis –** An axis is a linear progression of space connecting two or more dominant features (Fig 3.4b).

- **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. 3.4c).

- **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).

Figure 3.4b - Parade ground axis with building terminus

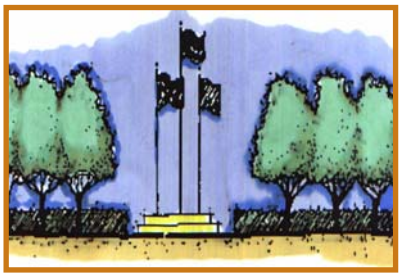


Figure 3.4c - Symmetrical elements

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.

Figure 3.5a – Buildings are typically the dominant feature on the installation.

- **Buildings and Structures** - Typically the most dominant features of an installation. Their location and design characteristics determine the primary visual image (Fig. 3.5a).

- **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. 3.5b and Fig3.5c).

- **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. 3.5d).

- **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.

Figure 3.5b – Landmarks provide orientation of place.

Figure 3.5c – Missile park is a landmark.

Figure 3.5d – Street trees improve the overall visual quality of the installation.

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

Links

Go to Section 4

Go to Table of Contents

SECTION 4

4.1 SETTING

White Sands Missile Range (WSMR) is set within an irregular land area of approximately 40 miles (east-west) x 100 miles (north-south), or about 3,200 square miles (about 2,016,733 acres) in the Tularosa Basin in the southern New Mexico desert. WSMR can temporarily add another 2,400 square miles for tests needing more area. The headquarters "cantonment" area is 20 miles east of Las Cruces, New Mexico and the Organ Mountains, and 45 miles north of El Paso, Texas. Fort Bliss in northeast El Paso shares an installation border to the south most of WSMR. Alamogordo, New Mexico and Holloman Air Force Base are about 48 miles to the northeast. Thus, three significant military installations border each other. However, WSMR is separate from any municipality and is the most "remote" desert setting of the three installations.

4.1.1 Regional Setting

White Sands Missile Range (WSMR) is one of the largest expanses of relatively undeveloped land remaining in the southwestern United States. WSMR is located at the northern margin of the Chihuahuan Desert Ecoregion (see Section 6.1-Setting) (Bailey 1998; Groves et al. 2000). WSMR is roughly a

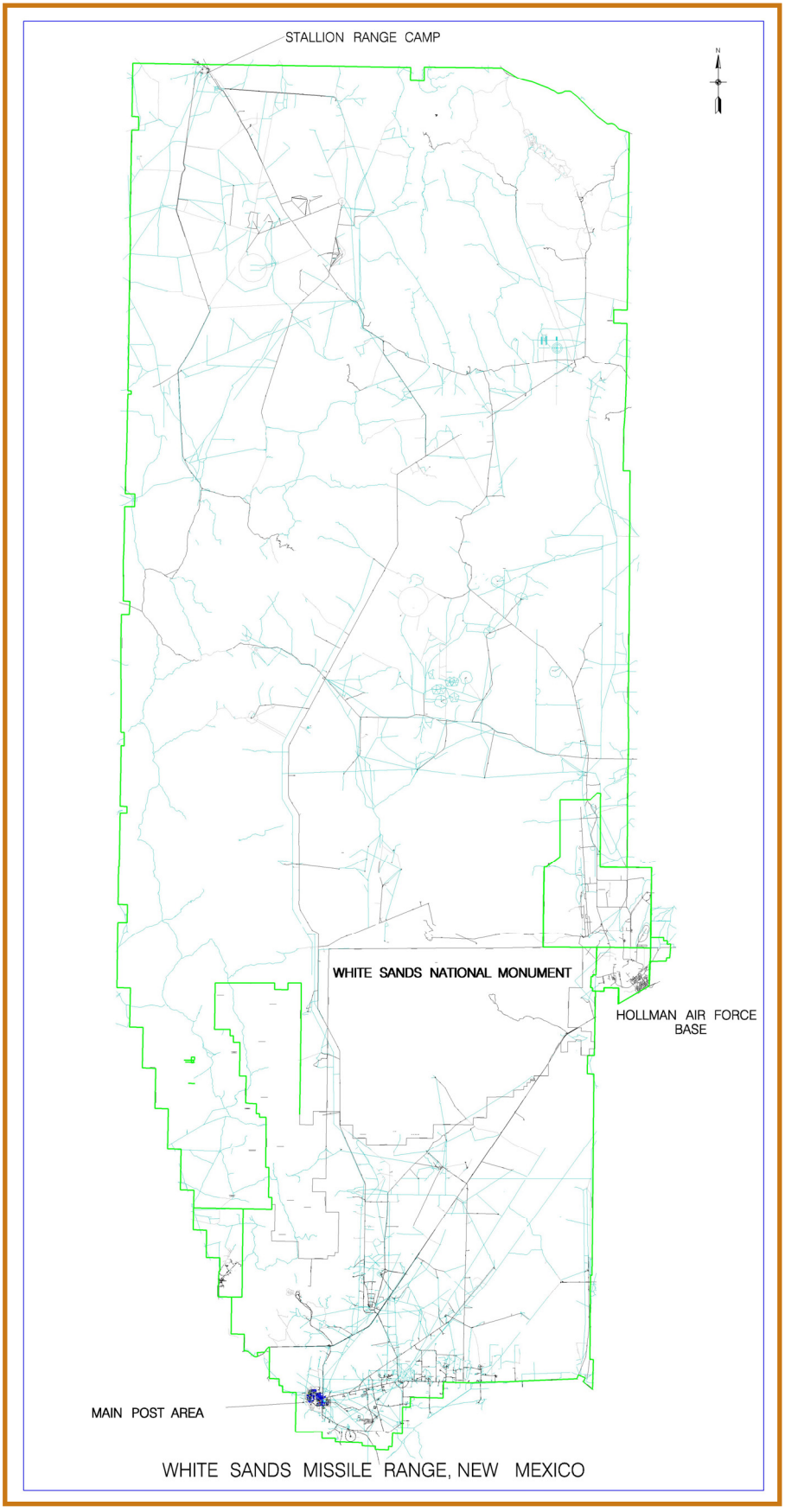


Figure 4.1.1 – WSMR region.

rectangle about 167 km (104 mi) long (north to south) and 63 km (39 mi) wide that extends into parts of five New Mexico counties. Its northeast coordinate is 106.1042o W, 33.8308 o N; the southwest coordinate is 106.7406 o W, 32.3214 o N. Holloman Air Force Base (HAFB) is located along the eastern margin, and Fort Bliss Military Reservation's Doña Ana and McGregor ranges abut WSMR along the southern margin. White Sands National Monument and the San Andres National Wildlife Refuge (NWR) are located entirely within WSMR's boundaries (Fig. 4.1.1).

4.1.2 History of the Installation

In the 1920s and 1930s Robert Goddard carried out his pioneering work in rocketry near Roswell, New Mexico, 160.9 km (100 mi) east of WSMR. But not until 1944, when Germany began attacking Britain with missiles, did the United States begin to pay attention to rockets as a weapon of war. Just as the Manhattan Project leaders looked to the deserts of southern New Mexico for a site to test the first atomic bomb in July 1945 (Eidenbach et al. 1996), so did the War Department and the Army Corps of Engineers turn to this sparsely populated and dry area as a likely place for testing the missiles they were developing (Minge and Guenther 1986).

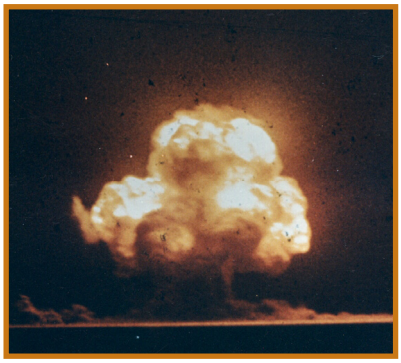


Figure 4.1.2a – Testing of the atomic bomb.

The federal government established White Sands National Monument (National Park Service) in 1933 and San Andres NWR (U.S. Fish and Wildlife Service) in 1941. WSMR was established in July 1945, and its boundaries encompassed both of these ecologically important areas. Trinity Site, where the first plutonium device was detonated, became part of WSMR as well; the device, called the "Fat Man" bomb, was the first and last atomic bomb tested on WSMR (Fig. 4.1.2a).

In August 1945 the first trainloads of captured German V-2 rocket components arrived at WSMR (WSMR 1998b). Under "Operation Paperclip," Wernher Von Braun and his team of 118 German rocket scientists began working at WSMR. They lived at Fort Bliss and commuted to WSMR daily to work on the rockets. V2 rocket launches took place from 1946 to 1952; in 1950, work on this project was transferred to Huntsville, Alabama (WSMR 1998b) (Fig. 4.1.2b).

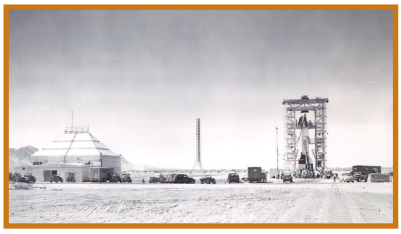


Figure 4.1.2b – Early V-2 rocket test site.

On 26 July 1947 the Air Force became an independent branch of the armed services, and the next day its representatives met with those from WSMR to execute a cooperative agreement

"locally integrating the *New Mexico Guided Missile Range*" (Eidenbach et al. 1996). In February 1948 Holloman Army Air Field (HAAF) became Holloman Air Force Base (HAFB), and in September of that year WSMR was declared a Class II activity under control of the Chief of Ordnance at Fort Bliss (Eidenbach et al. 1996). The Navy became involved in testing on WSMR in 1946. In January 1949 the WSMR Commanding General formed a Joint Range Coordination Committee that included himself and the commanding officers of HAFB and the naval contingent at WSMR. The Commanding General at Fort Bliss, citing the earlier mentioned Class II assignment, challenged the authority of this committee. In 1952, after three years of negotiations, the Secretary of Defense concluded that WSMR operations would be centralized under the authority of the Army, under the command of the WSMR Commanding General (Eidenbach et al. 1996).

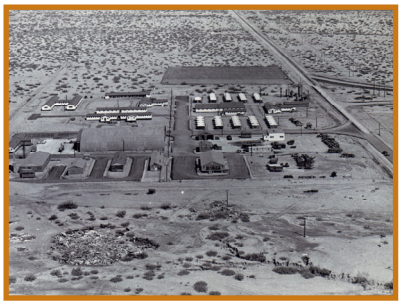


Figure 4.1.2c – Main Post 1945.

By 1955, the Main Post at WSMR was a small city of barracks, family houses, and trailers, complete with gas, water, sewage, and electricity. A weekly newspaper was published. The government provided bus service from nearby communities for those working on WSMR (WSMR 1998b) (Fig. 4.1.2c).

WSPG became WSMR in April 1958. In 1963, off-range launch sites were established in Green River and Blanding, Utah, and at Fort Wingate and Datil, New Mexico, which provided flight corridors of up to 400 mi from White Sands (WSMR 1998b) (Fig. 4.1.2d). In March 1982, Space Shuttle Columbia landed at Northrup Strip on WSMR, 12 after which Congress declared that this landing site was to be officially known as White Sands Space Harbor (WSSH) (WSMR 1998b). The following list summarizes the highlights in WSMR's history. The information was obtained from the WSMR homepage Public Affairs Office *Fact Sheet (A Chronology: Cowboys to V-2s to the Space Shuttle)*. The interested reader is directed to that source for the more complete story.

Figure 4.1.2d – Missile testing.

1945

May 7 – 100 tons of TNT exploded at Trinity site for rehearsal and calibration of atomic bomb detonation.

July 9 – White Sands Proving Ground established.

July 16 – First atomic bomb detonated at Trinity Site at 5:30 A.M.

September – Army Blockhouse completed at Launch Complex 33; cost: $95,000.

September 26 – Tiny Tim booster fired from tower at Launch Complex 33.

October 11 – WAC Corporal with Tiny Tim attains 43 miles altitude.

1946

March 15 – Static firing of V-2 at 100K Static Test Stand.

April 16 – First V-2 launched from Launch Complex 33; reaches an altitude of only 3.4 mi.

May 10 – V-2 successfully reaches 70 mi altitude.

June 14 – Navy establishes a presence at White Sands.

July 9 & 19 – V-2 carries corn seeds and fruit flies aloft for exposure to cosmic rays.

October 24 – Motion pictures taken from V-2 showing 40,000 mi2 of Earth.

1947

January 23 – First auto-pilot system used on a rocket.

March 16 – GAPA (“Toothpick Maker”) missile launched at Holloman.

May 22 – First Corporal “E” flight from Launch Complex 33.

May 29 – Missile 0 of Hermes series crashes outside Juarez, Mexico.

June 4 – First balloon launch from HAFB.

1948

May 13 – First Bumper launch (first stage V-2, second stage WAC Corporal).

May 21 – Launch of JB-2 Loon (American V-1) at HAFB.

June 11 – First Blossom flight with Albert, a rhesus monkey, aboard.

July 26 – Negatives pieced to make one photo covering 800,000 mi2.

November 15 – State of New Mexico allows military roadblocks on U.S. 70.

1949

February 24 – Bumper reaches an altitude of 250 mi and a speed of 5,000 mph.

March 5 – "Doc" Noss shot and killed by Charlie Ryan in conflict over Victorio Peak "treasure."

1950

March 2 – Weather research balloon launched at HAFB lands on 4 March in Myrdal, Norway.

May – First of five Hermes A-1 firings.

June 23 – Test of first launch sled on Holloman test track.

August 31 – Fifth and final Blossom flight photographed mouse in flight.

September 28 – First successful animal balloon from Holloman; reaches 97,000 ft. with eight mice aboard.

1951

Hermes C-1 missile with range of 500 mi becomes the Redstone.

November – Nike destroys B-17 for first intercept of plane by a guided missile.

1952

"Integrated Range" put under control of the Army, specifically the Commanding Officer of WSMR (WSPG).

1953

May 1 – First anthropomorphic dummy jump from balloon at 85,000 ft.

1954

March 19 – Lt. Col. John Stapp rides rocket sled at track for first time.

December 10 – Stapp experiences 43 Gs on rocket sled, called "fastest man in the world."

1957

August – Manned Manhigh balloon attains record altitude of 102,000 ft. in 32 hours of flight.

1958

White Sands Proving Ground is renamed White Sands Missile Range.

1960

NASA's 7 Mercury astronauts train over WSMR for a week in C-131.

Aug 16 – Capt. Joe Kittinger jumps from balloon at 102,800 ft altitude, a new record.

1961

January 31 – Ham, chimp trained at HAFB, does 155-mi-high flight for Project Mercury.

1962

NASA White Sands Test Facility established.

1964
July 8 – First successful Air Force flight of Athena from Green River, Utah.

1966

NASA completes Little Joe II test program for Apollo.

1969

Oryx (gemsbok, *Oryx gazella*) introduced on WSMR by New Mexico Department of Game and Fish.

1970

July 11 – Athena crashes in Mexico after launch from Green River, Utah.

1974

Solar Furnace, capable of producing temperatures of up to 5,000 °F, opened.

1978

October – Shuttle astronaut training begins at Northrup Strip.

1980

NASA tests shuttle maneuvering engine and landing system.

1982

March 30 – Shuttle Columbia lands at Northrup Strip, after an 8-day mission, due to poor weather at the primary landing site at Cape Kennedy in Florida.

1983

June – Tracking Data Satellite Relay System put into operation.

1989

March – First commercial rocket launch at WSMR.

1993

August 18 – First flight of Delta Clipper, a prototype, single stage, re-usable rocket, at WSMR.

1995

July 16 – Trinity Site public open house on fiftieth anniversary, 5,400 attend.

1996

July 31 – Delta Clipper tips over on landing and burns.
October 17 – Army TACMS missile successfully fired from Fort Wingate, New Mexico, to WSMR.

1997

March 24 – Media Day prior to four public rocket launches to observe the Hale-Bopp Comet.

November 17 – First Hera launch from Fort Wingate, New Mexico; second stage failed to ignite.

4.1.3 Environmental Setting

White Sands Missile Range (WSMR) lies entirely within the Basin and Range Section of the Chihuahuan Semi-desert Ecoregion, except for the extreme northeast corner, which barely extends into the Arizona–New Mexico Mountains Ecoregion. The Chihuahuan Semi-desert Ecoregion is bordered on the west by the American Semi-desert and Desert Ecoregion, on the north by the Arizona–New Mexico Mountains and Colorado Plateau Ecoregion, and on the east and northeast by the Southwest Plateau and Plains Dry Steppe and Shrub Ecoregion (Bailey et al. 1994) (Fig. 4.1.3a).

As defined by Bailey et al. (1994), the Basin and Range Section of the Chihuahuan Desert Ecoregion is located in southeast Arizona and southwest and central New Mexico. The

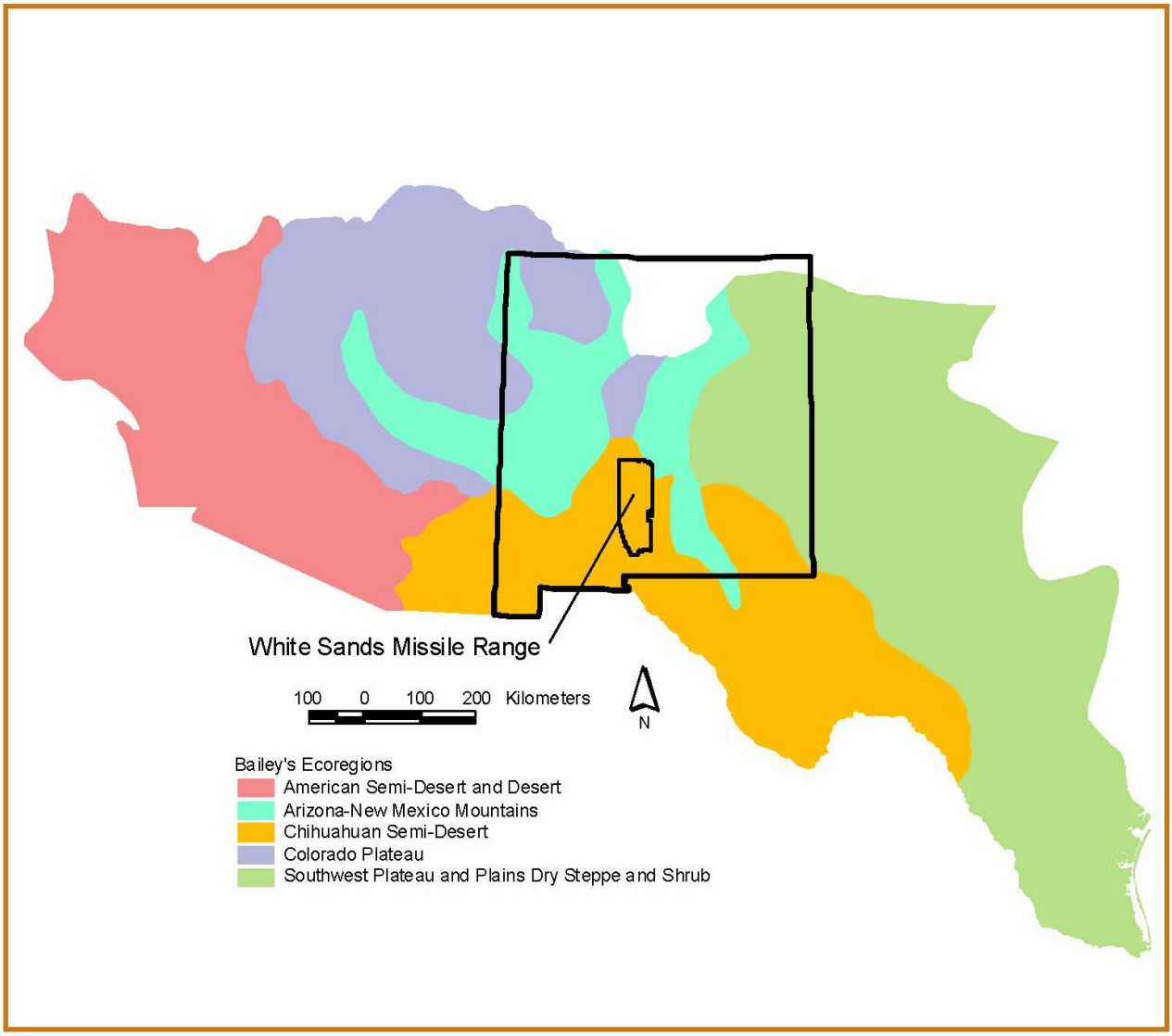


Figure 4.1.3a - Chihuahuan semi-desert ecoregion and adjacent ecoregions.

Chihuahuan Desert, however, extends into north-central Mexico, and other authors extend the ecoregion well into San Luis Potosi, Mexico (Dinerstein et al. 2000). The Chihuahuan Desert landscape is a series of basins and mountain ranges, with a central highland that extends from Socorro, New Mexico, south into Mexico (Dinerstein et al. 2000). Landforms include plains with low mountains consisting of gentle slopes and local relief of 300 to 900 m (1,000 to 3,000 ft), plains with high hills and local relief of 300 to 900 m (1,000 to 3,000 ft), open high hills with relief of 150 to 300 m (500 to 1,000 ft), and tablelands with moderate relief averaging 30 to 90 m (100 to 300 ft) (McNab and Avers 1994). The northeast corner of WSMR extends into the Sacramento–Manzano Mountain section of the Arizona–New Mexico Mountains Ecoregion, where major landforms include mountains, hills, plains, and scarps (Fig. 4.1.3b).

The Chihuahuan Desert is generally cooler and wetter than other warm desert regions because of its higher elevation (Dinerstein et al. 2000). Annual rainfall ranges from 200 to 320 mm (8 to 13 in). Annual mean temperatures range from 13 to 20 ^{o}C (55 to 70 ^{o}F), and the growing season lasts 200 to 240 days (McNab and Avers 1994; see Section 6.4 Climate for details). The Rio Grande is the only major through-flowing stream in the Chihuahuan Desert (Dinerstein et al. 2000). Few intermittent streams and very few rivers are present, and most originate in distant mountains. Flow rates are low except during rainy periods, primarily July and August, when high runoff occurs. Playa lakes are common following rainy periods. Cattle grazing, the principal land use, occurs over about 90% of the Basin and Range Section (McNab and Avers 1994).

Figure 4.1.3b – Elevated view of slopes and local relief.

Three major vegetation "classes" occur on WSMR: woodlands, shrublands, and grasslands. Muldavin et al. (2000) divided these vegetation classes into 52 alliances (e.g., Oneseed Juniper Woodland Alliance, *Juniperus monosperma*) comprising 193 plant associations (e.g., Oneseed Juniper/Black Grama Association, *Juniperus monosperma/Bouteloua eripoda*).

The vegetation patterns at WSMR generally follow an elevational gradient. In the Arizona–New Mexico Mountains Ecoregion, the primary vegetation is montane forest and woodland, but this applies only to the extreme northeast corner

of WSMR. The focus here is on the ecosystems of the Chihuahuan Desert Ecoregion, which applies to most of WSMR's land area. At the highest elevations, open ponderosa pine (*Pinus ponderosa*) forests and woodlands occur with deciduous oak (*Quercus gambelii*) woodlands. Lower montane elevations support a combination of pinyon (*Pinus edulis*) 65 and juniper woodlands, intermixed with evergreen oak (*Q. grisea* and *Q. turbinella*), mountain mahogany *(Cercocarpus montanus*), and wavy-leaf oak (*Q. undulata*) montane scrub (Muldavin et al. 2000).

Mountain valleys and mid-elevation slopes contain grasslands lacking a significant shrub component and are dominated by blue, hairy, and sideoats grama grasses (*B. gracilis, B. hirsuta,* and *B. curtipendula*), western wheatgrass (*Pascopyrum smithii*), and New Mexico needlegrass (*Stipa neomexicana*). Foothills and alluvial fans support Chihuahuan Desert grasslands dominated by various grama grasses, but particularly black grama, along with curlyleaf muhly *(Muhlenbergia setifolia*); these grasslands have a distinctive and conspicuous tall and dwarf shrub component represented by species such as common sotol (*Dasylirion wheeleri*), sacahuista (*Nolina microcarpa*), soaptree yucca (*Yucca elata*), mariola (*Parthenium incanum*), ocotillo (*Fouquieria splendens*), and Torrey's jointfir (*Ephedra torreyana*). Drainage ways contain some riparian forest and shrubland vegetation, especially where water is perennial (Muldavin et al. 2000).

Chihuahuan Desert shrublands, the most widespread of the three major vegetation types on WSMR, are found interspersed among the desert grasslands of the foothills and bajadas. Viscid acacia (*Acacia neomexicana*) communities occur on the lower slopes of the inner canyons and escarpments. Large stands of creosotebush (*Larrea tridentata*), acacia, and catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*) extend away from the mountain fronts. Undergrowths of the desert scrub communities range from sparse to grassy and contain black grama, fluffgrass (*Erioneuron pulchellus*), and bush muhly *(Muhlenbergia porteri)* (Muldavin et al. 2000).

Lower elevation basin floors also harbor extensive desert shrublands. Rolling sandy plains support sandsage (*Artemesia filifolia*) shrublands, and large alluvial flats are dominated by fourwing saltbush (*Atriplex canescens*) communities. In the southern Tularosa and southern Jornada basins, honey

mesquite (*Prosopis glandulosa*), tarbush (*Flourensia cernua*), and creosotebush prevail (Muldavin et al. 2000). Lowland grasslands containing tobosagrass (*Hilaria mutica*) and alkali sacaton (*Sporobolus airoides*) intermix with lower elevation shrublands. Gypsum dunes and outcrops in the basins support unique vegetation communities dominated by gyp dropseed (*Sporobolus nealleyi*), gypsum grama (*B. brevista*), and hairy coldenia (*Tiquilia hispidissima*). Waterways, springs, and basin bottoms, although few on WSMR, are dominated by wetland species such as American bullrush (*Scirpus americanus*), common reed (*Phragmites australis*), broadleaf cattail (*Typha latifolia*), and saltcedar (*Tamarix ramosissima)* (Muldavin et al. 2000).

Among desert ecoregions, the Chihuahuan Desert has particularly high biodiversity. It is widely recognized for its cactus diversity and endemism. Four other plant families—grasses, euphorbs, asters, and legumes—are also highly speciose and show high levels of endemism in the ecoregion. Plant endemism may be lower on WSMR than in other parts of the Chihuahuan Desert because endemism tends to be greater in the center of the Chihuahuan Desert than at its margins (Van Devender 1986) and WSMR is located on the northern edge of the ecoregion. The functioning of the Chihuahuan Desert depends heavily on its invertebrate fauna, which in turn reflects the diversity of plant communities. Because of this desert's recent origins, few mammals or birds are restricted to desert scrub communities. In contrast, herpetofauna are more strongly associated with the region than are mammals and plants, and reptile diversity is high among desert 66 ecoregions. The freshwater biota of the ecoregion is strongly distinguished not by species richness but by the high degree of local endemism (Dinerstein et al. 2000).

Historical accounts from the mid-1800s describe the ecoregion as lush, shrub-free grasslands. Unfortunately, the ecoregion has been heavily degraded. Riparian areas were once characterized by gallery forests, and unchanneled streams formed wetland systems. Today, native shrubs dominate the ecoregion, including former grassland, savanna, riparian, and wetland systems. Overgrazed by livestock and deprived of natural fire regimes, native grasslands are disappearing. Formerly perennial streams are now seasonal, and riparian forests are greatly reduced (Dinerstein et al. 2000.).

WSMR, in contrast, contains ungrazed grassland and riparian areas and virtually untouched montane vegetation communities. The diversity of habitats and the quality of vegetation communities found on WSMR provide environments supportive of great animal diversity. WSMR is therefore vitally important to the conservation and healthy functioning of the various Chihuahuan Desert ecosystems. This chapter provides an overview of the physical characteristics of WSMR, including topography, geology, climate, petroleum and minerals, soils, and hydrology; and accounts of the biological resources—flora, fauna, and threatened and endangered species.

4.1.3.1 Topography

WSMR lies within the Mexican Highland Section of the Basin and Range Physiographic Province (Hawley 1986). Two large basins occur on WSMR: the Jornada del Muerto, west and northwest of the San Andres Mountains, and the Tularosa, east of the San Andres Mountains. The Tularosa Basin ranges in elevation from 1,182 to 3,645 m (3,878 to 11,958 ft), and the Jornada del Muerto Basin, from 1,406 to 2,607 m (4,613 to 8,553 ft). The San Andres Mountains, the most prominent mountain range on WSMR, traverse the west side of the Tularosa Basin (129 km [80 mi] long) and rise more than 1,548 m (5,079 ft) above the basin's lowest point (Kottlowski et al. 1965; Kottlowski 1975). Salinas Peak (2,730 m [8,958 ft]), the highest point on WSMR, lies within the northern San Andres Mountains. Small interior valleys run north–south through the San Andres Mountains, and small canyons run east–west off these valleys and the eastern and western slopes of the mountain range, creating a mosaic of topographic relief. Rhodes Canyon, one of the largest east–west canyons, provides access to the interior valleys and across WSMR (Fig. 4.1.3.1).

The San Augustin Mountains extend southward from Quartzite Mountain to San Augustin Pass (Seager 1981). The pediment extends 12.8 km (8 mi) east and west from San Augustin Peak and is the widest in a chain of north–south mountains that include the San Andres, San Augustin, Organ, and Franklin Mountains. The most prominent feature of this small range, which separates the San Andres from the Organ Mountains to the south, is San Augustin Peak, 2,140 m (7,020 ft) in elevation. Only a small portion of the Organ Mountains lies within WSMR, just south of the Main Post area. Texas

Canyon, near the Main Post, is a prominent physical feature of the O

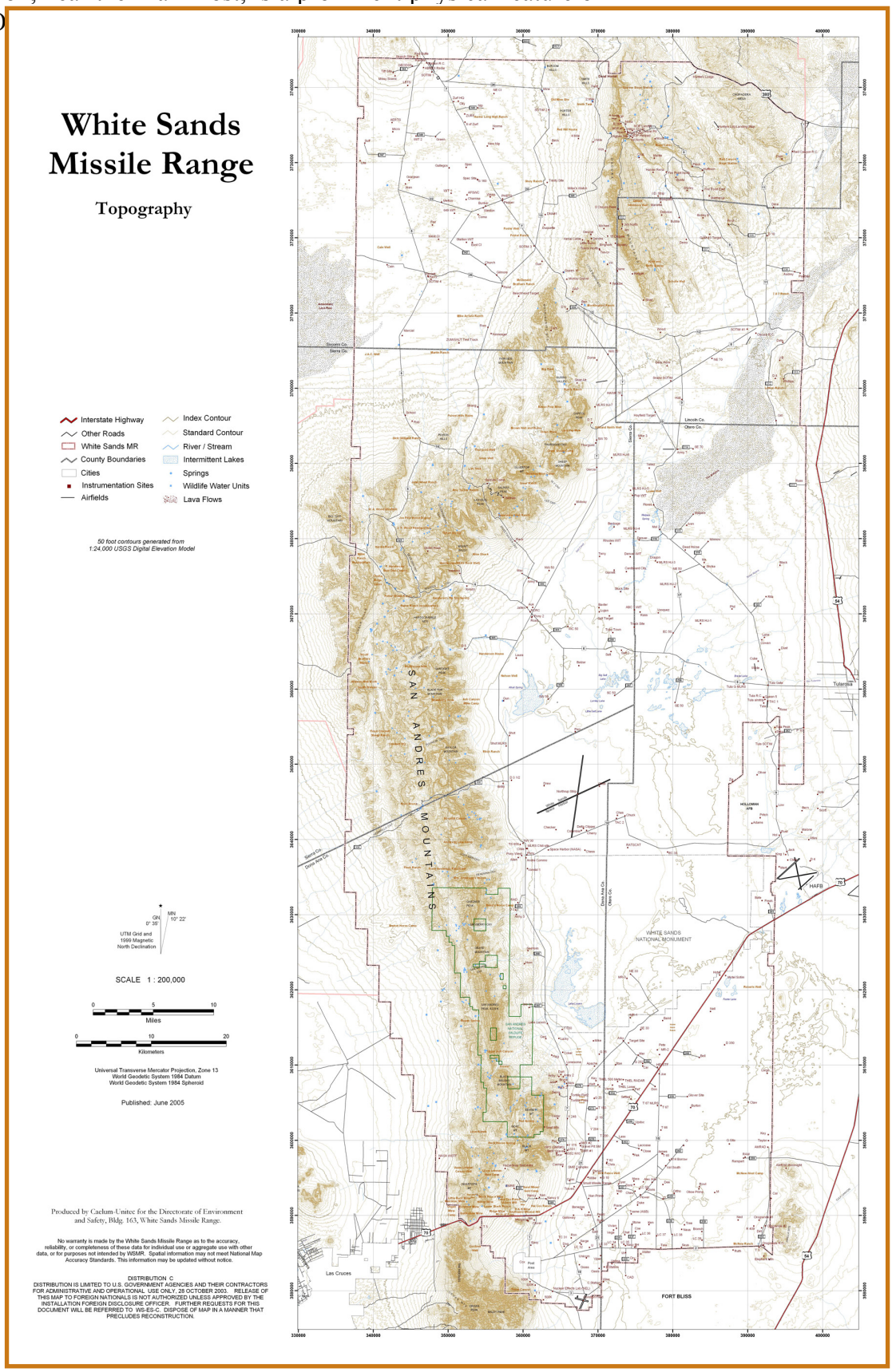


Figure 4.1.3.1 – WSMR topography map.

The Oscura Mountains, reaching an elevation of 2,650 m (8,700 ft) at Oscura Peak, are near the northeast boundary of WSMR; they form a steep escarpment on the west and dip gently northeastward toward Chupadera Mesa in the northeastern corner of WSMR and into the North Extension Area.

Other minor ranges on WSMR are the Mockingbird Mountains and the Little Burro Mountains. The Mockingbird Mountains are at the northernmost end of the San Andres Mountains. The Little Burro Mountains, reaching a maximum elevation of 2,247 m (7,373 ft), lie just to the northeast at Mockingbird Gap. The Jarilla Mountains lie just outside WSMR's southeastern boundary and reach a maximum elevation of 1,616 m (5,301 ft).

Additional prominent topographic and geologic features include the Carrizozo lava flows on the northeast side of WSMR and the Armendaris lava flows on the northwest side. Gypsum sand dunes occur in the south-central portion of WSMR and extend south into White Sands National Monument; the dunes comprise the largest gypsum dune field in the world and cover 111,976 ha (432 mi^2), most of which lies within WSMR.

4.1.3.2 Geology

Nearly 1.4 billion years of geologic history are recorded within WSMR's boundaries, from the Precambrian metamorphic units exposed at the base of the San Andres Mountain front to the continually shifting Quaternary dunes in the Tularosa Basin. Found within the region are the Precambrian Era, Paleozoic Era, Mesozoic Era, Cenozoic Era (Tertiary Period and Quaternary Period) (Fig. 4.1.3.2).

4.1.3.3 Soils

The names of soil series are typically derived from local place names, such as towns and prominent features in the landscape. The purpose for including the soil series in the classification is to show the relationship between the map units and their taxa and interpretations. As noted earlier, a map unit may comprise more than one soil series; for example, the Doña Ana soil series is found in three distinct map units: Berino–Dona Ana

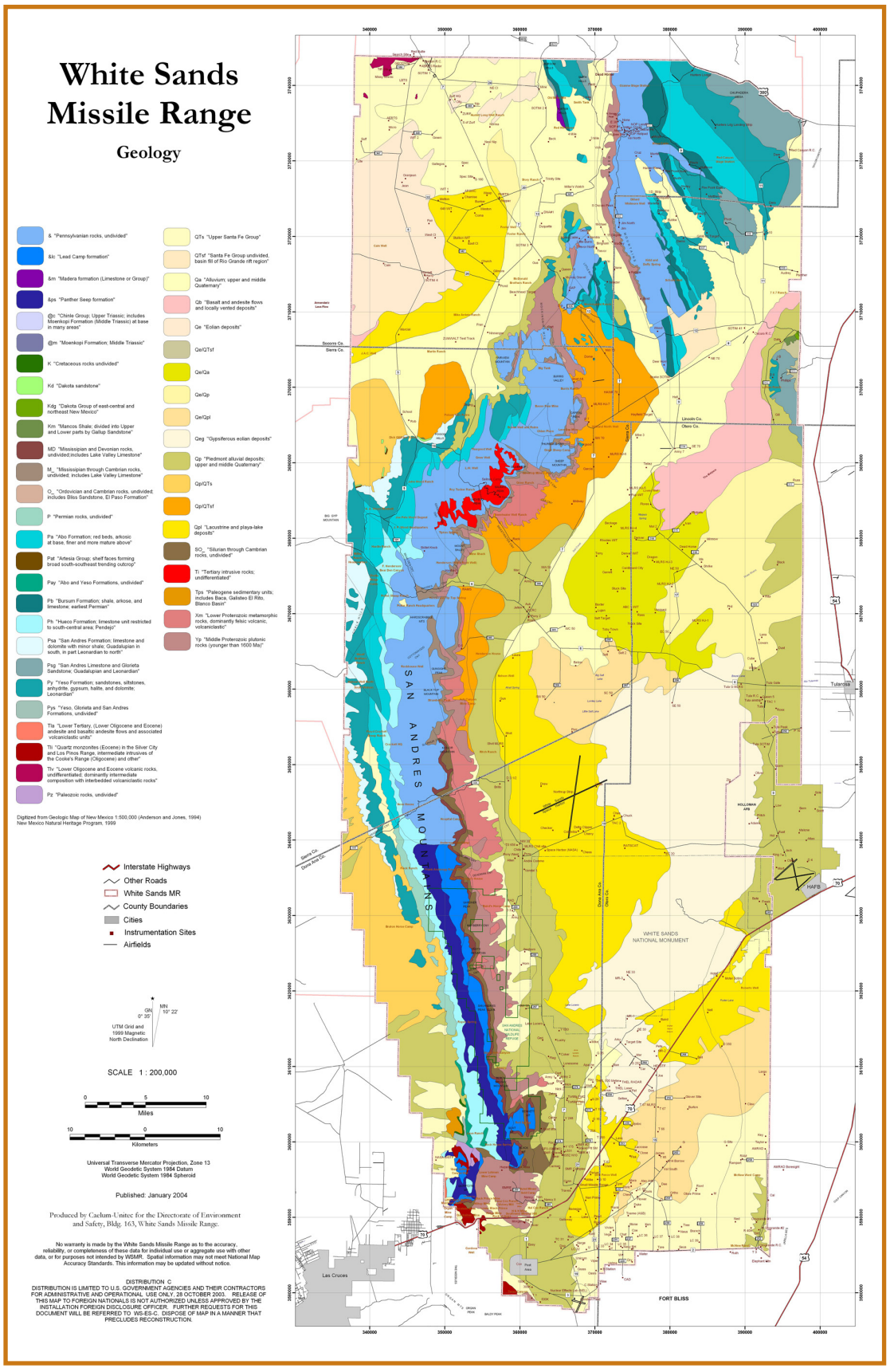


Figure 4.1.3.2 – WSMR geology mapping.

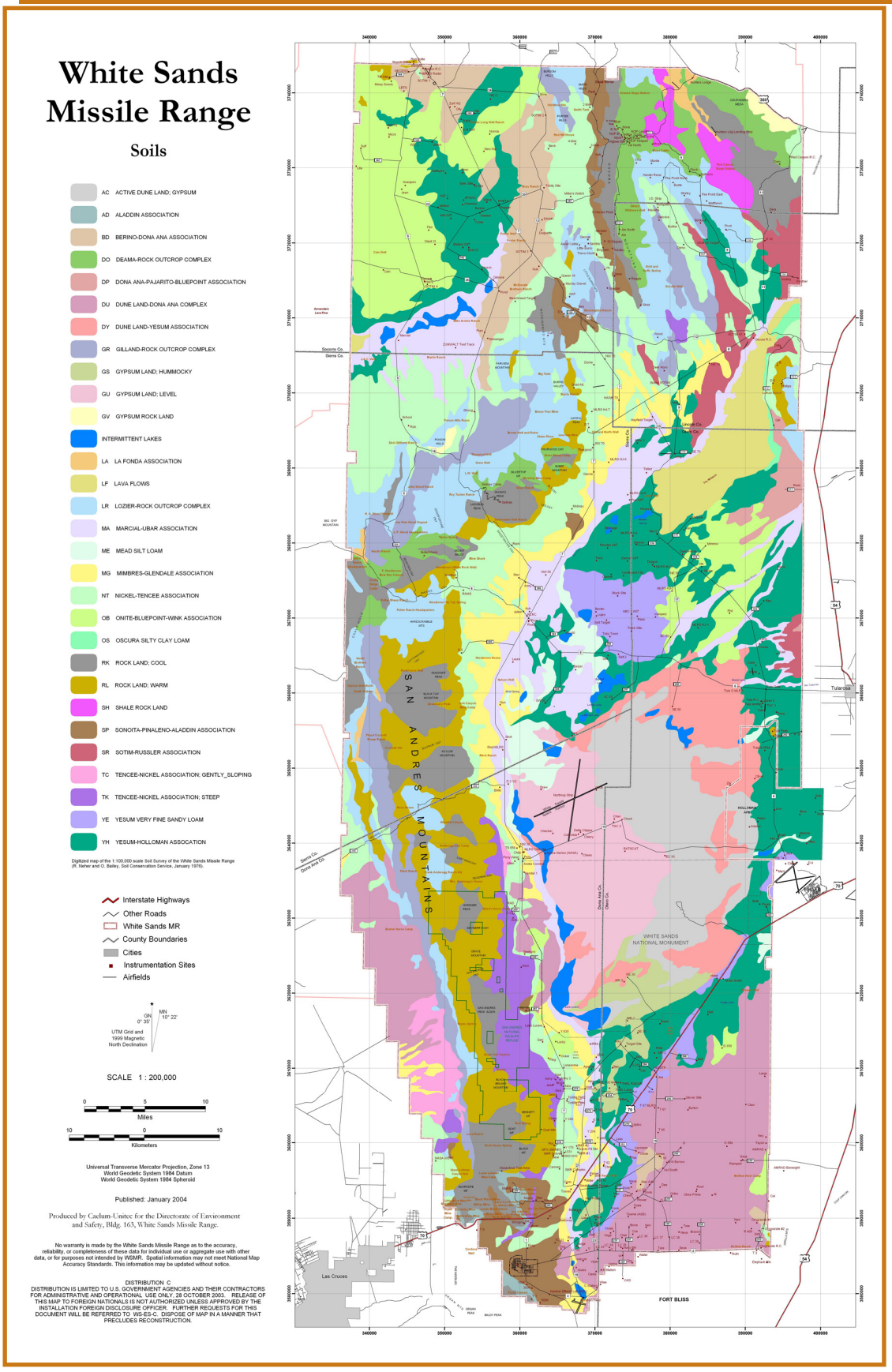


Figure 4.1.3.3 – WSMR soils mapping.

association, Doña Ana–Pajarito-Bluepoint association, and Dune Land– Doña Ana complex. However, not all map units are members of a soil series—for example, "Lava Flows," "Rock Outcrop," and "Intermittent Lakes" are not recognized in the USDA soil taxonomy, but they are mapped and described in the soil classification for WSMR (Fig. 4.1.3.3).

The Yesum Holloman association and the Nickel-Tencee association map units represent the largest percentage of soils on WSMR. The Yesum-Holloman association is composed of medium- to coarse-textured calcareous and gypsiferous alluvial and eolian deposits and covers approximately 12% of the soil surface on WSMR. These soils are widely distributed on bajadas, basin floors, and alluvial fan terraces. The Nickel-Tencee association is moderately permeable, shallow to very deep soil that formed in gravelly alluvium derived from mixed sources on terrace remnants and sides of ridges. On WSMR these soils are distributed on erosional fan remnants and pediments.

Natural processes, involving wind and water, tend to move soils, downhill and downwind, changing the texture of the landscape. A primary concern on WSMR is habitat degradation resulting from human activities that accelerate soil erosion. The potential for soil to erode is affected by a number of factors including slope, parent material, vegetation cover, climate, past land uses, and physical and/or chemical characteristics of the soil. On WSMR, the rate of erosion can be accelerated by natural disturbances, such as fires, high-intensity rain (monsoonal) events, high winds, and by human disturbances, such as construction activities. Water erosion can contribute substantially to downstream sediment loads, cause side-bank erosion (arroyo cutting), and is a principal threat to archaeological and fossil sites (Vogt 1997). Sediments that originate from subsoils and soil-forming materials contain large quantities of sand and gravel; these sediments do not improve the fertility of the underlying alluvial soils (Cooperrider and Hendricks 1937) and can potentially change the geometry of the stream channels (Vogt 1997). On WSMR, the large, established playas in the basin are part of the hydrologic system that includes the distribution and geometry of arroyos, and a change in channel geometry can produce adverse effects in these important areas of wildlife habitat. Arroyo cutting tends to lower the water table, altering the flora

and fauna of the area by widening and deepening the original stream channel (Bryan 1925).

4.1.3.4 Climate

WSMR has a typical northern Chihuahuan Desert climate. There is abundant sunshine, low humidity, modest rainfall, and about 250 frost-free days a year at lower elevations (measured at the Main Post) (Muldavin et al. 2000). Falls, winters, and springs are typically mild, and summers are hot. Strong westerly winds occur in the spring. Most of the precipitation occurs during thunderstorms in late summer (Hatfield and Koperski 2000). Skies are usually clear; visibility of less than 9.6 km (6 mi) occurs rarely, about 22 days a year. Daily and annual temperature and precipitation vary considerably, and weather patterns can be dynamic and difficult to predict (Goudie and Wilkinson 1977). WSMR maintains an extensive surface meteorological data collection system administered by the Army Research Laboratory/Battlefield Environment Directorate (referred to as the Surface Atmosphere Measuring System, or SAMS) (Fig. 4.1.3.4).

Although WSMR's climate as a whole can be generalized, it is important to keep in mind that WSMR, like any landscape, contains numerous "microclimates" that may vary substantially from one to another, even within a particular climate zone, and vegetation patterns often reflect subtle differences in microclimate (Muldavin et al. 2000). Topographic relief and wind exposure contribute greatly to small-scale variation—for example, slight changes in elevation affect the temperature and precipitation levels in a landscape, soils are moister and cooler beneath shrubs and other vegetation than when they are exposed, and north-facing landscape aspects are generally cooler than those that are south-facing. Therefore, regional and local climate patterns must be interpreted carefully and considered at the appropriate scale.

The arid climate of south central New Mexico has strongly influenced the biotic and abiotic processes on WSMR, including rates of soil formation, erosion, and organic matter decomposition, as well as plant and animal growth and distribution. Life on WSMR has evolved in tandem with its climate, and various adaptations enable desert biota to flourish under hot and dry conditions. For example, many basin plant

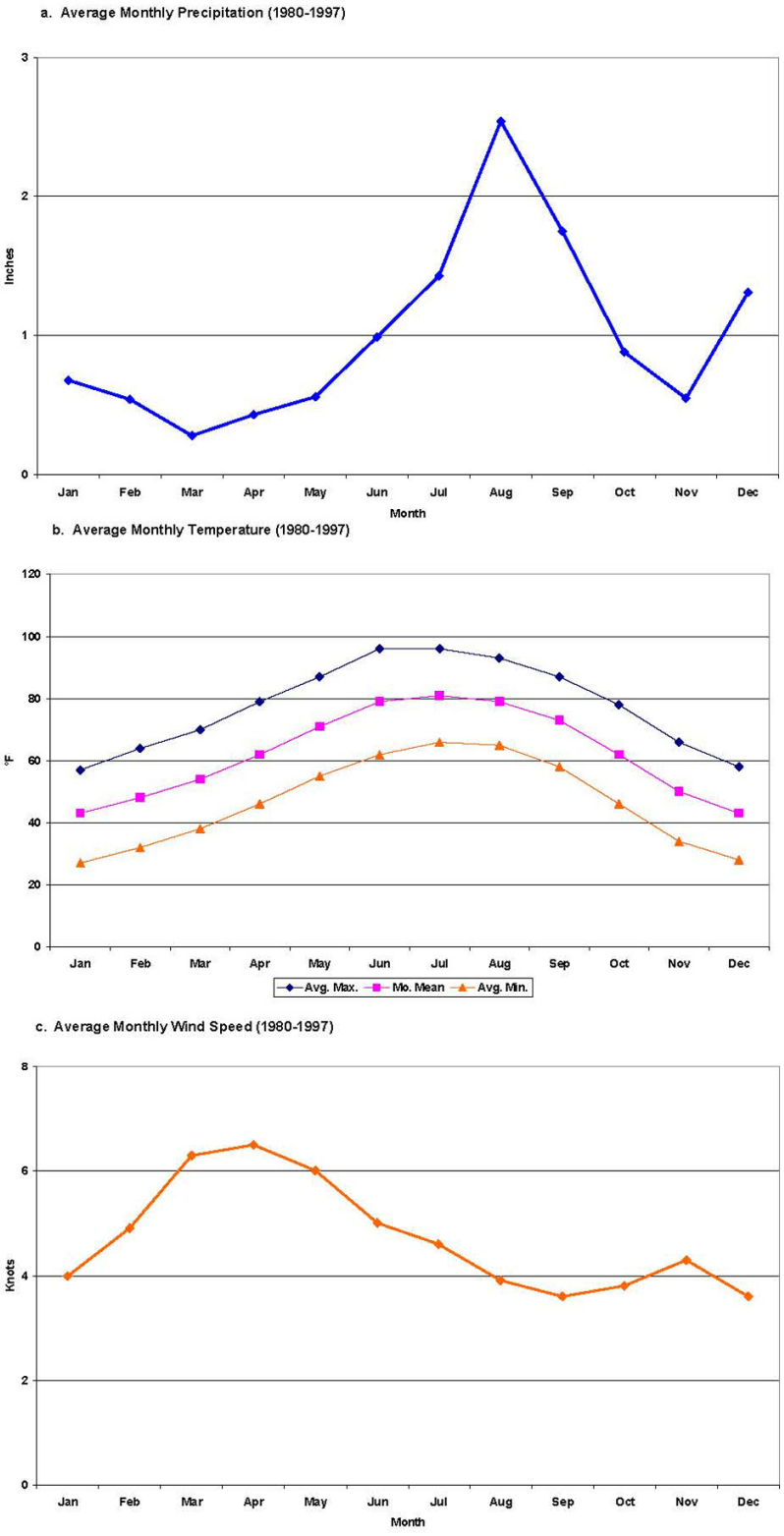


Figure 4.1.3.4 – WSMR climate conditions.

species on WSMR survive with very little water; trees occur only in relatively moist areas or in the mountains; most amphibians on WSMR are active only during the rainy season; and many mammals have physiological or behavioral characteristics that enable them to exist in arid conditions, such as being nocturnal or having physical morphologies that enable them to exist when water is scarce.

4.1.3.5 Hydrology

A watershed, also called a basin or subbasin, is a land area bounded by topography that drains waters to a common destination. Watersheds drain, capture, filter, and store water and determine its subsequent release. The watershed divides the landscape into hydrologically defined areas whose biotic and abiotic components function interactively (see Fig. 4.1.3.5).

The watershed can be large or small because every waterway (stream, tributary, wash, river) has an associated watershed and smaller watersheds combine to form larger watersheds. The watershed boundary will more or less follow the drainage divide or the highest ridgeline around the stream channels, which will meet at the bottom or lowest point of the land where water flows out of the watershed, commonly referred to as the mouth of the waterway. Any activity that affects water quality, quantity, or rate of movement at one location affects the characteristics of the watershed at locations downstream.

Watersheds are delineated by the USGS using a nationwide system based on surface hydrologic features. This system divides the country into 21 regions, 222 subregions, 352 accounting units, and 2,262 cataloging units. The WSMR boundary intersects three watershed cataloging unit boundaries: Jornada del Muerto, Tularosa Valley, and Jornada Draw (Mehlhop et al. 1998).

The Jornada del Muerto watershed, a closed basin located within the northwest portion of WSMR, drains an area comprising 467,076 ha (1,893.4 mi^2), nearly half of which is located within WSMR. The highest topographic relief of this watershed is within WSMR's boundaries and the North Extension Area and includes portions of the San Andres Mountains, Mockingbird Mountains, Little Burro Mountains, Oscura Mountains, and Chupadera Mesa.

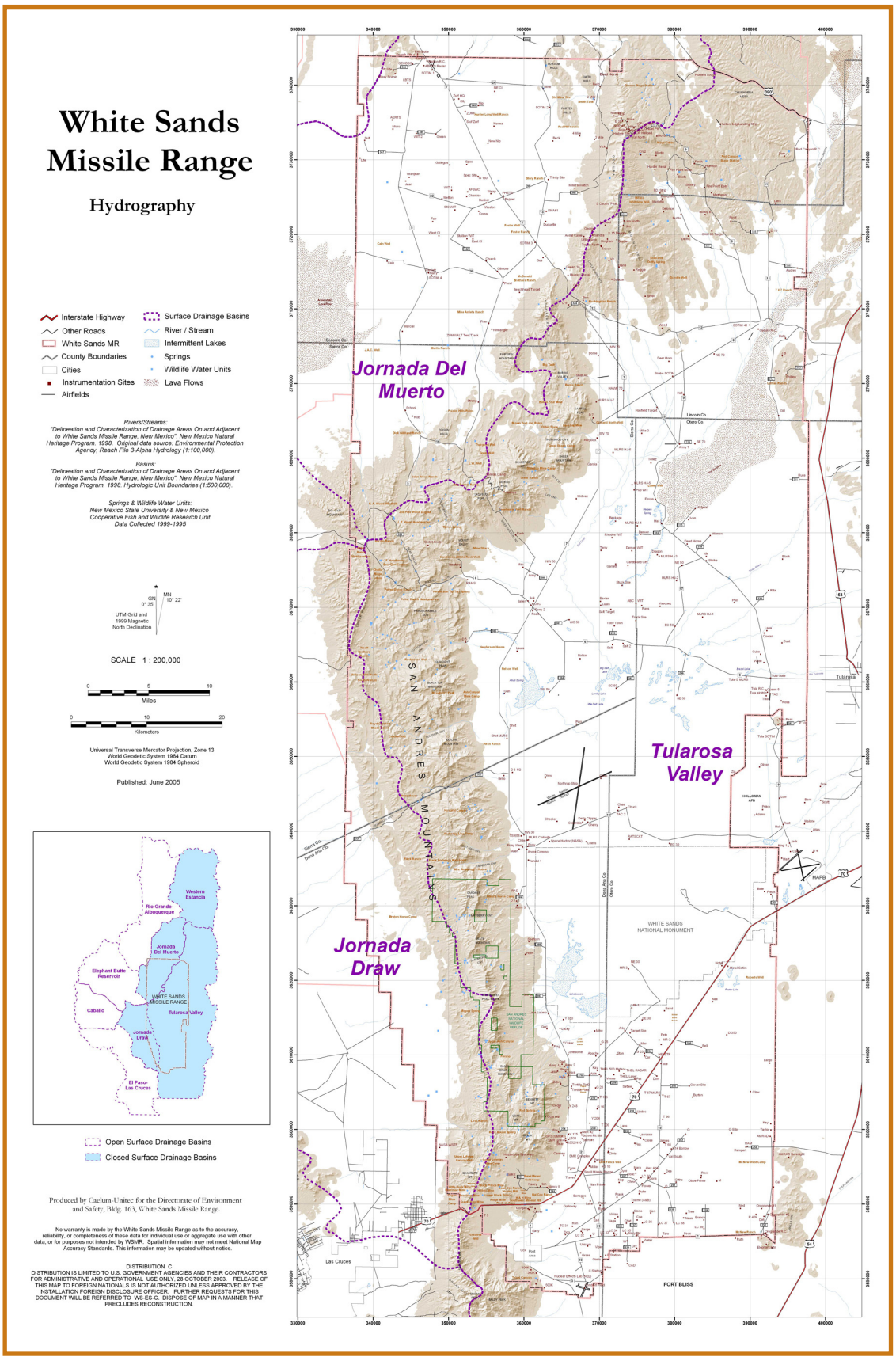


Figure 4.1.3.5 – WSMR hydrology and basins mapping.

The Tularosa Valley watershed drains most of the lands within WSMR (1,710,575 ha [6,604.57 mi2). More than a third of this basin lies within WSMR's boundaries. Both the San Andres and Sacramento Mountains form the high elevation points and headwaters that contribute to this closed basin system. This hydrogeologically closed basin receives recharge from the mountain front with discharge to evaporation occurring in the lowest portion of the basin at Lake Lucero (Wilkins 1986).

A narrow portion of the Jornada Draw watershed, a closed basin, lies within WSMR's boundaries and drains 328,445 ha (1,268 mi2). The San Andres Mountains are the high-elevation boundary within this watershed. Portions of another four watersheds fall within the WSMR extension areas: El Paso–Las Cruces, Elephant Butte Reservoir, Rio Grande Albuquerque, and Western Estancia.

4.1.3.6 Vegetation

Three major vegetation "classes" occur on WSMR: woodlands, shrublands, and grasslands. Muldavin et al. (2000) divided these vegetation classes into 52 alliances (e.g., Oneseed Juniper Woodland Alliance, *Juniperus monosperma*) comprising 193 plant associations (e.g., Oneseed Juniper/Black Grama Association, *Juniperus monosperma/Bouteloua eripoda*) (Fig. 4.1.3.6a).

The vegetation patterns at WSMR generally follow an elevational gradient. In the Arizona–New Mexico Mountains Ecoregion, the primary vegetation is montane forest and woodland, but this applies only to the extreme northeast corner of WSMR. The focus here is on the ecosystems of the Chihuahuan Desert Ecoregion, which applies to most of WSMR's land area. At the highest elevations, open ponderosa pine (*Pinus ponderosa*) forests and woodlands occur with deciduous oak (*Quercus gambelii*) woodlands. Lower montane elevations support a combination of pinyon (*Pinus edulis*) 65 and juniper woodlands, intermixed with evergreen oak (*Q. grisea* and *Q. turbinella*), mountain mahogany *(Cercocarpus montanus*), and wavy-leaf oak (*Q. undulata*) montane scrub (Muldavin et al. 2000).

Mountain valleys and mid-elevation slopes contain grasslands lacking a significant shrub component and are dominated by blue, hairy, and sideoats grama grasses (*B. gracilis, B. hirsuta,*

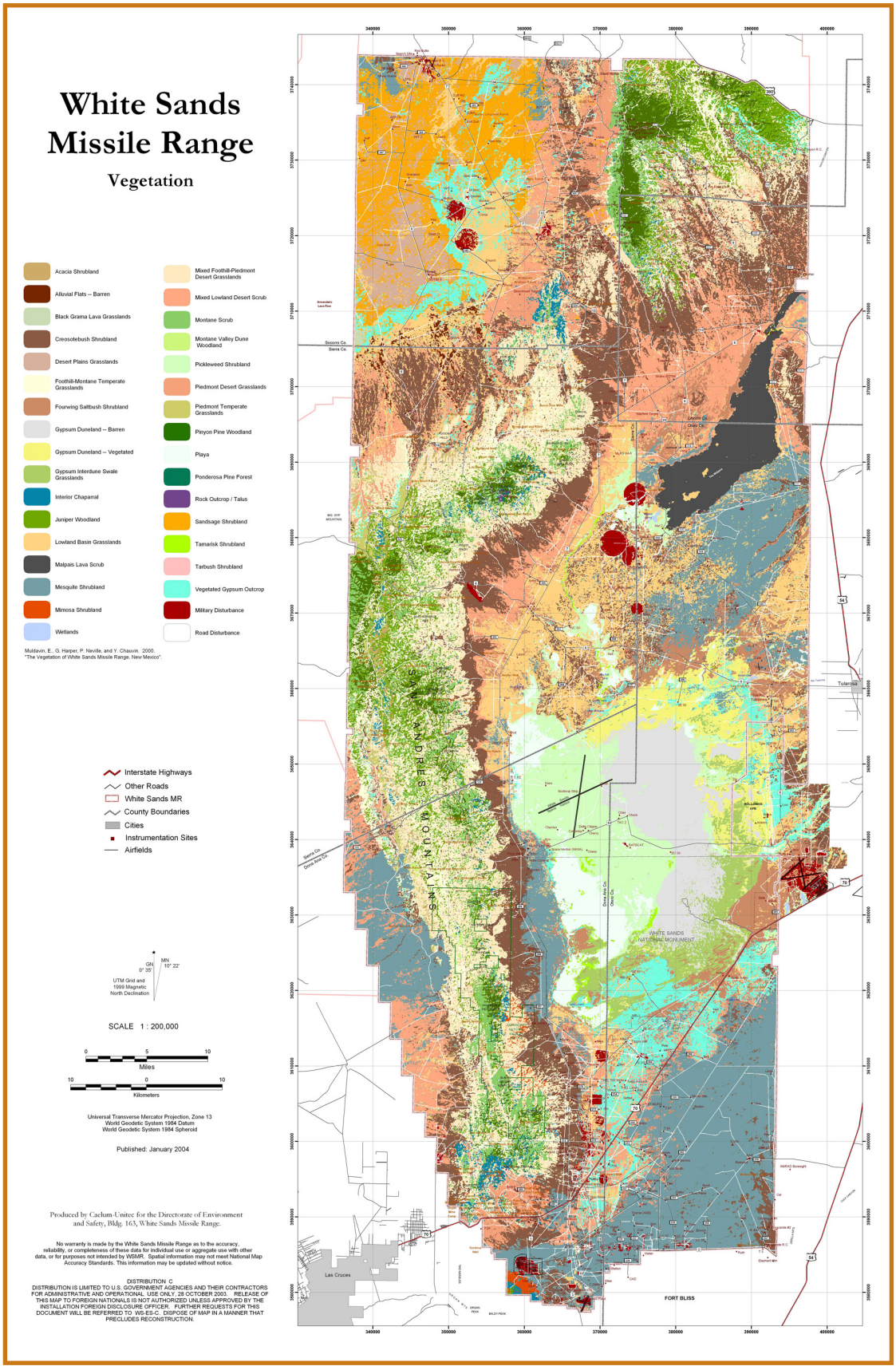


Figure 4.1.3.6a – WSMR vegetation mapping.

and *B. curtipendula*), western wheatgrass (*Pascopyrum smithii*), and New Mexico needlegrass (*Stipa neomexicana*). Foothills and alluvial fans support Chihuahuan Desert grasslands dominated by various grama grasses, but particularly black grama, along with curlyleaf muhly *(Muhlenbergia setifolia*); these grasslands have a distinctive and conspicuous tall and dwarf shrub component represented by species such as common sotol (*Dasylirion wheeleri*), sacahuista (*Nolina microcarpa*), soaptree yucca (*Yucca elata*), mariola (*Parthenium incanum*), ocotillo (*Fouquieria splendens*), and Torrey's jointfir (*Ephedra torreyana*). Drainage ways contain some riparian forest and shrubland vegetation, especially where water is perennial (Muldavin et al. 2000).

Chihuahuan Desert shrublands, the most widespread of the three major vegetation types on WSMR, are found interspersed among the desert grasslands of the foothills and bajadas. Viscid acacia (*Acacia neomexicana*) communities occur on the lower slopes of the inner canyons and escarpments. Large stands of creosotebush (*Larrea tridentata*), acacia, and catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*) extend away from the mountain fronts. Undergrowths of the desert scrub communities range from sparse to grassy and contain black grama, fluffgrass (*Erioneuron pulchellus*), and bush muhly *(Muhlenbergia porteri)* (Muldavin et al. 2000).

Lower elevation basin floors also harbor extensive desert shrublands Fig 4.1.3.6b). Rolling sandy plains support sandsage (*Artemesia filifolia*) shrublands, and large alluvial flats are dominated by fourwing saltbush (*Atriplex canescens*) communities. In the southern Tularosa and southern Jornada basins, honey mesquite (*Prosopis glandulosa*), tarbush (*Flourensia cernua*), and creosotebush prevail (Muldavin et al. 2000). Lowland grasslands containing tobosagrass (*Hilaria mutica*) and alkali sacaton (*Sporobolus airoides*) intermix with lower elevation shrublands. Gypsum dunes and outcrops in the basins support unique vegetation communities dominated by gyp dropseed (*Sporobolus nealleyi*), gypsum grama (*B. brevista*), and hairy coldenia (*Tiquilia hispidissima*). Waterways, springs, and basin bottoms, although few on WSMR, are dominated by wetland species such as American bullrush (*Scirpus americanus*), common reed (*Phragmites australis*), broadleaf cattail (*Typha latifolia*), and saltcedar (*Tamarix ramosissima)* (Muldavin et al. 2000).

Figure 4.1.3.6b – Chihuahuan desert.

4.1.3.7 Wetlands

Wetlands and riparian areas on WSMR include springs, seeps in mountainous areas, and extensive wetland marshes and creeks in the Tularosa Basin (Fig. 4.1.3.7). These habitats occupy 293 ha (724 acres), mostly in the Malpais Spring and Brazel Lake areas. Herbaceous wetlands associated with permanent water are dominated by American bulrush *(Scirpus americana*) and broadleaf cattail (*Typha latifolia*); other common species include spikerush (*Eleocharis* spp.), rush (*Juncus* spp.), and sedge (*Carex* and *Cyperus* spp.). There are also large stands of common reed (*Phragmites australis*) and grassland dominated by inland saltgrass (*Distichlis spicata*) and alkali sacaton.

Figure 4.1.3.7 – Wetland spring.

Lowland drainages, such as Salt Creek, are dominated by tamarisk (saltcedar). Along mid-elevation drainage bottoms and spring areas, there are woodland riparian communities dominated by netleaf hackberry (*Celtis laevigata var. reticulata*) and velvet ash (*Fraxinus velutina*) as well as small stands of willow (*Salix* spp.), *Baccharis* spp. And cottonwood (*Populus* spp.).

Although limited in extent, wetlands and riparian areas on WSMR are crucial areas for fauna because they provide forage, water, and cover. These areas are intertwined with aquatic environments and associated invertebrates and fishes. Hispid cotton rat (*Sigmodon hispidus*) is an obligate of these communities.

4.1.3.8 Wildlife

4.1.3.8.1 Invertebrates

The invertebrates, enormously variable in shape, size, abundance, and environmental adaptations, make up 95% of all animals in the world (Barnes 1987). Terrestrial groups are ancient, dating to over 400 million years, and include flatworms, roundworms (nematodes), annelid worms (such as earthworms and leeches), mollusks, crustaceans, arachnids (spiders and their relatives), centipedes, millipedes, and insects. The success of these animals is due to several factors: (1) small size, which allows them to take advantage of small or scarce resources that would not sustain larger animals (Wilson 1987); (2) ectothermic physiology—since less energy is spent maintaining body temperature, more can be directed toward

growth and reproduction (Eckert, Randall, and Augustine 1988); and (3) a wide range of acceptable foods for the group as a whole, though there are specialists as well (Price 1997) (Fig. 4.1.3.8a).

Invertebrates have formed many complex interactions with other organisms in their habitats. For example, invertebrates eat seeds, live plants, fungi, bacteria, dead organic matter, including carcasses, and each other (predation). Consequently, they participate in virtually all ecosystem processes, from pollination, soil aeration, organic matter decomposition, and seed dispersal, to indirect regulation of these processes through predation on other invertebrates (Wilson 1992). Of course, they also provide a valuable food resource for vertebrates, particularly birds, reptiles, and small mammals. A few groups, such as fleas and lice, are ectoparasites on vertebrates. Many species of flies (order Diptera) and wasps (order Hymenoptera) are parasitoids of other insects or arachnids and have a role in regulating the size of the host population (Price 1997).

Figure 4.1.3.8a – A butterfly is an example of an area invertebrate.

The world diversity of invertebrates is overwhelming: of the 1.4 million animal species known, only 42,000 of them are vertebrates. The beetles alone make up 25% (290,000 species) of all animals (Wilson 1992). The sheer numbers of species make the invertebrates a challenge to study, and we know far less about them than we do the vertebrates. Invertebrates are often overlooked because of their small size, cryptic coloring, and activity periods that do not coincide with ours (Crawford 1981). Although a large portion of Earth's invertebrate diversity is to be found in tropical forest, there is also a high level of diversity in temperate arid systems. In the Southwest, Danks (1994) predicted that arthropod species richness would be high because of the varied topography and the generally warm climate. The invertebrate fauna of the southwestern United States is poorly known, but richness is high for the groups that have been studied, such as tiger beetles, grasshoppers, and ants (Parmenter et al. 1995).

4.1.3.8.2 Fishes

The native fish fauna consists of a single, endemic species: White Sands pupfish (*Cyprinodon tularosa*). Four introduced species have been documented from isolated locations on WSMR.

Both pupfish and nonnative fish were stocked in aquatic habitats throughout the Tularosa Basin. G. Ritch, who operated a ranch at the mouth of Salt Creek prior to establishment of WSMR, reported that it was common practice for ranchers to stock pupfish into tanks and other waters to control mosquitoes (*fide* R. Charles). T. Danley (pers. comm.), who lived on a ranch about a mile north of Malone Draw until 1952, reported that he and his friends and family collected goldfish (*Carassius auratus*) from Guilez and Barrel Springs and placed them in stock tanks to "keep down the moss." Mosquitofish (*Gambusia affinis*) were likely introduced into the basin in the early 1970s for mosquito control.

The following are brief species accounts for fishes known to occur on WSMR. Goldfish (*Carassius auratus*) is native to eastern Asia and was introduced into the United States before 1900 (Sublette, Hatch, and Sublette 1990, 98–101). The species is used widely as a bait fish. Goldfish feed on aquatic vegetation and macroinvertebrates. Spawning begins when water temperature reaches 15.6 ^{o}C (61.7 ^{o}F) and may occur several times in a year. Goldfish typically have high fecundity. Preferred habitat for goldfish is warm, shallow water with aquatic vegetation.

Mosquitofish (*Gambusia affinis*), while native to several of the major river drainages in New Mexico, was introduced into the Tularosa Basin. Mosquitofish tolerate a wide range of environmental conditions (Sublette, Hatch, and Sublette 1990, 267–71). Mosquitofish reproduce by internal fertilization of eggs and bear live young. Young-ofyear born in the spring typically reach sexual maturity and produce one or two broods during the following summer. Mosquitofish are carnivorous and have eliminated populations of other native poeciliids in the Southwest.

Largemouth bass (*Micropterus salmoides*) is native to the Pecos River drainage and was introduced into the Tularosa Basin (Sublette, Hatch, and Sublette 1990, 314–18). Habitat suitable for largemouth bass is characterized by low current velocity or still water, warm water temperatures, low turbidity, and presence of aquatic vegetation. Largemouth bass spawn when water temperature reaches about 14 ^{o}C (57.2 ^{o}F). Spawning is inhibited when salinity exceeds 5,000 ppm. Largemouth bass is carnivorous.

Bluegill (*Lepomis macrochirus*) is native to the Pecos River and Rio Grande drainages in New Mexico (Sublette, Hatch, and Sublette 1990, 307–309). This centrarchid inhabits a variety of freshwater habitats. Spawning is initiated when water temperature reaches 19 ^{o}C (66.2 ^{o}F). Bluegill is primarily carnivorous.

4.1.3.8.3 Amphibians and Reptiles

In this section we summarize the amphibians and reptiles (herpetofauna) occurring (or potentially occurring) on WSMR (Fig. 4.1.3.8b). For planning purposes, we discuss the herpetofauna in the context of the major habitat types in which they would typically be encountered. The habitat types are generalized categories adapted from a model developed by Muldavin et al. (2000a,b) for classifying vegetation communities. Note, however, that herpetofauna habitat is tied to other factors besides vegetation, including microclimate, soil type, topography, and human disturbance. Some distributions discussed here have been inferred from statewide distributions or from species– habitat associations derived from the BISON-M database. Herpetofaunal habitat associations were reviewed by contract biologists at WSMR and the New Mexico Department of Game and Fish (D. Burkett, L. Kamees, and C. Painter, pers. comm.). For more detailed information on the herpetofauna of WSMR, see Burkett (2000); for New Mexico, see Degenhardt, Painter, and Price (1996); and for the western United States, see Stebbins 1985.

Figure 4.1.3.8b – Reptiles are commonly found in the area.

The herpetofauna of WSMR have not been thoroughly surveyed. Early government fauna surveys in New Mexico concentrated their efforts at international boundary areas and along railroads, and they focused primarily on taxa other than herpetofauna. Furthermore, specimens often did not make it into collections because of poor preservation technology. A period of intense, nationwide collecting took place after World War II, but because WSMR lands were occupied by the military, it was difficult or impossible for surveyors to gain access to the area.

Ruthven (1907) surveyed southern New Mexico and Arizona and collected herpetofauna from the plains west of Alamogordo and near WSMR. Lewis (1949, 311– 12; 1950) collected at the Carrizozo lava flow and along an elevational transect in the southern Tularosa Basin from the Organ Mountains into an area near the Main Post (Parker Lake

Quadrangle). Best, James, and Best (1983) collected on the Armendaris lava flows, the eastern edge of which is within WSMR's boundary, near Baca Well. In recent decades ITAM/LCTA groups have collected limited data on herpetofauna, and project clearance surveys have required herpetofauna records as a matter of procedure. Burkett and Kamees have recently contributed greatly to our knowledge of herpetofauna on WSMR (Burkett 1997a, 2000; Burkett and Kamees 1998) through pitfall trapping and night driving surveys since 1991 (L. Kamees, pers. comm.). During 1999 and 2000, nine new county records were collected by Burkett (Burkett in press, a,b; Burkett and Black 2000a,b,c,d,e,f,g).

Herpetofauna are ectotherms, and so extreme temperatures limit their activity. In general, they are inactive during the cool winter months and during the hottest part of the day in the summer months. From one species to another, however, activity cycles vary widely. Some species, such as the side blotched lizard (*Uta stansburiana*) and the tree lizard (*Urosaurus ornatus*), may be seen on WSMR during any month of the year, whereas some toads, such as the New Mexico spadefoot (*Spea multiplicata*) and Couch's spadefoot (*Scaphiopus couchii*), may be encountered only during the late summer rainy season. Almost all lizard species occurring on WSMR are diurnal and are frequently observed scurrying about during the day. Many snakes are nocturnal and are frequently encountered on blacktop roads during the late-summer monsoons. Some snakes are so reclusive that they are rarely, if ever, encountered by humans. Most likely there are several as yet undocumented snake species that occur on WSMR. Many reptiles may be active even when conditions are extremely dry, but amphibians are active only when moisture is available. During the rainy season, many toads rely on temporary ponds for completing their reproductive cycles, and their breeding choruses can be quite loud during these times.

Some species are habitat generalists—they are widespread and may use several habitat types—and others are restricted to very narrow habitats. Western diamondback rattlesnakes (*Crotalus atrox*), for instance, have been documented in every habitat available on the WSMR except for gypsum dunes; and banded rock rattlesnakes (*C. lepidis*) are restricted to talus slopes at high elevations. Distributions of herpetofauna are sometimes linked to soil structure rather than to vegetation type. For example, two species of horned lizard, Texas horned lizard

(*Phrynosoma cornutum*) and round-tailed horned lizard (*P. modestum*), are abundant and widespread in areas where harvester ants are available as prey—*P. cornutum* tends to occur in areas where the soil is sandy to gravelly, and *P. modestum* tends to occur in coarser soils with a rocky texture (Degenhardt, Painter, and Price 1996).

Some species are not well documented because they are difficult to detect or are frequently misidentified. The Texas blind snake (*Leptotyphlops dulcis*), for instance, is often mistaken for an earthworm; it is likely present in fair abundance on and around WSMR and was not documented in Otero County until 1999 (Carpenter and Painter 2000). The western blind snake (*L. humilis*) was also first documented in 1999, in both Otero and Lincoln Counties (Burkett and Black 2000c,d). Similarly, the western hooknose snake (*Gyalopion canum*) occupies a variety of habitats on WSMR, yet this species is rarely encountered because it is small, nocturnal, and seem to have a sparse population density. The more common night snake (*Hypsiglena torquata*) and glossy snake (*Arizona elegans*) are frequently seen on blacktop roads at night during the summer months, but they are rarely encountered at other times.

4.1.3.8.4 Birds

Avifaunal diversity on WSMR is high; of the 500 species of birds known to occur in New Mexico, 60% occur on WSMR. There are few historical studies of birds in the region between the Rio Grande and the Sacramento Mountains because early surveys typically were conducted only in areas containing Army forts or railroads.

The various habitats of WSMR support a diverse avifauna of 298 species (6 are hypothetical occurrences) representing 17 orders and 55 families. Among these species are 37 waterbirds, 18 hawks, 8 owls, 7 hummingbirds, 7 woodpeckers, 17 flycatchers, 7 wrens, 25 warblers, and 24 sparrows. For information on the identifying characteristics of the birds found on WSMR, see the journal *North America Birds* (published by the American Birding Association).

Seasonal aspects affect WSMR avifauna: spring is March–May, summer is June–July, fall is August November, and winter is December–February. Predictably, more species occur on WSMR during spring and fall (migration) than during

summer and winter. Nearly equal numbers of species occur during spring and fall; a few more species are present in winter than in summer (146 and 143, respectively). The breeding status also affects species encountered. Some unusual species that are confirmed or highly probable breeders on WSMR are Golden Eagle, Montezuma Quail, Western Snowy Plover, Inca Dove, Elf Owl, Western Burrowing Owl, Bell's Vireo, Gray Vireo, Phainopepla, Black-throated Gray Warbler, Varied Bunting, and Hooded Oriole.

Over half the documented species (158) are residents during summer, winter, or yearround, and these species are dependent on the resources of WSMR for much or all of the year. There are 99 transients species (including migrants) that occur for brief periods, primarily in the spring and fall, and rely on the natural resources of WSMR to replenish depleted nutrients before continuing on to breeding or wintering areas. Migrants include 49 species of waterbirds, 9 species of warbler, Golden-crowned Sparrow, and Rose-breasted Grosbeak; the rest are vagrants that occur only irregularly.

Three exotic bird species are common on WSMR. The Rock Dove and House Sparrow are restricted almost exclusively to areas of human disturbance. European Starling is a cavity-nesting species and occurs near human habitation.

4.1.3.8.5 Mammals

Documenting the mammal fauna of an area can be particularly difficult. Verification of a species' presence generally requires specialized survey techniques and the collection of voucher specimens. Accurate identification often requires examination of cranial and dental features and may require comparisons with other specimens located in museum collections. Published keys are often inadequate for absolute identification because of pronounced geographic and individual variation. Consequently, it is imperative that verification be based on preserved specimen material.

In producing a list of mammals for WSMR, four categories of species occurrence were used: verified, reported, probable, and possible. *Verified* species are only those for which (1) a specimen record had been published (such as records in Findley et al. 1975) or (2) a specimen was deposited in a museum collection (such as the Museum of Southwestern

Biology, USGS collection at UNM, and Natural History Museum at Eastern New Mexico University). *Reported* species are only those that (1) were reported in unpublished reports but were presumably based on specimens or (2) were based on visual observation of species that are unlikely to be confused with other similar species (such as oryx (Fig. 4.1.3.8c), pronghorn, and ringtail). *Probable* species are those that would reasonably be expected to occur on WSMR because specimens have been collected from nearby localities and appropriate habitat exists on WSMR. *Possible* species are those for which there is some probability that they may occur on WSMR. These generally are relatively rare species, migratory species, or those with specialized habitat requirements that are of limited extent on WSMR.

Figure 4.1.3.8c – Oryx are an introduced species to the area.

A total of 47 verified species, 21 reported species, 12 probable species, and 7 possible species of mammals occur, or historically occurred, on WSMR. Of these, at least 3 species are currently extirpated from the entire region (gray wolf [*Canis lupus*], grizzly bear [*Ursus arctos*], and black footed ferret [*Mustela nigripes*]) and one is extirpated from WSMR (black-tailed prairie dog [*Cynomys ludovicianus*]) but persists in adjacent areas. In addition, the list also includes 4 exotic species that are verified, reported, or probable (house mouse [*Mus musculus*], feral horse [*Equus caballus*], Barbary sheep [*Ammotragus lervia*], and oryx [gemsbok, *Oryx gazella*]) and two others that are possible (black rat [*Rattus rattus*], and feral goat [*Capra hircus*]). The 80 verified, reported, or probable species represent a high level of mammalian diversity. In comparison, the entire state of Illinois, for example, only has 67 native species of mammals (Frey and Yates 1996). Part of the high diversity on WSMR stems from the high regional diversity (e.g., within the United States, New Mexico has the second highest diversity of mammals, with 154 native species), which is due to the geographic position and topographic heterogeneity of the region (Frey and Yates 1996). Additional factors likely include the latitude, size, topographic relief, and variety of substrates found on WSMR. Although no thorough study of mammalian diversity patterns has been conducted in New Mexico, it is possible to compare the species richness of WSMR with that of other regions. For example, WSMR has higher diversity than Petrified Forest National Park, Arizona (55 species) (Ramotnik and Bogan 1998), and Guadalupe Mountains National Park, Texas (74 species) (Genoways, Baker, and Cornely 1979), but it has lower diversity than the

Negrito Creek drainage in the mid to higher elevations of the Mogollon Plateau in Catron County, New Mexico (Frey 1995).

4.1.4 Man-Made Environment

4.1.4.1 Main Post

The Main Post (Fig. 4.1.4) occupies approximately 360 hectares (900 acres) along the eastern slope of the Organ Mountains in the southwest corner of WSMR; it serves as the center of operations for most organizations and Team WSMR Functional Members (WSMR 1998c). The Main Post administrative and technical complex includes WSMR Headquarters, operations control center, administrative offices, technical laboratories and work areas, warehouses, and service centers. The Main Post also serves as a self-contained community with military and family housing, shopping facilities, medical clinics, emergency and fire services, educational and recreational facilities, and churches.

Figure 4.1.4 – WSMR main post.

4.1.4.2 Test Facilities

WSMR's infrastructure includes over 2,000 on-range test facilities and sites that support the military weapons test and evaluation mission (WSMR 1992; WSMR 1998c). The Oscura and Stallion Range Centers are strategically located on WSMR to provide administrative, technical, and service support to areas too remote to serve from the Main Post. Common test infrastructure types include missile launch sites, missile impact areas, instrumentation sites, communication sites, and radar and laser test facilities. Examples of highly specialized range operated test facilities are the Aerial Cable Range (ACR), Electro-Magnetic Radiation Effects (EMRE), Nuclear Effects Laboratory (NEL), and Zumwalt Test Track. A partial list of Team WSMR Functional Member-operated test facilities on WSMR includes Anti-Missile Radar Defense (AMRAD), High Energy Laser Test Facility (HELSTF), Large Blast/Thermal Simulator (LB/TS), Permanent High-Explosive Test Site (PHETS), National Radar Cross-Section Test Facility (NRTF), RATSCAT Advanced Measurement Site (RAMS, now considered a part of NRTF, but still called RAMS), Richardson Ranch Training Complex (RRTC), Seismic Hardrock In-Situ Source Testbed (SHIST), Tactical High-Energy Laser (THEL) Testbed, White Sands Space Harbor (WSSH), and the NASA Test Center–research.

4.1.4.3 Contaminated Areas

Most of the buildings on WSMR were built prior to 1980. The era in which these buildings were built routinely allowed the use of many types of hazardous building materials. Materials such as asbestos, lead-based paint, PCBs, etc. were routinely used. Therefore, it is imperative that, whenever such materials are to be disturbed for whatever reason, a comprehensive survey be conducted to determine the presence, location, quantity, and condition of hazardous building materials. Such a survey must be conduct prior to the start of any activities that may disturb any hazardous building material.

4.1.4.4 Solid Waste Management

Currently, there are two state-permitted landfills in operation at WSMR (H. Magallanes, pers. comm.). The Main Post Landfill, located 5 km (3.1 mi) east of the Main Post, occupies approximately 37 ha (92 acres) and is used for construction and demolition materials only. Of the 37 ha (92 acres), 4 ha (10 acres) are used for asbestos. Stallion Range Landfill is a domestic landfill, occupies approximately 4 ha (10 acres), and is located 1.6 km (1 mi) south of SRC. An additional 2 ha (5 acres) will be added in fall 2001. Domestic solid waste from the Main Post has been collected and transported off-range for disposal since 1997.

4.1.4.4.1 Solid waste management on WSMR is comprised of four main requirements:

a. Construction and Demolition Debris.

b. Sanitary Debris.

c. Hazardous Waste.

d. Asbestos Waste.

2. Each of the solid waste requirements is managed as follows:

a. Construction and Demolition Debris, as defined by the State of New Mexico Solid Waste Regulations, is disposed of at the WSMR Construction and Demolition Debris landfill. The construction and demolition debris landfill is located approximately 2 miles east of the main post area on Watertown avenue.

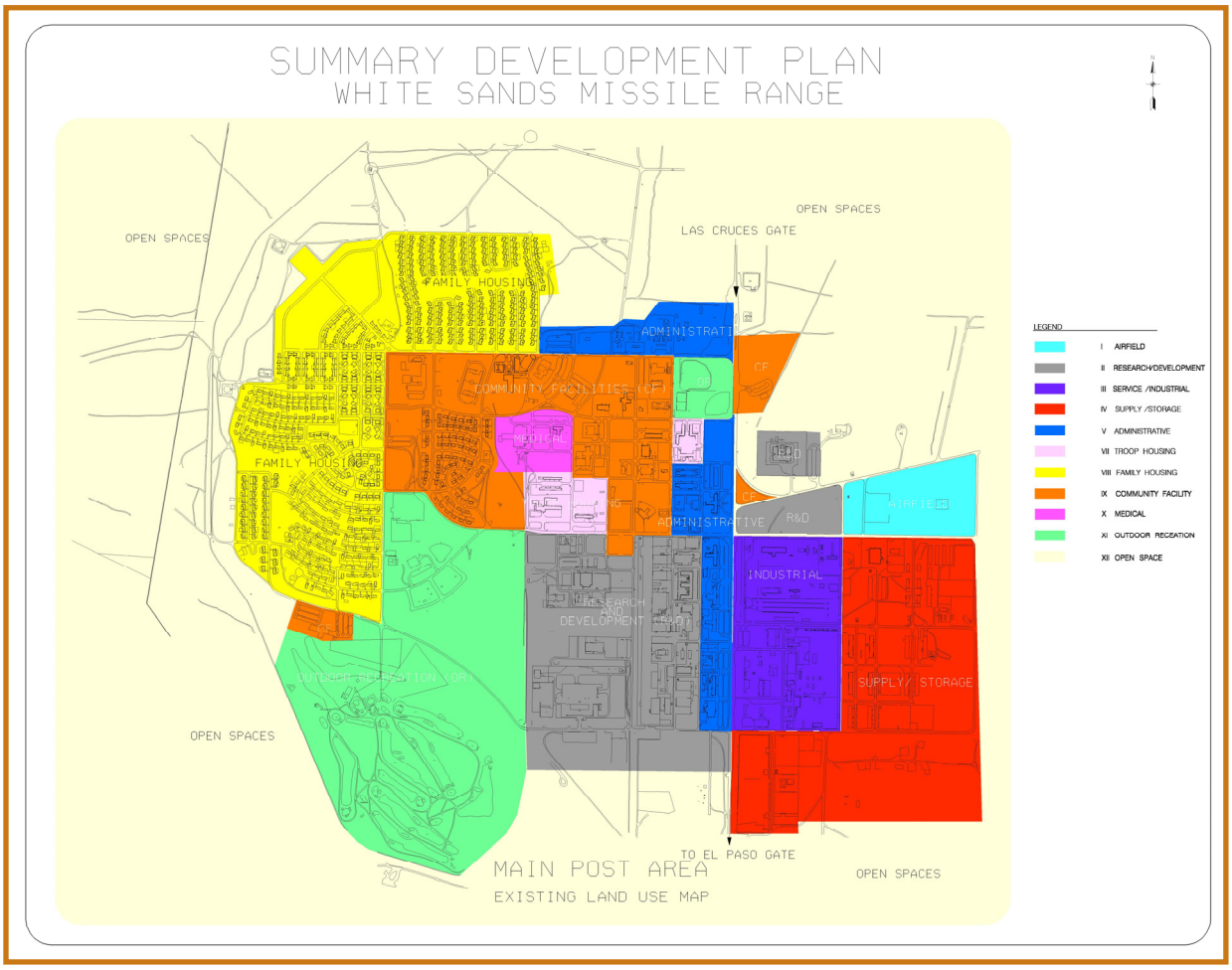
b. Sanitary Debris, as defined by the State of New Mexico Solid Waste Regulations, is disposed of at permitted off post landfills only. WSMR does not have a sanitary debris landfill; therefore, all sanitary debris must be sent off post.

c. Hazardous waste, as defined by the State of New Mexico Solid Waste Regulations, is disposed of through the WSMR Hazard Minimization Center.

d. Asbestos waste, as defined by the National Emission Standards for Hazardous Air Pollutants, EPA regulation 40 CFR 61 and the State of New Mexico Solid Waste Regulation, is disposed of at the WSMR asbestos landfill. The landfill is located adjacent to the construction and demolition debris landfill.

3. Deviations and exempts to the above are considered on a case by case basis only.

4.2 EXISTING LAND USE



4.3 PROPOSED LAND USE

4.3.1 Currently (September 2005), WSMR does not have a proposed land use map.

4.4 REFERENCES AND CONTACTS

- American Ornithologists' Union (AOU). 1998. *A checklist of North American birds*. 7th ed. Washington, D.C.: American Ornithologists' Union.

- Bailey, R. G. 1998. Ecoregions map of North America: Explanatory note. Miscellaneous Publication no. 1548. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 10 pp.

- Bailey, R. G., P. E. Avers, T. King, W. H. McNab, and W. Henry, eds. 1994. Ecoregions and subregions of the United States. Map, scale 1:7,500,000, colored. Accompanied by a supplementary table of map unit descriptions, compiled and edited by W. H. McNab, W. Henry, and R. G. Bailey. Prepared for the U.S. Department of Agriculture, Forest Service. Washington, D.C.: U.S. Geological Survey.

- Barnes, R. D. 1987. *Invertebrate zoology*. Philadelphia, Pa. Saunders College Publishing Co.

- Best, T. L., H. C. James, and F. H. Best. 1983. Herpetofauna of the Pedro Armendariz lava field, New Mexico. *The Texas Journal of Science* (Texas Academy of Science). 35:245–55.

- Burkett, D. W., and D. Black. 2000a. *Cnemidophorus tigris* (western whiptail lizard). USA: New Mexico: Lincoln Co. *Herpetological Review* 31 (2):108–15.

- ———. 2000b *Cnemidophorus uniparens* (desert grassland whiptail lizard). USA: New Mexico: Otero Co. *Herpetological Review* 31 (2):108–15.

- ———. 2000c. *Leptotyphlops humilis* (western blind snake). USA: New Mexico: Lincoln Co. *Herpetological Review* 31 (2):108–15.

- ———. 2000d. *Leptotyphlops humilis* (western blind snake). USA: New Mexico: Otero Co. *Herpetological Review* 31 (2):108–15.

- ———. 2000e. *Rhinocheilus lecontei* (longnose snake). USA: New Mexico: Lincoln Co.

Herpetological Review 31 (2):108–15.

- ———. 2000f. *Sceloporus magister* (desert spiny lizard). USA: New Mexico: Lincoln Co. *Herpetological Review* 31 (2):108–15.

- ———. 2000g. *Uta Stansburiana* (side-blotched lizard). USA: New Mexico: Lincoln Co. *Herpetological Review* 31 (2):108–15.

- Burkett, D. W., and L. Kamees. 1998a. Baseline herpetofauna survey report: San Andres National Wildlife Refuge. Unpublished MEVATEC Technical Report. Las Cruces, N.Mex.: San Andres National Wildlife Refuge.

- ———. 1998b. Mammals of White Sands Missile Range, New Mexico. Unpublished report. WSMR, N.Mex.: U.S. Department of the Army, CSTE-DTC-WS-ES-ES.

- Carpenter, G. C., and C. W. Painter. 2000. Distribution: *Leptotyphlops dulcis* (Texas blind snake). *Herpetological Review* 30 (4):235–36.

- Cooperrider, C. K., and B. A. Hendricks. 1937. Soil erosion and stream flow on range and forest lands of the Upper Rio Grande watershed region in relation to land resources and human welfare. Washington D.C.: US Department of Agriculture.

- Crawford, C. S. 1981. *Biology of desert invertebrates*. New York: Springer-Verlag.

- Danks, H. V. 1994. Regional diversity of insects in North America. *American Entomologist* 40:50–55.

- Degenhardt, W. G., C. W. Painter, and A. H. Price. 1996. *Amphibians and reptiles of New Mexico*. Albuquerque: University of New Mexico Press. 431 pp.

- D. Olson, J. Atchely, C. Loucks, S. Contreras-Balderas, R. Abell, E. Inigo, E. Enkerlin, C. E. Williams, and G. Castilleja. 2000. Ecoregion-based conservation in the

Chihuahuan Desert: A biological assessment and biodiversity vision. A collaborative effort by World Wildlife Fund, Comision National para el Conocimiento y Uso de la Biodiversidad (CONABIO), The Nature Conservancy, PRONATURA Noreste, and the Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM). Las Cruces, N.Mex.: World Wildlife Fund.

- Eckert, R., D. Randall, and G. Augustine. 1988. *Animal physiology: Mechanisms and adaptations*. New York: W. H. Freeman and Company.

- Eidenbach, P. L., R. L. Wessel, L. M. Meyer, and G. C. Wimberly. 1996. Star throwers of the Tularosa: The early Cold War legacy of White Sands Missile Range. Contributions by S. Eidenbach, J. Hilley and M. Lawson. WSMR Archaeological Report no. 9612 and Human Systems Research Reportno 9422. WSMR, N.Mex.: U.S. Department of the Army, CSTE-DTC-WS-ES-ES.

- Findley, J. S., A. H. Harris, D. E. Wilson, and C. Jones. 1975. *Mammals of New Mexico*. Albuquerque: University of New Mexico Press. 360 pp.

- Frey, J. K. 1995. Mammals of the Negrito Creek Watershed, Gila National Forest, Reserve Ranger District, Catron County, New Mexico. Final report submitted to the U.S. Department of Agriculture, Forest Service, Gila National Forest, Silver City, N.Mex. 34 pp.

- Frey, J. K., and T. L. Yates. 1996. Mammalian diversity in New Mexico. In *New Mexico's Natural Heritage: Biological diversity in the Land of Enchantment*, edited by E. A. Herrera and L. F. Huenneke. *New Mexico Journal of Science* (New Mexico Academy of Science) 36:4–37.

- Genoways, H. H., R. J. Baker, and J. E. Cornely. 1979. Mammals of the Guadalupe Mountains National Park, Texas. In *Biological investigations in the Guadalupe MountainsNational Park, Texas*, edited by H. H. Genoways and R. J. Baker, 271–332. National Park

Service Proceedings and Transactions Series no 4. Washington D.C.: U.S. GPO.

- Groves, C., L. Valutis, D. Vosick, B. Neely, K. Wheaton, J. Touval, and B. Runnels. 2000. *Designing a geography of hope: A practitioner's handbook to ecoregional conservation planning.* Vol. 1, 2nd ed. Arlington Va.: The Nature Conservancy.

- Hawley, John W. 1986. Physiographic provinces. In *New Mexico in Maps,* 2nd ed., edited by Jerry L. Williams, 23–27. Albuquerque: University of New Mexico Press.

- Kottlowski, F. E. 1975. Stratigraphy of the San Andres Mountains in south-central New Mexico. In *LasCruces country: New Mexico Geological Society 26th Field Conference,* edited by W. R. Seager, R. E. Clemons, and J. F. Callender, 95–104. Guidebook no. 26. Socorro: New Mexico Geological Society.

- Kottlowski, F. E., R. H. Flower, M. L. Thompson, and R. W. Foster. 1965. Sedimentary basins of south-central and southwestern New Mexico. *American Association of Petroleum Geologists Bulletin* 49 (11):2120–39.

- McNab, W. H., and P. E. Avers. 1994. *Ecological subregions of the United States: Section descriptions*. Administrative publication no. WO-WSA-5. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 267 pp.

- Mehlhop, P., T. Bennett, K. Elliott, and J. Preston. 1998. Delineation and characterization of drainage areas on and adjacent to White Sands Missile Range, New Mexico. Report prepared by New Mexico Natural Heritage Program for U.S. Department of the Army. WSMR, N.Mex: U.S. Department of the Army, CSTE-DTC-WS-ES-ES. 85 pp.

- Minge, A. M., and A. H. Guenther. 1986. Defense and science in New Mexico. In *From sundancers to space exploration: Significant contributions to science and technology in New Mexico*, D. His and J. Panitz. New

Mexico Journal of Science (New Mexico Academy of Science) special issue 26 (1) 275-315.

- Muldavin, E., Y. Chauvin, G. Harper, and P. Neville. 2000. *The vegetation of White Sands Missile Range, New Mexico*. Vol. 1, *Handbook of vegetation communities*; vol. 2, *Vegetation map.* Final report for Cooperative Agreement no. 14-16-002-91-233, White Sands Missile Range, U.S. Fish and Wildlife Service, The Nature Conservancy, and the University of New Mexico. Albuquerque: New Mexico Natural Heritage Program. 195, pp.; 99 pp.

- Muldavin, E., L. DeLay, T. Swetnam, C. Baisan, and K. Morino. 2001. Pinyon and juniper woodland fire studies in the Oscura and northern San Andres Mountains, White Sands Missile Range, New Mexico—fire history and stand structure (in process). Unpublished draft. Albuquerque: New Mexico Natural Heritage Program.

- Parmenter, R. R., and T. R. Van Devender. 1995. Vertebrates in the desert grassland. In *The desert grassland*, edited by M. P. McClaran and T. R. Van Devender, 194–233. Tucson: University of Arizona Press.

- Price, P. W. 1997. *Insect ecology*. New York: John Wiley and Sons.

- Ramotnik, C. A., and M. A. Bogan. 1998. Baseline surveys for mammals at Petrified Forest National Park, Arizona. Final report of the U.S. Geological Survey, Midcontinent Ecological Science Center, to the National Park Service. Denver, Colo.: U.S.Geological Survey, Midcontinent Ecological Science Center. 21 pp.

- Ruthven, A. G. 1907. A collection of reptiles and amphibians from southern New Mexico and Arizona. *Bulletin of the American Museum of Natural History* 23:483–604.
- Stebbins, R. C. 1985. *A field guide to western reptiles and amphibians*. 2nd ed. Boston, Mass.: Houghton Mifflin Co. 336 pp.

- Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. *The fishes of New Mexico*. Albuquerque: University of New Mexico Press. 393 pp.

- Vogt, B. J. 1997. The arroyo problem in the southwestern United States: Impact of climate change and land use in the southwestern United States. U.S. Geological Survey. Available at http://geochange.er.usfs.gov/sw/impacts/geology/arroyos/> (accessed September 2001).

- White Sands Missile Range (WSMR). 1992. Land use plan narrative for U.S. Army White Sands Missile Range, New Mexico. Prepared by U.S. Army Corps of Engineers, Ft. Worth District, Ft. Worth, Tex., contract no. DACA63-88-D0043. WSMR, N.Mex.: U.S. Department of the Army, CSTE-DTC-WS-IS-E. 41 pp.

- White Sands Missile Range (WSMR). 1998a. Pest Management Plan for U.S. Army White Sands Missile Range, New Mexico, November. WSMR, N.Mex.: U.S. Department of the Army, CSTE-DTC-WSES-ES.

- White Sands Missile Range (WSMR). 1998b. Public Affairs Office (PAO). White Sands Missile Range 1998 installation guide. San Diego, Calif.: Marcoa Publishing.

- White Sands Missile Range (WSMR). 1998c. White Sands Missile Range, range-wide Environmental Impact Statement.

- White Sands Missile Range Environmental Services Division Report no. WSMREIS-1.

- WSMR, N.Mex.: U.S. Department of the Army, CSTE-DTC-WS-ES-ES.

- Wilkins, D. W. 1986. Geohydrology of the southwest alluvial basins regional aquifer-systems analysis, parts of Colorado, New Mexico, and Texas. U.S. Geological Survey Water Resources Investigations Report no. 84-4224. Albuquerque, N.Mex.: U.S. Geological Survey.

- Wilson, E. O. 1992. *The diversity of life*. Cambridge, Mass.: Harvard University Press.

PERSONS CONTACTED

- Doug Burkett
  Wildlife/Range Specialist
  MEVATEC Corporation
  P.O. Box 399
  White Sands Missile Range, NM 88002
  Tel: 505-678-0693
  Email: dburkett@mevatec.com

- T. Danley
  Contact information unavailable

- Larry Kamees
  Environmental Scientist
  Environmental Services Group
  MEVATEC Corporation
  P.O. Box 399
  White Sands Missile Range, NM 88002
  Tel: 505-678-0263
  Email: lkkamees@utep.edu

- Charles W. Painter
  New Mexico Department of Game and Fish
  P.O. Box 25112
  Santa Fe, NM 87504
  Tel: 505-827-7911
  Email: cpainter@state.nm.us

Links

Go to Section 5

Go to Table of Contents

SECTION 5

5.1 INTRODUCTION

5.1.1 Visual themes and zones for the primary WSMR cantonment area are determined after performing the two 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 and Sheet 1 present a graphical portrayal of the of the installation's visual zones and themes.

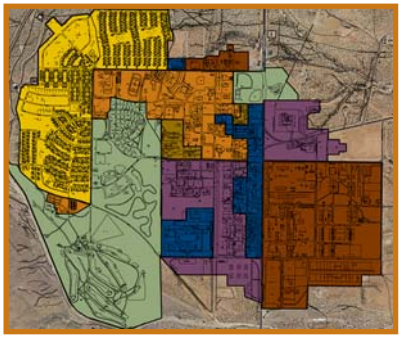


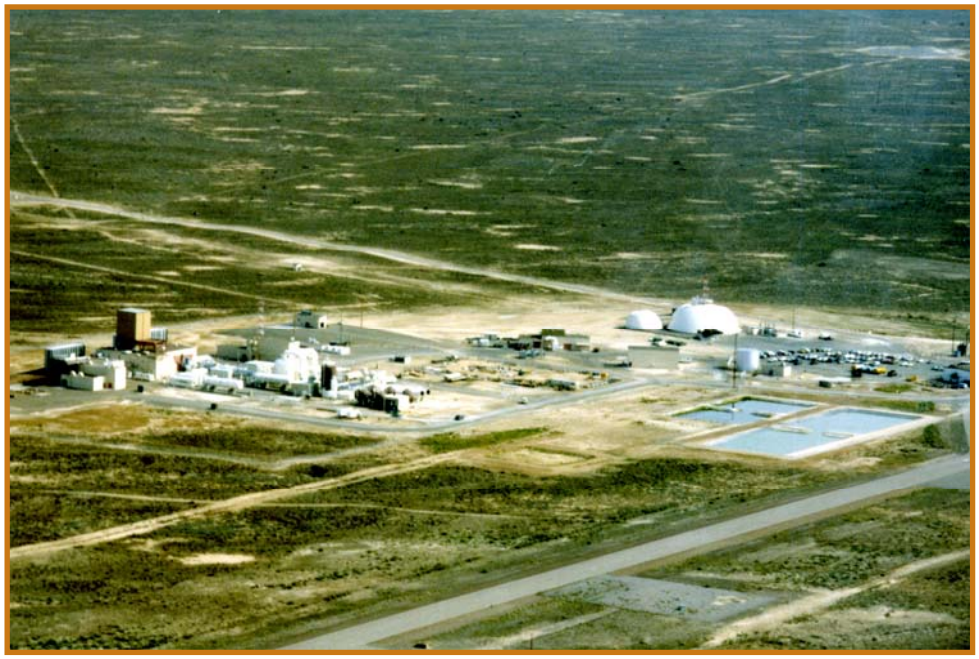
Figure 5.1 – Representation of WSMR zones and themes.

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 zones 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 5.2.2 shows the theme/visual zone relationship throughout the installation. NOTE: Visual themes for the more secondary building clusters of “Stallion” and “Helstf” areas downrange should be considered separate from the cantonment, but yet shall follow

the essential provisions and guidelines of this IDG (Fig. 5.2.2a and 5.2.2b).



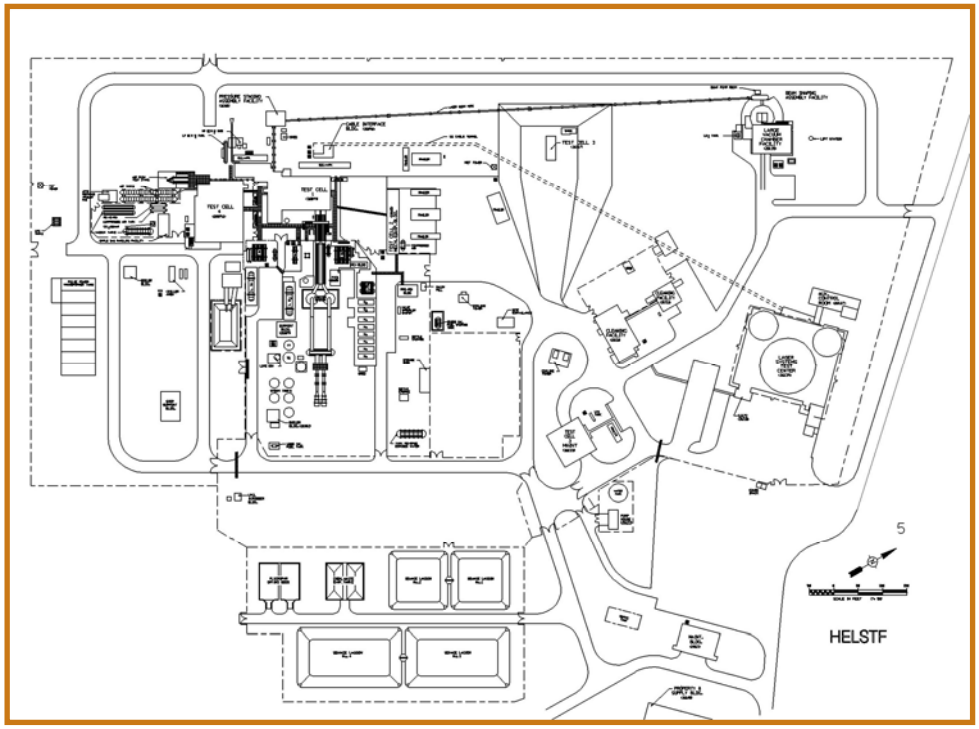


Figure 5.2.2a – HELSTF.

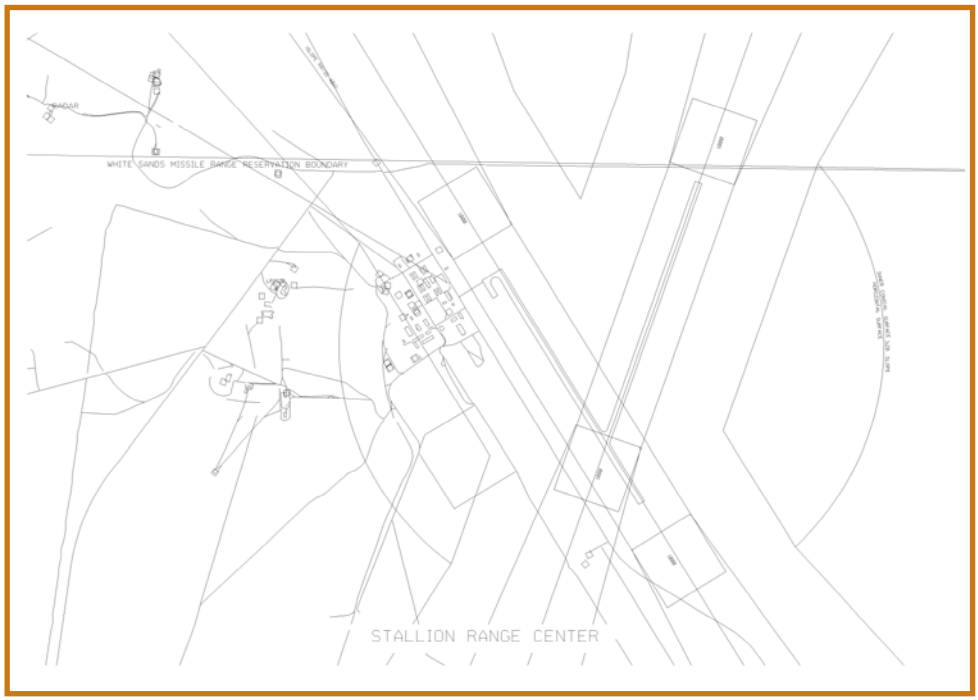


Figure 5.2.2b – Stallion range camp.

TABLE 5.2.2 THEME/ZONE RELATIONSHIP

WSMR THEME
Family Housing Visual Zone
Barracks Visual Zone
Community Facilities Visual Zone
Service Area Visual Zone
Technical Area Visual Zone
Administration Visual Zone
Outdoor Recreation Visual Zone

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 “form follows functions” 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), visual elements (Section 3, para 3.3) and design principles (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 POST-WIDE VISUAL ZONE

5.4.1 Visual Character: As a relatively remote Army installation "in the desert", the overall visual image is one of technical and military "institutional" motif. With few exceptions, the facility vocabulary is of boxy "form follows function" sterility. New architectural projects are changing this existing visual character.

5.4.2 Visual Analysis Map – See Sheet 1 (opposite p. 8-5-6).

5.4.3 **Assets**

5.4.3.1 Site Planning

Mission - The presence of the installation mission is visually prominent at the main entrance, headquarters area and museum displays. This expression of function generates pride and a sense of overall purpose and heritage (Fig. 5.4.3.1a).

Figure 5.4.3.1a – WSMR Headquarters building as a site planning asset.

Post History - Many old structures, landmarks and museum articles found throughout the installation are reflective of the post's history and provide opportunities to accentuate focal points and create cohesive visual links.

Scale – The installation's size, shape and materials create a pleasing, human-scaled environment with a good sense of a boundary.

Location –The installation's location in relation to the Organ Mountains provides a positive visual experience (Fig. 5.4.3.1b).

Figure 5.4.3.1b – Organ Mountains as a location asset

5.4.3.2 Buildings

New Construction - Recent construction has set a positive precedent for overall site design considerations such as compatibility of materials, site furnishings, vehicular and pedestrian circulation, parking, lighting, and signage. The most positive attributes seen in this new construction should be adapted and utilized in future construction. New architectural vernaculars reflecting New Mexican geometries by minimalist abstraction attempt to soften edges and corners and offer a warm desert color palette, and yet portray the "techno" R&D heritage of WSMR.

Color Scheme – The overall color palette is appropriate to the region and blends with the surroundings.

Figure 5.4.3.3 – Headquarters Avenue as a circulation asset

5.4.3.3 Circulation

Roads – Headquarters Ave. and the main perimeter loop is acceptable and easily navigated (Fig. 5.4.3.3).

5.4.3.4 Plant Material

Landscaping – The landscaping associated with newly constructed buildings and recently renovated buildings is a visual asset.

5.4.3.5 Site Elements

Facilities – The hike and bike trail, recreational amenities, playground equipment and park settings found within the installation are appropriate and provide the residents with a positive installation experience.

Figure 5.4.3.6 – New model for security barriers as an asset

5.4.3.6 Security Measures and Building Protection

Barriers – This new model around Building 100 headquarters (and Building 102) is an appropriate palette of materials, site furnishings, and plantings that help soften the appearance of barriers and other security measures, providing a good template for future construction (Fig. 5.4.3.6).

5.4.4 Liabilities

5.4.4.1 Site Planning

Visual Clutter - Unsightly areas such as motor pools, industrial facilities, service areas, trash dumpsters, storage areas and utilities often occupy visually prominent locations with inadequate screening and buffers (Fig. 5.4.4.1).

Figure 5.4.4.1 – Visual clutter, such as improperly placed dumpsters, are a liability.

Hydrology – There is currently inadequate information pertaining to the hydrology of the installation and surrounding areas. There is question to the effectiveness of the western levee system during a less frequent flood event. The lack of drainage hydrology data and criteria for design projects has caused concern on recent construction projects.

5.4.4.2 Buildings

Entries - Many entrance areas throughout the installation have been inadequately addressed providing a poor entry focus and visual impression.

Historical Buildings - The historical structures are expensive to maintain and improve due to their construction. Many such structures badly need painting and repairs.

Parking Areas - In general, parking areas are predominantly large expanses of asphalt with little or no landscaping, inconsistent lighting and signage, and no consistent maintenance (Fig. 5.4.4.2).

Figure 5.4.4.2 – Parking areas are a liability.

5.4.4.3 Circulation

Pedestrian Circulation - The installation has developed a good pedestrian circulation system in some areas, but has not developed an overall system.

5.4.4.4 Plant Material

Landscaping - Many high visibility areas are lacking in appropriate landscape planting development. There is an inadequate amount of landscaping for screening, foundation plantings, entry accents, parking lots, and buffering of incompatible land uses.

5.4.4.5 Site Elements

Site Furnishings - Site furniture, light fixtures and signage are inconsistent in design and detail, improperly located and often create visual clutter in the surrounding environment.

Signage – There is a lack of proper and uniform DOD/Army-approved signage indicating building information, visitor parking, points of entry, etc.

Emergency – There is a lack of regulation conforming fire hydrants found throughout the installation (Fig. 5.4.4.5).

Figure 5.4.4.5 – Non-conforming fire hydrants are an emergency liability.

5.4.4.6 Protective Barriers and Other Security Measures

Potential security risks are found within the zone in the form of temporary, rather than permanent solutions to security issues. For example, temporarily situated jersey barriers in some locations produce a negative visual image of the zone.

5.4.5 Recommendations

5.4.5.1 Site Planning

Visual Clutter - Remove visual clutter with proper screening techniques and appropriate organization.

5.4.5.2 Buildings

Parking Areas – Determine the necessary number of parking spaces per parking lot; then, remove the unnecessary asphalt. The addition of landscaping, proper lighting and signage, and properly painted parking spaces and circulation will help formalize the space. Employ consistent parking lot maintenance procedures.

5.4.5.3 Circulation

Pedestrian Circulation - Developed and implement an installation wide pedestrian circulation system.

5.4.5.4 Plant Material

Landscaping - Incorporate landscaping for screening, foundation plantings, entry accents, parking lots, and buffering of incompatible land uses in highly visible areas to produce a positive visual quality.

5.4.5.5 Site Elements

Signage – Incorporate properly placed regulation acceptable signage indicating building information, visitor parking, points of entry, etc throughout the installation.

5.4.5.6 Force Protection

Barriers – Address and correct any security risks are found within the installation. Also, replace the variety of unaesthetic temporary force protection barriers producing a negative visual image with the new permanent force protection model found at headquarters Building 100 (See “Antiterrorism Force Protection Landscape Design Concept Guidelines” in these IDG provisions).

INSTALLATION DESIGN GUIDE

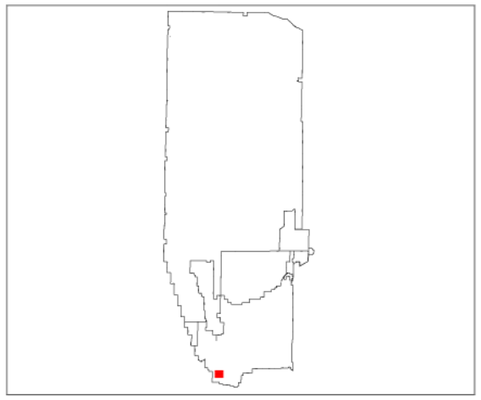
WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ZONES MAP

LEGEND

- FAMILY HOUSING
- BARRACKS
- COMMUNITY FACILITIES
- SERVICE AREA
- TECHNICAL AREA
- ADMINISTRATION
- OUTDOOR RECREATION

KEY MAP



SHEET 1

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.5 FAMILY HOUSING VISUAL ZONE

5.5.1 Visual Character

The Family Housing Visual Zone consists of all family housing units. Southwestern style architecture, flat roofs and overhanging eaves describe the overall character of the structures. Brick and stucco construction are the primary materials of which the homes consist. Many homes have a one car garage and yard space is limited. Oasis style landscape areas are minimal and dated, and trees are often overly mature.

5.5.2 Visual Analysis Map – See Sheet 2.

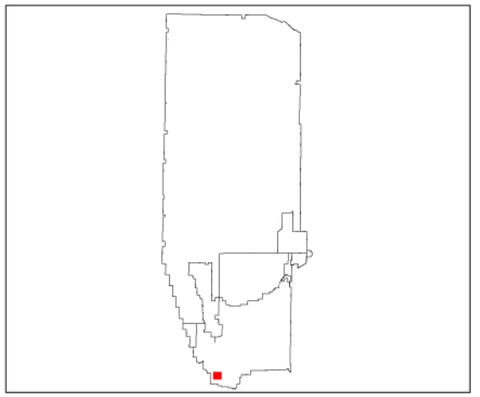
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
FAMILY HOUSING

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 2

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.5.3 Assets

5.5.3.1 Site Planning

Setting – The zone is located in a well-defined land use area in relation to the rest of the installation. The location provides an appropriate visual presence in relation to the installation's community facilities and outdoor recreation.

5.5.3.2 Buildings

Not Applicable

5.5.3.3 Circulation

Roads – The main traffic flow is contained to the perimeter of the zone. The zone is a contiguous unit with no main thoroughfares, which provides a safe environment for it residents and their children.

5.5.3.4 Plant Material

Plants – The presence of mature trees found within the zone provides a positive visual experience and is appropriate for neighborhoods (Fig. 5.5.3.4).

Figure 5.5.3.4 – The presence of mature trees is an asset.

5.5.3.5 Site Elements

Facilities – The hike and bike trail, recreational amenities, playground equipment and park settings found within the zone are appropriate and provide the residents with a positive neighborhood experience (Fig. 5.5.3.5).

Figure 5.5.3.5 – The hike and bike trail is a facility asset.

5.5.3.6 Force Protection

Barriers – This zone contains the new model for perimeter force protection. An appropriate palette of materials gives a good example for future construction.

5.5.4 Liabilities

5.5.4.1 Site Planning

Not Applicable

5.5.4.2 Buildings

Architecture - Outdated architectural design is apparent in the zone providing a poor visual image (Fig. 5.5.4.2).

Figure 5.5.4.2 – Outdated architecture is a liability.

5.5.4.3 Circulation

Not Applicable

5.5.4.4 Plant Material

Not Applicable

5.5.4.5 Site Elements

Not Applicable

5.5.4.6 Force Protection

Not Applicable

5.5.5 Recommendations

5.5.5.1 Site Planning

Not Applicable

5.5.5.2 Buildings

Architecture – Replace outdated housing units.

5.5.5.3 Circulation

Not Applicable

5.5.5.4 Plant Material

Not Applicable

5.5.5.5 Site Elements

Not Applicable

5.5.5.6 Force Protection

Not Applicable

5.6 BARRACKS VISUAL ZONE

5.6.1 Visual Character

The Barracks Visual Zone consists of all troop housing units. Functional in style, the architecture is strong in geometric form. Brick, concrete and CMU construction are the primary materials of which these multi-level barracks consist. These institutional structures, both old and new, have associated parking lots. Landscape areas are minimal.

5.6.2 Visual Analysis Map – See Sheet 3.

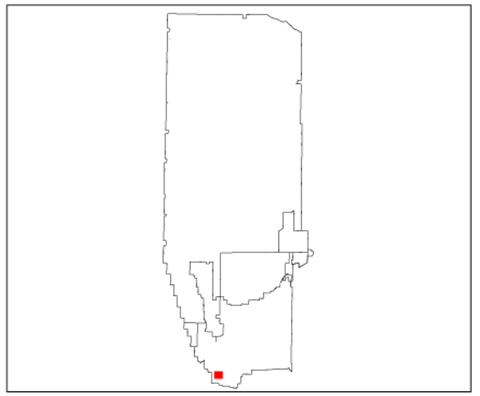
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
BARRACKS

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 3

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.6.3 Assets

5.6.3.1 Site Planning

Setting – The zone is located in a well-defined land use area in relation to the rest of the installation. The location provides an appropriate visual presence in relation to the installation's headquarters and community facilities.

5.6.3.2 Buildings

Architecture - The buildings design and constructions are appropriate for their function (Fig. 5.6.3.2).

Figure 5.6.3.2 - Building design is appropriate and an architectural asset.

Parking – There is defined parking associated with new building construction within the zone.

5.6.3.3 Circulation

Not Applicable

5.6.3.4 Plant Material

Not Applicable

5.6.3.5 Site Elements

Not Applicable

5.6.3.6 Force Protection

Not Applicable

5.6.4 Liabilities

5.6.4.1 Site Planning

Site Relationships – There is a disconnected relationship between buildings in the zone. Also, the zone is not clearly defined in relation to the surrounding community areas, creating visual confusion.

Figure 5.6.4.2 – Inconsistent architecture is a liability. Compare 5.6.3.2 to 5.6.4.2.

5.6.4.2 Buildings

Architecture - An inconsistency in architectural design is apparent in the zone. The buildings do not share a common construction (Fig. 5.6.4.2).

5.6.4.3 Circulation

Roads – Traffic flow within the zone becomes confusing due to a poorly indicated circulation pattern and the road pattern itself.

5.6.4.4 Plant Material

Landscaping – There is an inconsistency in the landscaping treatment of materials, design and plant materials used within the zone, if any landscaping at all (Fig. 5.6.4.4).

Figure 5.6.4.4 – Lack of plant material and landscape treatment is a liability.

5.6.4.5 Site Elements

Not Applicable

5.6.4.6 Force Protection

Not Applicable

5.6.5 Recommendations

5.6.5.1 Site Planning

Not Applicable

5.6.5.2 Buildings

Architecture – Long term solutions indicate that all new construction, renovation and design within the zone should attempt to unify the buildings visual character. Short term, a unity can be achieved with distinct landscaping at building focal points.

5.6.5.3 Circulation

Roads – Enhance traffic flow within the proper street signage, intersection articulation and street landscape planting.

5.6.5.4 Plant Material

Landscaping – Incorporate a consistency in the landscaping treatment of materials, design and plant materials used within the installation. Also, incorporate landscaping in areas void of landscaping.

5.6.5.5 Site Elements

Not Applicable

5.6.5.6 Force Protection

Not Applicable

5.7 COMMUNITY FACILITIES VISUAL ZONE

5.7.1 Visual Character

The Community Facilities Visual Zone consists of the community's retail, banking and grocery needs. Brick, concrete and CMU construction are the primary materials used within the zone, but no common theme or building style exists. An inconsistent architectural image and quality range is found. There is adequate parking associated with the structures. Landscape elements range from limited to good.

5.7.2 Visual Analysis Map – See Sheet 4.

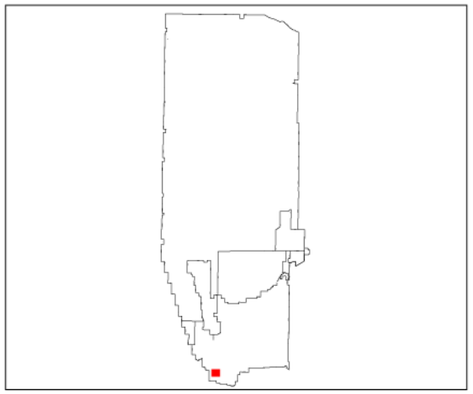
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
COMMUNITY FACILITIES

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 4

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.7.3 **Assets**

5.7.3.1 Site Planning

Setting – The zone is located in a well-defined land use area in relation to the rest of the installation. The location provides an appropriate visual presence in relation to the installation's housing.

Facilities – There is an appropriate variety in the services and facilities provided for the population living within the installation.

Figure 5.7.3.2a – The architectural design of the PDC is an asset.

5.7.3.2 Buildings

Architecture - The architectural design of the PDC sets the tone and style for future construction within the zone (Fig. 5.7.3.2a).

Parking – There is defined parking associated with new building construction within the zone (Fig. 5.7.3.2b).

Figure 5.7.3.2b – Buildings are typically the dominate feature on the installation.

5.7.3.3 Circulation

Not Applicable

5.7.3.4 Plant Material

Landscaping – The landscaping associated with newly constructed buildings and recently renovated buildings is a visual asset (Fig. 5.7.3.4).

5.7.3.5 Site Elements

Not Applicable

5.7.3.6 Force Protection

Not Applicable

Figure 5.7.3.4 – New landscaping is a visual asset.

5.7.4 **Liabilities**

5.7.4.1 Site Planning

Site Relationships – The orientation and relationship between buildings is a visual liability. There is a lack of street orientation.

Erosion – The visual presence of erosion and lack of maintenance in drainage areas provides a poor visual quality to the zone.

Figure 5.7.4.2a – The museum is an example of modern construction at WSMR. Inconsistent design is an architectural liability.

5.7.4.2 Buildings

Architecture – Different design styles were used at the installation at different points in time. This has resulted in inconsistencies in architectural design in the zone. The buildings do not share a common construction (Fig. 5.7.4.2a).

Parking - Some of the parking lots are not properly maintained and in disrepair providing a poor visual image (Fig. 5.7.4.2b)

5.7.4.3 Circulation

Roads – Traffic flow within the zone becomes confusing due to a poorly indicated circulation pattern and the road pattern itself.

Figure 5.7.4.2b – Unmaintained parking lots are a liability.

Pedestrians – There is no organized pedestrian circulation within the zone.

5.7.4.4 Plant Material

Not Applicable

5.7.4.5 Site Elements

Not Applicable

5.7.4.6 Force Protection

Not Applicable

5.7.5 Recommendations

5.7.5.1 Site Planning

Erosion – Proper site maintenance in drainage areas will provide a better visual quality to the zone.

5.7.5.2 Buildings

Parking Areas – Determine the necessary number of parking spaces per parking lot; then, remove the unnecessary asphalt. The addition of landscaping, proper lighting and signage, and properly painted parking spaces and circulation will help

formalize the space. Employ consistent parking lot maintenance procedures.

5.7.5.3 Circulation

Roads – Enhance traffic flow within the proper street signage, intersection articulation and street landscape planting

5.7.5.4 Plant Material

Not Applicable

5.7.5.5 Site Elements

Not Applicable

5.7.5.6 Force Protection

Not Applicable

5.8 SERVICE AREA VISUAL ZONE

5.8.1 Visual Character

The Service Area Visual Zone consists of the installation's motor pools, service areas, and storage facilities**.** Functional in style and large in scale, the sterile architecture is strong in geometric form and light in color. CMU and metal construction are the primary materials used within the zone. Large paved lots store some military vehicles and equipment, but overall, are wasted open areas. There are large expanses of chain link fence associated with the zone. Little to no landscaping is found within the zone. Unsightly, unused parking pavement expanses are common.

5.8.2 Visual Analysis Map – See Sheet 5.

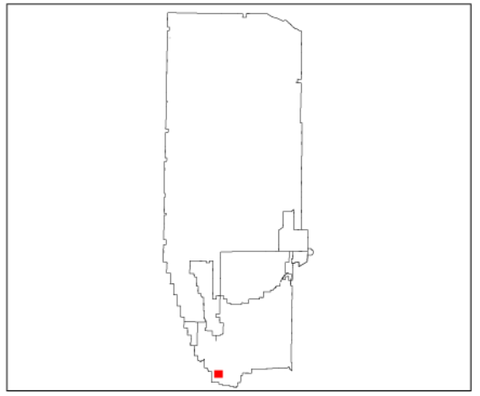
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
SERVICE AREA

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 5

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.8.3 Assets

5.8.3.1 Site Planning

Setting – The zone is located in a well-defined land use area separate from the rest of the installation. The location provides an appropriate distribution of low noise-high noise uses in relation to the adjacent areas.

Layout – The overall site layout is organized.

Figures 5.8.3.2a - Exterior building colors are typically consistent and are an asset.

5.8.3.2 Buildings

Color Scheme – The zone's buildings generally provide a visual consistency between exterior colors (Fig. 5.8.3.2a).

Architecture - A consistency in architectural design is apparent in the zone. The buildings share a common construction as well as an appropriate design for their function (Fig. 5.8.3.2b).

Figures 5.8.3.2b – Buildings are consistent in design and an architectural asset.

5.8.3.3 Circulation

Not Applicable

5.8.3.4 Plant Material

Not Applicable

5.8.3.5 Site Elements

Not Applicable

5.8.3.6 Force Protection

Not Applicable

5.8.4 Liabilities

5.8.4.1 Site Planning

Visibility - The zone is fully visible to vehicles entering the installation from the main gates and Headquarters Ave.

Screening – A lack of visual buffer around and within the zone detracts from the visual quality of the zone. Loading facilities, dumpsters, and aboveground utility structures are often visible from building entries and major roadways. There are inadequate screens or buffers between other zones and adjacent

Figure 5.8.4.1a – A lack of visual screen or buffer is a liability.

parking areas and roadways. There is also inadequate screening for deep storage areas (Fig. 5.8.4.1a).

Erosion – The visual presence of erosion and lack of maintenance in drainage areas provides a poor visual quality to the zone (Fig 5.8.4.1b).

Figure 5.8.4.1b – Erosion and lack of maintenance is a liability.

5.8.4.2 Buildings

Maintenance - Some of the older buildings are in disrepair providing a poor visual image.

Parking – There is a lack of defined parking in relation to the zone's buildings. The zone's excessive amount of unused paved parking area is a visual distraction (Fig 5.8.4.2).

Figure 5.8.4.2 – Parking areas are a liability.

5.8.4.3 Circulation

Roads – Traffic flow within the zone becomes confusing due to the lack of intersection definition. Also, poor road conditions are frequently found in the zone.

5.8.4.4 Plant Material

Not Applicable

5.8.4.5 Site Elements

Signage – There is a lack of proper signage indicating building information, visitor parking, points of entry, etc.

Common Areas – The zone is lacking common areas or courtyards for employees that office and work within the zone. Vegetated outdoor areas with site furnishings, such as benches, are missing.

5.8.4.6 Security Measures and General Site Protection

Above ground storage tanks (for water, fuels or other commodities) without landscape enhancement are an aesthetic liability.

5.8.5 Recommendations

5.8.5.1 Site Planning

Screening – Incorporate visual buffers around and within the zone for improved visual quality. Screen loading facilities, dumpsters, and aboveground utility structures that are often visible from building entries and major roadways. Screen between other zones and adjacent parking areas and roadways. Screen deep storage areas.

5.8.5.2 Buildings

Parking Areas – Determine the necessary number of parking spaces per parking lot; then, remove the unnecessary asphalt. The addition of landscaping, proper lighting and signage, and properly painted parking spaces and circulation will help formalize the space. Employ consistent parking lot maintenance procedures.

5.8.5.3 Circulation

Roads – Enhance traffic flow within the proper street signage, intersection articulation and street landscape planting.

5.8.5.4 Plant Material

Not Applicable

5.8.5.4 Site Elements

Signage – Incorporate properly placed regulation acceptable signage indicating building information, visitor parking, points of entry, etc throughout the zone.

5.8.5.5 Force Protection

Barriers – Address and correct any security risks are found within the zone, for example force protection barriers around fuel storage tanks.

5.9 TECHNICAL AREA VISUAL ZONE

5.9.1 Visual Character

The Technical Area Visual Zone consists of the installations technical areas and large scale warehouse facilities**.** Functional in style and large in scale, the institutional architecture is strong in geometric form and light in color. CMU and metal construction are the primary materials used with a varied quality and result found within the zone. Large paved lots store equipment and are used for parking. There are large expanses of chain link fence associated with the zone. Little to no landscaping is found within the zone.

5.9.2 Visual Analysis Map – See Sheet 6.

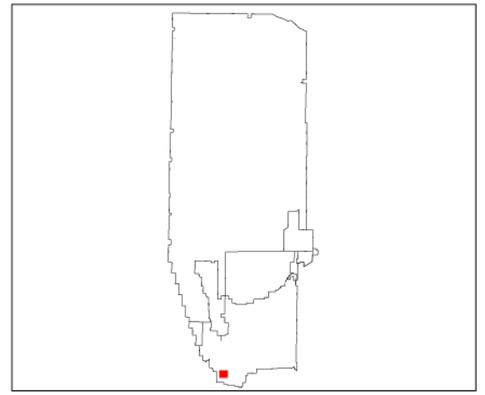
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
TECHNICAL AREA

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 6

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.9.3 Assets

5.9.3.1 Site Planning

Image - The zone's utilitarian image is appropriate for the area's industrial activities (Fig. 5.9.3.1a).

Figure 5.9.3.1a – Building design is appropriate for the zone.

Historic – The historic district within the zone appropriately reflects the historic mission of the installation (Fig. 5.9.3.1b).

Figure 5.9.3.1b – Historical buildings reflect the mission.

5.9.3.2 Buildings

Architecture - The modern architectural design of the Cox Center reflects the installation mission.

Architecture - A consistency in architectural design is apparent in the zone. The buildings share a common construction as well as an appropriate design for their function.

5.9.3.3 Circulation

Not Applicable

5.9.3.4 Plant Material

Not Applicable

5.9.3.5 Site Elements

Not Applicable

5.9.3.6 Force Protection

Not Applicable

5.9.4 Liabilities

5.9.4.1 Site Planning

Visibility - The zone is fully visible to vehicles traveling the installation from the main roads.

Figure 5.9.4.1 – A lack of visual screen or buffer is a liability.

Screening – A lack of visual buffer around and within the zone detracts from the visual quality of the zone. Loading facilities, dumpsters, and aboveground utility structures are often visible from building entries and major roadways. There are inadequate screens or buffers between other zones and adjacent

parking areas and roadways. There is also inadequate screening for deep storage areas (Fig. 5.9.4.1).

Erosion – The visual presence of erosion and lack of maintenance in drainage areas provides a poor visual quality to the zone.

Site Relationships – The proximity and zone usage in relationship to administrative buildings is a visual liability.

Figure 5.9.4.2a – Inconsistent exterior building color is a liability.

5.9.4.2 Buildings

Color Scheme – The zone's buildings are visually inconsistent between exterior colors (Fig. 5.9.4.2a).

Maintenance - Some of the older buildings are not well maintained and in disrepair providing a poor visual image.

Parking – There is a lack of defined parking in relation to the zone's buildings. The zone's excessive amount of unused paved parking area is a visual distraction. Also, uncontrolled parking is apparent (Fig. 5.9.4.2b).

Figure 5.9.4.2b – Excessive amounts of paving and undefined parking is a liability.

5.9.4.3 Circulation

Roads – Traffic flow within the zone becomes confusing due to a poorly indicated circulation pattern and lack of intersection definition. Also, poor road conditions are frequently found in the zone.

Pedestrians – There is no organized pedestrian circulation within the zone.

5.9.4.4 Plant Material

Not Applicable

5.9.4.5 Site Elements

Signage – There is a lack of proper signage indicating building information, visitor parking, points of entry, etc (Fig. 5.9.4.5).

Common Areas – The zone is lacking common areas for employees that office and work within the zone. Vegetated outdoor areas with site furnishings, such as benches, are missing.

Figure 5.9.4.5 – A lack of proper signage and signage placement is a liability. The sign shown is not even on the same side of the street as the building.

5.9.4.6 Force Protection

Barriers – Potential security risks are found within the zone. There is a lack of permanent force protection around the Cox Center.

5.9.5 Recommendations

5.9.5.1 Site Planning

Screening – Incorporate visual buffers around and within the zone for improved visual quality. Screen loading facilities, dumpsters, and aboveground utility structures that are often visible from building entries and major roadways. Screen between other zones and adjacent parking areas and roadways. Screen deep storage areas.

5.9.5.2 Buildings

Color Scheme – Painting buildings a consistent exterior color will unify the zone and enhance its visual quality.

5.9.5.3 Circulation

Roads – Enhance traffic flow within the proper street signage, intersection articulation and street landscape planting.

5.9.5.4 Plant Material

Not Applicable

5.9.5.5 Site Elements

Signage – Incorporate properly placed, regulation acceptable signage indicating building information, visitor parking, points of entry, etc. throughout the zone.

5.9.5.6 Force Protection

Barriers – Address and correct any security risks found within the zone. Around the Cox Center, replace the variety of temporary force protection barriers (which create a negative visual image) with the new permanent force protection model found at headquarters.

5.10 ADMINISTRATION VISUAL ZONE

5.10.1 Visual Character

The Administration Visual Zone consists of the installations administrative facilities**.** The buildings are generally boxy with varied quality of image. Brick and CMU construction are the primary materials used within the zone. There are large expanses of parking associated with the structures. Landscaping is found within the zone.

5.10.2 Visual Analysis Map – See Sheet 7.

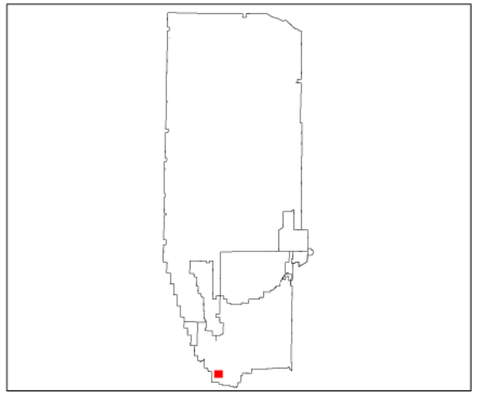
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP ADMINISTRATION

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 7

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.10.3 Assets

5.10.3.1 Site Planning

Setting – The zone is located in a well-defined land use area in relation to the rest of the installation. The location provides an appropriate visual presence in relation to the main installation access points.

Figure 5.10.3.2 – WSMR Headquarters building as an architectural asset.

5.10.3.2 Buildings

Orientation – Building orientation along Headquarters Ave. is well defined and organized. There is a positive visual entrance articulation.

Architecture - A consistency in architectural design is apparent in the zone. The buildings share a common construction as well as an appropriate design for their function (Fig. 5.10.3.2).

5.10.3.3 Circulation

Roads – The size and scale of Headquarters Ave. is appropriate and gives visitors a sense of arrival.

Figure 5.10.3.4 – Landscaping and green spaces are an asset.

5.10.3.4 Plant Material

Landscaping – The landscaping in the zone helps define the buildings and establish a sense of importance to the zone.

Visibility - Green spaces help establish a positive visual image of the installation (Fig. 5.10.3.4).

5.10.3.5 Site Elements

Not Applicable

5.10.3.6 Force Protection

Barriers – This zone contains the new model for force protection. An appropriate palette of materials, site furnishings, and plantings help soften the idea of force protection and give a good example for future construction (Fig. 5.10.3.6).

Figure 5.10.3.6 – New model for force protection as an asset.

5.10.4 Liabilities

5.10.4.1 Site Planning

Visual Clutter - Unsightly areas such as motor pools, industrial facilities, service areas, trash dumpsters, storage areas and utilities often occupy visually prominent locations with inadequate screening and buffers (Fig. 5.10.4.1).

Figure 5.10.4.1 – Overhead utilities create visual clutter.

5.10.4.2 Buildings

Parking – There is a lack of defined parking in relation to the zone's buildings. The zone's excessive amount of unused paved parking area is a visual distraction (Fig. 5.10.4.2). Also, uncontrolled parking is apparent.

5.10.4.3 Circulation

Roads – Traffic flow within the zone becomes confusing due to a poorly indicated circulation pattern and the road pattern itself.

Pedestrians – There is no organized pedestrian circulation within the zone.

Figure 5.10.4.2 – An excessive amount of unused pavement is a liability.

5.10.4.4 Plant Material

Landscaping – There is an inconsistency in the landscaping treatment of materials, design and plant materials used within the zone.

5.10.4.5 Site Elements

Signage – There is a lack of proper signage location and orientation in relation to the indicated building information.

5.10.4.6 Protective Barriers and Other Security Measures

Potential security risks are found within the zone in the form of temporary, rather than permanent solutions to security issues. For example, temporarily situated jersey barriers in some locations produce a negative visual image of the zone.

5.10.5 Recommendations

5.10.5.1 Site Planning

Screening – Incorporate visual buffers around and within the zone for improved visual quality. Screen loading facilities, dumpsters, and aboveground utility structures that are often visible from building entries and major roadways. Screen between other zones and adjacent parking areas and roadways. Screen deep storage areas.

5.10.5.2 Buildings

Parking Areas – Determine the necessary number of parking spaces per parking lot; then, remove the unnecessary asphalt. The addition of landscaping, proper lighting and signage, and properly painted parking spaces and circulation will help formalize the space. Employ consistent parking lot maintenance procedures.

5.10.5.3 Circulation

Roads – Enhance traffic flow within the proper street signage, intersection articulation and street landscape planting.

5.10.5.4 Plant Material

Landscaping – Unify the landscaping treatment of materials, design and plant materials used within the zone by using similar palette throughout.

5.10.5.5 Site Elements

Signage – Incorporate properly placed regulation acceptable signage indicating building information, visitor parking, points of entry, etc throughout the zone.

5.10.5.6 Force Protection

Barriers – Replace the variety of temporary force protection barriers producing a negative visual image with the new permanent force protection model found at headquarters.

5.11 OUTDOOR RECREATION VISUAL ZONE

5.11.1 Visual Character

The Open Space / Recreation Visual Zone consist of the community's recreational facilities and open spaces. Unique to the installation is the exceptional V2 museum and outdoor missile park which portrays the heritage of WSMR. There is adequate parking associated with the museum facility, playgrounds and gym facility. Except for the museum area, landscape elements are limited.

5.11.2 Visual Analysis Map – See Sheet 8.

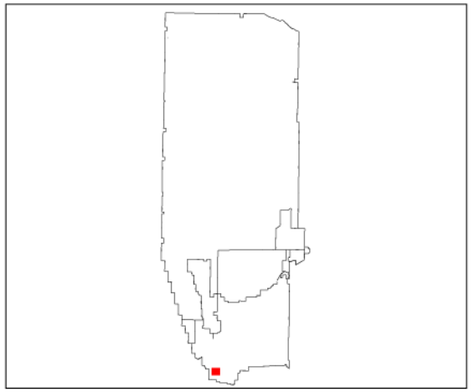
INSTALLATION DESIGN GUIDE

WHITE SANDS MISSILE RANGE, NEW MEXICO

VISUAL ANALYSIS MAP
OUTDOOR RECREATION

- MAIN ENTRANCE
- CIRCULATION
- FOCAL POINTS
- OPEN SPACE
- BUFFER
- PRIMARY ROAD
- SECONDARY ROAD
- SIGNIFICANT VEGETATION
- GOOD VIEWS
- HISTORIC BOUNDARY
- HISTORIC STRUCTURES

KEY MAP



SHEET 8

N

GRAPHIC SCALE

0 400 ft 800 ft 1600 ft

US Army Corps of Engineers

5.11.3 Assets

5.11.3.1 Site Planning

Setting – The zone is located in a well-defined land use area in relation to the rest of the installation. The location provides an appropriate visual presence in relation to the installation's housing.

Facilities – There is an appropriate amount of open space and variety in the facilities provided for the population living within the installation.

Figure 5.11.3.2 – The V2 Museum's design is an architectural asset.

5.11.3.2 Buildings

Architecture - The architectural design of the new V2 Museum Facilities and surrounding site areas provide a positive visual condition. Also, the renovation of the missiles outside the museum will continue to provide visitors with a positive experience (Fig. 5.11.3.2).

5.11.3.3 Circulation

Access – The zone is easily accessible.

5.11.3.4 Plant Material

Not Applicable

5.11.3.5 Site Elements

Playgrounds – The variety of playground facilities give children of all ages a positive recreational experience (Fig. 5.11.3.5).

Figure 5.11.3.5 – Playgrounds are a recreational asset.

5.11.3.6 Force Protection

Not Applicable

5.11.4 Liabilities

5.11.4.1 Site Planning

Setting – The northern ball fields are not located in a well-defined land use area in relation to the rest of the recreational facilities. The location provides a poor visual presence in relation to the north gate access and detracts from the arrival experience due to lack of screening (Fig. 5.11.4.1).

Figure 5.11.4.1 – The location of the northern ball fields are a visual liability.

Site Relationships – The unused housing area found within the zone, now an undefined area, is a visual liability.

Figure 5.11.4.4 – The lack of landscaping at the RV park is a liability.

5.11.4.2 Buildings

Architecture - An inconsistency in architectural design in the museum facilities is apparent in the zone. The old buildings do not share a common construction with the new facilities.

5.11.4.3 Circulation

Not Applicable

5.11.4.4 Plant Material

Landscaping – There is a lack of landscaping and plant materials used around the RV camping area (Fig. 5.11.4.4). There is a poor visual presence to the camping area and an uninviting quality for visitors using the grounds.

5.11.4.5 Site Elements

Shading – The exercise trail lacks the appropriately spaced shaded areas commonly associated with a trail of its character. There are no associated tree clusters or covered areas (Fig. 5.11.4.5).

Figure 5.11.4.5 – The lack of shaded areas along the exercise trail is a liability.

Facility – The golf course is incomplete of the intended 18 holes.

5.11.4.6 Force Protection

5.11.5 Recommendations

5.11.5.5 Site Planning

Setting – Screen the northern ball fields to provide a better visual presence in relation to the north gate access that detracts from the arrival experience.

5.11.5.5 Buildings

Architecture – Renovate the exterior of the old section of museum facilities.

5.11.5.3 Circulation

Not Applicable

5.11.5.4 Plant Material

Landscaping – Incorporate landscaping and plant materials around the RV camping area. There will enhance the visual presence to the camping area and the quality for visitors using the grounds.

5.11.5.5 Site Elements

Shading – Incorporate appropriately spaced shaded areas throughout the exercise trail through the use of tree clusters or covered areas.

5.11.5.6 Force Protection

Not Applicable

Links
Go to Section 6
Go to Table of Contents

SECTION 6

6.1 INTRODUCTION

6.1.1 Section 6 consists of projects generated from the recommendations presented in the visual zone analysis section starting at paragraph 5.4. The projects may consist of enhancement of a single visual element or improvement of an area that includes a variety of visual elements. Examples of "before" and "after" installation improvements can be viewed in Figures 6.1.1a through 6.1.1d. Depending on the project scope and cost, the projects could include: Military construction (MILCON), SRM, Host Nation programs, Non-appropriated-funded (NAF), Other Procurement, Army (OPA) and maintenance and repair, local minor construction, and self-help. For each improvement project, a description and high-level cost estimate has been provided. In each case, this information is intended to permit placement of the project within the appropriate project list or annual work plan, in an appropriate Fiscal Year, within the statutorily correct funding program. Each project requires a Capital Investment Strategy.

Figure 6.1.1a – "Before" B100 force protection landscaping.

Figure 6.1.1b - "After" B100 force protection landscaping.

6.1.2 The paragraphs below provide a general description of each project, including existing conditions, design concept, cost estimate, primary and alternate recommended funding sources, photographs, sketches and maintenance impact, as applicable.

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 provided in an interactive form and designed to be altered as circumstances effecting the prioritization scheme change.

Figure 6.1.1c – "Before" B124 walkway design.

6.2 FORCE PROTECTION

6.2.1 Existing Conditions: Throughout the WSMR installation, a variety of temporary force protection measures exist, such as concrete jersey curbs, plastic water filled jersey curbs and military jacks. There are also areas of concern with no apparent force protection measures.

Figure 6.1.1d – "After" B124 walkway design.

6.2.2 Project Description: Seek and obtain adequate funding to replace all temporary force protection measures with approved permanent force protection measures in compliance with IDG standards Section 12. All nonconforming facilities or grounds should be identified, and the appropriate permanent force protection measures provided. Projects should occur in reasonably coherent phases in different visual zones of WSMR to ensure order and uniformity, in conformance with the IDG.

6.2.3 Design Concept: All temporary force protection measures and facilities not conforming to current standards will be replaced with one of several WSMR approved models (Fig. 6.2.3a and Fig. 6.2.3b). These models include, but are not limited to:

- rock wall configurations
- berms
- bollards
- strategically located and grouped trees, shrubs and planters

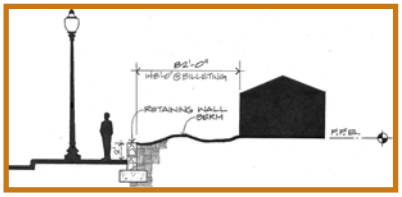


Fig. 6.2.3a – Wall and berm force protection model.

Approved force protection measures will be implemented for an individual facility and/or groups of facilities.

For cost estimating purposes, the existing rock wall configuration encircling the Headquarters facility has been used. This model is composed of a bollard system with an exterior rock wall fascia and planters. Decorative lighted

bollards are dispersed throughout the system, with pneumatic bollards positioned at driveway entries. The plant materials and curvilinear shape of the wall add an aesthetic quality to the force protection system. This model is more expensive than other force protection methods; therefore the cost estimate below represents a higher cost per linear foot for the preferred system.

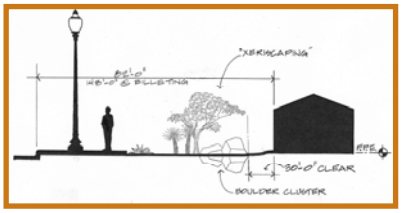


Fig. 6.2.3b – Landscape barrier force protection model.

6.2.4 Cost Estimate: The estimated cost for a rock wall force protection system is $1,000.00 per linear foot. As a less costly option, a system of Force Protection Bollards (materials + installation = $4,300 each) may be used without retaining walls and planters.

6.2.5 Site Plan: WSMR Main Cantonment

6.2.6 Maintenance Impact: All new force protection will conform to Army standards, and should by nature require minimal maintenance.

6.2.7 Recommended Funding Source: GWOT

6.2.8 Alternate Funding Source: SRM

6.3 PEDESTRIAN CIRCULATION SYSTEM

6.3.1 Existing Conditions: Throughout the WSMR installation, there are instances where pedestrian circulation routes have not been clarified, or safe pedestrian passages are lacking altogether. There are also instances where no pedestrian sidewalks or formalized crosswalks exist. Painted street and parking lot pedestrian crossings are often aged or non existent.

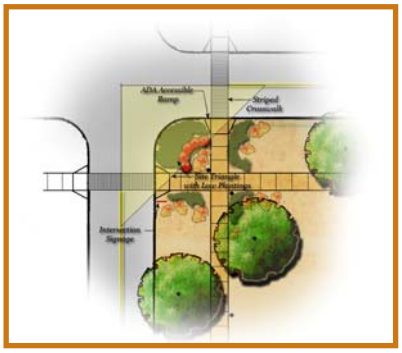


Figure 6.3.3a – Enhanced intersection conditions.

6.3.2 Project Description: Seek and obtain adequate funding to remedy the pedestrian circulation issues described above.. All sidewalks and crosswalks will comply with IDG standards Section 9. The project will be implemented at one time, or in reasonably coherent phases.

6.3.3 Design Concept: Sidewalks, crosswalks and properly painted crossings will be added throughout the installation to improve pedestrian circulation and safety (Fig. 6.3.3a and Fig. 6.3.3b). Sidewalks will be of concrete construction, 4’ to 6’ in width, with properly cut ADA street/sidewalk crossings and painted striping. For cost estimating purposes, a typical

intersection crossing and installation has been used along with a cost per linear foot of sidewalk and installation.

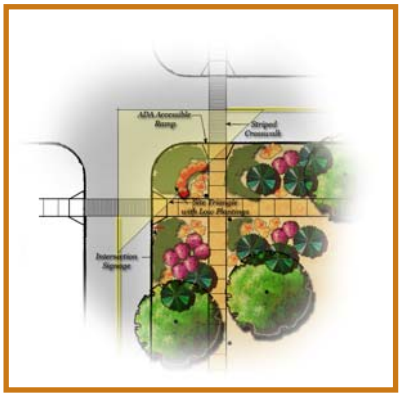


Figure 6.3.3b – Enhanced intersection conditions.

6.3.4 Cost Estimate:

Description	Cost	Unit
6' Pedestrian Sidewalk	$21.00	LF
Intersection Striping	$1,590.00	EA
Curb Ramp - ADA Accessible (new)	$1,500.00	EA
Curb Ramp - ADA Accessible (modified)	$1,500.00	EA
Pathway-Pedestrian Lighting (Materials and Installation)	$1,900.00	EA

6.3.5 Site Plan: WSMR Cantonment

6.3.6 Maintenance Impact: All pedestrian circulation elements will be of the quality and materials required by Army standards. All of these elements will have minimal maintenance requirements.

6.3.7 Recommended Funding Source: SRM

6.3.8 Alternate Funding Source: TBD

6.4 INSTALLATION SIGNAGE

6.4.1 Existing Conditions: Existing signage for entry gates, buildings and streets does not conform to Army and WSMR standards (Fig. 6.4.1a and 6.4.1b). In many cases the graphics, colors, logos and conditions are inconsistent.

Figure 6.4.1a – Missing sign.

6.4.2 Project Description: Seek and obtain adequate funding to replace nonconforming, existing signage. All signage should be replaced at one time to conform with current Army and WSMR standards.

6.4.3 Design Concept: All signage components as described in IDG section 11.4 must conform to current Army standards. For cost estimating purposes, a facility example has been used. Signage for an individual facility will consist of properly designed, colored and positioned street signage, street address identification and building number identification.

Figure 6.4.1b – Incorrect logo.

6.4.4 Cost Estimate:

Description	Cost
Large Location Sign	$1,000.00
Building Number & Street Address Sign	$500.00
Labor & Other Materials	$500.00
Total Cost Per Facility	**$2,000.00**

6.4.5 Site Plan: WSMR Cantonment

6.4.6 Maintenance Impact: All new signage will be of the quality and materials required by Army standards. All new signage will have minimal maintenance requirements.

6.4.7 Recommended Funding Source: SRM or other

6.4.8 Alternate Funding Source: TBD

6.5 EROSION AND DRAINAGE CONTROL

6.5.1 Existing Conditions: Throughout the WSMR installation, there are eroding and improperly maintained drainage areas, as well as flowage problems. Overgrowth in drainage ditches causes trash to accumulate, creates maintenance issues and hinders proper dispersal of runoff.

6.5.2 Project Description: Seek and obtain adequate funding to repair and replace eroded drainage channels, and to create a properly functioning system that is improved in visual quality. Project will address drainage areas that are visibly eroding or otherwise not properly functioning. A hydrologist will be consulted to determine proper repair and replacement scheduling, so as not to intensify a drainage problem during construction.

6.5.3 Design Concept: All problem drainage areas will be repaired. If necessary, drainage areas will be graded, and Articulating Concrete Blocks (ACBs) installed. ACBs, a linked concrete block system, are a more aesthetic alternative to traditional concrete lined channels (Fig. 6.5.3a and Fig. 6.5.3b). ACBs will help prevent erosion in drainage areas, divert runoff quickly and provide a low maintenance alternative to grass lined channels. For cost estimating purposes, a cost per square foot of materials and installation has been used.

Figure 6.5.3a – Articulating concrete blocks.

Figure 6.5.3b – Articulating concrete blocks.

6.5.4 Cost Estimate: ACB material, delivery and installation cost is $5.25 per square foot.

6.5.5 Site Plan: WSMR Cantonment

6.5.6 Maintenance Impact: Properly constructed, an installation of ACB materials will require minimal maintenance.

6.5.7 Recommended Funding Source: SRM

6.5.8 Alternate Funding Source: TBD

6.6 SCREENING

6.6.1 Existing Conditions: Throughout the WSMR installation, multiple motor pools and equipment storage lots are prominently located with little or no visual screening (Fig. 6.6.1). These facilities detract from the visual quality of the installation.

Figure 6.6.1 – Unscreened storage area.

6.6.2 Project Description: Seek and obtain adequate funding to install screening where these unattractive features exist. .All screening projects should be implemented at one time to conform with current Army standards.

6.6.3 Design Concept: Screening will be added to all chain link fence that does not currently provide a visual barrier. Several screening methods may be used. Screening fabrics, much like those on a tennis court, or metal webbing inserts like those currently found on the installation are available (Fig. 6.6.3). All screening methods must conform to the colors established for the *Southwest USA* per Appendix L. For estimating purposes, a cost per linear foot of materials and installation has been used. WSMR chain link fence sections are 8’0” x 10’0”.

Figure 6.6.3 – Screened storage area.

6.6.4 Cost Estimate: Cost for 94% privacy fabric is $3.20 - $3.50 per linear foot. Cost for Bottom-Locking Slats is $47.36 per linear foot.

6.6.5 Site Plan: WSMR Cantonment

6.6.6 Maintenance Impact: All new and updated screening will be of the quality and materials required by Army standards. All screening will have minimal maintenance requirements.

6.6.7 Recommended Funding Source: SRM

6.6.8 Alternate Funding Source: TBD

6.7 LANDSCAPING

6.7.1 Existing Conditions: Throughout the WSMR installation, a lack of landscaping creates an unaesthetic quality at highly visible areas. The lack of landscaping also makes main entrances difficult to locate.

6.7.2 Project Description: Seek and obtain adequate funding to add landscaping to create a positive visual and functional environment for those entering or otherwise utilizing the installation. All landscaping elements, techniques and plant materials will conform to IDG standards Section 10 and Appendix O. The project will be implemented at one time, or in reasonable coherent phases.

Figure 6.7.3 – Well landscaped building entry.

6.7.3 Design Concept: Landscaped areas and entry accents will be added to buildings and the RV park to enhance their visual quality. Landscaped areas will provide a variety of plant materials, colors and textures (Fig. 6.7.3). Plant materials shall consist of small to medium sized trees, shrubs, grasses and other native flora. For cost estimating purposes, a typical landscaped building entry has been used, including plant materials, edging, soil, hardscape materials and installation.

6.7.4 Cost Estimate:

Description	Cost	Unit
Site Preparation	$7.00	CY
Landscape Edging	$2.00	LF
Hardscape Paving	$27.50	SY
Soil Fill	$3.50	CY
Shade Trees	$500.00	EA
Ornamental Trees	$160.00	EA
Shrub	$40.00	EA
Groundcover	$7.00	SF
Irrigation	$0.35	SF
48” Diameter Tree Grate	$354.00	EA
Landscape Gravel (Franklin)	$10.00	CY

6.7.5 Site Plan: WSMR Cantonment

6.7.6 Maintenance Impact: All landscaping will be of quality materials, proper installation and conform to Army standards. Plant materials will require some maintenance.

6.7.7 Recommended Funding Source: SRM

6.7.8 Alternate Funding Source: TBD

6.8 PAINT/COAT EXISTING BUILDINGS

6.8.1 Existing Conditions: Throughout the WSMR installation, there are buildings and structures with wood, masonry, stucco-like, or metal clad exteriors whose colors and finishes are in varying states of deterioration (Fig. 6.8.1). Their. coloration (tones and chrome) is inconsistent with Army Standards.

Figure 6.8.1 – Old structures need paint.

6.8.2 Project Description: Project Description: Seek and obtain adequate funding to recoat/repaint all existing building walls and structure surfaces to conform with the IDG. All non-conforming building walls and structure surfaces be recoated/repainted at one time.

6.8.3 Design Concept: All exterior walls and exposed surfaces shall be limited to the three IDG wall colors per standards established for the *Southwest USA (*Appendix L, page L-13). Certain colors will be reserved for use in different visual zones to enhance and emphasize that zone's visual image, function and identification, while retaining conformance with Army's standards (Fig. 6.8.3). For cost estimating purposes, a cost per square foot of high quality paint and coating system, materials and installation has been used.

Figure 6.8.3 – PDC has been painted with colors from new palette.

6.8.4 Cost Estimate: One gallon (1 gal.) of paint will cover 250 sf of surface area. Materials and labor cost of paint is estimated to be $1.00 per square foot. A typical facility at 17,814 square foot will cost approximately $17,814.00.

6.8.5 Site Plan: WSMR Cantonment

6.8.6 Maintenance Impact: Premium paint and coating systems shall be selected to ensure longevity.

6.8.7 Recommended Funding Source: SRM or other

6.8.8 Alternate Funding Source: TBD

6.9 OUTDOOR COMMON AREAS AND COURTYARDS

6.9.1 Existing Conditions: Throughout the WSMR installation, there is a shortage of outdoor spaces for common use. The areas that do exist often have dated or otherwise unattractive site furnishings.

Figure 6.9.3a – Typical bench.

6.9.2 Project Description: Seek and obtain adequate funding to install outdoor common areas and courtyards around building clusters lacking these formalized spaces. All site furnishings must conform to the IDG standards Section 11. The project will be implemented at one time, or in reasonably coherent phases.

6.9.3 Design Concept: Outdoor common areas and courtyards will be added throughout the installation to improve the quality of life for employees and residents alike. For cost estimating purposes, a typical courtyard, associated elements and installation has been used. A courtyard space will include a hardscape ground surface with site elements such as a small covered pavilion, multiple benches, table seating, trash receptacles, and a cigarette disposal receptacle (Fig. 6.9.3a and Fig. 6.9.3b). Cost estimates associated with an outdoor courtyard will also include small landscaped areas with shrubs and trees.

Figure 6.9.3b – Typical trash receptacle and cigarette disposal.

6.9.4 Cost Estimate:

Description	Cost	Unit
6’ Concrete Sidewalk	$21.00	LF
Covered Pavilion	$25,000.00	EA
Bench	$1,500.00	EA
Picnic Table and Accessories	$1,200.00	EA
Trash Receptacle	$800.00	EA
Cigarette Disposal Receptacle	$150.00	EA
Hardscape Paving	$27.50	SY
Pathway-Pedestrian Lighting (Materials and Installation)	$1,900.00	EA
Shade Trees	$500.00	EA
Ornamental Trees	$160.00	EA
Shrubs	$40.00	EA
Groundcover	$7.00	SF
Irrigation	$0.35	SF
48” Diameter Tree Grate	$354.00	EA
Landscape Gravel (Franklin)	$10.00	CY

6.9.5 Site Plan: WSMR Cantonment

6.9.6 Maintenance Impact: All new and updated outdoor common areas will be of the quality and materials required by Army standards. These areas will have minimal maintenance requirements.

6.9.7 Recommended Funding Source: SRM

6.9.8 Alternate Funding Source: TBD

6.10 ROADWAY AND CIRCULATION ENHANCEMENT

6.10.1 Existing Conditions: Throughout the WSMR installation, improper street signage, poor intersection articulation and limited streetscape plantings exist, resulting in traffic flow problems, circulation confusion, and other potentially dangerous situations (Fig. 6.10.1).

Figure 6.10.1 – Because the cross streets are not aligned, this intersection can be awkward or confusing to both motorists and pedestrians.

6.10.2 Project Description: Seek and obtain adequate funding to update and install traffic awareness and circulation enhancing elements to conform to IDG standards (Section 9). Implementation should occur consistent with intersection hierarchy: primary, secondary and tertiary intersections.

6.10.3 Design Concept: Traffic awareness and circulation elements will be updated or revised to conform to IDG standards (Section 9). For cost estimating purposes, a typical intersection is defined as a four-way street intersection. Proper street name signage and any other relevant street signage (i.e. stop signs) will be located at each corner. Appropriately positioned planting materials will be used to formalize and articulate the space. Intersections will have sidewalks and properly painted crosswalks (Fig. 6.10.3).

Figure 6.10.3 – The same intersection, with proposed improvements.

6.10.4 Cost Estimate:

Description	Cost	Unit
6’ Concrete Sidewalk	$21.00	LF
24 ‘ Asphalt Paving	$52.00	LF
Street Name Sign	$500.00	EA
Associated Traffic Signage (i.e. stop/yield signs)	$250.00	EA
Traffic Signal (New)	$2,850.00	EA
Traffic Signal (Modified)	$1,550.00	EA
Intersection Striping	$1590.00	EA
Road Striping	$0.19	LF
Curb & 1' Gutter	$15.00	LF

Curb Ramp - ADA Accessible (new)	$1,500.00	EA
Curb Ramp - ADA Accessible (modified)	$1,500.00	EA
Street Lighting (Pole, Base, Luminaries)	$2,682.00	EA
Bollard (Materials, Installation)	$1,800.00	EA
Pedestrian Lighting (Materials, Installation)	$1,900.00	EA
Street Trees	$500.00	EA
Shrub	$40.00	EA
Groundcover	$7.00	SF
48” Diameter Tree Grate	$354.00	EA
Landscape Gravel (Franklin)	$10.00	CY

6.10.5 Site Plan: WSMR Cantonment

6.10.6 Maintenance Impact: All new and updated roadway intersections will be of the quality and materials required by Army standards. All new and updated intersections will have minimal maintenance requirements.

6.10.7 Recommended Funding Source: SRM

6.10.8 Alternate Funding Source: TBD

Figure 6.11.1 – Fire hydrant paint which does not comply with Army standards

6.11 PAINT FIRE HYDRANTS

6.11.1 Existing Conditions: Throughout the WSMR installation, there are numerous fire hydrants which are currently not in compliance with Army standards for paint and water pressure testing (Fig. 6.11.1).

6.11.2 Project Description: Seek and obtain adequate funding to bring all fire hydrants into compliance with IDG standards (Section 11). The project will be implemented at one time, or in reasonably coherent phases.

6.11.3 Design Concept: Fire Hydrants will be highly visible and unobscured by vegetation, walls or other screening. They will be nutmeg brown in color with luminous paint, and caps painted to indicate tested water pressure (Fig. 6.11.3). For cost estimating purposes, a single fire hydrant with a quality paint and coating system, materials and installation has been used.

6.11.4 Cost Estimate: Cost for materials and installation is estimated at $100.00 per hydrant.

Figure 6.11.3 – Fire hydrant painted to comply with Army standards.

6.11.5 Site Plan: WSMR Cantonment

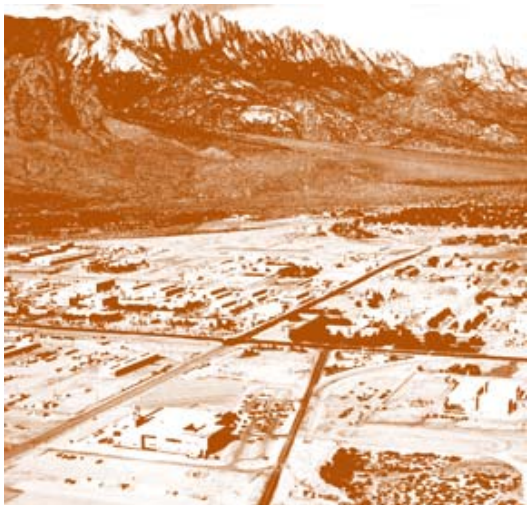
6.11.6 Maintenance Impact: Premium paint and coating systems shall be selected to ensure longevity.

6.11.7 Recommended Funding Source: SRM

6.11.8 Alternate Funding Source: TBD

Links
Go to Section 7
Go to Table of Contents

SECTION 7



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*.

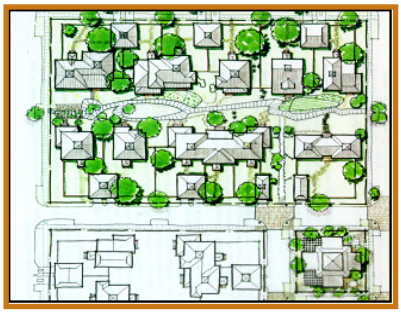


Figure 7.1.2a - Planning is the overall spatial organization of a site.

7.1.2 The site planning component provides the spatial arrangement of the installation. (Fig. 7.1.2a and Fig. 7.1.2b) 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, *Real*

Property Master Planning for Army Installations, and the Master Planning Instructions (MPI) , provide additional information concerning the master plan.

Figure 7.1.2b – WSMR conceptual 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

7.2 SITE PLANNING OBJECTIVES

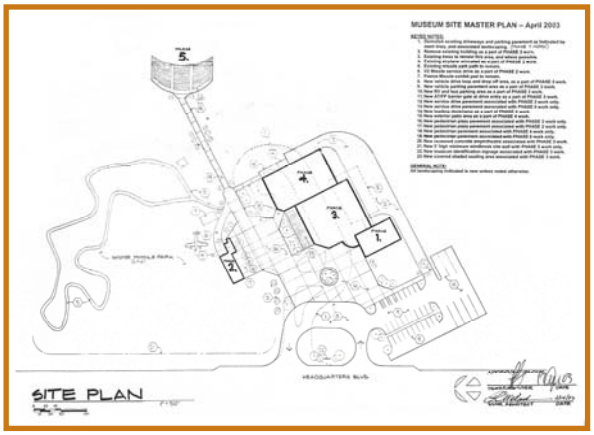


Figure 7.2.1 – Example of an approved WSMR site plan.

7.2.1 The goal of site planning for the installation is to produce an attractive, sustainable development (Fig. 7.2.1). 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 land forms and features. This development approach minimizes extensive earthwork, preserves existing drainage patterns, and preserves existing vegetation and habitat.

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.

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. 7.3.1a and Fig. 7.1.3b).

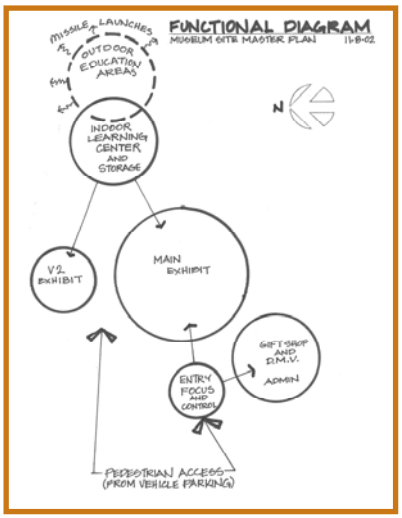


Figure 7.3.1a – Functional diagram plan.

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) , [NM] Governor's Committee on Concerns of the Disabled (GCCH) guidance, 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 raised above grade only enough for drainage with a 1 on 12 or gentler grade transition. Do not create tripping hazards when raising elevations to drain such as ramped sidewalks. Provide plenty of lighting below eye level in a wheelchair. 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.

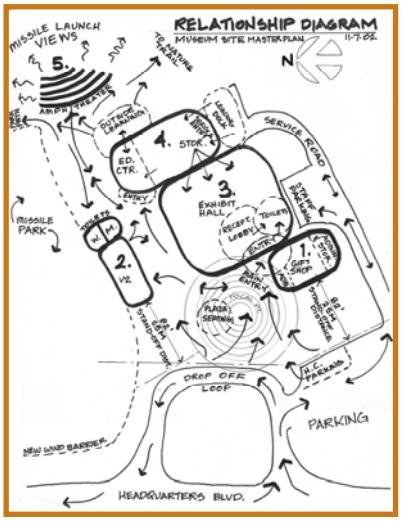


Figure 7.3.1b – Relationship diagram plan.

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. Coordinate construction plans with environmental interests as early in the conceptual stage as possible so habitat, not just wetlands, may be integrated into the conceptual design proposals.

- 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.

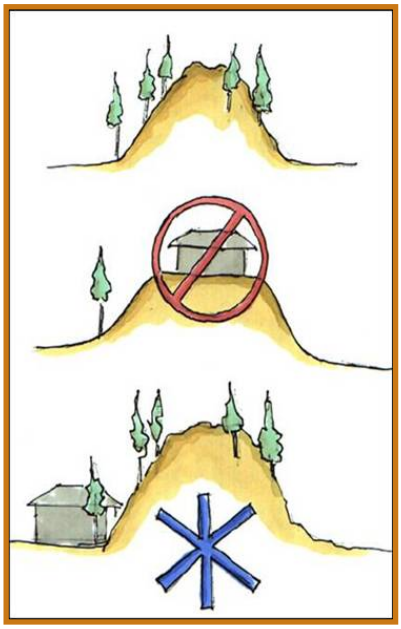


Figure 7.5.1 - Develop around natural landforms.

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 (Fig. 7.5.1).

7.5.1.1 Maintain natural ground slopes and elevations where practical to site functionality.

7.5.1.2 Align roadways and buildings along topographic lines where practical to site functionality.

7.5.1.3 Locate facilities that have expansive ground coverage on relatively flat terrain where practical to site functionality.

7.5.1.4 Use moderately sloping areas for buildings with less ground coverage area where practical to site functionality.

7.5.1.5 Avoid development on steep slopes where practical to site functionality (Fig. 7.5.1.5).

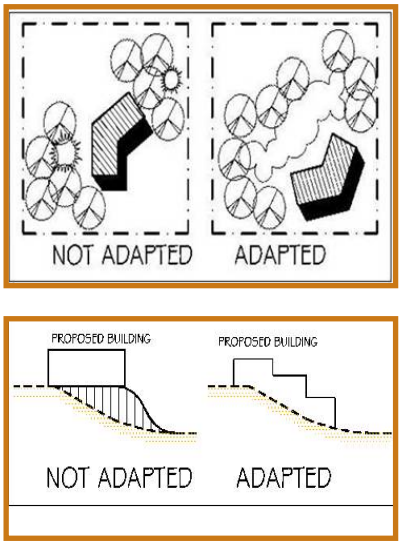


Figure 7.5.1.5 - Accommodate natural conditions.

7.5.1.6 Avoid development in natural drainage ways and flood plains where practical to site functionality. Adding river rock to decrease erosive velocities, slight arroyo alignment changes, and increased conveyance capacity may even be preferable to leaving an arroyo in its naturally unpredictable erosive state.

7.5.1.7 Provide a reasonable balance of cut and fill if sufficient quantities and quality of cut and fill are available and contribute to the functionality of the site.

7.5.2 Hydrology. The site planning team will consider the following hydrologic concerns for natural sheet flow, ponding areas, and shifting arroyos during the site planning process. Drainage must be handled with care at WSMR for new projects and the analysis of the unique watersheds, topography, impervious surfaces and streets must occur as a part of sound engineering processes for new sites. The main installation area at White Sands Missile Range is located on alluvial fan

deposits originating from the Organ Mountains to the west. The alluvial fans have created a natural slope descending from the west to east. Storm drainage is an essential consideration during the site selection process. Summer monsoon season rainfall events are usually high intensity-short duration events resulting from thunderstorms. The majority of storm water is conveyed by streets rather than an underground storm water system. Technically, comprehensive drainage plans follow determining flows (hydrology) then measures to mitigate damages to acceptable flood profiles (hydraulics) after rigorous cost to benefit analysis for various conditions and proposals augmented by value engineering considerations and R&U (Risk and Uncertainty Analysis).

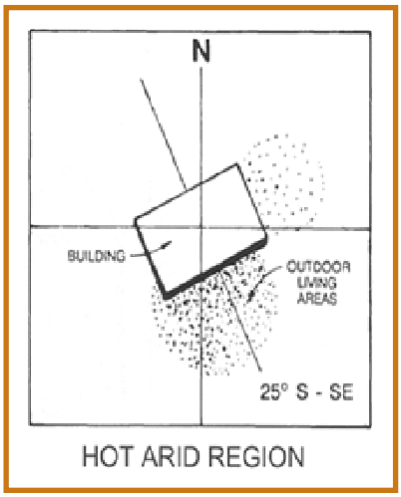


Figure 7.5.3.2 - Hot arid region development.

7.5.2.1 Preserve and maintain natural drainage areas and floodplains where practical to site functionality. Adding or restoring habitat by altering existing drainage can improve quality of life for both man and nature. Also, natural arroyos in this area are ephemeral or temporary and tend to dynamically change course, width, overflow patterns, braiding arrangements, erosion patterns and so forth if left alone.

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

7.5.2.3 Preserve significant arroyos allowing for variances as they change alignment, flood profile, vegetation patterns, overflow patterns, braiding patterns, and often dry conditions making them sometimes “invisible” to some. Incorporate sufficient distance and smart erosion protection strategies into the design layout. As a general rule, arroyos will follow the path of least resistance or energy expenditure.

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 Design and develop site to balance the effects of seasonal thermal variations promoting both winter heating and summer cooling in terms of seasonal solar orientation and prevailing winds.

7.5.3.2 Hot Arid Regions. Design and develop site to minimize solar heat gain in the summer and maximize shade and encourage humidity in outdoor spaces (Fig. 7.5.3.2).

7.5.4 Views and Vistas. The installation will be designed to preserve and enhance the significant WSMR 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, optimizes albedo benefits, 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).

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. 7.6.2.2).

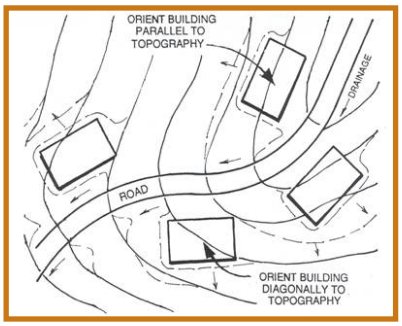


Figure 7.6.2.2 - Orient buildings and roads to topography.

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 significant 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. Recommend blending antiterrorism, planting, ditches, and people paths with common elements.

7.6.2.6 Utilize lighter colored building surfaces exposed to the sun and darker colors on recessed surfaces to absorb radiation, but in conformance with the WSMR IDG color palette and visual zones.

7.6.2.7 Orient windows according to impact of climatic conditions. Window orientation will also include energy reduction consideration with regard to natural sunlight for interior facility lighting. (also see Section 8, paragraph 8.2.2.8)

7.6.2.8 Locate development on leeward side of hills where site functionality allows.

7.6.2.9 Design and locate roads to provide a hierarchy of traffic carrying capacities to include wider and heavier military hardware.

7.6.2.10 Locate roads to blend with topography and vegetation where functionality allows.

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.

7.6.2.13 Locate trees and shrubs and other approved Xeriscape barriers to buffer harsh natural conditions absorb traffic sound (Fig. 7.6.2.13).

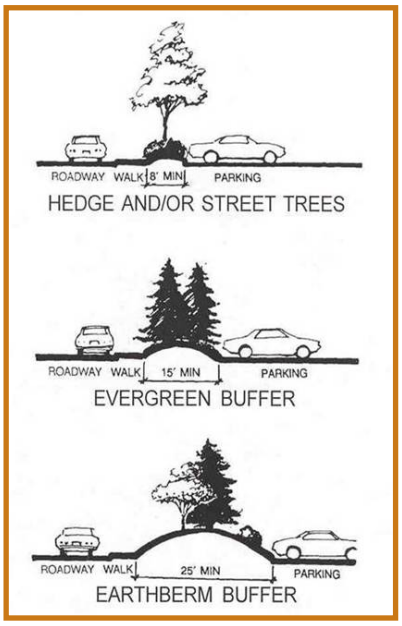


Figure 7.6.2.13 - Screen parking areas.

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, with a wide variation of barrier components and in conjunction with planned landscape design in a way that is most visually natural and not portraying a defensive paranoia.

7.7 ARMY STANDARDS

7.7.1 The cited Army Standards shall be met.

- Unified Facilities Criteria (UFC) *3-210-06FA*, Design: Site Planning and Design
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)

7.8 REFERENCES

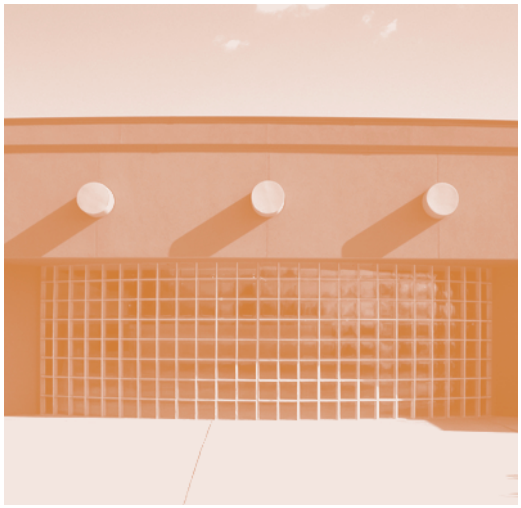
7.8.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Site Planning Design Ccomponent*, 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
- [NM] Governor's Committee on Concerns of the Disabled (GCCH)

Links
Go to Section 8
Go to Table of Contents

SECTION 8



8.1 INTRODUCTION

8.1.1 The design character of an installation's buildings affects its overall image, especially when considering the historical and technical mission heritage of WSMR, and the unique southwestern architectural vernacular of New Mexico. 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 (Fig. 8.1.1a and Fig. 8.1.1b).

Figure 8.1.1a – The V2 Museum leads the way in unique southwestern architecture.

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, forms, and colors (and combinations of colors) indigenous to the region and in conformance with the IDG's EXTERIOR COLOR CHARTS, *Southwest USA*. The preservation of historically and culturally significant structures, and the modern portrayal, interpretation, and homage paid to existing materials, colors and forms for new architectural projects adds to an installation's character and provides a sense of heritage (Fig. 8.1.2).

Figure 8.1.1b – Example of technical facility.

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 desirable incorporation of plazas covered pavilions, verandas, gazebos,

awnings, and courtyards, interior design and the appropriateness and quality of building maintenance.

Figure 8.1.2 – Rendering of V2 Museum.

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.

8.2.2 Building Design Objectives:

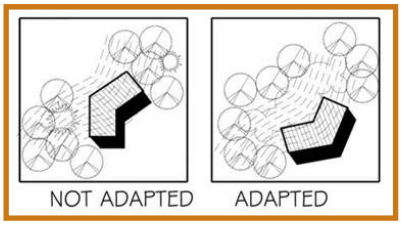


Figure 8.2.2.1 - Adapt building design to site conditions.

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

8.2.2.2 Design buildings in clusters to preserve land and reduce construction and maintenance costs. This will also assist the planning and implementation of effective and economical force protection (AT/FP) barrier strategies at building areas of concern.

8.2.2.3 Develop a coherent architectural style that results in the blending of new and old structures. Although old architecture is “boxy” and rectilinear, creative but conservatively discrete use of softer edges and corners and the inclusion of round massings/geometries with cubist forms are encouraged in new designs (Fig. 8.2.2.3a). However, when considering historical buildings one should be able to differentiate between the historic fabric and the new material and more modern architectural vernaculars (Fig. 8.2.2.3b).

Figure 8.2.2.3a – A rounded corner creates a soft edge.

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, where applicable at WSMR.

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

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, systems, trades, and practices that require less energy to produce and transport and may be recycled at the end of their usefulness (Fig 8.2.2.7).

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. Consider using building rubble in creative ways such as stone walls, to fill gabions and serve as rip-rap for use in erosion control and steep embankment preservation.

8.2.2.10 Prohibit the installation and use of hazardous building materials such as asbestos, paint containing lead (Pb), materials containing PCBs, mercury switches, and ozone depleting substances.

Figure 8.2.2.3b – The use of glass block as a modern material.

Figure 8.2.2.7 - Use of indigenous materials.

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, but also defines functional areas.

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. Therefore, any subtle changes of architecture with the use of “softer” forms for the purpose of departing from a precedent “boxy” sterility will require great care and design sensitivity.

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. 8.3.3.1). 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, building entry focus, and landscape plantings.

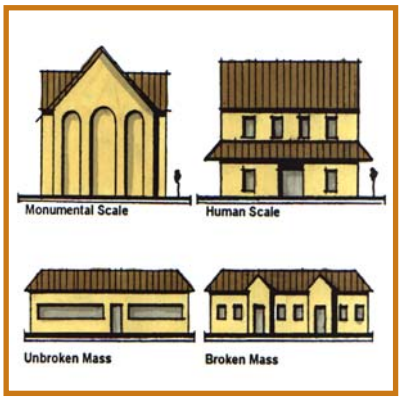


Figure 8.3.3.1 - Structure scale and massing.

8.3.3.2 Massing. Massing refers to the overall bulk or volume of a building or buildings. 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. However, at WSMR there is now a desire to initiate a departure from the sterile boxy mediocrity in building zones of high visual exposure and public usage. Creative use of architectural massing layers, stepping forms, cube forms in conjunction with round geometries, and softer edges and corners are desired for a new visual improvement and architectural interest.

Fig. 8.3.3.4a - 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. 8.3.3.4a and Fig. 8.3.3.4b). However, color schemes throughout the installation often vary according to the visual zone and visual theme in which the structure is located. In certain architectural designs with well-defined, visually segregated wall forms and massings, or emphasized entry

Fig. 8.3.3.4b - Color and form contribute to a sense of place.

elements, the creative but conservative use of color combinations may be acceptable to further define and amplify these architectural distinctions as long as the colors conform to the IDG's Exterior Color Chart *Southwest USA* and avoid a cluttered "busy" esthetic.

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

8.3.3.5.1 In housing areas, minimize use of rough exterior textures (e.g., rough stucco, rough brick, rough concrete) that can provide a foothold for bats to roost on buildings. Especially in protected areas under eves or in breezeways. Some bird species (e.g., the cliff swallow) will use rough surfaces for building mud or clay nests. Bats can also cling to protruding seams or uneven surfaces between materials (e.g. bricks, blocks, wood paneling).

Figure 8.3.3.6.2a – Example of exposed concrete as an architectural element.

8.3.3.6 Materials. The use of the same materials in the exterior finish and trim of buildings helps provide visual continuity. Certain materials and systems are required at White Sands Missile Range:

Figure 8.3.3.6.2b – Example of exposed concrete as an architectural element.

8.3.3.6.1 Walls. Most buildings in most visual zones at WSMR will employ finish wall fields composed of stucco or synthetic exterior insulation finish systems (EIFS such as "STO" or "DRYVIT" or as approved), providing a smooth textural wall typical of southwestern architecture. EIFS shall have extra thick reinforcing mesh such as "Panzer Mesh" by "DRYVIT" or "Armor Mesh" by "STO " or approved equal the first 8'-0" high of a building minimum and at areas of high exposure as approved. The textures of these stucco-like wall surfaces should be smooth and regular as possible. In technical/service zones, lab, storage, downrange or utilitarian functional areas of WSMR employing pre-engineered metal building systems, the manufacturer's standard colors for new buildings, or recoat colors for existing buildings that match closest to the required PANTONE colors per the IDG *Southwest USA* will be required. Use of natural "Franklin" stone (matching other existing WSMR stone walls and other force protection elements) may be appropriate for architectural accents, entry emphasis elements, or building wall/wainscot components.

8.3.3.6.2 Exposed Concrete. Concrete used on planters, ramps, exposed structural columns and other similar building expressions can be used discretely in a minimal way relative to

a “form follows function” design license, and to pay homage in an esthetic way to a heritage of both pronounced and historical concrete test structures at WSMR (Fig. 8.3.3.6.2a and Fig. 8.3.3.6.2b). Exposed finish on concrete is typically expressed as “rubbed”, exposed aggregate or “bush-hammered”, as approved.

Figure 8.3.3.6.3a – Example of glass block as an architectural element.

8.3.3.6.3 Glass Block. Glass block accent elements can be used for thermal benefits, diffused lighting effects, to imply and pay homage to a shiny, almost metallic (from a viewing distance), slick “techno” esthetic, and to express a traditional fenestration/wall motif that was common on some buildings during the historical era of WSMR (Fig. 8.3.3.6.3a and Fig. 8.3.3.6.3b). Preferred block type is largest size possible (12”x 12”), non-patterned clear such as “Vue” by Pittsburgh Corning. Force protection specialty type glass block can be considered at applicable site conditions that require greater levels of protection. Ballistic Resistant Glass Block such as “Vistabrik” and “Thickset” by Pittsburgh Corning should be considered in appropriate force protection (AT/FP) requirements. Coordination with the Installation Force Protection Officer and Installation Architect is necessary for determining the appropriate products.

Figure 8.3.3.6.3b - Example of glass block as an architectural element.

8.3.3.6.4 Metal Roofs. Prefinished metal roofs such as standing seam pitched roofs or the unique “barrel” rounded metal roof system should be at least 24 gage with a double lock type seam or approved substitute, and a 70% resin fluorocarbon (PVDF) finish such as Kynar 500 or Hylar 5000 (Fig. 8.3.3.6.4a and Fig. 8.3.3.6.4b).

8.3.3.6.5 Metal Doors & Frames. Doors and frames should have the same gage with the pertinent proper SDI designation to ensure that all exterior applications have a minimum of 16 gage steel sheet, and interior applications no less than 18 gage construction.

Figure 8.3.3.6.4a – Example of a rounded metal roof.

8.3.3.6.6 Wood Doors. There shall be no hollow core wood doors. Interior solid core wood doors should have the proper specification designation to ensure that the construction fabrication is “5 plies” rather than “7 plies” and a type and quality appropriate for an attractive “natural” finish, as approved.

8.3.3.6.7 Membrane Roofing. “Flat” roofs shall be of the Modified Bituminous Roofing, SBS type, 3 ply system with a

granular/mineral felt reflective cap sheet, white color, or other roofing system type only as approved.

8.3.3.6.8 Flooring. Non-carpet floor finish scenarios at exterior and interior conditions, such as various tile types and other coatings on concrete slabs shall conform to the intent of ANSI/ADA standards of static coefficient of friction (SCOF) and non-slip standards established per ASTM C-1028 and OSHA. The coefficient of friction (COF) ratings for such "hard" floors allowable at White Sands Missile Range shall be a minimum of .6 for any circumstance and condition, but .7 is desired for all flat surfaces. A COF rating of .8 shall be required at sloped ramp conditions.

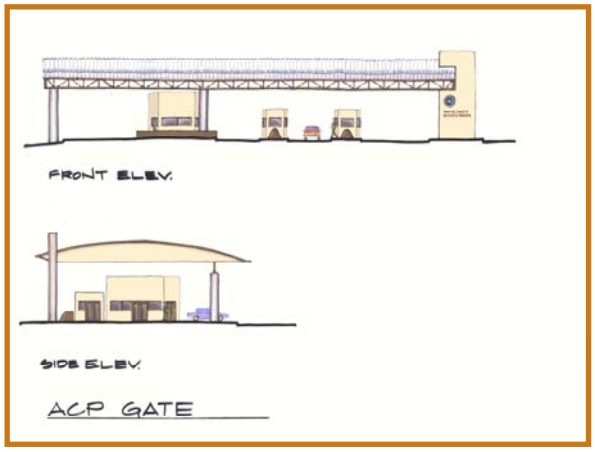


Figure 8.3.3.6.4b – Proposed metal roof for the ACP Facility.

8.3.3.6.1 New Mexico and West Texas has rock aggregates susceptible to Alkali-Silica Reaction (ASR). Alkali-aggregate reaction is a chemical phenomena involving the reaction of alkalis from the portland cement and certain aggregates in concrete. This reaction forms a gel around the rim of aggregate particles and this gel absorbs water that can lead to destructive expansion of the portland cement concrete. This expansion may result in map cracking in the surface of the concrete, popouts, spalling, expansion of the concrete, or some combination of symptoms. The aggregates involved in such reactions are usually certain forms of silica (alkali-silica reaction) and much more rarely certain forms of dolomitic aggregates (alkaili-carbonate reaction). These reactive aggregates may be either the fine or coarse aggregate or both. Damage from this reaction may become evident after just a few years or it may take decades to develop. A preliminary assessment of the alkali-aggregate reaction problem has been identified at Holloman AFB, NM and Ft Bliss, TX. Aggregate sources in the vicinity of WSMR,NM have been tested by the government for Alkai-Silica Reactivity. Contact the Albuquerque District, US Army Corps of Engineers (COE), 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435. Aggregates to be used for concrete production shall have a measured expansion equal to or less than 0.1 or les IAW current COE guidance, when tested using ASTM, C 1260 modified to incorporate the mix design proportions of cementitious materials. As a recommendation, course and fine aggregates should be washed. Aggregate shall be evaluated and tested by the contractor for alkali-aggregate reactivity in

accordance with ASTM C 1260 (Modified). ASTM C 1260 shall be modified as follows:

Utilize Type V low alkali cement and Class "F" fly as in combination as the cemetitious material for the test. Project Class "F" fly ash shall be used at a rate of 15 to 30 percent of the total cemetitious material by mass. The maximum allowable expansion shall not exceed 0.10% at 16 days. The results of such testing investigation shall be submitted to the contracting officer for evaluation and acceptance.

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. Windows shall be double-pane, low emissivity (low-e) glass with brown anodized aluminum frames or as approved. Careful selection of glazing types is necessary relative to compatible esthetics, force protection, solar shading, and energy conservation concerns. Window performance level of "40" (ie. HC-40 etc.) or greater is required (Fig. 8.3.3.7).

Figure 8.3.3.7 - Fenestration breaks up mass.

8.3.3.7.1 Minimize ledges or any horizontal surfaces that are convenient to birds for nest-building, especially above doorways, pathways, or seating.

8.3.3.8 Finished Slab Elevation. The elevation of the finished slab of a building shall be constructed a minimum of 12 inches above surrounding grade a minimum of 50 feet from the building.

8.3.3.9 Energy and Water Management. The following are energy and water items for IDG guidance:

8.3.3.9.1 Interior Lighting

8.3.3.9.1.1 Lighting levels shall be determined using AR 11-27, Army Energy Program, and Illuminating Engineering Society. Generally, 50 foot-candles (FC) at work stations, 30 FC in working areas, and 10 or less FC in non-working areas.

8.3.3.9.1.2 Lighting shall be energy efficient, compact fluorescent instead of incandescent and T-5 with electronic ballasts for working spaces.

8.3.3.9.1.3 High-bay working area lighting shall consider T5 technology.

8.3.3.9.1.4 Building window orientation shall make use of day lighting (natural light) whenever possible including the use of skylights in building entrance vestibules and restrooms. Placement of windows (if windows are to be installed) should be oriented to take advantage of natural sunlight to reduce the need for turning on interior lighting. Skylights or solar tubes should also be considered for day lighting.

8.3.3.9.1.5 Lighting in restrooms, stairways and break room areas shall be controlled by motion sensors with manual over ride.

8.3.3.9.2 Exterior Lighting

8.3.3.9.2.1 All lighting (i.e., building, parking, storage and common use areas) shall at a minimum be controlled by photocells.

8.3.3.9.2.2 Parking lot and common use area lighting located shall be solar powered.

8.3.3.9.2.3 Decorative lighting shall be kept to a minimum and require justification by the designer during the pre-design phase of the project. Total energy consumption in kilowatt-hours of decorative lighting shall be quantified including the cost to operate as part of the justification. Approval to install decorative lighting shall be obtained from the installation Energy Manager or his/her Director.

8.3.3.9.2.4 Based on security and safety requirements, lighting with exception of solar, shall also be controlled by motion sensors or timers. Timers shall turn off at 2300 hrs and remain off until 0400 hrs the following day.

8.3.3.9.2.5 New and replacement lighting shall be lowest wattage possible to meet physical security and safety requirements.

8.3.3.9.2.6 White light shall be first choice for illumination.

8.3.3.9.2.7 New and replacement lighting shall be canopied to illuminate down and not exceed 30 degrees down from horizontal spread. Lighting selection issues shall be coordinated with Directorate of Installation Support - Master

Planning Division, and, Environment and Safety Directorate - Customer Support Division.

8.3.3.9.3 Interior Water.

8.3.3.9.3.1 Water closets shall be no greater than 1.6 gpf.

8.3.3.9.3.2 Lavatory faucets and shower heads shall be low flow.

8.3.3.9.3.3 First choice for hot water shall be solar active hot water supply system. An economic analysis shall be made to verify the use of a solar active hot water supply system.

8.3.3.9.3.4 Hot water temperatures shall adhere to AR 11-27, Army Energy Program.

8.3.3.9.3.5 Hot water supply on major renovations or retrofit projects shall be by tankless water heater placed underneath the lavatory or an appropriate location close to its use. To avoid cost of installing a gas line for a standard gas water heater or a gas tankless water heater, electric powered tankless water heater(s) is acceptable.

8.3.3.9.3.6 One tankless water heater shall be installed to provide hot water for up to three lavatories. Consideration should be given to designating one or two tankless water heaters to provide hot water to these lavatories in restrooms requiring more than three lavatories.

8.3.3.9.4 HVAC.

8.3.3.9.4.1 New and replacement central chillers shall be energy efficient and be connected to Garrison's or Base Operations contractor's Energy Monitoring and Control System (EMCS).

8.3.3.9.4.2 Air cooled chillers shall be designed to meet the highest SEER possible in order to economically satisfy the cooling requirements.

8.3.3.9.4.3 Before a Ground Source Heat Pump (GSHP) system is considered to heat and cool a facility, the design engineer shall confirm a soil conductivity test was performed in the proximity of the facility to assure the GSHP application is appropriate and will operate efficiently.

8.3.3.9.4.4 Window air conditioners to augment central HVAC

are prohibited. Air distribution problems shall be reported to the Garrison Trouble Desk for corrective action.

8.3.3.9.4.5 Design of facilities containing a combination of personnel working areas and critical equipment requiring close humidity and temperature settings shall segregate the two environmental cooling/heating requirements. The critical equipment shall be placed within it's own controlled environment while the environmental control of personnel working areas shall adhere to AR 11-27, Army Energy Program guidelines for comfort heating/cooling.

8.3.3.9.4.6 Heating in large open spaces such as high bay, warehouse, missile assembly buildings shall be accomplished by radiant heaters. Radiant heaters shall be the primary replacement selection of old or failed space heaters.

8.3.3.9.4.7 First choice for facility heating and hot water supply for remote facilities shall be solar active system. An economic analysis shall be made to verify the use of a solar active system.

8.3.3.9.5 Grounds

8.3.3.9.5.1 Desert tolerant plants in conjunction with xeriscape shall be first choice for landscaping.

8.3.3.9.5.2 Consideration shall also be given to installing artificial turf in common areas in lieu of grass or as an alternative to xeriscape. An economic analysis shall determine feasibility of installing artificial turf.

8.3.3.9.5.3 Irrigation of areas around buildings and common areas shall adhere to current Garrison Water Management Plan policy with regard to watering schedules.

8.3.3.9.6 Metering

8.3.3.9.6.1 All new and major renovation of buildings shall be metered for electric, natural gas and water.

8.3.3.9.6.2 Electric and natural gas meters shall be designed for automated meter reading capabilities. Contact the Energy Management and Utilities Services Office for current metering requirements and specifications.

8.3.3.9.6.3 Activities that are required to reimburse the Garrison for utilities shall contact the Energy Management and Utilities Services Office for metering and utilities sales requirements.

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 and focus regardless of the size or importance of the building (Fig. 8.4.1a, and Fig. 8.4.1b showing Building 100 Headquarters).

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 8.4.1a - Entrance is positive visual experience.

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 (Fig. 8.5.2).

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). Attempt to merge dumpster and trash collection areas with force protection barriers and bus stops.

8.5.4 Temporary storage containers, walk-in refrigerators, grease storage containers, recycle containers, etc. shall have screening. All permanent structures shall conform to the requirements in this document.

Figure 8.4.1b – A building's entry should be a prominent feature.

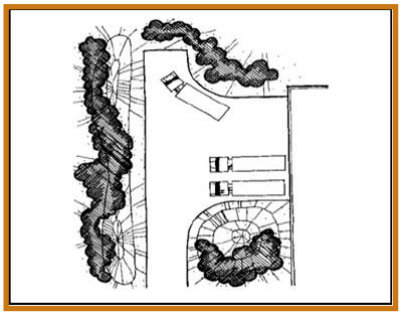


Figure 8.5.2 - Plants and berms in service area present a positive visual image.

8.6 BUILDING ACCESSIBILITY

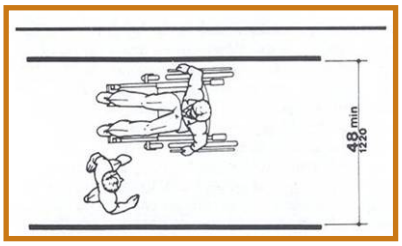


Figure 8.6.1a - ADA compliance must be met.

8.6.1 All structures or facilities, other than the exceptions mentioned below, must meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG), [NM] Governor's Committee on Concerns of the Disabled (GCCH), and the Uniform Federal Accessibility Standards (UFAS) accessibility standards. The more stringent standards apply in the event of conflicting guidelines (Fig. 8.6.1a and Fig. 8.6.1b). Any needed advisory or evaluation of accessibility conformance for buildings shall be through the office of the Installation Architect, Master Planning Division.

Figure 8.6.1b – Example of WSMR ADA ramp associated with Headquarters B100.

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.

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. 8.9.1a). Indigenous design elements should be utilized in the design of new buildings.

Figure 8.9.1a – Example of a indigenous culture from the region.

8.9 HISTORIC ARCHITECTURE

8.9.1 Indigenous structures known to have been on the WSMR range in the ancient past influence modern regional architecture (Fig. 8.9.1a), as do existing "listed" historical buildings and other structures on post. 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 (Fig. 8.9.1b). The State of New Mexico's State Historical Preservation Office (SHPO) is the jurisdiction authority at WSMR for the NHPA and this is administrated by the (ES) WSMR post archeologist through coordination and request of a Master Planning Division project manager or Installation Architect. When working with historic properties the Army uses the following three categories:

Figure 8.9.1b – Historical WSMR chapel 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.

8.9.3 See Appendix M, Historic Preservation Guidelines.

8.10 RENOVATIONS AND ADDITIONS

8.10.1 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. 8.10.1a and Fig.8.10.1b). 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.

Figure 8.10.1a – WSMR headquarters entry addition.

Not This.
Figure 8.10.1b - Renovation and additions should be compatible.

8.10.2 Prohibit the use of hazardous building materials in all renovations and additions. Hazardous building materials include but are not limited to asbestos containing material, paint containing lead (Pb), mercury switches, material containing PCBs, and ozone depleting substances.

8.10.3 Ensure that prior to any renovations or additions, existing buildings, are inspected to determine the presence, location, quantity, and condition of hazardous building materials.

8.10.4 Utility Metering:

- All new and major renovation of buildings shall be metered for electric, natural gas and water.
- Electric and natural gas meters shall be designed for automated meter reading capabilities. Contact the Energy Management and Utilities Services Office for current metering requirements and specifications.
- Activities that are required to reimburse the Garrison for utilities shall contact the Energy Management and Utilities Services Office for metering and utilities sales requirements.

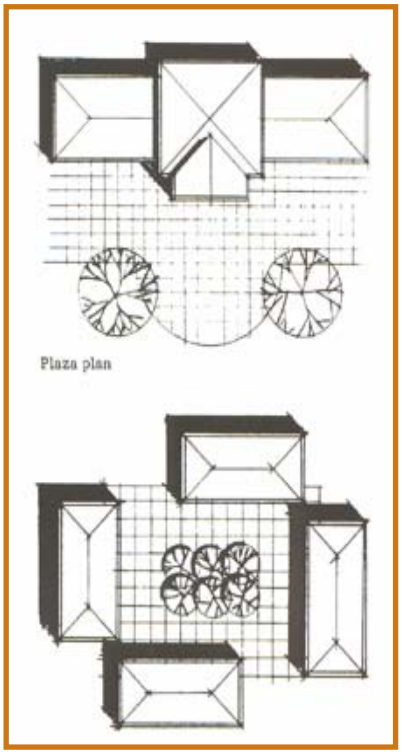


Figure 8.11.1 - Plazas and courtyards.

8.11 PLAZAS AND COURTYARDS

8.11.1 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. 8.11.1). Wide, paved entrance plazas need vehicular barriers. Decorative lighting will be minimal and provided by solar powered fixture(s).

8.11.2 Minimize the use of outdoor breezeways at all buildings. Breezeways are especially attractive to bats for daytime roosting, and are sometimes used by nesting birds.

Figure 8.13.1a – Rendering of WSMR headquarters interior lobby.

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.

Figure 8.13.1b – Example of constructed interior lobby.

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, architects, or as approved by the WSMR Installation Architect, Master Planning Division. 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 (Fig. 8.13.1.a through Fig. 8.13.1c). In general, it is desirable for WSMR projects that the interior esthetic reflects the southwestern and New Mexican motifs, modernistic technical heritage and desert tone colors for walls, floors, and furniture where possible.

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*.

Figure 8.13.1c – Example of interior lobby.

- 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.

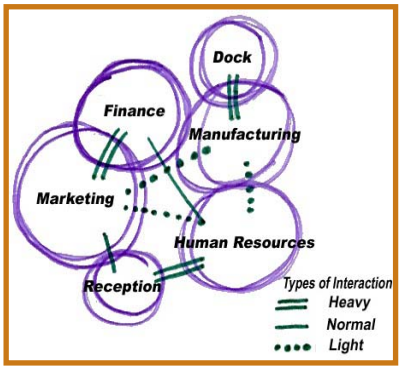


Figure 8.13.4.2.1 - A typical bubble diagram indicating group relationships.

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.

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 and architects are best at gathering the required information to formulate a space utilization plan.

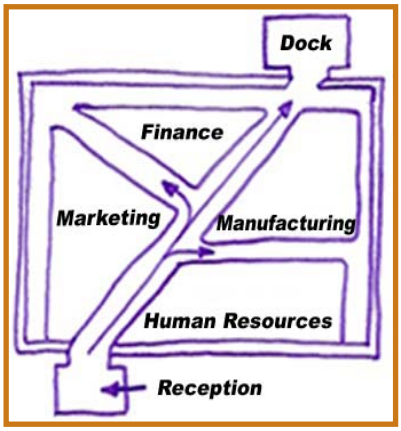


Figure 8.13.4.2.2 - A typical blocking diagram demonstrating the fit into the floor plan.

8.13.4.2.1 Bubble Diagrams. Bubble diagrams show the working relationship of one group to another (Fig 8.13.4.2.1). They do not represent a site plan, 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 site or facility as well as a new facility, and allow for user/customer confirmation prior to developing space/floor plans. Bubble diagrams evolve into block diagrams or zone plans, that then evolve into rough floor plans later.

8.13.4.2.2 Blocking Diagram. An extension of the bubble diagram is the block diagram, the first version of a rough site plan or floor plan. The blocking diagram is made more regular

and is for fitting inside the proposed floor plan area constraints (Fig. 8.13.4.2.2).

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

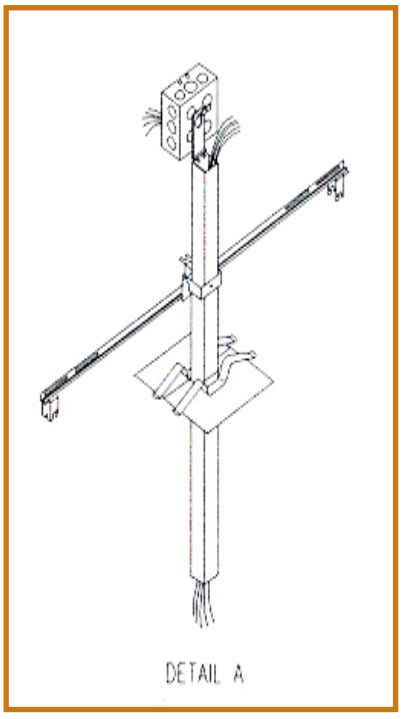


Figure 8.13.5.3 - System furniture utility column for electrical and communication distribution.

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.

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, 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. 8.13.5.3).

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. Bright interior colors to minimize lighting requirements to reduce energy usage shall be the primary selection. Avoid dark, non-reflective interior colors. *There should be a relationship of interior color with exterior color in facilities to assure a coherent order and overall design theme.* The color scheme of a project shall be approved by the WSMR Installation Architect, Master Planning Division.

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, landscape architect, and architect are is concerned with reducing unwanted noise on sites and buildings and preserving desirable sound in a space. Sound can be controlled in the

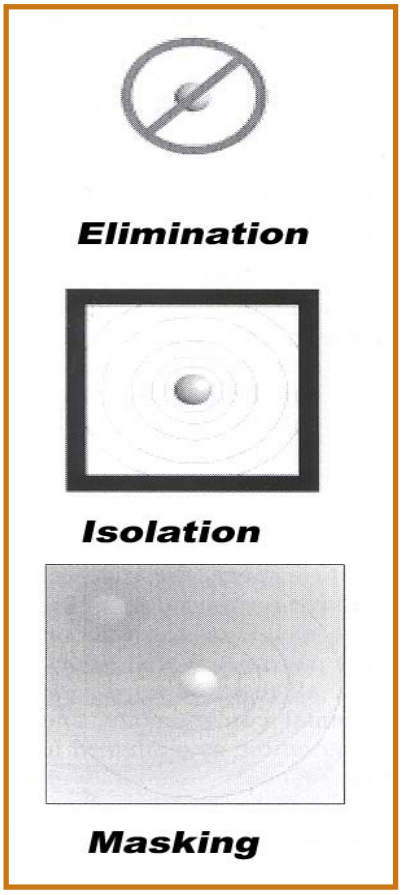


Figure 8.13.7.1 - Control noise sources.

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 (Fig. 8.13.7.1).

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. AR 11-27, Army Energy Program, recommends 50 foot-candles (FC) at work stations, 30 FC in working areas and 10 FC or less in non-working areas. Consider using skylights and solar tubes for entrance vestibules, restrooms and waiting areas. When needed, 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. Coordinate fenestration design for daytime lighting levels. Glass block accents on walls are desirable to amplify natural lighting from exterior to interior areas, and for "opening" constricted, dark interior areas and transferring natural light to spaces that may not have direct contact with exterior fenestration. Occupancy sensors with manual overrides should be considered for restrooms, stairways and break rooms. Attempts shall be made to use day lighting whenever possible. Lighting located in entrance vestibules and stairwells that contain windows large enough to provide 30 to 40 foot-candles will be controlled by a photo-sensor and manual ON/OFF switch to reduce energy usage during daylight hours.

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 8.13.8.2). Use compact fluorescent instead of incandescent and T-5 with electronic ballast for working spaces. 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. New and renovated buildings will utilize T5 lighting technology with reflective fixture. Any T12 fluorescent fixture requiring replacement will be replaced by a T5 fixture. In areas where more than one T12 fixture will be replaced, a photometric analysis should be conducted to determine placement of new T5 fixtures

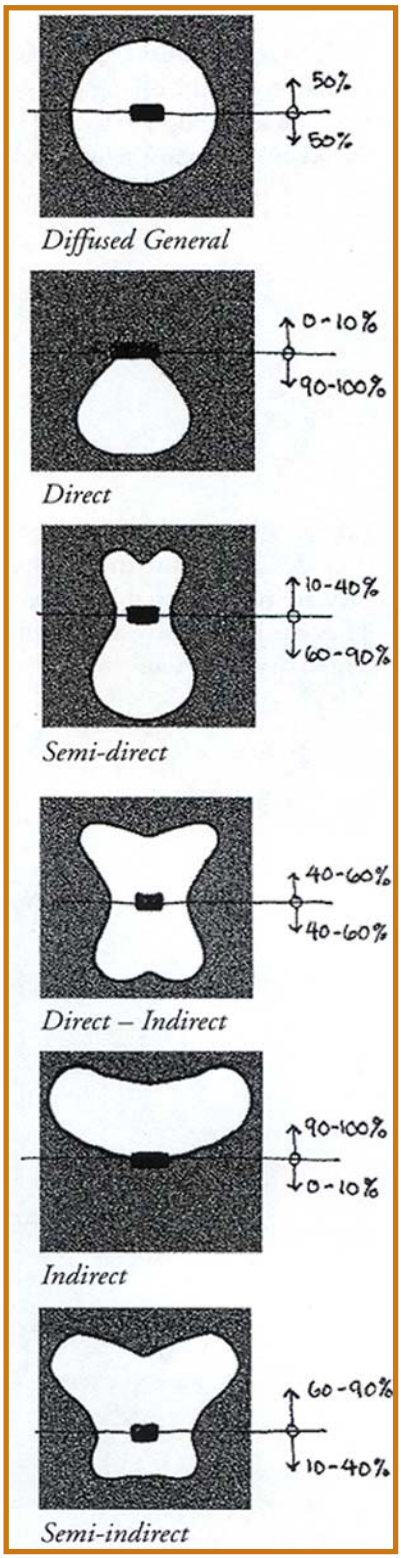


Figure 8.13.8.2 - Typical distribution of light.

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 Chp. 5
- Air Force Interior Design Guides, Chp. 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, Chp. 9. A lighting maintenance program shall be set-up in order to maintain the proper foot-candle levels required by 8.13.8.1. Poor lighting maintenance leads to lower than desirable foot-candle levels resulting in an increase in the use of unnecessary supplemental lighting.

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 Finishes Standards. Installation finishes 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. When selecting furnishings for an interior environment, under ideal circumstances and within realistic budget constraints, care should be taken to include their design as an integral part of the overall concept and to ensure coherency between architecture, materials, furniture, color, 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.

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.

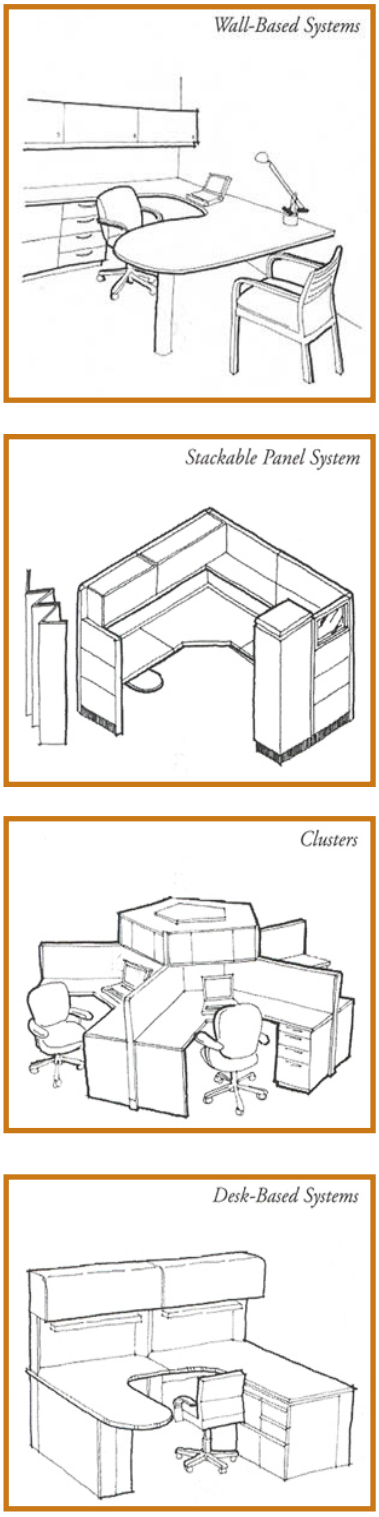


Figure 8.13.11.1 - Systems furniture.

Furniture includes seating and case goods (Fig 8.13.11.1). 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 (Fig. 8.13.11.1.1). 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 Heating/Cooling 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
    - 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 separation, 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, telephone equipment or fire alarm pull stations.
- 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.

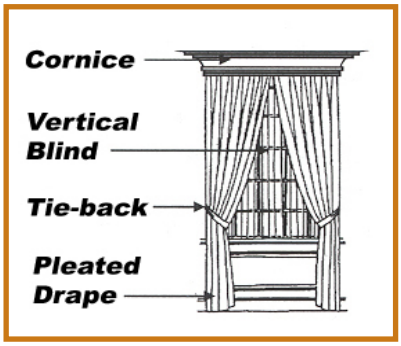


Figure 8.13.11.2.2 - Window treatments should complement the interior space.

8.13.11.2.2 Window treatments should complement and support the interior design of a space (Fig. 8.13.11.2.2). 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. 8.13.11.3.1).

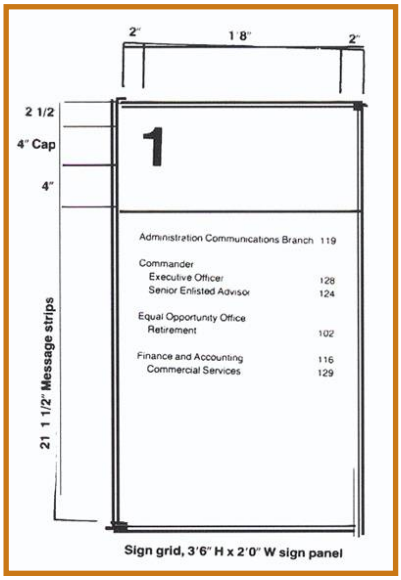


Figure 8.13.11.3.1 - Directional signal directs circulation.

8.13.11.3.2 Interior signage is covered in detail in UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003. The manual includes graphics for the following: directional, identification signs, information, and pictograms.

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 (Fig. 8.13.11.4.3).

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.

Like This

Not This

Figure 8.13.11.4.3 - Decorative accessories can add a sense of uniqueness.

8.13.11.6.1 Plants add color, texture, indigenous nature and variety of form and shape to the interior. They bring a natural element to an interior space. They can bring the New Mexican desert into the building in discrete ways, and unify the overall design concept. 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.

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 hazardous building materials.
- 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.
- For new construction or major renovations, fire extinguishers will be recessed into the wall and not wall-mounted.
- 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.

Figure 8.14.1.1a – Example of a conceptual design for the family housing visual zone.

Figure 8.14.1.1b – Example of a building in the barracks visual zone.

Figure 8.14.1.1c – Example of a building in the community facilities visual zone.

8.14 EXTERIOR BUILDING MATERIALS AND COLOR

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. The exterior color is an essential element to relate to the local architectural vocabulary of WSMR in conformance with Army requirements, and those colors relate to a unique regional (New Mexican) desert palette, often reflected in the traditional building designs of this State. A limited palette of durable, low maintenance materials should be used that encourages a variety of expressions while providing 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, but also the particular character of local architecture, which is predominantly a stucco-like even-textured wall finish with straight-line parapet rooflines. With the exception of sloped roof images in the residential areas, the image of this exterior material and flat roof appearance is desired at WSMR, and is a traditional

esthetic paying homage to the adobe tradition of New Mexico and indigenous structures of the ancient WSMR past (Fig. 8.14.1.1a though Fig. 8.14.1.1g).

8.14.1.2 Use the following guidelines when selecting exterior building materials.

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 except as necessary with existing buildings and other exposed structures at WSMR.

8.14.1.2.3 Use WSMR installation IDG-approved standard colors for exterior walls. Add accent colors sparingly, and usually employ a single field color for a building wall. Use combinations of approved colors for walls only to emphasize and complement unique architectural massings that may occur in high exposure designs rarely, and only in a discrete way to avoid a cluttered look, and as approved by the WSMR installation architect. Accent colors can be used in recesses/reveals, doors/frames, canopies, and to accent certain portions of a buildings façade and for entry focus. Minimal and discrete use of native stonework and/or exposed concrete for certain architectural elements in a new design can be employed as an "accent".

8.14.1.2.4 Use pre-finished material where possible for gutters, window frames, metal roofs, stucco/EIFS, doorframes, etc.

8.14.1.2.5 Use manufacturer's standard colors that most closely approximate IDG-approved colors in Appendix L on pitched metal roofs, pre-engineered metal building systems, and stucco/stucco-like systems.

Figure 8.14.1.1e – Example of a building in the technical visual zone.

8.14.2 **Appendix K, Exterior Materials Charts** list and the subsequent Appendix L list the required building materials and associated colors for *Southwest USA* generally applicable to WSMR. The following charts based on Appendix L have specific guidance for some materials and colors, applicable to the particular WSMR visual zones as listed as follows:

- Housing Visual Zone

Figure 8.14.1.1f – Example of a building in the administration visual zone.

- Community Support Visual Zone
- Technical/Service Visual Zone
- Administrative Visual Zone

Figure 8.14.1.1g – Example of a building in the outdoor recreation visual zone.

8.14.3 Exterior Building Color.

8.14.3.1 Color charts have been developed for specific geographical areas (Fig. 8.14.3.1) giving consideration to climate, geography, culture, facility function, historical context, architectural character, etc. Color changes of existing buildings will be implemented during normally scheduled paint cycles or as a program or project is funded (see Appendix L, Exterior Color Charts).

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. All colors shall be approved by the Installation Architect.

8.14.3.3 Historic Buildings. Repaint the building or structure to match the existing colors or colors that can be documented and on record to have been used on that building, or as approved by SHPO and the Installation Architect.

Figure 8.14.3.1 - The geographical areas for exterior colors.

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, Army 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 (DEFAC). 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 criteria 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 criteria 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 equipped with an approved residential range top extinguishing system;
- 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, BBN HQ buildings, BDE buildings, and DEFAC 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

8.16.1 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.

8.16.2 Physical security lighting shall meet the minimum illumination requirement to reduce energy use and cost. Consideration will be given to controlling the lighting by timers and or motion sensors. All security lighting will be controlled by photocell.

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 WSMR PERSCRIPTIONS/LESSONS LEARNED

8.18.1 Preparation of this IDG has demonstrated the importance of having all stakeholders brought on board early in the process, and keeping them informed and involved throughout.

8.19 ARMY STANDARDS

8.19.1 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

8.20 REFERENCES

8.20.1 The following references are provide 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) 3-600-01, Design Fire Protection Engineering for 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, Information on 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

Links
Go to Section 9
Go to Table of Contents

SECTION 9

9.1 INTRODUCTION

9.1.1 The image of the installation is greatly determined by the design and location of roadways, walkways, entrances (Access Control Points, or ACPs), and parking lots (Fig. 9.1.1a and Fig. 9.1.1b). 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.

Figure 9.1.1a – ACP complex.

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.

Figure 9.1.1b – ACP reception facility.

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.

Figure 9.2a - Vehicular/pedestrian system.

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

Figure 9.2b - Separate pedestrian/ bicycle/ vehicular access.

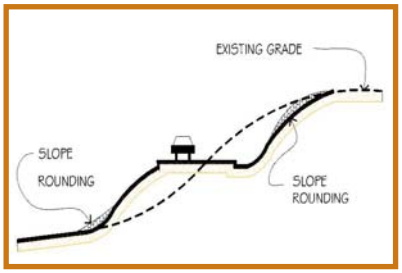


Figure 9.2c - Adapt circulation to topography.

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. 9.3.1).

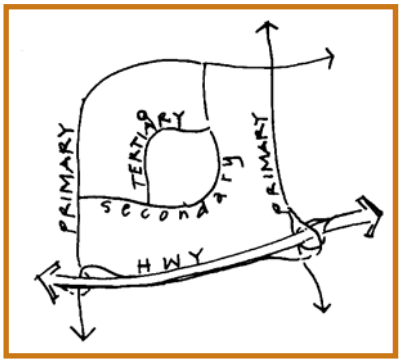


Figure 9.3.1 - Roadway hierarchy.

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.

9.3.1.1.8 Incorporate culvert underpasses or overpasses in new highways at known wildlife crossings to reduce traffic accidents with wildlife. Design and spacing of culverts will be coordinated with WSMR Wildlife Biologists.

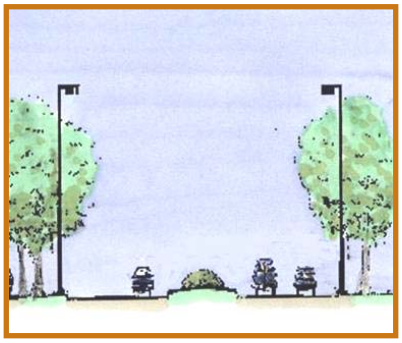


Figure 9.3.1.2a - Primary roadway.

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. 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 (Fig. 9.3.1.2a) are designated as boulevards (Fig. 9.3.1.2b) in urban areas and as avenues in rural and suburban areas. Design characters include:

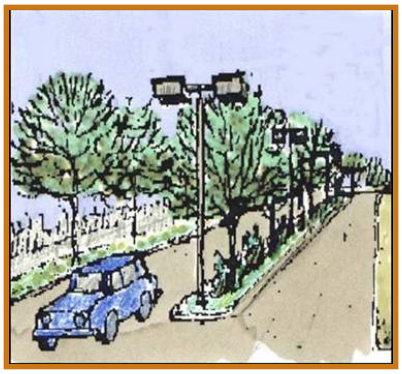


Figure 9.3.1.2b – Boulevard.

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.

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 acre. Curbs should be designed to deny vehicles the capability of exiting the roadway except at authorized location in accordance with access control procedures.

9.3.1.2.9 Incorporate culvert underpasses or overpasses in new primary roadways at known wildlife crossings to reduce traffic accidents with wildlife. Design and spacing of culverts will be coordinated with WSMR Wildlife Biologists.

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. 9.3.1.3a and Fig. 9.3.1.3b). 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:

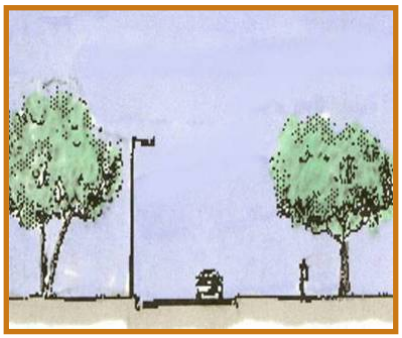


Figure 9.3.1.3a - Secondary street.

Figure 9.3.1.3b - Improved, visually appealing streetscape.

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.

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 (Fig. 9.3.1.4a and Fig. 9.3.1.4b). Design characteristics include:

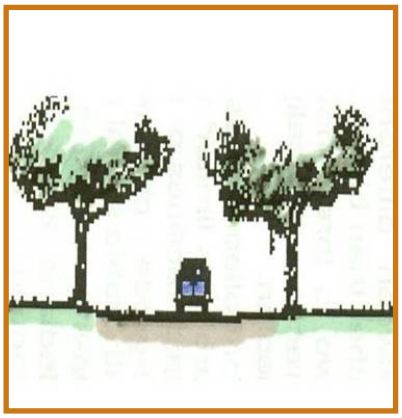


Figure 9.3.1.4a - Tertiary street elevation.

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.

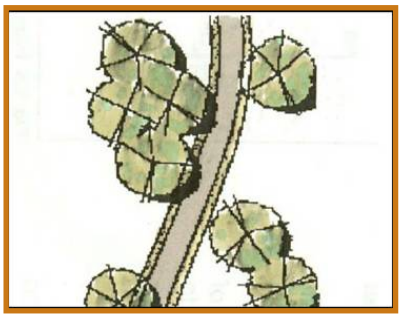


Figure 9.3.1.4b - Tertiary street plan.

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.

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.

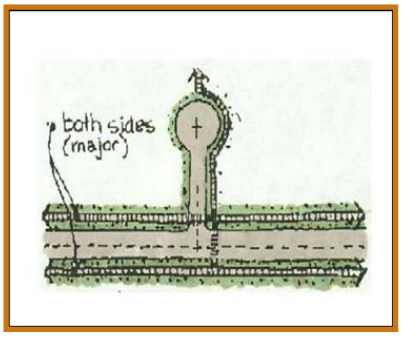


Figure 9.3.1.5 - Cul-de-sac plan.

9.3.1.5 **Cul-de-sacs**. Cul-de-sacs are short dead-end tertiary streets located primarily in residential areas (Fig. 9.3.1.5). 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.

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.

9.3.1.5.4 Turnarounds must include a diameter to accommodate fire apparatus, other emergency vehicles 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 (Fig. 9.3.1.5.6).

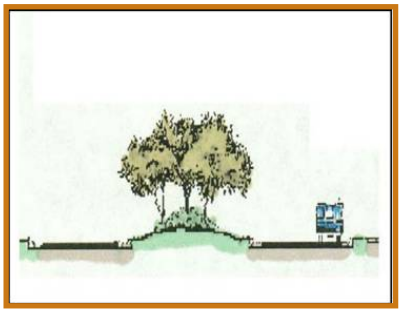


Figure 9.3.1.5.6 - Cul-de-sac section may incorporate plantings.

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.

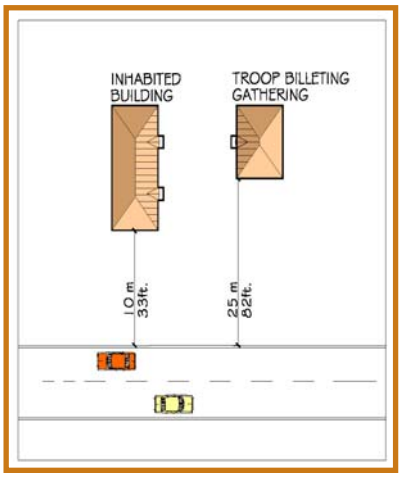


Figure 9.4 - Antiterrorism roadway setbacks within a controlled perimeter.

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. 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) (Fig. 9.4). The recommended minimum setback for White Sands Missile Range is 25 meters (82 feet). (See, Unified Facilities Criteria (UFC) 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

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. 9.5.1). The following design techniques should be applied to circulation system design.

Figure 9.5.1 - Positive visual image.

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. 9.5.2).

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.

Figure 9.5.2 - Build circulation into 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 must be given to meeting 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. 9.5.3).

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.

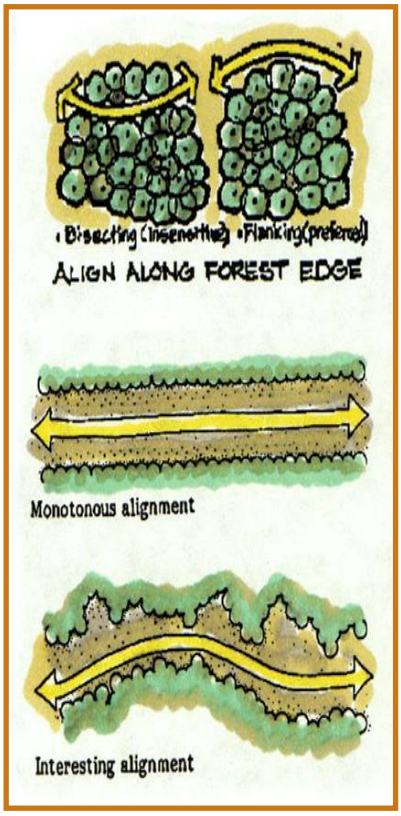


Figure 9.5.3 - Roadway alignment.

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

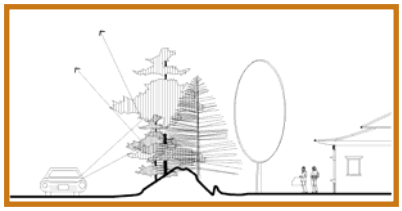


Figure 9.5.4.2 – Landscape and berms buffer air and noise pollution.

downwind and/or providing planted buffers. Tactical 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 (Fig. 9.5.4.2).

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. 9.6.1):

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.

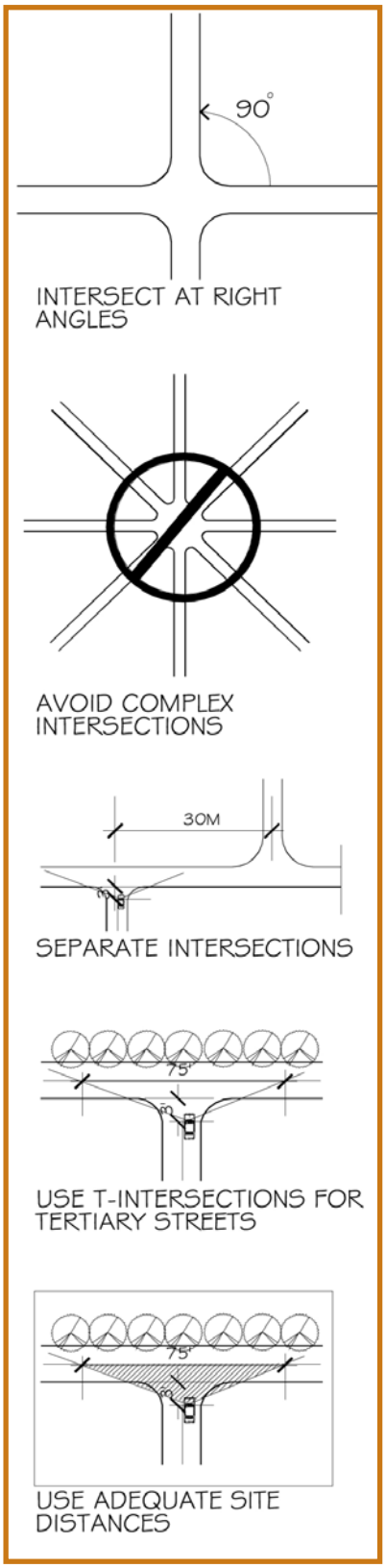


Figure 9.6.1 - Intersection design.

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), [NM] Governor's Committee on Concerns of the Disabled (GCCH), and the Uniform Federal Accessibility Standards (UFAS). In the event of a conflict the most stringent standards will be applied. If there is a conflict with ADAAG and the UFC to secure the facility, the UFC will take precedence.

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 (Access Control Points) 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, but also present the initial "welcome wagon" image of the installation itself. The image is portrayed by the architectural vernacular of facilities such as the reception center and the control gates themselves. See Section 12, Force Protection, para 12.7 for information on the design standards for installation gates.

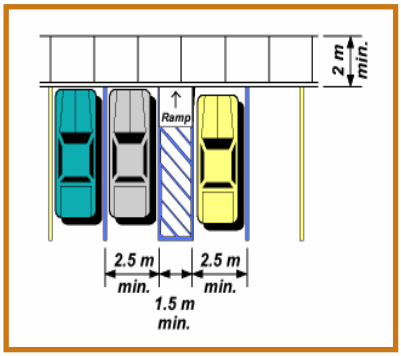


Figure 9.8.1.1a - Accessible parking space.

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) (Fig. 9.8.1.1a). 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 9.8.1.1b.

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 9.8.1.1b - Required minimum number of accessible parking spaces.

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, which also reduces drainage requirements, and allows more conformance to natural topography.

Figure 9.8.1.6 - Promote means of access other than vehicular, provide walkways and bikeways.

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. Using open cell pavers, especially for low volume or overflow lots, rather than AC or PC pavement blends in better with environment and reduces run-off. Since nuisance run-off is reduced as well as flood control, then quality of life is improved even for minor storms.

9.8.1.6 Promote means of access other than vehicular by providing alternative means of access such as walkways and bikeways (Fig. 9.8.1.6).

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. 9.9.1.4).

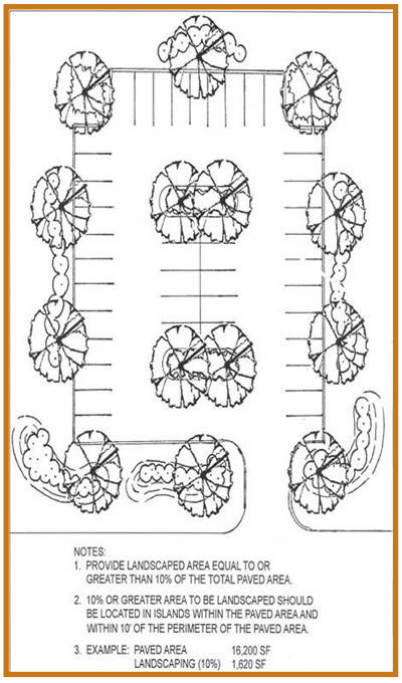


Figure 9.9.1.4 - Provide islands with trees to soften visual expanse.

9.9.1.5 Use natural topography and existing trees to visually screen parking areas from adjacent facilities and other parking bays (Figs. 9.9.1.5). Add to relatively flat topography with landscaped berms for all the reasons previously discussed.

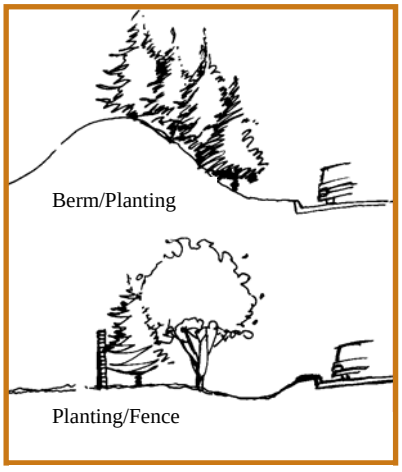


Figure 9.9.1.5 - Trees/berms/walls screen parking lot.

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 unsafe.

9.9.1.8 Parking lots should be paved with open cell pavers, concrete, asphalt, or other paving material and sloped to drain. Provide sufficient culverts, storm sewer, open ditches, and detention basins to alleviate up to a 25-year (4%) hypothetical flood event return period. Again, increasing infiltration by

using open pavers rather than AC or PC pavements will reduce flood control costs. Without express exception by the hydrologist, no increased drainage from improvements should be allowed to escape the site. This is normally accomplished by providing sufficiently sized combined storage such as detention basins and expanded ditches.

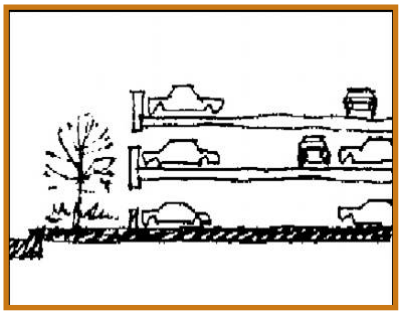


Figure 9.9.1.9 - Parking structures are desirable but expensive - consider antiterrorism standards in planning.

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 (Fig. 9.9.1.9). 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) from 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 provided the housing is not apartment style housing with more than 13 units per building.

Figure 9.10a - Trees/berm screen service area.

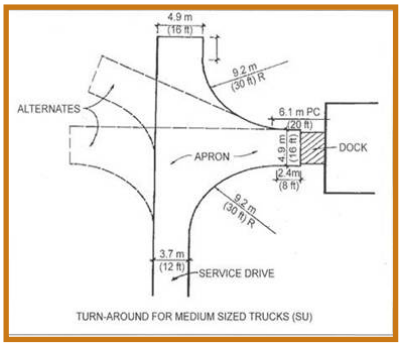


Figure 9.10b - Typical loading area.

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 adjustable, direct, easy access for vehicles ranging in bed height and not conflict with railroad operations (Fig. 9.10a and Fig. 9.10b). They should be screened from

public view to reduce negative visual impacts. Service areas shall meet all antiterrorism requirements.

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. 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. 9.11).

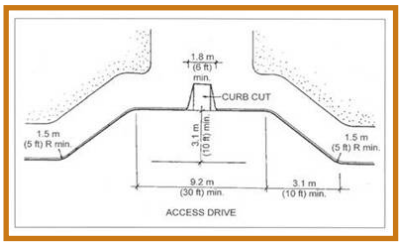


Figure 9.11 - Typical drop off area.

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. 9.12.1 and Fig. 9.12.2a).

Figure 9.12.1 - 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 and enhance the WSMR quality of life and work (Fig. 9.12.2a and 9.12.2b).

Figure 9.12.2a – Rendering of walkway at Army Family Housing (AFH).

9.12.3 In order to achieve this goal the following objectives must be met:

- Provide walkways that are designed with colored stone, cobble, brick or pressed concrete products at a pedestrian scale to be comfortable, safe, accessible (per ADA), and pleasant, and relative to the WSMR walkway hierarchy.

- Initiate and maintain a walkway design program that promotes a campus-like streetscape in coordination with the Landscape Design Guidelines with antiterrorism force protection barrier provisions.

- Provide safe and secure pedestrian facilities that are esthetically distinct and separate from vehicular traffic.

- Provide amenities such as seating, tables, trees shade, shaded pavilions with a seat, drinking fountains, and minimal night (solar) lighting etc. for pedestrians.

- Provide accessibility to all users, including physically impaired or challenged persons. All street and driveway crossings shall be ramped, marked, and accessible to persons with disabilities in accordance with requirements of the UFAS (Fig. 9.12.3). See the following UFAS paragraphs for the respective standards: Curb Ramps, paragraph 4.7; Ramps, paragraph 4.8; Stairs, paragraph 4.9.

- Provide links to major attractions and generators of pedestrian traffic.

- Provide design consistency throughout the walkway and be well drained.

Figure 9.12.2b – Rendering of museum plaza.

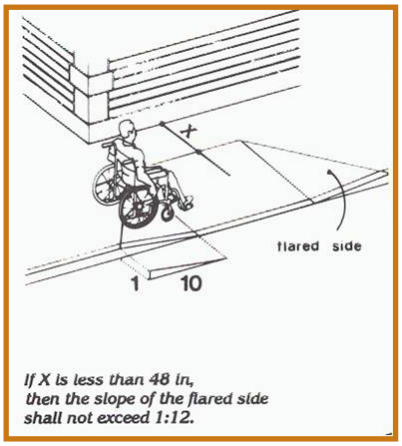


Figure 9.12.3 - Ramps must be provided per UFAS Standards.

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.

9.12.4.1 Primary Walkways.

9.12.4.1.1 Primary walkways (Fig. 9.12.4.1.1) 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 9.12.4.1.1 - Primary 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. 9.12.4.2.1) 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 9.12.4.2.1 - Secondary 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. 9.12.4.3.1a) 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. 9.9.12.4.2.1b). Where paths are designated for use by bicyclists and pedestrians, these widths should be increased an additional three feet for each bike lane.

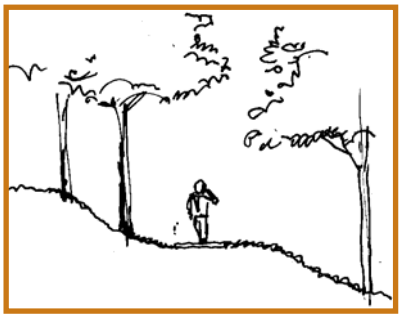


Figure 9.12.4.3.1a - Tertiary walkways.

9.12.5 Troop Running Trails (when applicable)

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.

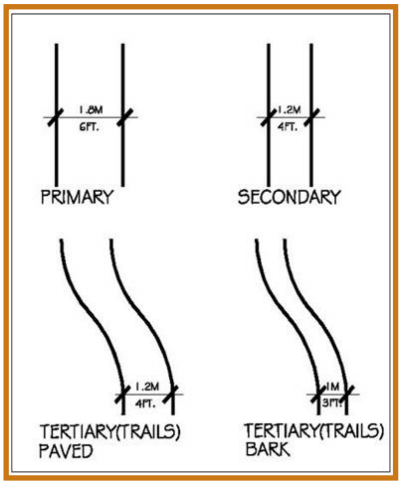


Figure 9.12.4.3.1b - Minimum walkway widths.

9.12.6 Troop Movement Paths (when applicable)

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.

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" (Fig. 9.12.8). 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.

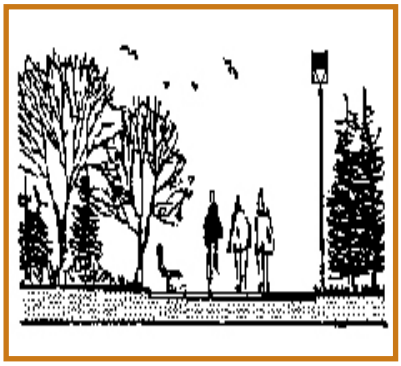


Figure 9.12.8 -Place landscape and site furnishings along walkways.

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. (9.13.3.1). Class I Bikeway considerations include:

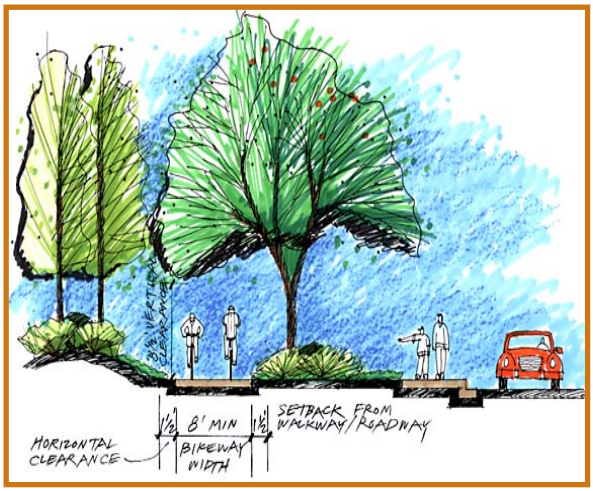


Figure 9.13.3.1 - Class I bikeway.

- 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. 9.13.3.2). Class II Bikeway considerations include:

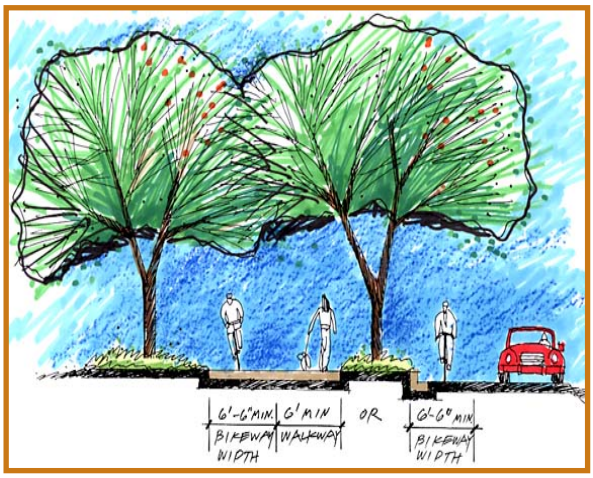


Figure 9.13.3.2 - Class II bikeway.

- 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. 9.13.3.3). Class III Bikeway considerations include:

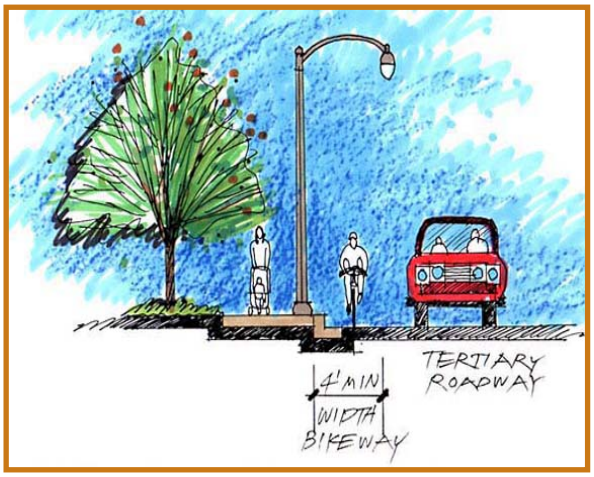


Figure 9.13.3.3 - Class III bikeway.

- 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.

- 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.

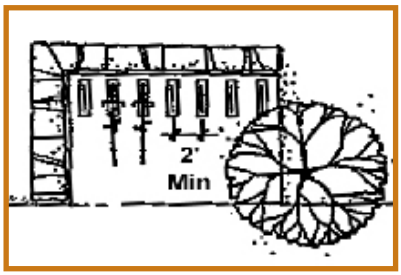


Figure 9.13.6a - Provide convenient bicycle storage.

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 9.13.6a). Bicycle storage areas should be covered, especially at barracks, and easily accessible to building entrances (Fig. 9.13.6b).

Figure 9.13.6b - Bicycle storage should be covered.

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. Choose water wise landscaping providing soaker hose, drip irrigation, and bubblers as needed. Don't use oscillating sprinklers or otherwise waste water through evaporation.

9.13.8 Crosswalks. Provide crosswalks at all intersections of roads and walkways/bikeways. When laying out the crosswalk, consider the following:

- Extend crosswalk 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. 9.13.8).

- Adequate light should be provided.

- Provide barrier-free access at all intersections or used raised crosswalks.

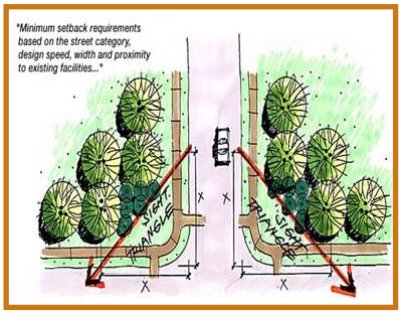


Figure 9.13.8 - Adequate sight lines give pedestrians an unobstructed view of crosswalks.

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 lo-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, Roadway and Area Lighting
- 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) 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- Manual on 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).

Links
Go to Section 10
Go to Table of Contents

SECTION 10

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 (Fig. 10.1.1a and Fig. 10.1.1b).

Figure 10.1.1a – Example of landscape enhancement.

10.1.2 The visual image conveyed by a military installation, even with force protection barriers 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.

10.1.3 Plantings and associated landscaping enhancements 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, be a force protection component or provide a visual transition between dissimilar land uses.

Figure 10.1.1b – Example of landscape enhancement.

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 existing healthy 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. 10.2.1.2):

10.2.1.2.1 Blend to built environment with the natural environment.

10.2.1.2.2 Provide scale and shade comfort to pedestrian environments (Fig. 10.2.1.2.2).

10.2.1.2.3 Reinforce the hierarchy of the circulation system (Fig. 10.2.1.2.3).

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 and irrigation through the use of native plant materials that require less maintenance and irrigation to survive. Support Water Management Plan Best Management Practice regarding Water Efficient Landscaping (BMP#3).

10.2.1.2.7 Enhance Antiterrorism capabilities.

10.2.1.2.8 For energy conservation of buildings, provide windbreaks in winter, shade in summer, and directive paths for convection cooling in the summer.

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

Figure 10.3.1.8 - Principles of design illustrated.

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 (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 (Fig. 10.3.1.8).

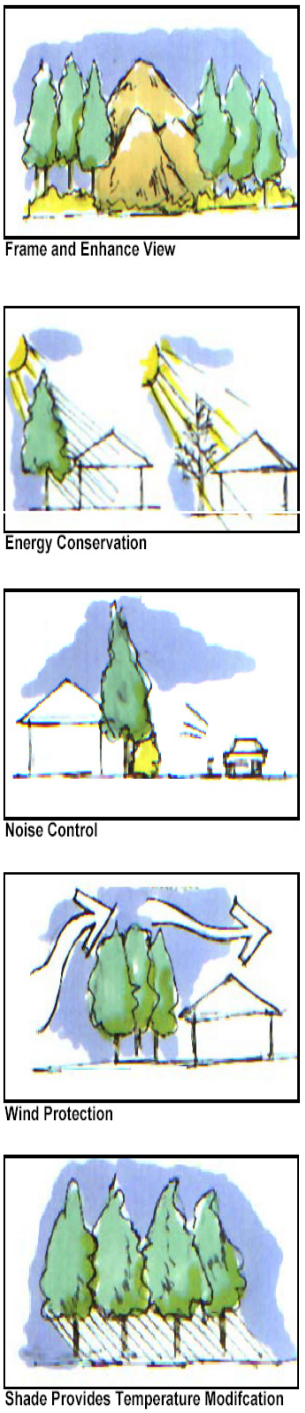


Figure 10.5.2.2.1 - Windscreen.

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, water and energy conservation, climate modification, erosion control, air purification, and noise abatement. Consider installing open cell articulating concrete blocks (ACBs) with plants on about 5' centers for erosion control lining. Groundcover can be used for lining detention basins and ditches. Bring ACBs up to about the 1-year return period flood event profile in ditches to act as toe protection. ACBs and more colorful plants can be added at the bank line at a formed berm to prevent rilling (overbank run-off) and provide a safe windscreen.

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.

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. When developing foundation planting plans consideration should be given Antiterrorism measures (See paragraph 10.11).

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.

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.

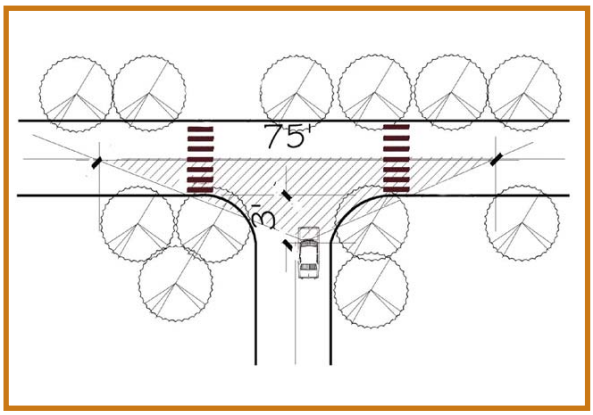


Figure 10.5.2.5 - Trees help imply road hierarchy.

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 (Fig. 10.5.2.2.1).

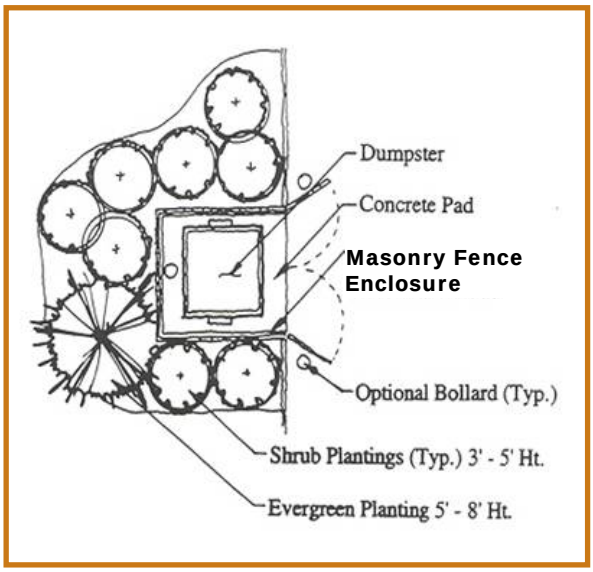


Figure 10.5.2.2.2 - Dumpster screening.

10.5.2.2.2 Screening of Dumpsters. Landscape planting should be used to supplement wood fence and masonry wall dumpster enclosures (Fig. 10.5.2.2.2).

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. 10.5.2.4).

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. 10.5.2.5). 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.

Figure 10.5.2.4 - Enhance open spaces with plantings.

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.

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. 10.5.2.6). Prudent drainage layouts can also result in a greener, lush landscape.

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.

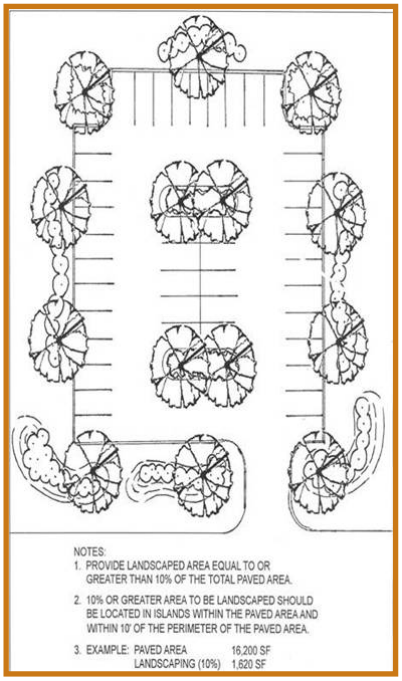


Figure 10.5.2.6 Parking lot planting.

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.

10.5.2.6.5 Use a mix of evergreen and deciduous plant material to screen parking areas from adjacent uses except for windscreens. For windscreens ensure plants are tightly packed enough to function. Deciduous trees can't be relied on for cold winter winds. Recommend using evergreens more for windscreens and deciduous trees more for summer shade. Provide well-draining soils, water-conserving irrigation, and adjacent ditches to protect from root rot.

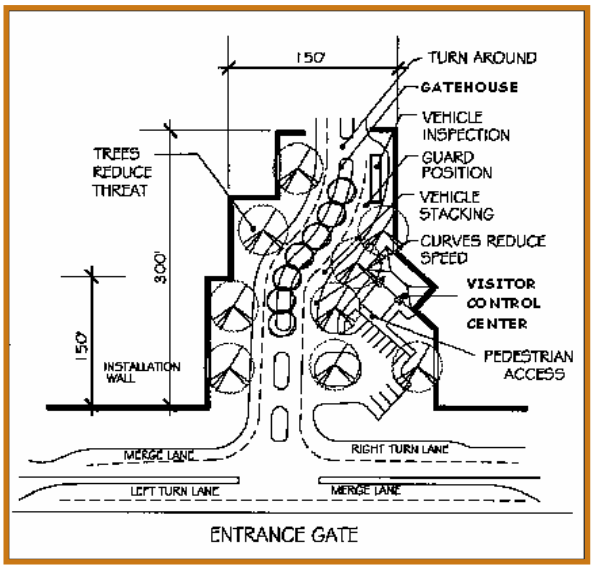


Figure 10.5.2.9 - Landscaping at entrance gates will meet AT/FP requirements.

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 massings 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.

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. 10.5.2.9).

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. Zeroscaping means NO plants. This may be appropriate for industrialized, temporary, and remote areas but not around where people reside for any interval or permanent offices.

10.5.2.11 Xeriscape. Xeriscape is the conservation of water and energy through creative and adaptive landscape design but including water-wise plants. 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. 10.6.3):

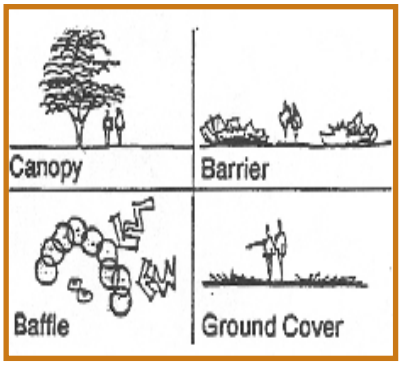


Figure 10.6.3 - Four basic uses of plantings.

- Canopy
- Barrier
- Screen (or Baffle)
- Groundcover

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. 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).

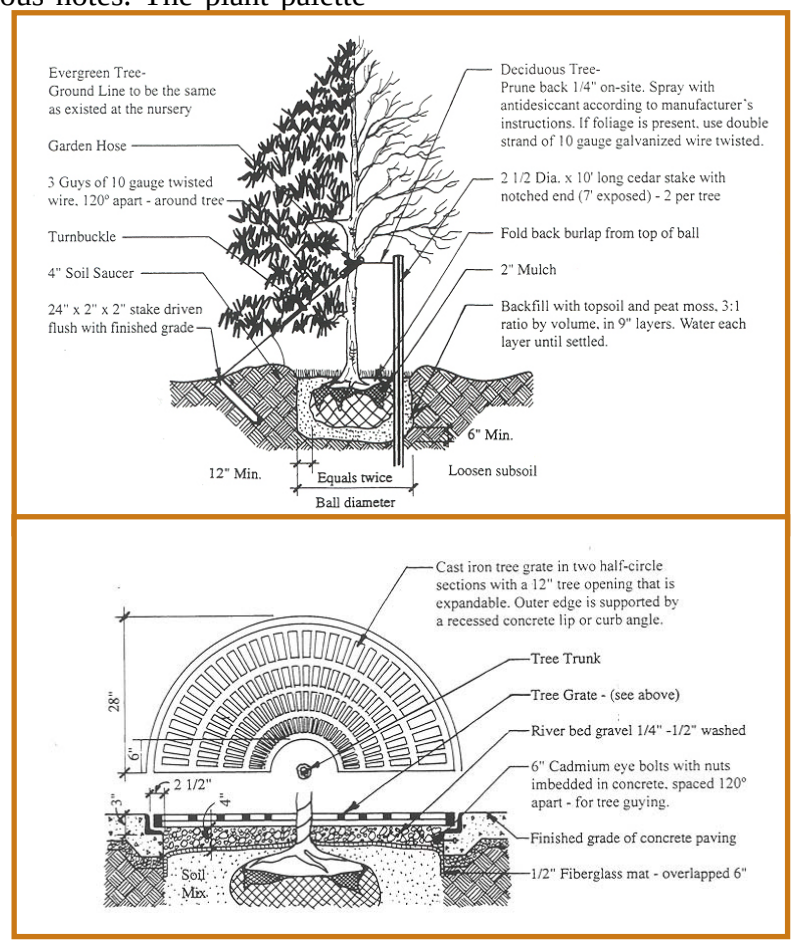


Figure 10.8.4 - Plant installation.

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.

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 (Fig. 10.8.4).

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. 10.8.4.5).

10.8.4.6 Install plant materials in groups for greater impact (Fig. 10.8.4.6).

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.

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. 10.9.1).

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.

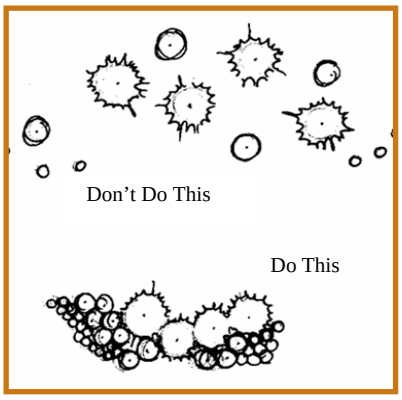


Figure 10.8.4.6 – Grouped plants have greater impact.

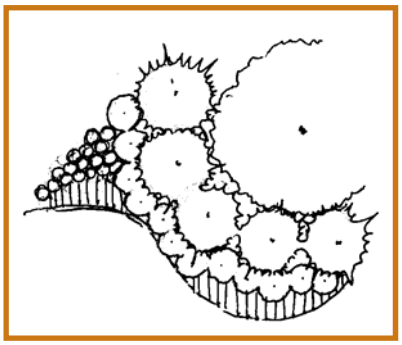


Figure 10.9.1 - Group plants in mulched beds to reduce maintenance.

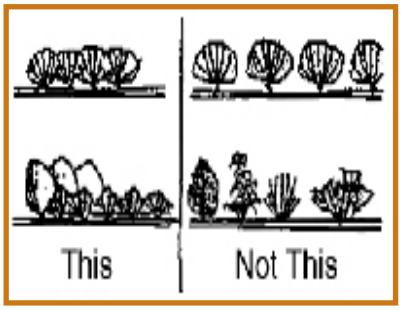


Figure 10.8.4.5 – Space plants according to their mature size.

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 10.9.2.2).
- Make the second cut on the top of the branch within 1" of the undercut (Cut B, Fig 10.9.2.2).
- Make the final cut just beyond the outer portion of the branch collar (Cut C, Fig 10.9.2.2). 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.

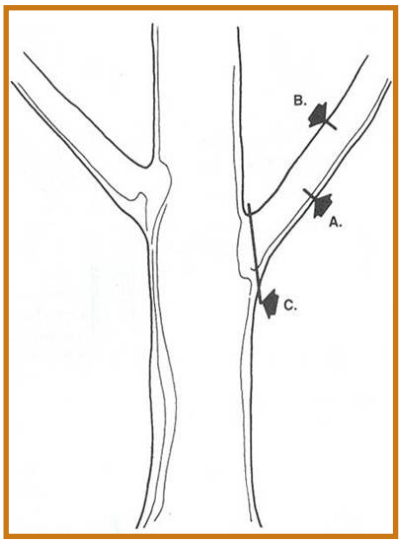


Figure 10.9.2.2 - Proper tree pruning procedures.

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.

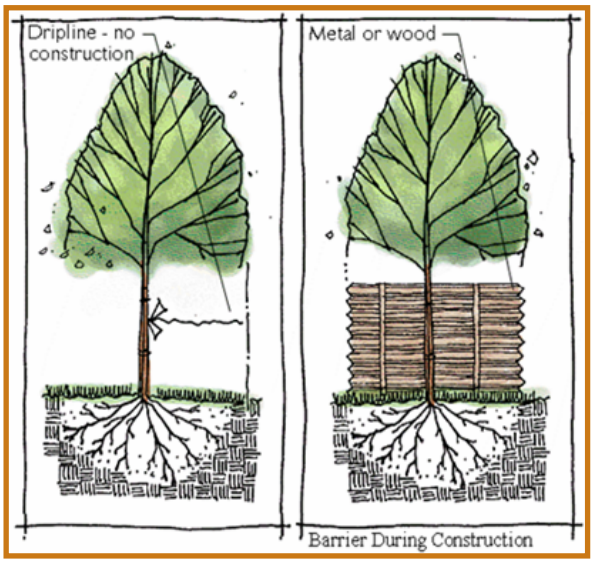


Figure 10.10.3 - Construct a barrier at drip line during construction to maintain grade.

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 tree's canopy (the drip line) (Fig. 10.10.3).

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. 10.11.2).

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. 10.11.3).

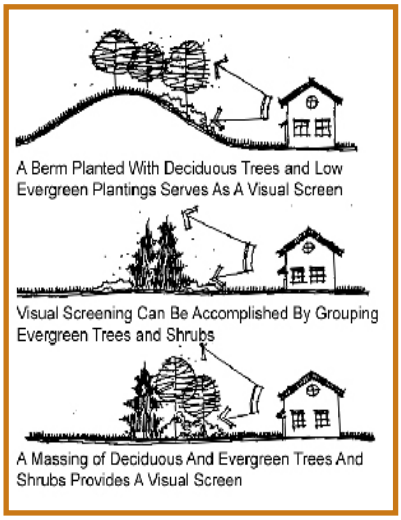


Figure 10.11.2 - Use trees to obscure sight lines.

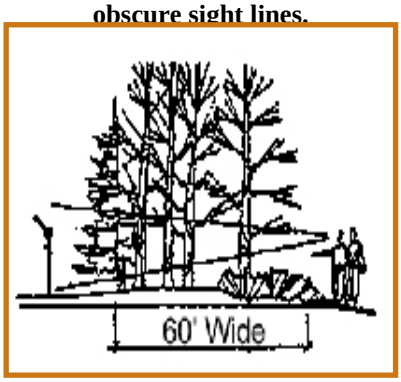


Figure 10.11.3 Establish a visual buffer along installation perimeter.

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.

Links
Go to Section 11
Go to Table of Contents

SECTION 11

11.1 INTRODUCTION

11.1.1 Site elements include all visual elements of the installation that are considered utilitarian in use (Fig. 11.1.1). 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 The WSMR installation should reflect consideration of local design standards.

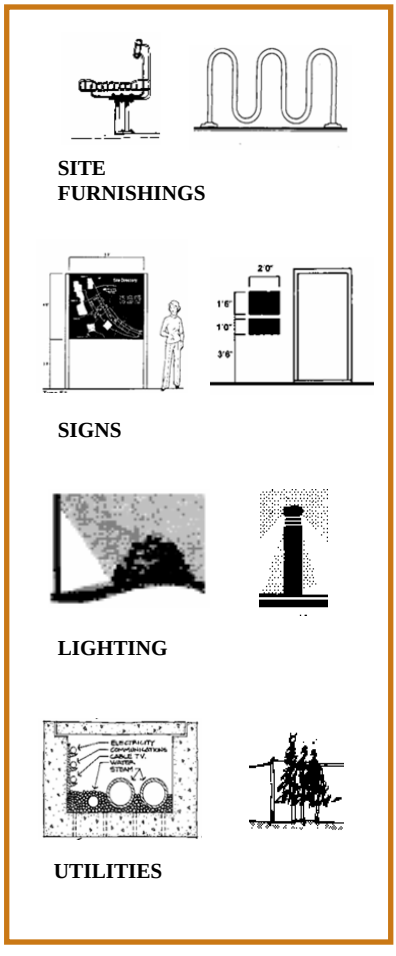


Figure 11.1 1 - Site Elements.

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, consistency, and scale appropriate to the WSMR installation.

11.2.1.4 Design, coordinate and locate all site elements to enhance and 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 and effective products and procedures that are vandal-proof per the Vulnerability Assessment report and our water system's Emergency Response Plan following EPA guidance.

11.2.1.7 Minimize negative visual impacts of all utility systems (Figs. 11.2.1.7a and 11.2.1.7b).

11.2.1.8 Minimize environmental impacts of all utility systems.

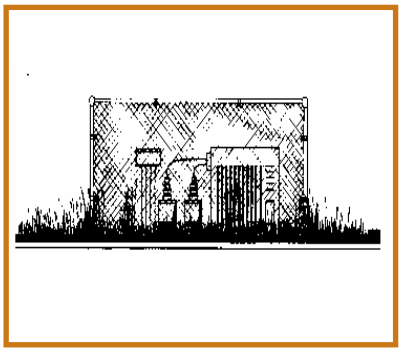


Figure 11.2.1.7a - Negative visual impact.

Figure 11.2.1.7b - 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.

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

11.3.3 Seating. Seating includes benches and walls, as well as tables and movable chairs.

11.3.3.1 Benches.

11.3.3.1.1 Bench Location. Benches should be located in areas of high pedestrian use, and arranged to encourage socialization within a pleasant outdoor setting. This includes

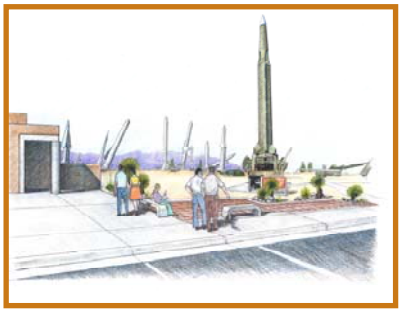


Figure 11.3.3.1.1 – Museum donor park.

pedestrian nodes along primary walkways, at major building entryways, courtyards, and at bus stops (Fig. 11.3.3.1.1).

11.3.3.1.2 Bench Sitting. Benches should be sited on concrete pads adjacent to walkways. Provide proper clearance around benches, a minimum 2'0" setback from adjacent sidewalks and a minimum of 5'0" between front of bench and any stationary obstacle. Provide appropriate planting treatment for visual definition and seasonal shade.

11.3.3.1.3 Bench Design.

11.3.3.1.3.1 Benches. Wood benches will not be used at WSMR. Benches will be an inherent part of masonry or concrete planter wall systems (see Fig. 11.3.3.1.3.1), or be of stand alone precast concrete type as follows: Nominal size of 2'-0" x 6'-0", model 6A, silica white, by DURA ART STONE (phone: 909-350-9632) or type CB1, L3 Sandblasted, by ENVIRONMENTAL FEATURES Inc. (phone 248-478-2775) or approved equal. See Fig. 11. Bench dimensions should meet specifications presented in the Technical Manual (TM) 5-803-5, *Installation Design Manual*, Fig. 2.5, page 8. Wall mounted benches if they occur should be similar in style and color to free standing benches.

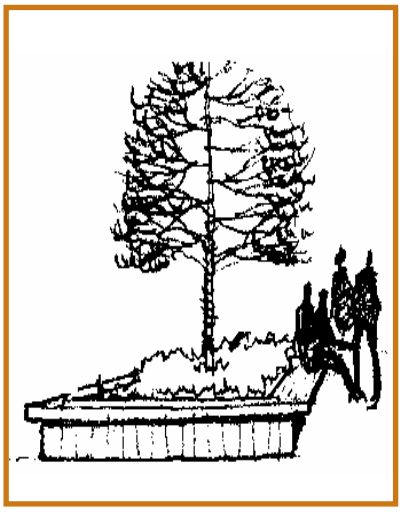


Figure 11.3.3.1.3.1- Planter serves as bench.

11.3.3.2 Seating Walls.

11.3.3.2.1 Seating Walls Location. Wherever possible, seating should be incorporated into planter boxes or retaining walls, particularly at building entrance area. Seating walls should be integrated into the overall area design and the pedestrian circulation system (Fig. 11.3.3.2.1).

Figure 11.3.3.2.1 – Security wall / seating.

11.3.3.2.2 Seating Wall Design. Seating walls should generally be between 18" and 22" high, and 12" to 18" wide and constructed of textured concrete or brick in a manner to complement or match the materials of the adjacent buildings (Fig. 11.3.3.2.2).

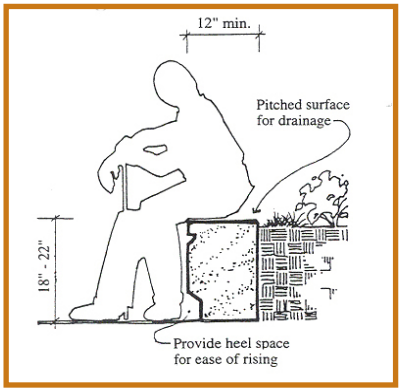


Figure 11.3.3.2.2 – Retaining wall / seating.

11.3.3.3 Tables. Locate tables together with seating that is oriented to the user needs of socializing, relaxing, or eating in less formal spaces with a pleasant setting and attractive view.

11.3.3.3.1 Table Location. Small groupings of tables in high visibility areas should be placed within proximity of recreation or food service facilities. These groupings should be located on hard pavement areas adjacent to walkways. Pavement should

be constructed of exposed aggregate or broom finish concrete. Incorporate tree plantings and overhead trellis structures within these areas to provide shade and spatial definition (Fig. 11.3.3.3.1).

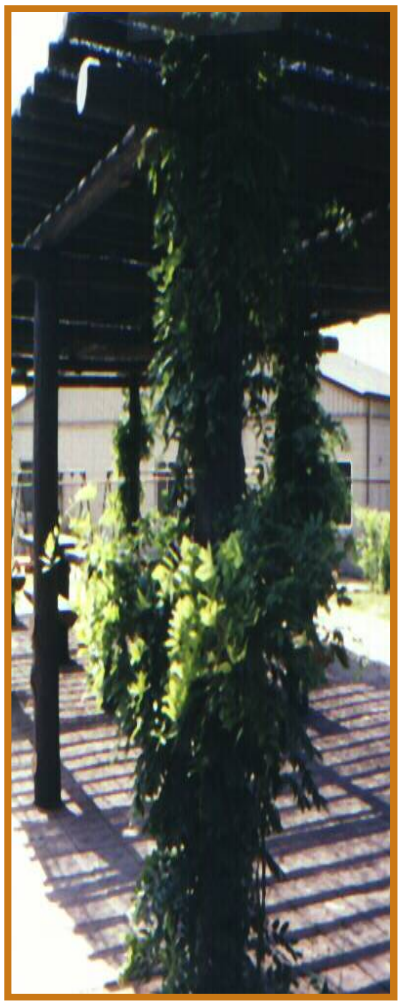


Figure 11.3.3.3.1 - Trellis and vines provide shelter.

11.3.3.3.2 Table Materials. Materials should be same as benches of little or no maintenance-concrete is preferred.

11.3.3.4 Chairs.

11.3.4 Telephone Booths. Telephone booths should be incorporated into building architecture, utilizing building recesses and overhangs, or integrated into bus or other shelters. Provide a minimum 3'0" clearance between booths and the edge of walkways. All service line wiring should be underground or concealed. Booths should be equipped with lighting for nighttime use. In sheltered areas, use standard wall-mounted phone enclosures. Provide telephone books accessible from both wheelchair level (34") and an average standing adult reading height (42"). Use a cable or chain rather than the rigid telephone book mounts.

11.3.5 Shelters.

11.3.5.1 There are many different types of shelters on military installations. Shelters are provided for those waiting for buses, and in areas where people congregate to socialize or eat such as in courtyards or picnic areas. Prefab or site-built, open sided pavilions near pedestrian walkways, parks or plazas are excellent options to provide shade and enhance exterior environments for pedestrians that wish to congregate or seek shade and shelter. Ensure that all shelters are built to deflect run-off and windblown rain and dust. Consider summer sun and winter wind direction when designing shelters. Don't allow glass to be placed so as to magnify an already hot space in summers (Fig. 11.3.5.1).

Figure 11.3.5.1 – Shelters provide shade.

11.3.5.1.1 Bus Shelters.

11.3.5.1.1.1 Bus Shelter Location. Bus shelters should be located at major facilities along the bus route such as Commissary/Post Exchange areas, barracks areas, Hospital, and Library. Bus stops should relate to major pedestrian walkways, and be placed on concrete pads. Provide a minimum 3'0" clearance between shelters and the edge of walks.

11.3.5.1.1.2 Bus Shelter Design. Bus shelters should provide protection from wind, rain, and sun with an overhead roof with enclosure on three sides. Side enclosures should be a transparent, unbreakable type material to allow for adequate visibility. Bus shelter design typically should be simple and consistent throughout the post, matching the existing units in terms of materials, scale, and detail (Fig. 11.3.5.1.1.2a). Shelter design should have similar character as that for kiosks and vending machine shelters. Bus shelters should have a minimum size of 5' by 8' with a minimum height of 6’-6" from floor to underside of roof. The shelters should include an integral bench, trash receptacle, and ashtray (Fig. 11.3.5.1.1.2b).

Figure 11.3.5.1.1.2a - Bus shelters enclosures should allow for adequate visibility.

11.3.5.1.1.3 Lighting. Bus shelter lighting will be by solar power.

11.3.5.1.2 Picnic Shelters.

11.3.5.1.2.1 Picnic Shelter Location. Picnic shelters should be strategically located and sized for shared use to discourage the proliferation of small shelters scattered throughout the installation.

11.3.5.1.2.2 Picnic Shelter Design. Picnic shelters can be open on all sides. The minimum size should be 20 feet square with a minimum 8 foot vertical clearance (Fig. 11.3.5.1.2.2).

Figure 11.3.5.1.1.2b – Example WSMR bus shelter.

11.3.6 Kiosks

11.3.6.1 Kiosk Location.

Kiosks can be used as information centers at pedestrian nodes within the installation. Place kiosks on a concrete base adjacent to walkways. Allow a minimum 3 foot clearance on all sides.

11.3.6.2 Kiosk Design.

Kiosk design should blend compatibly with other site furnishings and with the architectural character of the zone in terms of form, scale, and materials. A similar design treatment should be established for kiosks and shelters.

Figure 11.3.5.1.2.2 – Picnic shelters should be at least 20 feet square.

11.3.7 Walls and Fences.

11.3.7.1 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.

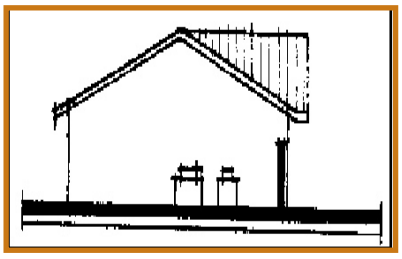


Figure 11.3.7.2a - Screen wall hides mechanical equipment.

11.3.7.2 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 (Fig. 11.3.7.2a). 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 native stone (Franklin, by Jobe "Rainbow") with stone or concrete cap, or concrete with a textured finish and stone or concrete cap. Retaining walls may be constructed of brick, block, or preferably 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 (Fig. 11.3.7.2b). Walls used to screen service areas or trash enclosures should incorporate landscape plantings to help reduce the negative visual impact of these areas.

Figure 11.3.7.2b - Retaining wall constructed of concrete block planters.

11.3.7.3 Fences.

Fences should be utilized for screening of service areas and site utilities, particularly dumpsters. Screen fencing should consist of native stone, stucco on masonry, or only if budgets are constrained, 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.

11.3.8 Trash Receptacles.

Figure 11.3.8.2a – Approved trash receptacle installation.

11.3.8.1 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 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).

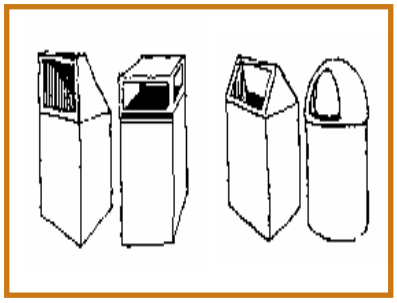


Figure 11.3.8.2b - Trash receptacles.

11.3.8.2 Trash Receptacle Design.

Container should be of a design that is compatible and in harmony with other site furnishings (Fig. 11.3.8.2a and Fig. 11.3.8.2b).

11.3.8.3 Trash Receptacle Type. As approved by the Installation Architect.

11.3.8.4 Dumpsters.

11.3.8.4.1 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. 11.3.8.4.1). 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).

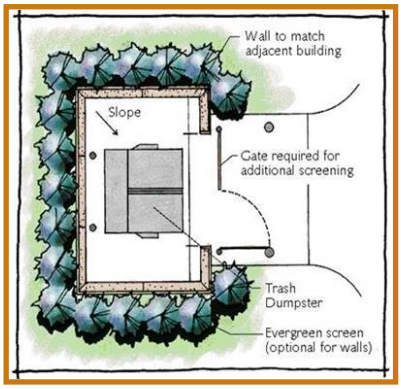


Figure 11.3.8.4.1 - Enclose dumpsters with walls, fences, or plantings and place on concrete pad.

11.3.8.4.2 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 (Fig. 11.3.8.4.2). Dumpsters can neither sit in a ponding area nor lie within a flow path; put them at least 1’ above any surrounding grade.

Figure 11.3.8.4.2 – Dumpster with walls and new planting.

11.3.9 Flagpoles.

The standard flagpole for WSMR will be tapered mill finish aluminum, fitted with a gold anodized finish "ball" finial (Figure 11.3.9). 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.

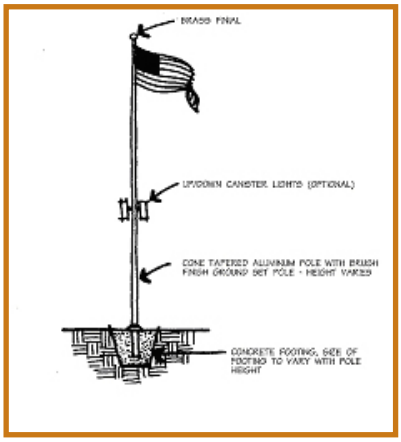


Figure 11.3.9 – Standard flagpole.

11.3.10 Planters.

11.3.10.1 Movable pre-cast concrete planters may be used outside building entrances to provide seasonal color and interest and function as security threat barriers (Fig. 11.3.10.1). 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.

11.3.10.2 Planters Sizes and Design.

Sizes of planters will vary as per the scope of work and need. Planters should be of exposed, rubbed concrete or native stone (Franklin "Rainbow" by Jobe) or as approved by the Installation Architect.

Figure 11.3.10.1 – Movable planters.

11.3.11 Bicycle Racks.

Bicycle racks should be provided at key destination locations. They should be located on a concrete surface where they will not impede pedestrian movement or block building entrances. Use galvanized steel or aluminum and avoid painting.

A ribbon type tubular aluminum bike rack with an anodized dark bronze finish is the post standard (Fig. 11.3.11). Bicycle storage areas near barracks should be covered.

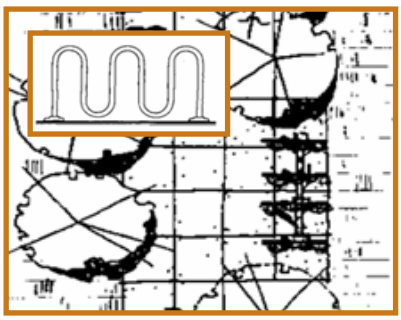


Figure 11.3.11 - Bicycle rack system.

11.3.12 Tree Grates.

Tree grates should be used when installing trees in large paved areas such as pedestrian plazas, walks, and ceremonial entrance courts (Fig. 11.3.12). Tree grates and planting pits should be a minimum of 4'x 4' or 4' diameter and depending on tree size and type.

11.3.13 Bollards.

Bollards are utilized to separate vehicular and pedestrian traffic, to direct access, or as decorative elements in pedestrian areas (Fig. 11.3.1.3a and Fig. 11.3.13b). Style and size will vary per project and shall be as approved by the Installation Architect.

Figure 11.3.12 – Tree grates should be used in paved areas.

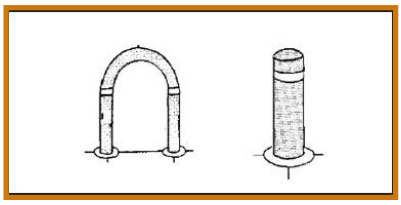


Figure 11.3.13a – Bollard types.

Figure 11.3.13b – Pneumatic bollards can used for limiting vehicular access.

11.3.14 Playgrounds/Tot Lots.

11.3.14.1 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. 11.3.14.1). All playgrounds shall have a fabric sunshade over the equipment (Fig. 11.3.14.2). Design play areas to neither pond nor become sheet flow paths. Ensure rubber matting and shading is provided at all jungle gyms and swing sets for health, safety, and "foot scour" prevention. Outdoor drinking fountains should be installed in proximity to playgrounds/tot lots (Fig. 11.3.17).

11.3.14.2 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 (Fig. 11.3.14.2).

11.3.14.2.1 Lighting.for playground shall be by solar power.

11.3.14.3 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*.

11.3.14.4 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.

Figure 11.3.14.1 - Playgrounds and tot lots should meet specific materials, color, and design criteria throughout the installation.

11.3.15 Mailboxes.

11.3.15.1 All mailboxes should be located in close proximity to the facility they serve (Fig. 11.3.15.1). 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).

Figure 11.3.14.2 – Playground for children with disabilities.

11.3.15.2 The location should be coordinated with the Postal Services.

11.3.15.3 If group mailboxes are required, provide central locations for them adjacent to hard-surface walkways but not to impede pedestrian movement. Cluster mailboxes shall be aluminum finish.

Figure 11.3.15.1 – Example of mailbox unit.

11.3.16 Monuments, Memorials, and Military Equipment Static Displays.

11.3.16.1 Monuments and static displays (Fig. 11.3.16) should be carefully designed and placed in prominent locations to serve as visual focal points within the installation. Static displays of equipment should be consolidated in one location to create a central museum or exhibition facility within the installation.

Figure 11.3.16 – WSMR missile park as a central static display.

11.3.16.2 Memorials will conform to the guidance set forth in Army Regulation (AR) 1-33, *Memorial Programs*.

11.3.17 Drinking Fountains.

Outdoor drinking fountains should not be provided, except to support larger playgrounds, outdoor recreation facility complexes, jogging or bicycle rest stops, and outlying recreation areas if convenient to a potable water supply line (Fig. 11.3.17). Steps should be provided for children and the Americans with Disabilities Act Accessibility Guidelines (ADAAG), [NM] Governor's Committee on Concerns of the Disabled (GCCH), and Uniform Federal Accessibility Standards (UFAS) standards meet.

Figure 11.3.17 – Outdoor drinking fountains should be associated with playgrounds.

11.4 SIGNS

11.4.1 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 UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003. TM 5-807-10, Signage, 1 December 1983, was cancelled in September 2000, without replacement. UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003, has been accepted by the services as the signage criteria.

11.4.2 Sign System Characteristics. There are several basic characteristics that, by serving to convey necessary information clearly and attractively, are an integral part of any successful signage system. Use of exposed concrete bases or pedestals, or colored rock veneer as a pedestal for major signs and marquees is considered acceptable at WSMR. This will tie the signage into the concrete and rock accent themes seen in landscaping and architectural elements on post to ensure prominence and focus. It is common on post and in the local surrounding areas to make use of rock (Jobe "Rainbow") in this way. Concrete as an exposed architectural element is becoming more prevalent and is encouraged in recent designs. Common to all signage graphics should be the round WSMR emblem/logo (see Figure 11.4.2). The use of this WSMR insignia assures the desired "Team WSMR" theme. The older four-sided "zia" version is no longer acceptable.

Figure 11.4.2 –WSMR emblem /logo supports installation-wide "Team WSMR" theme.

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.

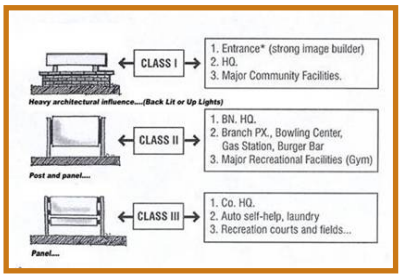


Figure 11.4.4.2 - Signs can be organized into classes within the visual hierarchy.

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.

11.4.2.5 **Lighting.** Solar powered lighting will be used for signs requiring nighttime illumination especially in remote areas of the installation.

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 (Fig. 11.4.3.2).

- Reference
- Information/Message
- Presentation
- Architectural Influence
- Graphic Architecture

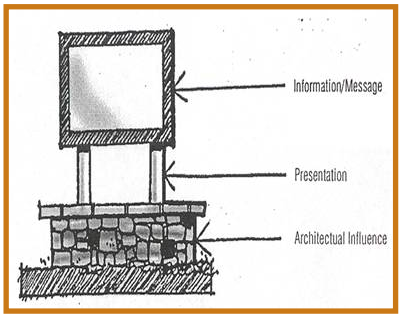


Figure 11.4.3.2 - Signing language helps establish a signing system.

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 (Fig. 11.4.4.2).

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.

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. 11.4.5.1a). 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. 11.4.5.1b). These signs are designed to include the following:

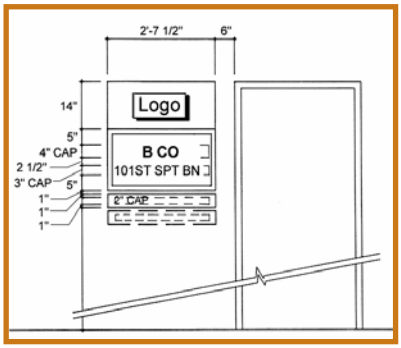


Figure 11.4.5.1a - Building mounted information sign.

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

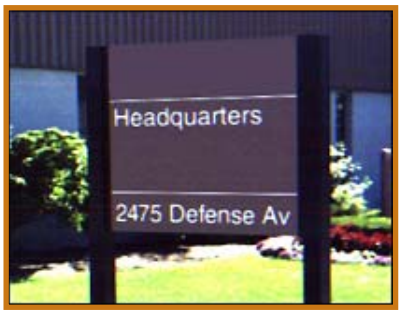


Figure 11.4.5.1b - Use of street addresses on all building identification sign.

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

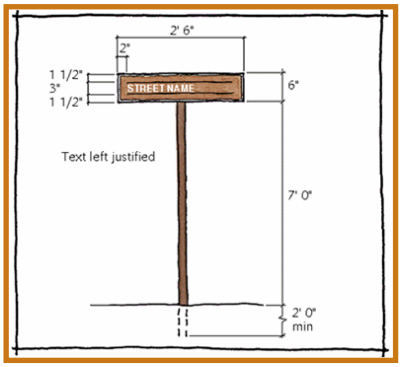


Figure 11.4.5.1.4.1 - Typical street signs.

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. 11.4.5.1.4.1) 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).

Addresses such as "Building 123 Roberts Street" are not a valid address format and shall not be used (C3.3.2.2.6).

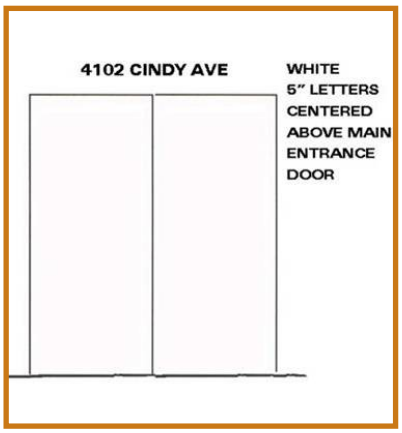


Figure 11.4.5.1.4.2a – Street address location.

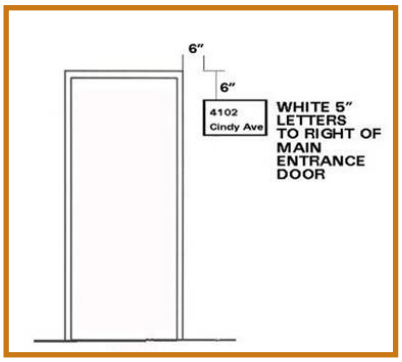


Figure 11.4.5.1.4.2b - Street address location at entrance doors.

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. 11.4.5.1.4.2a).

Buildings without identification signs shall have the address number and street name centered above the main entrance or located to the right side (Fig. 11.4.5.1.4.2b).

Figure 11.4.5.1.6.1 - Installation entrance signs.

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. 11.4.5.1.6.1). 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 11.4.5.1.6.1 - 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.

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 UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003., for sign specifications and for sign placement guidelines.

11.4.5.1.7 Street Signs.

Street name identification signs should be designed with the same lettering, color, and materials as other information signs.

11.4.5.1.8 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. 11.4.5.2). 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:

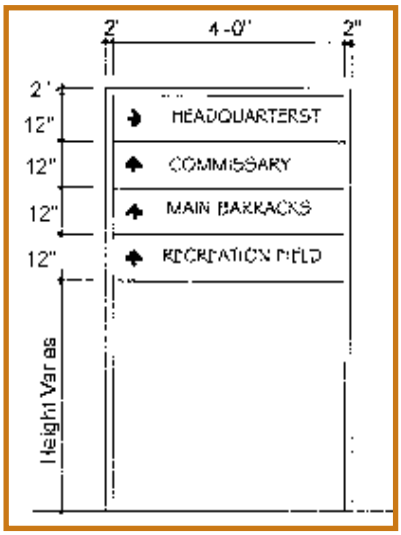


Figure 11.4.5.2 – Direction sign.

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 (Fig. 11.4.5.2.2).
- Stoke width: Helvetica Medium cap

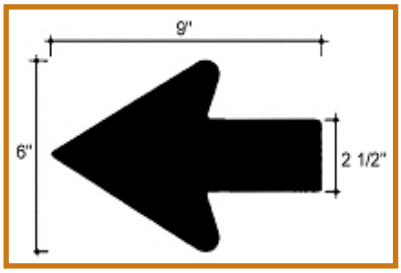


Figure 11.4.5.2.2 - Typical arrow for use on all destination signs.

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

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. 11.4.5.3). Related to these signs are pavement markings and traffic signals. These signs are designed to include the following:

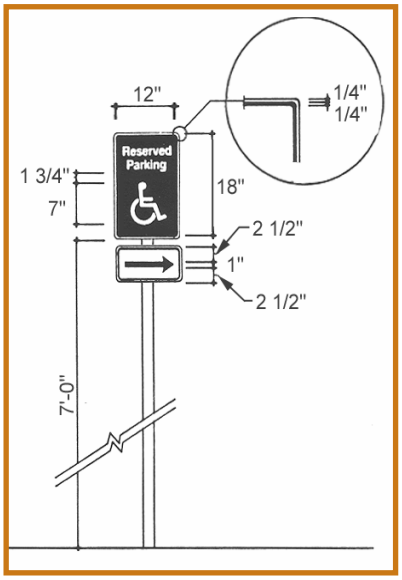


Figure 11.4.5.3 - Regulatory sign.

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

11.4.5.3.3 **Materials:**

- Panel: Double-face 1/8” thick aluminum

- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

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.

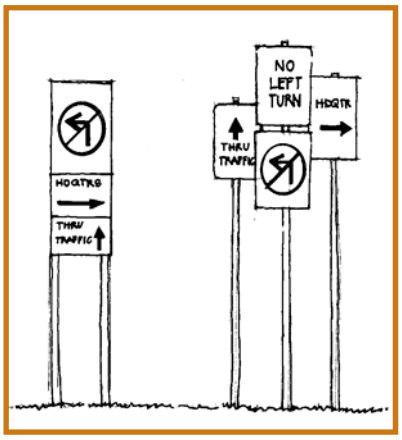


Figure 11.4.7a - Sign should be simple, legible, and combined.

11.4.532.4.2 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 UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003.

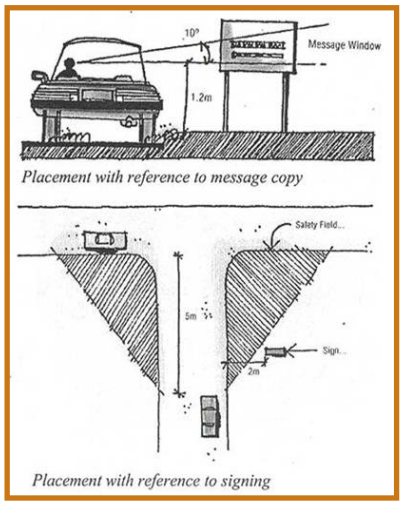


Figure 11.4.7b - Placement is critical to ensure easy readability.

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. 11.4.7a and Fig. 11.4.7b).

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.

Place signs approximately 1.2 meters (4 feet) above ground level to be within 10 degrees the driver's line of vision (Fig 11.4.7b). 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.

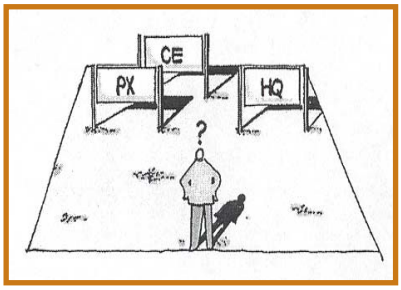


Figure 11.4.9.1 - Visual clutter causes confusion.

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 from a uniform sign system and if left uncontrolled will eventually destroy the integrity of the system (Fig. 11.4.9.1).

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.

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 (Fig. 11.4.10.1).

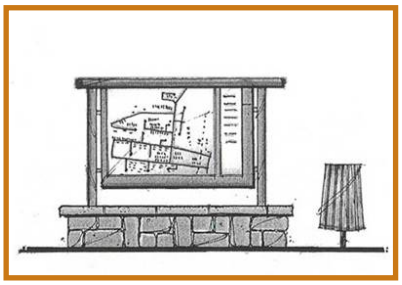


Figure 11.4.10.1 - Location maps provide a sense of place.

11.4.10.2 The location map should contain the following characteristics within the design.

- 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 shall be used, except for security or safety reasons, and set to turn off the lighting at 2300 hours. The timer may be set to turn the lighting back on at 0400 hours if needed. All attempts shall be made to use solar lighting in parking 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. New and replacement lighting shall be canopied to illuminate down and not exceed 30 degrees down form horizontal spread.

11.5.5.1 General. Interior lighting levels (in foot-candles) shall be in accordance with AR 11-27, Army Energy Program, and Illuminating Engineering Society. Generally, 50 foot-candles (FC) at work stations, 30 FC in working areas, and 10 or less FC in non-working areas. Exterior lighting levels shall be in accordance with Physical Security and Safety lighting requirements and shall meet the minimum illumination requirement in order to reduce energy use and cost. All exterior lighting will be controlled by photocell. Control of exterior lighting by timers and/or motion sensors will be a consideration by the Project Engineer during the conceptual design phase. The Project Engineer shall consult with Physical Security, Safety and Energy Management personnel on best practice of control.

- Interior:
    - Lighting shall be energy efficient, compact fluorescent instead of incandescent screw-

inbulbs; and T-5 tube fixtures with electronic ballasts for work stations and working spaces.

- High-bay working area lighting shall consider T5 technology or High Pressure Sodium – Retrofit White.

- Building window orientation shall make use of day lighting (natural light) whenever possible including the use of skylights in building entrance vestibules and restrooms. Placement of windows (if windows are to be installed) should be oriented predominantly facing south or east/west to take advantage of natural sunlight to reduce the need for turning on interior lighting. Skylights or solar tubes should also be considered for day lighting.

- Where work stations and/or working areas receive more than four hours of natural sunlight daily from a window(s), lighting fixture(s) located close to the window(s) shall be placed on a separate ON/OFF lighting circuit switch to encourage use of the natural light to reduce energy consumption.

- Lighting in restrooms, stairways and break room areas shall be controlled by motion sensors with manual over ride.

- Exterior:

  - All lighting (i.e., building, parking, storage and common use areas) shall at a minimum be controlled by photocells.

  - Parking lot and common use area lighting located shall be solar powered (Fig. 11.5.5.1).

  - Decorative lighting shall be kept to a minimum and require justification by the designer during the conceptual design phase of the project. Total energy consumption in kilowatt- hours of decorative lighting shall be quantified including the cost to operate as part of the justification. Approval to install decorative lighting shall be

Figure 11.5.5.1 – Solar powered parking lot lighting.

obtained from the installation Energy Manager or his/her Director.

- Lighting place on timers shall turn off at 2300 hrs and remain off until 0400 hrs the following day.

- New and replacement lighting shall be lowest wattage possible to meet physical security and safety requirements.

- White light shall be first choice for illumination.

- New and replacement lighting shall be canopied to illuminate down and not exceed 30 degrees down from horizontal spread. Lighting selection issues shall be coordinated with Directorate of Installation Support - Master Planning Division, and, Environment and Safety Directorate - Customer Support Division and Security Directorate - Physical Security Division.

11.5.5.2 Lighting will be in accordance with the New Mexico Night Sky Protection Act (NMSA1978 ARTICLE 12). Maintaining Dark Skies is beneficial to the WSMR mission and quality of life for WSRM residents.

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 – Retrofit White	●	●							●	●	●	●			●		●	●	●
	Solar	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●
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															●				
	Fiberglass																			
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 11.5.6.2 includes examples of four of the categories.

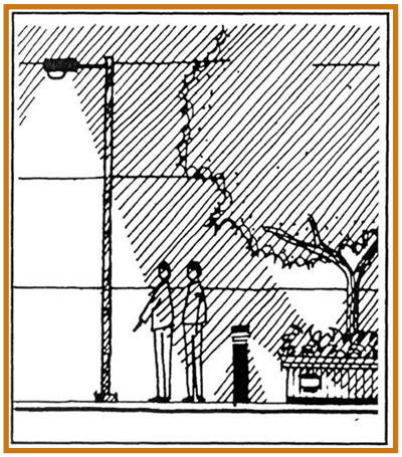


Figure 11.5.6.2 - Example of cutoff, bollard, wall and spot lighting.

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 and shall be the type used for exterior lighting.

11.5.6.2.2 Utility Lighting.

Refers to simple, inexpensive fixtures that are used in industrial areas of low visibility and shall be controlled by a photocell. Solar powered lighting shall be considered a first choice..

Figure 11.5.6.2.3 – Bollard lighting for pedestrian trails.

11.5.6.2.3 Bollard Lighting.

Refers to fixtures that are mounted on or in a short post toilluminate pedestrian areas (Fig. 11.5.6.2.3). They can also be used as physical barriers between pedestrian and vehicular traffic. Bollard lighting shall be controlled by a photocell. Use lighted bollards and avoid bright lights such as pole and building mounted halogen and sodium lights where pedestrians commonly cross the street in the dark.

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. Spotlighting shall be controlled by a photocell.

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. Wall-mounted lighting shall be controlled by a photocell. Timers and motion sensors shall also be considered to control lighting to reduce energy use and cost. Physical Security and Safety should be consulted when a timer or motion sensor will control the lighting.

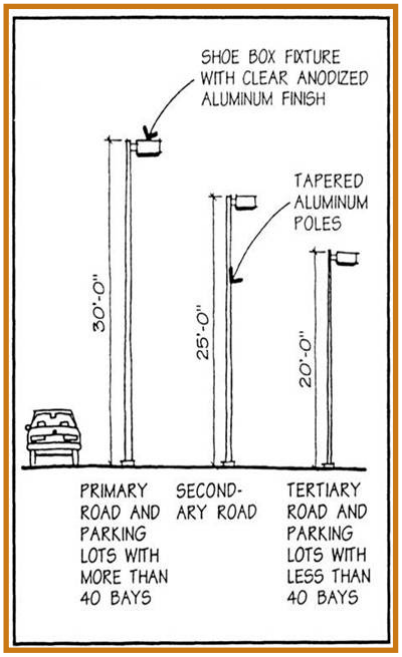


Figure 11.5.8a - Pole height determined by function.

11.5.7 Light Poles

11.5.7.1 The light fixture size should be proportional to the intended pole height and shall be controlled by a photocell.

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. 11.5.8a and Fig. 11.5.8b).

Light fixtures will be a standard bronze finish similar to the fixtures used for the parking lot at Bldg 102.

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. All lamps shall be controlled by a photocell. Need to specify solar lighting or solar and wind powered lighting.

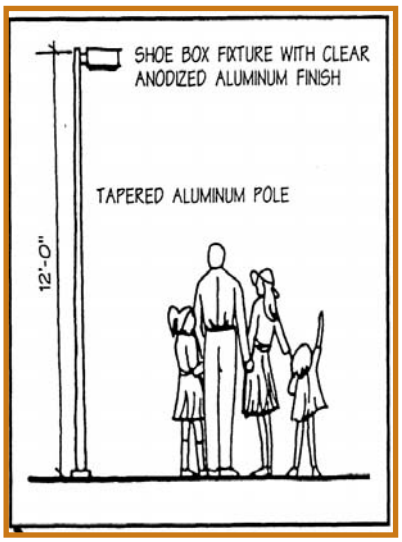


Figure 11.5.8b – Lamp characteristics.

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

11.5.9.7 **Solar**

- Excellent color rendition
- Broad application – Installs anywhere; not connected to power grid
- 25-Year life expectancy
- Complies with Executive Order 13123 Greening the Government through Efficient Energy Management
- Contribute to achieving WSMR energy reduction goals
- High initial cost

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 (Fig. 11.6.2). 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. Care on placement of trees and/or large shrubs must be taken to prevent wind driven or snow laden broken limbs from falling on power lines causing a power outage.

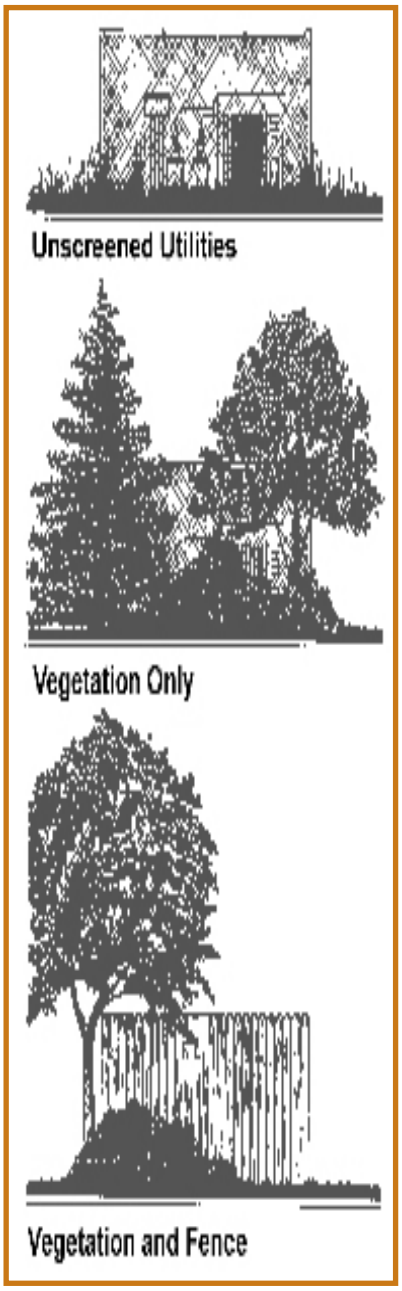


Figure 11.6.2 - Screen existing utilities to decrease visual impact.

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:

11.6.3.1.1 New and replacement transmission line structures shall be configured to meet the latest requirements of Raptor Protection On Power Lines and Migratory Bird Treaty Act. Contact the installation Environmental and Safety Directorate or the Utilities Services Officer for coordination and approval of the pole and structure configuration design.

11.6.3.3 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.

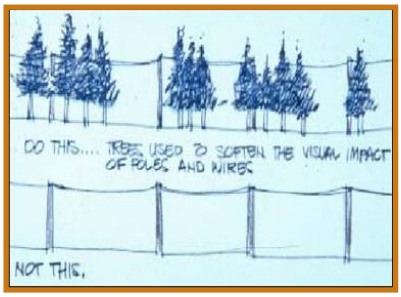


Figure 11.6.4.1a - Soften impact of overhead lines.

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.

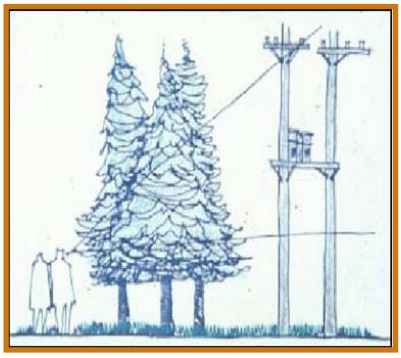


Figure 11.6.4.1b - Screen utilities to reduce negative impact.

11.6.4 Distribution Lines.

11.6.4.1 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. 11.6.4.1a and Fig. 11.6.4.1b). 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.

11.6.4.2 Power lines and poles must be designed and installed to prevent electrocution of large birds. The design of all new power lines, poles, and other power distribution facilities must be in accordance with the WSMR Commander's Guidance CG-02-02 (Appendix R), The Migratory Bird Treaty Act, and The Bald And Golden Eagle Protection Act – Conservation and the publication "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996"

11.6.4.3 Care on placement of trees and/or large shrubs must be taken to prevent wind driven or snow laden broken limbs from falling on power lines causing a power outage.

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.

11.6.5.1 Care on placement of trees and/or large shrubs must be taken to prevent wind driven or snow laden broken limbs from falling on power lines causing a power outage.

11.6.6 Sewer and Water.

11.6.6.1 All sewer and water lines should be underground. All underground sewer lines shall be non-metallic PVC or HDPE pipe. All underground water lines shall be non-metallic PVC pipe with the class and rating suitable for the application. Pipe fittings, clamps, pressure relief valves, hydrants and other water line appurtenances shall be non-metallic to the maximum extent possible and any metallic items buried shall be cathodically protected with sacrificial anodes. Cathodic protection design life shall be a minimum of 10 years and test stations shall be provided for each anode field. Water piping shall be designed for a maximum velocity

of 3 fps or per manufacturer's recommendation, whichever is less. Plastic piping shall be Schedule 40 for pipes 4 inches in diameter and less and for pipes greater than 4 inches the pressure pipe shall be capable of withstanding 165 psi. Trenching, back filling, and pipe installation shall be done according to manufacturer's recommendations. Pipe shall have minimum cover of three (3) feet of clean fill. No pressure piping shall be allowed under slabs-on-grade unless it is in a crawl space or pipe chase except for the service entrance. The service entrance shall be perpendicular to the slab edge and not extend more than 5 feet under the slab. Sewer lines shall be installed according to manufacturer's recommendations with not less than a 2.5 fps hydraulic velocity flow; minimum size of the sewer lateral from the building to the street sewer main shall be 4 inches. Sewer manholes shall be pre-cast reinforced concrete manhole sections with two exterior coats of a heavy duty bituminous coating. Manholes shall conform to ASTM C478-72. Position manholes at every change of direction and shall not exceed a maximum distance of 300 feet apart. Provide reduced pressure back flow preventers at the service entrance. The mechanical make--up water system shall have a separate air gap type (10 gallon tank and float with pressure actuated gear driven pumps) back flow prevention device. Gas lines shall have a maximum working pressure of 60 PSIG.

Approved Materials/Treatments

Water Supply Piping - shall be non-metallic such as:
Polybutylene (PB)

Chlorinated Polyvinyl Chloride (CPVC)

Polyvinyl Chloride (PVC)

Waste, Vent, and Drainage Piping - shall be non-metallic, such as:

Acrylonitrile-Butadiene-Styrene (ABS)

Polyvinyl Chloride (PVC)

Polypropylene (PP)

Filament-wound Reinforced Thermo-setting

Resin (RTRP)

Gas Piping - shall be non-metallic, such as:

Polyethylene. It shall comply with Department of Transportation (DOT) requirements.

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.

11.6.6.3 Treatment facilities should be screened from view of major roads and other installation facilities by plant material, berms, walls, and fences.

11.6.6.4 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.

11.6.6.5 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 IAW NFPA 291(Fig. 11.6.6.5).

Figure 11.6.6.5 - Fire hydrants shall be nutmeg brown. Caps shall indicate tested water pressure.

11.6.6.6 Interior:

- Water closets shall be no greater than 1.6 gpf.
- Lavatory faucets and showerheads shall be low flow.
- First choice for hot water shall be solar active hot water supply system. An economic analysis shall be made to verify the use of a solar active hot water supply system.
- Hot water temperatures shall adhere to AR 11-27, Army Energy Program.
- Hot water supply on major renovations or retrofit projects shall be by tankless water heater placed underneath the lavatory or an appropriate location close to its use. To avoid cost of installing a gas line for a standard gas water heater or a gas tankless water heater, an electric powered tankless water heater(s) is acceptable.
- One tankless water heater shall be installed to provide hot water for up to three lavatories. Consideration should be given to designating one or two tankless

water heaters to provide hot water to these lavatories in restrooms requiring more than three lavatories.

11.6.6.7 All sewer laterals from facilities shall have a double cleanout installed approximately 5 feet from the building foundation. All sewer laterals from facilities shall be a minimum of 4 inch PVC.

11.6.7 Storm Drainage

11.6.7.1 Storm Lines, Detention Basins, and Open Ditch Drainage Requirements: Ensure all Appendix B paragraph 1.4.D standards are met 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 and require much less O&M. Where detention ponds [retention ponds hold run-off until it sinks into the ground; detention ponds also slowly release flows back into the storm drainage within a day] 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, when convenient space beside the area to be drained is cheaply available. Detention ponds that are designed to be dry most of the time can be utilized for recreational purposes such as a soccer field or as open space. In either case, the areas should be designed to conform to the natural contours of the land. Do not harbor standing water in a retention pond other than at remote sites to recharge aquifers where the mosquito health risk and annoyance isn't an issue.

11.6.7.2 Paved Area Drainage Requirements: Ensure gratings promote safety such as by using "bicycle proof" grates at curb inlets and area drains within paved areas. Large hard surfaced parking lots should have covered drainage at the entry to prevent water draining into adjacent streets or otherwise adding to other areas' drainage rather than using local detention basins beyond what the storm sewer can handle. Drainage should handle up to the 25-year return period event and contribute no additional drainage flow rates to the existing system with improvements.

11.6.7.3 All storm drainage pipes shall be constructed of non-metallic PVC or HDPE pipe. Galvalume coated corrugated steel pipe and reinforced concrete pipe may be used if the PVC

or HDPE pipe cannot be used due to engineering constraints or material limitations.

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
- Army Regulation (AR) 11-27, Army Energy Program
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003.
- 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

- Unified Facilities Criteria (UFC) 3-600-01, Design Fire Protection Engineering for Facilities
- 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
- Unified Facilities Criteria Interior Electrical System- UFC 3-520-01 .June 10, 2002

Links
Go to Section 12
Go to Table of Contents

SECTION 12

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 and landscaped sites in ways that do not portray a paranoid defensiveness. 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 (Fig. 12.1.1a and Fig.12.1.1b). Assure that elements adhere to WSMR Vulnerability Assessment. The WSMR Emergency Response Plan produced by WSMR to obtain EPA certification specifically addresses potable water supply public health security and bio-terrorism preparedness.

Figure 12.1.1a – Force protection should blend with surroundings.

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), [NM] Governor's Committee on Concerns of the Disabled (GCCH), 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.

Figure 12.1.1b – Temporary force protection should be removed and replaced with permanent barriers.

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. These standards apply to FY 2004, and all subsequent fiscal years, for projects involving new construction and major renovations for inhabited structures. 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 require 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 standoff distance is found in *DoD Minimum Antiterrorism Standoff Distance for Buildings* will be found in UFC 4-010-02. 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 buildings 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.

12.2.3.7 Along with appropriate orientation, design of the architecture itself should take great care to follow force protection engineering provisions, but not portray an image of defensive paranoia, and rather seek creative esthetics in conformance with the intent of the provisions of this IDG.

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. 12.3.1). A fence will assist in controlling and screening authorized access to a secured area. Fences also serve the purposes listed below.

Figure 12.3.1 - 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.

12.3.3 When practicable, design fences that allow for natural movements of wildlife. Large mammals at WSMR have large home ranges and interference with long range movements can have a negative impact on populations. Fence design will be coordinated with WSMR Wildlife Biologists.

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. Buildings will have clear zones within 30 feet of the walls.

12.4.2 Establish clear zones along both sides of security fencing. Vegetation in the clear zone will 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).

Figure 12.4.3a – Locate planters and trees together as force protection.

12.4.3 Strategically locate trees and planters and other barrier material to prevent penetration of an attack vehicle into the secure area perimeter (Fig. 12.4.3a).

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 Designers need to balance the need for signs that identify, locate, and direct residents and supported personnel to installation assets, versus the need to discourage and frustrate

hostile intelligence gathering and access. One method of achieving this balance could be to direct people to a community support or information center to obtain directions to high security activities. Another could be "All incoming personnel and visitors report to building number ___".

12.4.9 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).

12.4.10 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.

12.4.11 Landscaping. The following are conceptual guidelines established by the Installation Architect for coordinating landscaping design in conjunction with force protection needs.

12.4.11.1 Purpose. To establish an esthetic guideline and design approach to landscaping in conformance with current DOD antiterrorism force protection (AT/FP) provisions and engineering criteria, and the particular needs at White Sands Missile Range. This guideline will establish general criteria and a sample design “template” applicable to various perimeter locations of “building cluster” zones on the W.S.M.R. post.

12.4.11.2 Criteria. To provide as subtle as possible, a practical, engineered AT/FP barrier system with a pleasing landscaping esthetic that complies with ADA and applicable codes and standards, and is compatible with project cost budgets. To reach a desired level of protection without turning every facility or complex perimeter into a bunker or fortress, but with security measures that to the untrained eye would look like common “non-defensive” landscape design (Fig. 12.4 .11. 2).

Figure 12.4.11.2 – Force protection should blend with surroundings.

12.4.11.3 Criteria Concepts. To ensure emphasis of design intent, there may be redundancy with some of the guideline concepts below:

- Expand the palette of elements (Fig. 12.4.11.3a) that can gracefully provide perimeter standoff security, avoiding the monotony of endless lines of sterile jersey barriers, boulder dams, "dikes", or redundant bollards, which can only evoke and imply "defensiveness" and paranoia. Avoid regular "cookie cutter" predictable patterns of barrier components and landscaping.

Figure 12.4.11.3a – Trash receptacle with force protection.

- Site-verify, analyze, incorporate, and make use of existing trees of good health and structural integrity at locations (new and mature), to serve as barrier components.

- Enhance existing trees with new trees, and other barrier components.

- Establish a streetscape "campus effect" with new barrier landscaping for pedestrian flow (Fig. 12.4.11.3b).

Figure 12.4.11.3b – Force protection wall / seating.

- Establish landscaping tree "clusters" and other plantings in combination with varied barrier components. Avoid regular patterns and element rhythms unless particular focus and "framing" of a building is needed.

- Avoid surrounding individual buildings with continuous barrier landscaping unless they are remote and individual in the site setting.

- Produce a coherent strategy for deploying specific families of streetscape and security elements in which priority is given to achieving continuity along streets, and within areas, rather than solutions selected solely by the needs of a particular building. Extend the AT/FP minimum standoff distance of 33' (or to 82' as per WSMR Force Protection Officer) further away from buildings, to greater practical perimeters around multi-building "cluster" zones. Provide security in the context of a post-wide program of streetscape enhancement and public realm beautification, rather than separate or redundant system of components whose only purpose is security.

- All landscape barrier conditions must conform to the most current DOD Antiterrorism Standards for Buildings and engineering standards as approved by the WSMR Force Protection Officer and DPW.

- All landscaping components and motifs developed in a design must reflect sensitivity to our southwestern regionalism, dignity of our WSMR post's function and heritage, demonstrate sensitivity to architecture, and be compatible with the most current Installation Design Guide (IDG) herein.

- Provide appropriate levels of perimeter security for sensitive buildings as determined and ranked by WSMR, against threats generated by unauthorized vehicles approaching them (see item 7. above).

- Provide a security perimeter in a manner that does not impede the WSMR Post's emergency access, ADA pedestrian conformance, or vehicular mobility, or established operational use of sidewalks that already exist and are to remain.

- Removable or pneumatic type bollards (instead of gates – see Fig.12.4.11.3c) can serve as usual barriers where occasional controlled vehicle access to buildings is needed at entry/exit drives, curb cuts, etc.

Figure 12.4.11.3c – Pneumatic bollards can be used for limiting vehicular access.

- Streetscape design and application should demonstrate sensitive differences in the various WSMR "Visual Areas" or zones (Community Area, Administrative/Lab, Housing Area, Technical Service, Recreational Open Spaces etc.) as defined by the current WSMR Installation Design Guide (IDG). Landscaping designs within these "visual" areas or zones should include varied esthetic temperaments, reflecting different combinations and arrays of streetscape elements that incorporate security components such as: plinth walls, fences, rails, planters, bollards, hardened street furniture including benches and other seats, and kiosks, anchored trash cans, streetlights, hedges with hidden boulders, stand alone boulders and rock gardens, color bushes and trees (new and existing)

in esthetic combination with barrier cluster boulders.

- Seek opportunities for "Xeriscaping," low maintenance, low water, also with shaded plantings, to promote water and energy conservation (and even "Xeroscaping," with no plantings by creative use of rock landscaping).

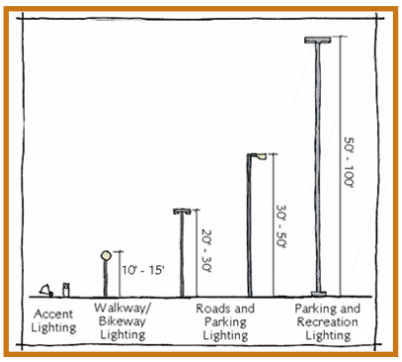


Figure 12.5 - Lighting creates a deterrent.

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. 12.5). Guidance on the use of security lighting may be obtained from TM 5-811-1, Electrical Power Supply and Distribution.

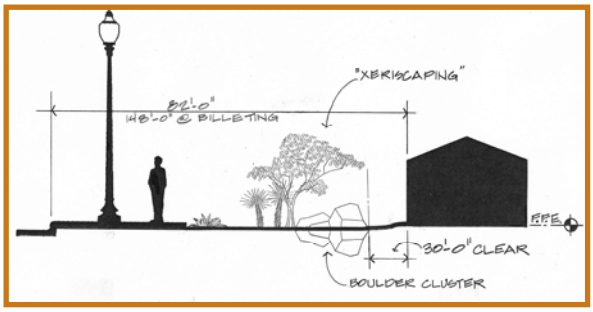


Figure 12.6.1c – Detail of WSMR boulder force protection.

12.6 BERMS

12.6.1 Use of berms (sometimes with boulder cluster and gravel field type xeroscaping) for force protection can fulfill one of more of the following functions (Fig. 12.6.1a through Fig. 12.6.1c).

Figure 12.6.1a - Berms can serve many force protection functions.

- Define boundaries of property or boundary limits.
- Provide a barrier to moving vehicles.
- Hinder pedestrian movement.
- Intercept projectiles.
- Obstruct lines of sight.
- Provide topographic relief and esthetic interest.

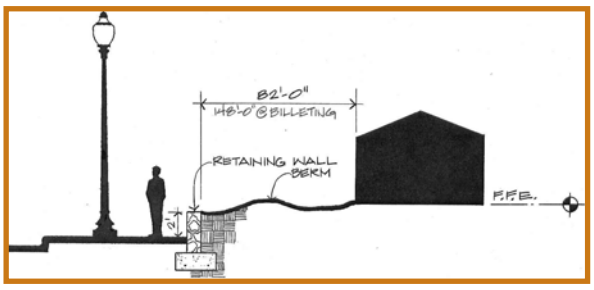


Figure 12.6.1b – Detail of WSMR berm construction.

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.*

12.6.3 If berms are used to prevent access by vehicles, they must be engineered so as to prevent the smallest vehicle that presents a threat from entering the perimeter that is being protected.

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 [ACPs])

12.7.1 Installation entry points are key components in the force protection security program. New ACPs along with reception centers for the El Paso and Las Cruces gates of WSMR have been designed in the year 2004 via the Ft. Worth District Corps of Engineers. This design project has been approved by the WSMR Force Protection Officer and Installation Architect. 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. 12.7.1).

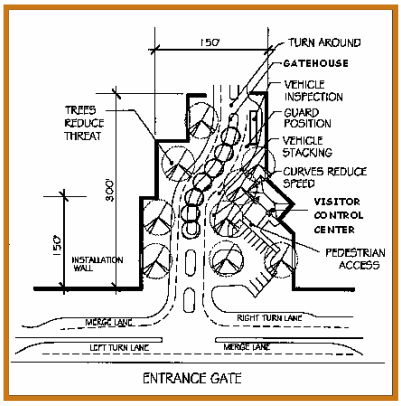


Figure 12.7.1 - Conceptual entrance gate to meet AT/FP requirements.

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, Force Protection Systems (PM-FPS) 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-FPS homepage is listed below.

- Product Manager - Force Protection Systems Homepage
- Product Manager - Force Protection Systems Homepage

12.8 INSTALLATION STANDARDS

12.8.1 Obtain WSMR and engineering standards from the WSMR project manager and Installation Force Protection Officer during planning and design of a project to ensure proper level of force protection.

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) 4-010-02, *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).

- Unified Facilities Criteria (UFC) 3-600-01, Design Fire Protection Engineering for Facilities
- 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 2004 (This Handbook is a "For Official Use Only (FOUO)" publication. Users may obtain a copy of the Handbook through the Point of Contact posted at the following website: http://www.dtic.mil/whs/directives/corres/html/o20 0012h.htm
- Army Regulation (AR) 525-13, The Antiterrorism (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).

Links

Go to Appendix A

Go to Table of Contents

Appendix A

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. All design teams shall be issued, or directed to the provisions of the current WSMR IDG prior to any planning and design services. 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 coordinated through the Master Planning project manager, to be completed by the design team to assure the guidelines and standards have been considered and complied with in the design process, coordinated and by the Master Planner's project manager for review by the Installation Architect in project review. The Installation Architect shall review all design documents for projects impacting the appearance of WSMR.

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% or similar approved levels 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, Team WSMR Functional Members, etc. shall have the perspective design build contractors submit a completed IDG Checklist as part of their proposal. The completed checklist and design documents will be provided to the WSMR Master Planner for review by the IDG Coordinator (WSMR Installation Architect), with a 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.

c. Have all 10 WSMR Water Management Plan Best Management Practices (BMP) been adequately considered? _____Yes_____No

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 considered 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 including the allowable colors for exposed exterior elements (walls, roof etc.)?

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 *the Secretary of the Interior's Standard's for Rehabilitation and Guidelines for Rehabilitating Historic Buildings* and *Appendix D of DA Pamphlet 200-4 (Army Historic Building Management Standards)* requirements for any deviations?

Yes _____ No _____

e. Does the building exterior design meet AT/FP requirements?

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 _____

b. Does the proposed planting plan enhance and meet AT/FP requirements defined in the IDG?

Yes _____ No _____

c. Does the proposed planting plan include plant material recommended in the selected Plant Palette Matrix included in the IDG?

Yes _____ No _____

d. Designer Comments on Landscape Design:

_____

_____

_____

e. Does Landscape Design comply with the IDG? If not, provide justification.

_____

f. Does the proposed planting plan allow for keeping sprinklers and drip irrigation from clogging [e.g. filters; appropriate gradient], siphoning into hose bib [e.g. adequate backflow prevention], leaking due to pressure [e.g. pressure reduction], and over watering [e.g. drip or bubbler emitters]?

Yes _____ No _____

g. Have trees been chosen and located to reduce storm run-off, resist drought, lower AC costs, increase shade where it most appreciated, stabilize soils, survive weather extremes, reduce pruning needs [e.g. power lines], and be non-allergenic?

Yes _____ No _____

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 IDG?

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. Will all storm drain systems designed to meet the guidelines defined in the IDG?

Yes _____ No _____

h. Designer Comments on Site Elements Design:

_____

_____

i. Does the Site Elements Design comply with the 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 DoD or DA guidelines? If not, provide justification (Department of Defense or DA waiver).

_____

_____

10. ENVIRONMENTAL AND SAFETY REQUIREMENTS

a. Have steps been taken to ensure that no hazardous building materials are used in the construction of new buildings, renovations or additions?

Yes _____ No _____

b. If the project is a renovation or addition, has a thorough inspection been made to determine the presence, location, quantity, and location of all hazardous building materials such as, but not limited to, asbestos containing materials, paint containing lead (Pb), mercury switches, materials containing PCBs, and ozone depleting substances?

Yes _____ No _____

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 (WSMR Installation Architect) **Date**

Accept _____ **Deny _____, Explanation of denial is attached.**

_____ _____

Command Review (Where Applicable) **Date**

Links

Go to Appendix B

Go to Table of Contents

Appendix B

B

B.1 PROJECT CHECKLIST

B.1.1 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 Natural Gas Lines
   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.
    c) Hazardous building materials surveys.

B. Project Building Plans: (If renovation/addition or prior design, provide available information and plans)

1.	Foundation	7.	Electrical
2.	Basement	8.	Mechanical
3.	Floor	9.	Plumbing
4.	Structural	10.	Site Utilities
5.	Roof	11.	Specifications
6.	Elevations	12.	Other (HAZMAT, etc.)

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: NM Building Code, NM Plumbing Code, NM Drinking Water Regulations.

Environmental Regulations:

DoD / DA AT requirements: See Section 12

Installation Regulations:

Cultural Regulations:

Other:

National Fire Protection Codes (NFPA), Unified Facilities Criteria (UFC) 3-600-01, Design Fire Protection Engineering for Facilities

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. Ensure that the Real Property Office of the Master Planning Division is notified of any planned facilities demolition in order for that office to obtain approval to dispose of facilities from the Department of Housing and Urban Development under the McKinney Homeless Assistance Act.

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: _____
6. Special signage required: _____
7. Concrete wheel stops required: _____Yes _____No.
8. 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). Ensure no ponding or inflows thru dumpster site will occur.

1.4 UTILITIES SERVICE REQUIREMENTS

A. Electrical Service: Meter required: _____Yes _____No.

Meters are always required

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.

Meters are always required

1. Size and location of tie-in point: _____
2. Additional fire hydrant (s) required: _____
3. List tie-in fittings with sizes and brand to include backflow preventers, valve boxes, valves, strainers, supports, and saddles:
   _____
4. Maximum new fire hydrant separation (500' max.): _____
5. Minimum new fire hydrant pressure (square root total floor sf protected /25):
   _____
6. Are new fire hydrants all valved and protected from traffic: Yes ____No____
7. Are all new water mains looped and sufficiently valved to isolate any section between junctures? _____Yes_____No

C. Sanitary Sewer Service:

1. Size and location of tie-in point: _____
2. Minimum new manhole interval (300' min.): _____
3. Are double brass capped cleanouts provided next to every facility to receive new or replaced service?_____Yes_____No
4. Are new and replaced lines at least 4" diameter?_____Yes_____No
5. Are new and replaced lines exterior to facility covered by at least 1' of AC, PCC, or 85% min compacted granular fill?_____Yes_____No
6. Is gradient 1 to 9% with 2' maximum drops?_____Yes_____No
7. Are rubber gaskets at every joint (pipe to pipe section, pipe to MH, and MH riser sections)?_____Yes_____No

8. Are rubberized MH treads at 1’ maximum intervals to land man on invert base safely out of flow?_____Yes_____No_____N/A

9. Is MH rebar or WWF #4 minimum at 3” minimum from surfaces? _____Yes_____No_____N/A

10. Are MH openings at least 4’ ID?_____Yes_____No_____N/A

11. Are 4’ and 5’ ID MH lids at least 6” and 8” thick?_____Yes_____No

12. Are MH invert bases at least 9” thick?_____Yes_____No_____N/A

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.

4. Minimum new MH or catch basin interval (300’ min.): _____

5. Are new and replaced culvert openings at least 2’ diameter?____Yes____No

6. Are new and replaced culverts covered by at least AC, PCC, or 1’ thick pea gravel?___Yes____No

7. Are open channel gradient, flow area, and lining roughness selected to maintain 2.5-10 fps range draining up to a 25-year event?___Yes___No

8. Do culvert outlets have adequate scour protection (at least 4 times culvert opening width in lieu of design information)?____Yes____No

9. Are rubber gaskets at every joint (pipe to pipe section, pipe to MH, and MH riser sections) to prevent “piping” or erosion above joints?___Yes_____No

10. Are rubberized MH or catch basin treads at 1’ maximum intervals to land man on invert base safely out of flow?_____Yes_____No____N/A

11. Is MH rebar or WWF #4 minimum at 3” minimum from surfaces?___Yes__No____N/A

12. Are MH openings at least 4’ ID?_____Yes_____No____N/A

13. Are 4’ and 5’ ID MH lids at least 6” and 8” thick?____Yes____No

14. Are MH invert bases at least 9” thick?_____Yes_____No____N/A

E. Gas Service: _____Natural, _____Propane;

Meter required: _____Yes _____No.

Meters are always required

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, fittings, pipe material, and location of tie-in point: _____

(Identify dielectric unions between dissimilar metals for corrosion reasons. Identify gaskets, seals, and packing with expected life as gas leaks can be lethal.)

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.

NOTE: The portion of track immediately off of US Highway 54 belongs to Union Pacific Railroad and should not be worked on.

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.

Solar Powered Lighting or Solar and wind powered lighting

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 and weather proofing 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

Specify Direct Digital Controls

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):

   Contract for waste removal: _____Yes_____No

   Oil/Water Separator (s) required: _____Yes _____No.

4. Commodes shall be floor mounted flush valve type.

5. Lift station and grinder 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 with trap	_____	Add flow-restricting washer
Commode	_____	Explain why 1.6gpf can't be used if applicable
Faucets	_____	chrome finish. Add flow restrictors
Shower	_____	Add flow restricting washer if head doesn't have < 1gph rating
Expose pipes/valves	_____	chrome finish.
Pipe penetrations	_____	chrome finish escutcheons.
Clean outs	_____	chrome covers.
Backflow preventor	_____	Use a double check valve with strainers arrangement.
Mirrors	_____	mech. wall fasteners. Lighting
Floor drain with trap	_____	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.
Waterless Urinal	_____	Same as above but no potable water is wasted.

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).

D. Minimum requirements for other items using water. Specify the lowest water and energy usage rated appliance that is economically available.

Washing Machine _____

Ice Maker _____

Refrigerator _____

Drinking Fountain _____

Dish Washer _____

3.0 FIRE PROTECTION REQUIREMENTS

Specify Reduced Pressure Backflow Preventers.

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:

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.

E. **All interior finish materials shall be per NFPA standards and** Unified Facilities Criteria (UFC) 3-600-01, Design Fire Protection Engineering for Facilities**.**

F. **Water supply lines: for the sprinkler system shall be black steel pipe.**

G. **The installation's standard fire alarm panels shall be specified for ease of maintenance and sustainability.**

H. **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 unremovable 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 "Centrex 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 to the Army Installation Design Guide and Post Wide Paint/Exterior Finish Standards and color charts.

7.0 OTHER COMMENTS

a. Prohibit the use and installation of hazardous building materials in the construction of buildings, and additions and renovations.

b. Ensure that, for additions and renovations, a thorough hazardous building material survey is conducted prior to any construction activity. The hazardous building material survey shall determine the presence, location, quantity, and condition of existing hazardous building materials.

Links
Go to Appendix C
Go to Table of Contents

Appendix C

C

C.1 PROJECT CHECKLIST

C.1.1 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?			
- Design 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			

ITEM	YES	NO	N/A
- Retained designer to review and approve contractor submittals			
- Retained designer to oversee the installation of furnishings			
- 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**

Links
Go to Appendix D
Go to Table of Contents

Appendix D

D

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.1.1a). 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.1.1b). The basic objectives of sustainability are:

Figure D.1.1a - 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.

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.

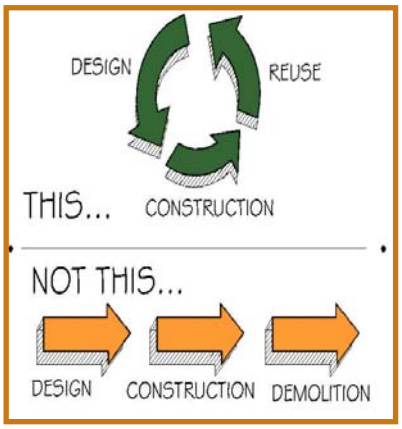


Figure D.1.1b - Sustainable design process.

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.2.1a), healthy (Fig. D.2.1b), high-performance (Fig. D.2.1c), and safe buildings.

Figure D.2.1a - Energy efficient lighting contributes to sustainability.

D.2.2 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)

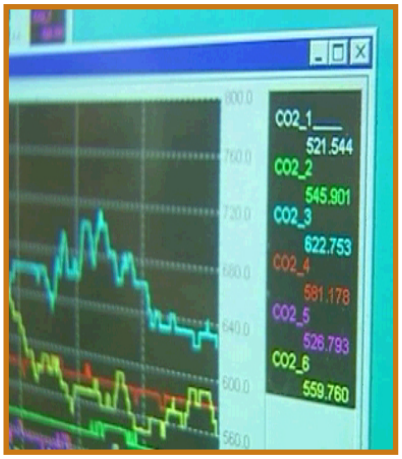


Figure D.2.1b - CO2 measurements of indoor air quality assisting in creating a healthy environment.

D.2.3 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.

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.

Figure D.2.1c - Efficient water usage contributes to a high performance facility.

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 principles of sustainable design for Federal Agencies established by EO 13123 include siting, design, and construction, as follows (Fig. D.3.1):

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.

D.3.1.8 Future Missions – Functional life of facility and support systems.

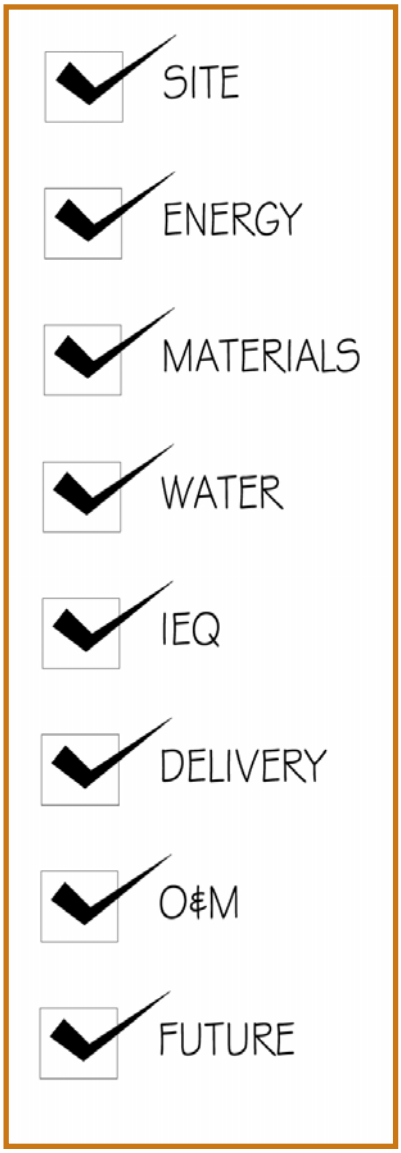


Figure D.3.1 - Sustainable design principles.

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.4.3). A facility 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.

Figure D.4.3 - 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

Links
Go to Appendix E
Go to Table of Contents

Appendix E

E

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
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

Template IDG

SUSTAINABILITY PROJECT RATING TOOL (SPiRiT)

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**
*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**		

Links

Go to Appendix F

Go to Table of Contents

Appendix F

F

F.1 LANDSCAPE MAINTENANCE SCHEDULE

F.1.1 The WSMR is divided into three landscape maintenance zone. The zones are classified as the blue zone, green zone and yellow zone (Fig. F.1.1). Follow the below scheduling for each zone treatment.

F.1.1.1 Landscape Maintenance Schedule Blue Zone

Tasks	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mowing												
edging												
watering			M	2W	2W	2W	2W	2W	2W	2W		
policing	W	W	W	W	W	W	W	W	W	W	W	W
weedeating												
vegetation removal			M	M	M	M	M	M	M	M		
tree well shaping	Q			Q				Q			Q	
low tree trimming	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN
tree pruning	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN
fertilize			X		X			X				
prune shrubs				ASN		ASN		ASN		ASN		

F.1.1.2 Landscape Maintenance Schedule Green Zone

Tasks	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mowing			M	W	W	W	W	W	W	BW		
edging			M	W	W	W	W	W	W	BW		
watering			M	2W	2W	2W	2W	2W	2W	2W		
policing	W	W	W	W	W	W	W	W	W	W	W	W
weedeating			M	W	W	W	W	W	W	W	W	W
vegetation removal			M	M	M	M	M	M	M	M		
tree well shaping	Q			Q				Q			Q	
low tree trimming	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN
tree pruning	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN
fertilize			X		X			X				
prune shrubs				ASN		ASN		ASN		ASN		

F.1.1.3 Landscape Maintenance Schedule Yellow Zone

Tasks	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mowing			M	M	M	M	M	M	M	M		
edging			M	M	M	M	M	M	M	M		
watering												
policing	M	M	M	M	M	M	M	M	M	M	M	M
weedeating			M	M	M	M	M	M	M	M		
vegetation removal			M	M	M	M	M	M	M	M		
tree well shaping												
low tree trimming	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN	ASN
tree pruning	ASN	ASN									ASN	ASN
fertilize												
prune shrubs				ASN		ASN		ASN		ASN		

W – Weekly

2W – Twice a week

BW – Bi-weekly

M – Monthly

Q – Quarterly

ASN – As needed

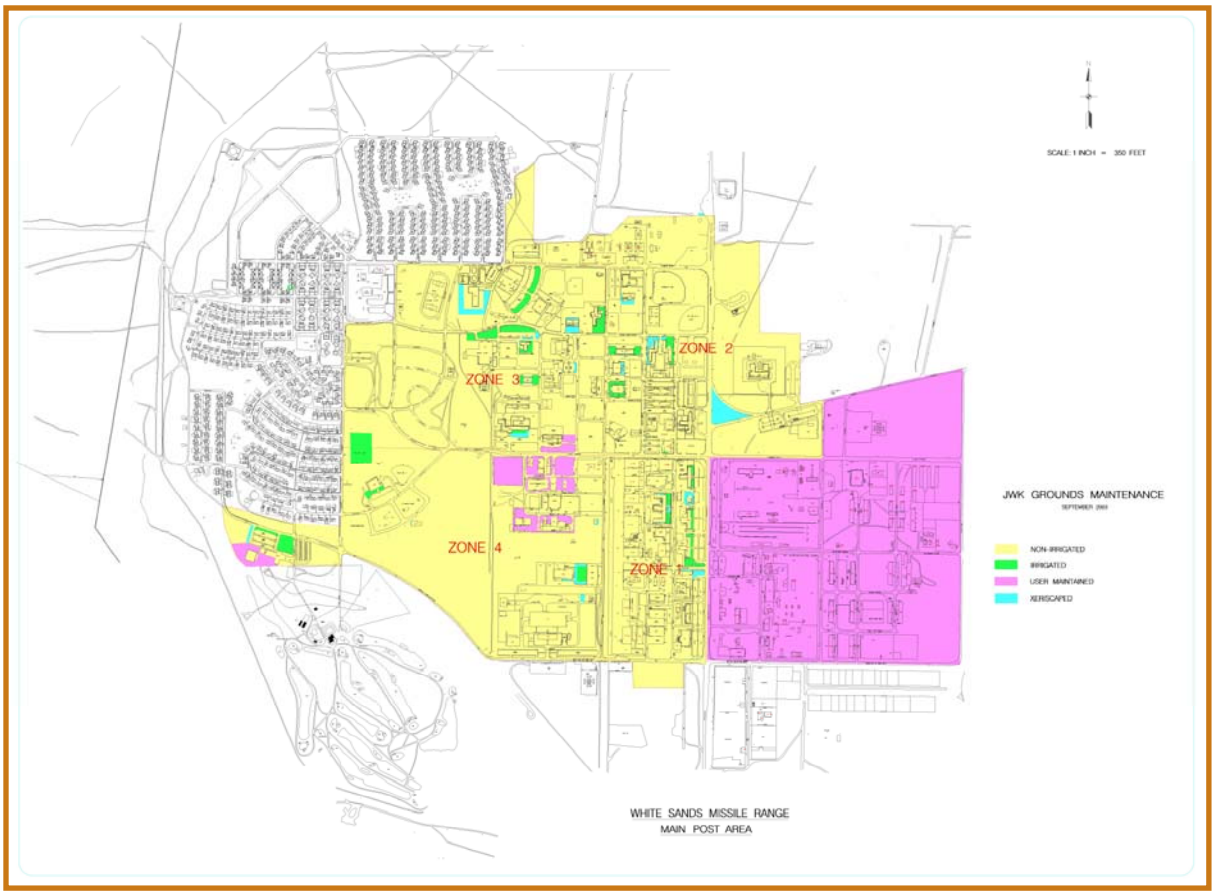


Figure F.1.1 - WSMR maintenance zones

Links
Go to Appendix G
Go to Table of Contents

Appendix G

G

Prioritized Improvements Projects List

INSTALLATION: White Sands Missile Range

DPW or EQUIVALENT - MASTER PLANNER

NAME: Rich Willard	PHONE: 505.678.6805 EMAIL: richard.c.willard@us.army.mil willardrc@wsmr.army.mil	ADDRESS: Building 102

PRIORITY NO.	PROJECT TITLE	RECOMMENDED FUNDING SOURCE	ALTERNATIVE FUNDING SOURCE	COST ESTIMATE	IDG PARA NO.	POINT OF CONTACT
1	Force Protection	GWOT	SRM	$1,000.00 lf	6.2	Rich Willard
2	Pedestrian Circulation System	SRM	TBD	See Section 6.10.4 for Detailed Cost Estimate	6.10	Rich Willard
3	Installation Signage	SRM	TBD	Total Cost per Facility: $2,000.00	6.3	Rich Willard
4	Erosion and Drainage Control	SRM	TBD	CB material, delivery and installation cost is $5.25sf.	6.6	Rich Willard
5	Screening	SRM	TBD	Cost for 94% privacy fabric is $3.20 - $3.50lf. Cost for Bottom-Locking Slats is $47.36lf.	6.8	Rich Willard
6	Landscaping	SRM	TBD	See Section 6.9.4 for Detailed Cost Estimate	6.9	Rich Willard

Prioritized Improvements Projects List

INSTALLATION: White Sands Missile Range

DPW or EQUIVALENT - MASTER PLANNER

NAME: Rich Willard	PHONE: 505.678.6805 EMAIL: richard.c.willard@us.army.mil willardrc@wsmr.army.mil	ADDRESS: Building 102

PRIORITY NO.	PROJECT TITLE	RECOMMENDED FUNDING SOURCE	ALTERNATIVE FUNDING SOURCE	COST ESTIMATE	IDG PARA NO.	POINT OF CONTACT
7	Paint/Coat Existing Buildings	SRM	TBD	Materials and labor cost of paint is estimated to be $1.00sf.	6.5	Rich Willard
8	Outdoor Common Areas and Courtyards	SRM	TBD	See Section 6.7.4 for Detailed Cost Estimate	6.7	Rich Willard
9	Roadway and Construction Enhancement	SRM	TBD	See Section 6.4.4 for Detailed Cost Estimate	6.4	Rich Willard
10	Paint Fire Hydrants	SRM	TBD	Cost for materials and installation is estimated at $100.00 per hydrant.	6.11	Rich Willard

Links

Go to Appendix H

Go to Table of Contents

Appendix H

H

H.1 HAZARDOUS FACILITIES

H.1.1 Determine whether a hazardous building materials clearance has been performed. If abatement is required, then, the self-help project should be denied until all hazardous building materials have been abated.

Links

Go to Appendix I

Go to Table of Contents

Appendix I

I

I.1 INTERIOR FINISHES

I.1.1 All interior finishes shall be free of asbestos containing material and lead (Pb).

I.1.2 All interior finishes and colors shall be reviewed by the Installation Architect.

Links
Go to Appendix J
Go to Table of Contents

Appendix J

J

Links

Go to Appendix K

Go to Table of Contents

Appendix K

K

K.1 EXTERIOR MATERIALS

K.1.1 All exterior materials shall be free of asbestos containing materials and lead (Pb).

K.1.2 All exterior materials and colors shall be reviewed by the Installation Architect.

EXTERIOR MATERIALS CHART
VISUAL ZONE: *Housing Visual Zone*

Building Design Element		Permitted Material Type	Notes
Walls	Base (primary) material	New or existing Stucco, EIFS, Synthetic Stucco: Pantone colors- “Almond”,”Custard”, “Mocha”	Alternate the house wall colors
	Secondary material	Native stone (Franklin “rainbow” by Jobe or eq.): for separator yard walls, planters, wainscots, plazas, plinth walls, and architectural accents	As accents
Roof	Sloped areas	Clay, metal, or concrete mission tile style, color- “Terracotta”	Preferred roofing
		Fiberglass shingle, colors gray or white	Not preferred
	“Flat” areas	White (reflective): granular, mineral cap, membrane, or gravel/flood coat system as approved	
Fenestration	Doors		
	Storm Doors		
	Door & Window Frames		
	Storm window or sash		
	Window		
Trim Items	Fascia		
	Soffit		
	Gutters and D.S.		
	Awnings and canopies		
	Stair or balcony railings, balusters, and related trim/accessories		
	Handrails		

Building Design Element		Permitted Material Type	Notes
Trim Items	Fire Escapes		
	Grilles and louvers		
	Coping		
	Roof ventilators		
Related Site Structures	Courtyard enclosure walls, retaining walls, fences, dumpster enclosures		
	Porch crawl space enclosure		

NOTES:	
Note 1	
Note 2	
Note 3	

EXTERIOR MATERIALS CHART
VISUAL ZONE: *Community Visual Zone*

Building Design Element		Permitted Material Type	Notes
Walls	Base (primary) material	New Stucco, EIFS, Synthetic Stucco, or painted/coated if existing buildings: Pantone Colors-“Almond”, “Custard” (as the predominant color), “Mocha”	Single Wall Color typical, or in rare approved designs, per wall massings, color enhancing combinations
	Secondary material	Tan Brick/masonry	
		Native Stone (Franklin “rainbow” by Jobe or eq.)	For accents
Roof	Sloped areas	Metal, Standing Seam: color- “Metal Bronze” or “Terracotta” as approved	Barrel or 3:12 slope minimum
	“Flat” areas	White (reflective): granular, mineral cap sheet, membrane, or gravel flood coat system as approved	With straight wall parapets, as typical predominant roofline
Fenestration	Doors		
	Storm Doors		
	Door & Window Frames		
	Storm window or sash		
	Window		
Trim Items	Fascia		
	Soffit		
	Gutters and D.S.		
	Awnings and canopies		
	Stair or balcony railings, balusters, and related trim/accessories		
	Handrails		

Building Design Element		Permitted Material Type	Notes
Trim Items	Fire Escapes		
	Grilles and louvers		
	Coping		
	Roof ventilators		
Related Site Structures	Courtyard enclosure walls, retaining walls, fences, dumpster enclosures		
	Porch crawl space enclosure		

NOTES:	
Note 1	
Note 2	
Note 3	

EXTERIOR MATERIALS CHART

VISUAL ZONE: *Technical/ Service Visual Zone*

Building Design Element		Permitted Material Type	Notes
Walls	Base (primary) material	New Stucco, EIFS, Synthetic Stucco, Pre-engineered metal building system with manufacturer's standard colors, or existing painted/coated to match Pantone color, "Custard"	Single wall color, typical
	Secondary material	Tan brick/masonry	
Roof	Sloped areas	Pre-engineered metal building system, or standing seam metal system with colors of "Metal Bronze" or "Terracotta", as approved.	
	"Flat" areas	White (reflective): granular, mineral cap sheet, membrane, or gravel flood coat system as approved	
Fenestration	Doors		
	Storm Doors		
	Door & Window Frames		
	Storm window or sash		
	Window		
Trim Items	Fascia		
	Soffit		
	Gutters and D.S.		
	Awnings and canopies		
	Stair or balcony railings, balusters, and related trim/accessories		
	Handrails		

Building Design Element		Permitted Material Type	Notes
Trim Items	Fire Escapes		
	Grilles and louvers		
	Coping		
	Roof ventilators		
Related Site Structures	Courtyard enclosure walls, retaining walls, fences, dumpster enclosures		
	Porch crawl space enclosure		

NOTES:	
Note 1	
Note 2	
Note 3	

EXTERIOR MATERIALS CHART
VISUAL ZONE: *Administrative Visual Zone*

Building Design Element		Permitted Material Type	Notes
Walls	Base (primary) material	New Stucco, EIFS, Synthetic Stucco, or painted/coated if existing buildings: Pantone Colors-"Almond, "Custard" (as the predominant color), "Mocha"	Single wall color typical, or in rare approved designs, per wall massing color enhancing combinations
	Secondary material	Tan brick/masonry	
		Native Stone (Franklin "rainbow" by Jobe)	
Roof	Sloped areas	Standing seam metal system: Color "Metal Bronze"	Barrel or 3:12 slope minimum
	"Flat" areas	White (reflective): granular, mineral cap sheet, membrane or gravel flood coat system as approved	With straight wall parapet, as typical predominant roofline
Fenestration	Doors		
	Storm Doors		
	Door & Window Frames		
	Storm window or sash		
	Window		
Trim Items	Fascia		
	Soffit		
	Gutters and D.S.		
	Awnings and canopies		
	Stair or balcony railings, balusters, and related trim/accessories		
	Handrails		

Building Design Element		Permitted Material Type	Notes
Trim Items	Fire Escapes		
	Grilles and louvers		
	Coping		
	Roof ventilators		
Related Site Structures	Courtyard enclosure walls, retaining walls, fences, dumpster enclosures		
	Porch crawl space enclosure		

NOTES:	
Note 1	
Note 2	
Note 3	

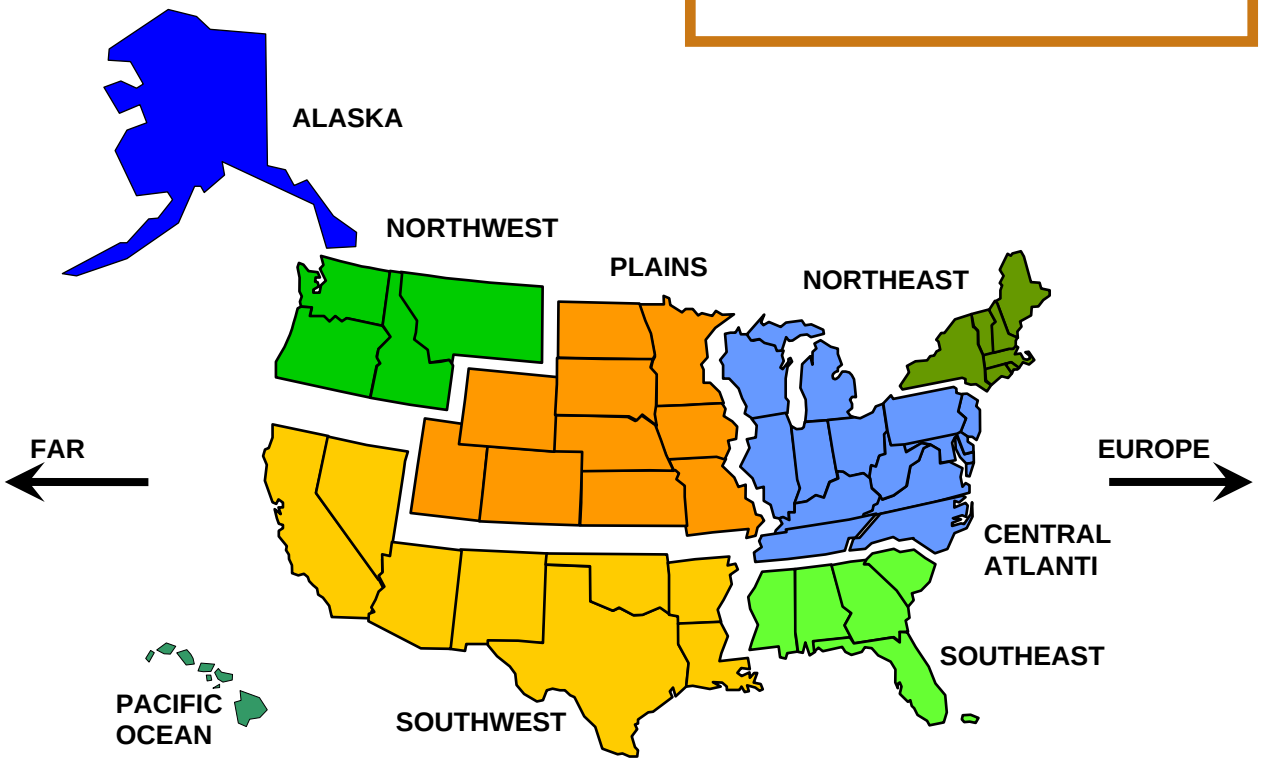
Links

Go to Appendix L

Go to Table of Contents

Appendix L

L



EXTERIOR COLOR REGIONS

Page	Area
L7-8	Southwest USA

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 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. 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 supplemental 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 probably be inaccurate to a greater or lesser degree depending on the printer used. A hard copy is available which contains accurate representations of all of the Army's standard exterior colors. This hard copy is the **COLOR BOARD for the IDS APPENDIX L: HARD COPY VERSION** and 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.

L.5.2 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

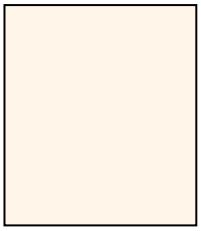
Site Elements, addressed in Chapter 6, are painted one of the colors used in the Color Charts and shown on the Color Board. Fire Hydrants (see Paragraph 6.6.6.5) which shall be Nutmeg Brown in color shall be finished in a standard manufacturers paint, suitable for this application, to which glass beads 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

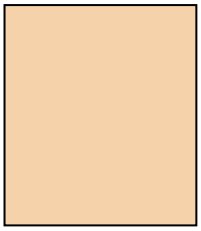
Water storage tank finishes shall be in accordance with guidance provided in Chapter 6, paragraph 6.6.6.4.

COLOR BOARD for the Army Installation Design Standards / Appendix L

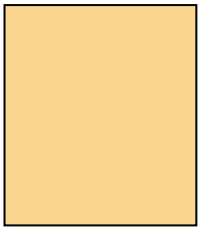
The color squares shown here are approximations of the PANTONE® for architecture and interiors color numbers indicated. They have been simulated using RGB values and are intended to be reproduced electronically. Color quality may vary with printer. PANTONE colors are a standard. In order to accurately 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.



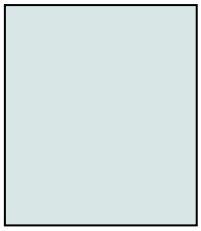
PANTONE 11-0604 TPX SHELL



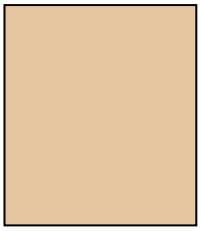
PANTONE 11-0907 TPX ALMOND



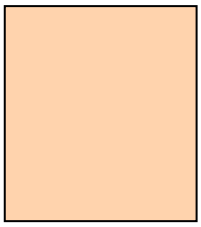
PANTONE 12-0910 TPX CUSTARD



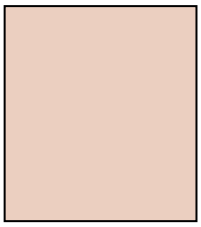
PANTONE 12-4607 TPX PASTEL SKY



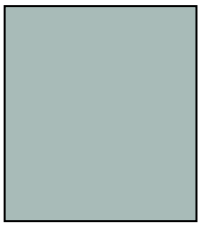
PANTONE 13-1009 TPX TAN



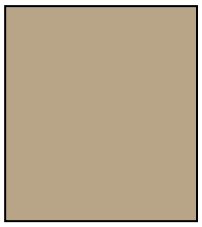
PANTONE 13-1013 TPX ALLSPICE



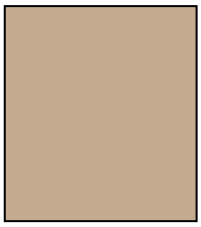
PANTONE 13-1107 TPX BEIGE



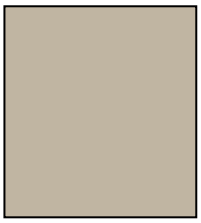
PANTONE 14-4506 TPX BLUEGRAY



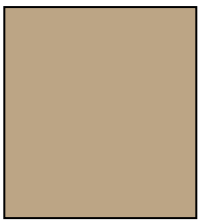
PANTONE 15-1306 TPX TAUPE



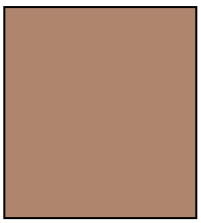
PANTONE 15-1309 TPX NATURAL



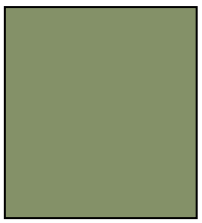
PANTONE 15-5704 TPX GRAY



PANTONE 16-1210 TPX MOCHA

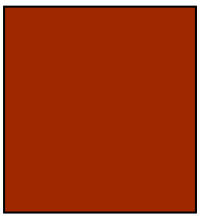


PANTONE 16-1221 TPX BROWN

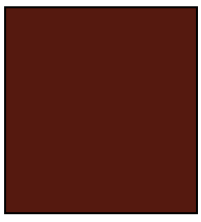


PANTONE 16-6216 TPX METAL GREEN

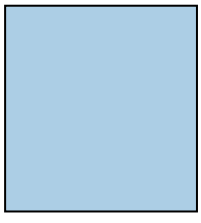
PANTONE 18-1027 TPX DARK BROWN



PANTONE 18-1444 TPX SALSA



PANTONE 19-1540 TPX MAROON



PANTONE 14-4318 TPX SKY BLUE

PANTONE 18-1222 TPX NUTMEG BROWN

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***

Exterior Color Charts

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 Chocolate 18-1124 TPX		
	Porch Crawl Space Enclosure	White		

NOTES:	
Note 1	Identify type, color, and texture of local brick and stone, to include mortar color and joint style.
Note 2	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 3	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.

Links
Go to Appendix M
Go to Table of Contents

Appendix M

M

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.

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 districts and zones on WSMR.

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)

Figure M.2.4 - Many army properties are listed on the national register of historical properties.

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 (Fig. M.2.4). 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.

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 WSMR 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 the WMSR 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 (Fig. M.3.2). 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.

Figure M.3.2 - Make every effort to use historical structures as originally intended.

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.

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.3.3.2).

Figure M.3.3.2 - Retain distinguished stylistic or character defining features.

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.

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 in conjunction with the Installation ICRMP.

Figure M.3.4.1 - Replace or restore roofs with historical materials.

M.3.4 Guidelines for Historic Preservation Projects.

M.3.4.1 Roof Guidelines

- Preserve existing historic roofing. Repair and patch with matching materials (Fig. M.3.4.1).

- 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.

Figure M.3.4.3 - Retain existing historical porches.

M.3.4.3 Porch Guidelines

- Retain or maintain existing original porches (Fig. M.3.4.3).

- 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 to bring 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

Links
Go to Appendix N
Go to Table of Contents

Appendix N

N

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 Housekeeping Rules

Housekeeping Rules for Maintenance Contactor

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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581).

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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581). 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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581).

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.

12. Hazardous Building Materials: Employees shall not disturb or handle any hazardous building material unless the said employee is competent, qualified, certified, and authorized to do so.

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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581).

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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581). 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 (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581). 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

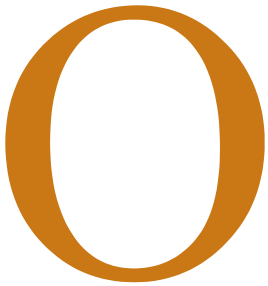
a. Laminate Surfaces – To clean laminate tops, use a soft cloth or non abrasive sponge dampened in a solution of mild detergent and warm water. Remove residue of cleaning solution with a soft cloth wrung out in clean water. Dry with a soft cloth.

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 work stations, contact (Job Order & Service Contracts Branch, IS-EJ, (505)678-8744 or (505)678-1581).

Links
Go to Appendix O
Go to Table of Contents

Appendix O



O.1 PLANT PALETTE

O.1.1 Landscaping Plants Allowed on White Sands Missile Range.

O.1.1.1Plants for landscaping and/or xeriscaping on WSMR shall be chosen from this list. There is a wide variety of plants available in all size/functionality categories, so there shall be no substitutions of other plants not on this list. Do not substitute different species within the same genus, unless specifically stated (e.g. Acacia sp., Echinocereus sp.). Common and scientific/botanical names are provided to ensure selection of proper species. If further information on a species, whether on this list or not listed, is required, or ideas for companion plantings or substitution recommendations for more "traditionally recognized" landscaping plants is desired, please contact SFIM-WS-ES, at 678-7817.

* Plants indicated in yellow are preferred varieties for WSMR. Mulberry trees/shrubs of any kind are prohibited at WSMR.

Common Name/ Botanical Name	Description	Culture
TREES		
Whitethorn acacia, Viscid acacia, Catclaw acacia, Guajillo, Acacia *Acacia constricta, A. neovernicosa, A. greggii, A. berlandieri, Acacia sp.*	Small tree to large shrub. Most have small ball-shaped flowers in spring or summer. Select species that are cold hardy.	Cold hardiness: varies Soil Type: Adaptable Light: full sun Water: Moderate to low
Sweet acacia *Acacia farnesiana*	Small deciduous tree 15-30' high. Spreading branches, stems armed with paired straight thorns. Yellow ball-like flowers in Spring.	Cold hardiness: to 20F Soil Type: Adaptable Light: full sun Water: Moderate to low
Netleaf hackberry *Celtis reticulata*	Small- to medium-sized deciduous tree, to 30' tall and similar width.	Cold hardiness: to –10F Soil type: well drained Light: partial shade to full sun Water: moderate to low
Blue palo verde, Little leaf palo verde, Texas palo verde *Cercidium floridum, C. microphyllum, C. texanum*	Small deciduous tree, to 25' tall and similar spread. Yellow flowers in summer.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: moderate to low
Desert willow *Chilopsis linearis*	Deciduous shrub to 25' tall and 15' wide, can be trimmed up to tree shape. Lavender, pink or white flowers, April through September.	Cold hardiness: to 10F Soil type: well drained, adaptable Light: full sun Water: moderate to low

Chitalpa *Chitalpa tashkentensis* *(Chilopsis X catalpa)*	Small- to medium-sized deciduous tree, to 25' tall and 25'wide. White, pink or lavender flowers May to November.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low to moderate
Arizona cypress *Cupressus arizonica*	Large evergreen tree, to 50' with 45' spread. Nice shape with good shade. NOTE: This plant can produce large quantities of pollen during several months, which should be considered prior to selecting for planting.	Cold hardiness: to 0F Soil type: well drained, alkaline adaptable Light: full sun Water: moderate to low
Eucalyptus (Forman's) *Eucalyptus formanii*	Small evergreen tree, 15' to 25' tall, with 10' to 15' spread.	Cold hardiness: to 15F Soil type: well drained Light: partial shade to full sun Water: low
Fragrant ash *Fraxinus cuspidata*	Small deciduous tree to 20' High. Slender tree, with dark green leaves. Clusters of fragrant white flowers in spring.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: low
Gregg ash *Fraxinus greggii*	Small tree to 25' high, or clump-forming shrub. Olive-green leaves.	Cold hardiness: to 0F Soil type: well drained, adaptable Light: full sun to partial shade Water: low
Texas Ash, Arizona Ash *Fraxinus texensis, Fraxinus arizonicus*	Deciduous tree, 25' to 40' in height, and 25' to 35' crown.	Cold hardiness: to -20F Soil type: well drained Light: full sun Water: low to moderate

Honey locust (non-thorned) *Gleditsia triacanthos var. inermis*	Large tree, 40' tall and 40' wide. Attractive shade tree, with fairly open canopy. Round to irregular canopy form. Only use the thornless variety of honey locust.	Cold hardiness: to –20F Soil type: well drained, adaptable Fairly salt tolerant Light: full sun Water: low to moderate
Golden ball lead tree *Leucaena retusa*	Small- to medium-size tree, 15' to 25' tall and about as wide. Flowers in spring, with yellow golden puffball-like flowers. Often has multiple trunks, but can be trimmed to a single main trunk.	Cold hardiness: to 5F Soil type: adaptable Light: full sun Water: low to none
Arroyo Sweetwood *Myrospermum sousanum*	Small- to medium sized tree, 15' to 25' tall, and about as wide. Cream colored flowers in spring.	Cold hardiness: to 9F Soil type: adaptable Light: full sun Water: low to moderate
Olive *Olea europaea*	Small tree to 25' tall and 25' wide. Fragrant white flowers in spring. Produces fruits that can be messy to clean.	Cold Hardiness: to 10F Soil type: well drained Light: full sun Water: moderate to low
American pistachio, Texas pistache, Chinese pistache *Pistacia texana, P. chinense*	Small, semi-evergreen tree, 25' in height, and 25' in width. Green leaves often will have bronze tips.	Cold hardiness: to –10F Soil type: well drained, adaptable, salt and alkaline tolerant Light: full sun to partial sun Water: low
Texas ebony, Mexican ebony *Pithecellobium flexicaule, P. mexicanum*	Semi-evergreen, small tree to 20' tall and 20' wide. Dark green foliage with yellow to cream colored flowers in summer. Should be planted against south or west facing areas to catch reflected warmth in winter.	Cold hardiness: to 18F Soil type: well drained, alkaline adapted Light: full sun Water: moderate to low

Mesquite (various species) *Prosopis sp.*	Deciduous tree or large shrub. Most have flower spikes spring or summer, fruit pods summer through fall. May need to trim lower branches to achieve tree form. Select cold hardy species.	Cold hardiness: varies Soil type: well drained Light: full sun Water: moderate to low
Honey mesquite *Prosopis glandulosa var. glandulosa*	Deciduous tree or large shrub. Can achieve 25' high and 30' wide, though commonly smaller. Yellow flower spikes April and May, fruit pods summer through fall. May need to trim lower branches to achieve tree form.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Screwbean mesquite *Prosopis pubescens*	Deciduous tree or large shrub, to 25' high and 25' spread. Spikes of greenish-white flowers, 1½ to 3 inches long.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: low
Velvet mesquite *Prosopis velutina*	Deciduous tree or large shrub to 20' high and 30' wide, though commonly smaller. Yellow flower spikes spring and summer, fruit pods summer through fall. May need to trim lower branches to achieve tree form.	Cold hardiness: to 5F Soil type: well drained Light: full sun Water: moderate to low
Common hoptree *Ptelea trifoliata*	Deciduous small tree, to 15' tall and 15' wide. Small white flowers.	Cold hardiness: -30 Soil type: well drained Light: full sun Water: moderate to low
Burr Oak *Quercus macrocarpa*	Large deciduous tree, 40' to 70' in height, and 35'to 60' wide. Excellent yard tree.	Cold hardiness: to -30 Soil type: well drained Light: full sun to part shade Water: moderate to low

Mexican blue oak *Quercus oblongifolia*	Semi-evergreen, small tree or large shrub, to 25' tall and 25' wide. Bluish foliage color.	Cold hardiness: to 0F Soil type: well drained, alkaline Light: full sun Water: low
Mexican elder *Sambucus mexicana*	Medium, semi-evergreen tree, 15-25' tall with a spreading canopy. Clusters of white or cream colored flowers in summer.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: moderate
Western soapberry *Sapindus drummondii*	Deciduous tree, 25-30' high and 20-25' wide. Nice shade and good fall color (golden).	Cold hardiness: to –5F Soil type: adaptable Light: full sun Water: low
Texas sophora, Eve's necklace *Sophora affinis*	Small deciduous tree, to 25' tall and 25' wide. Showy pink to white flowers in summer.	Cold hardiness: to 0F Soil type: adaptable, alkaline tolerant Light: full sun to full shade Water: low
Texas mountain laurel Sophora secundiflora	Small tree, to 15' in height and 15' in width. Has evergreen, dark glossy leaves, and showy wisteria-like clusters of fragrant, purple flowers in spring. This tree should not be planted in housing areas, as the seeds are poisonous if ingested.	Cold hardiness: to 10F Soil type: well drained, alkaline adapted Light: full sun to partial shade Water: low
Mexican buckeye *Ungnadia speciosa*	Small deciduous tree, 15' high and 10' wide. Dark green foliage with golden yellow fall color. Profuse showy rosy-pink flowers in spring.	Cold hardiness: to 10F Soil type: adaptable Alkaline tolerant Light: partial sun to partial shade Water: low

Chaste tree *Vitex agnus-castus*	Small tree, to 15' tall and similar spread. Lilac or white flowered varieties available.	Cold hardiness: to 5 F Soil type: well drained Light: full sun Water: low to moderate
CACTI, ACCENTS, AND OTHER SUCCULENTS		
Lechuguilla *Agave lechuguilla*	Clumping succulent rosette, to 18" tall and 2' wide. Mature plants (many years old) will send up a flowering stalk, to 14' tall, with yellow flowers. Central (flowering) plant will die-back at that point, but young offsets (pups) will have sprouted at the base of the 'parent' plant.	Cold hardiness: to 0F Soil type: well drained Light: partial sun to full sun Water: none to low
New Mexico agave, Parry agave *Agave neomexicana* *Agave parryi*	Clumping succulent rosette, to 2 ½" tall and 3' wide. Mature plants (more than 20 years old) will send up a flowering stalk, to 15' tall, with orange or yellow flowers. Central (flowering) plant will die-back at that point, but young offsets (pups) will have sprouted at the base of the 'parent' plant.	Cold hardiness: to -20F Soil type: well drained Light: full sun Water: none to low
Agave (many available) *Agave sp.*	Clumping succulent rosettes. Mature plants (many years old) will send up a flowering stalk, most over 10' tall, with yellow flowers. Central (flowering) plant will die-back at that point, but young offsets (pups) will have sprouted at the base of the 'parent' plant.	Cold hardiness: to 0F Soil type: well drained Light: partial sun to full sun Water: none to low
Jelly Palm *Butia capitata*	Feather palm, to 15' tall.	Cold hardiness: to 10F Soil type: well drained, sandy Light: partial shade to full sun Water: moderate

Sotol *Dasylirion wheeleri, Dasylirion sp.*	A member of the Agave family. Leaves to 4' tall and 5' wide. A central flower stalk is put up every year.	Cold hardiness: to 5F Soil type: well drained Light: full sun Water: low
Cholla *Cylindropuntia sp.*	Cacti closely related to prickly pear, growing upright as a shrub 3-8' tall, with elongated pads. Fuschia flowers in spring and summer, yellow fruit buds in summer. Many varieties and species.	Cold hardiness: to –5F Soil type: well drained Light: full sun Water: low
Hedgehog cactus, Rainbow cactus, or Claret-cup cactus *Echinocereus sp.*	Low growing, clump forming or single columnar cactus, to 16" tall. Large, showy flowers in many colors in spring.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: low
Candelilla, Wax Euphorbia *Euphorbia antisyphilitica*	Leafless evergreen accent plant, to 3' tall and 2' wide. Excellent for rock gardens and planter boxes, especially against south and west facing walls.	Cold hardiness: to 10F Soil type: alkaline Light: full sun Water: low
Fishhook barrel cactus *Ferocactus wislizeni*	Solitary barrel shaped cactus, to 6' tall and 21" diameter, or more. NOTE: Barrel cactus must have documentation proving nursery grown or salvage origin.	Cold hardiness: to 5F Soil type: well drained Light: full sun Water: low to none
Ocotillo *Fouquieria splendens*	Unusual deciduous shrub, to 20' tall and 15' spread. Bright reddish-orange flowers at tops of stems in spring and early summer.	Cold hardiness: to 0F Soil type: well drained, rocky soil preferred Light: full sun Water: low to none

Texas false-agave *Hechtia texensis*	Rosette-forming plant, to about 6" tall and 8" wide, eventually developing offsets with clumps to 18" wide. Medium green leaves, turning reddish in fall. Similar in appearance to true agaves.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
False red yucca, Texas yucca, Coahuilan hesperaloe *Hesperaloe parviflora, H. funifera, Hesperaloe sp.*	Resembles true yuccas, with narrow leaves, to 3' tall and 5' wide. Attractive red flowers on a tall stalk. (Yellow cultivars also available.)	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Mammillaria cactus *Mammillaria sp.*	Low growing cacti, most less than 1' high. Showy flowers spring or summer. Nice accent plant.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
Spice lily, Manfreda *Manfreda maculosa*	Low growing member of the yucca family, to <6" tall and 1' wide with fleshy leaves. Flower stalk to 2' tall with cream colored flowers.	Cold hardiness: to 5F Soil type: well drained Light: full sun Water: Moderate
Beargrass (or sacahuista) *Nolina sp.*	Grass-like shrub, to 5' tall and Evergreen. Sends up a spike of yellowish flowers late spring.	Cold hardiness: to –5F Soil type: well drained Light: full sun Water: low to none
Prickly pear *Opuntia sp.*	Cacti with flattened pads, 2-6' tall and 3-15' wide clumps. Showy flowers in many colors, spring and summer. Red to purple fruits summer to fall. Many species are available.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low

Banana yucca *Yucca baccata*	Low growing shrub, stemless rosette to 4'tall and 4' wide.	Cold hardiness: to –5F Soil type: well drained Light: full sun Water: low
Soaptree yucca *Yucca elata*	Tree like succulent, to 20' and 10' wide. Flowers from May to July.	Cold hardiness: 0F Soil type: well drained Light: full sun Water: low
Yucca species *Yucca sp.*	Many species of yucca are suitable for this area. NOTE: Tree forming yuccas must have documentation proving nursery grown or salvage origin.	Cold hardiness: 10F Soil type: well drained Light: full sun Water: low
SHRUBS		
Catclaw acacia *Acacia greggii*	Large, spreading shrub to 30' high. Covered with curved thorns. Creamy yellow clusters of flowers in summer.	Cold hardiness: to 0F Soil type: Adaptable Light: full sun Water: low to none
Bee brush, Oreganillo, Spicebush *Aloysia gratissima, A. wrightii*	Deciduous shrub, 5' to 8' in height and 5' to 8' in width. Leaves are very fragrant, with small fragrant white flowers spring through fall.	Cold hardiness: to 15F Soil Type: adaptable Light: full sun to partial sun Water: low
Triangle-leaf bur-sage White bur-sage *Ambrosia deltoidea, A. dumosa*	Deciduous shrubs 18" to 2' tall and 2' to 3' wide. Leaves are grey-green or white, with small yellow-green flowers blooming from late winter to spring, and occasionally fall.	Cold hardiness: to 20F Soil type: adaptable Light: full sun Water: moderate to low

Desert honeysuckle, Flame Anisacanthus *Anisacanthus thurberi, Anisacanthus sp.*	Deciduous shrub, 3-6' high and 4-5' wide. Showy orange. Flowers in summer.	Cold hardiness: to 5F Soil type: well drained Light: full sun to partial shade Water: moderate to low
Sand sage *Artemisia filifolia*	Evergreen shrub, 3-6' high, 4-6' wide. Leaves are grey-green with a pleasant fragrance.	Cold hardiness: to -10F Soil type: well drained Light: full sun Water: moderate to low
Wormwood, Sagebrush, White sage *Artemisia sp.*	Low growing to moderate size shrubs, 1-4' high. Most have inconspicuous flowers, with green to grey-green foliage.	Cold hardiness: most to –10F Soil type: well drained Light: full sun Water: moderate to low
Four-wing saltbush *Atriplex canescens*	Evergreen shrub to 6' tall, 4-8'spread. Inconspicuous flowers. Showy seeds through winter.	Cold hardiness: to –10F Soil type: adaptable Alkaline and salt tolerant Light: sun to partial shade Water: low
Desert broom *Baccharis sarothroides*	Evergreen shrub, 3-9' high. Female shrubs have showy fruits, fall through winter, a nice 'smoky' appearance.	Cold hardiness: to 15F Soil type: well drained Light: full sun to partial shade Water: moderate to low
Chihuahuan orchid tree *Bauhinia congesta*	Small semi-deciduous tree, or large deciduous shrub, to 8' tall and 12' spread. Showy lavender to white blossoms.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: moderate

Red barberry, Agarita *Berberis haematocarpa* *Berberis trifoliolata* *(Mahonia haematocarpa, M. trifoliolata)*	Evergreen spiny-leaved shrub 3-10' tall. Red fruits ripen in fall, attract birds.	Cold hardiness: to 20F Soil type: well drained Light: sun to partial shade Water: low
Woolly butterfly-bush *Buddleja marrubiifolia*	Low shrub 3-10' tall. Thick and velvety grey-green leaves. Small orange to yellow flowers.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: moderate to low
Mexican bird-of-paradise *Caesalpinia mexicana*	Small to medium sized evergreen shrub, to 10' tall and 6' wide. Yellow flowers, spring through fall. Can be trimmed to keep compact.	Cold hardiness: to 20F Soil type: well drained Light: full sun to partial shade Water: low (infrequent deep watering)
Red bird-of-paradise *Caesalpinia pulcherrima*	Small- to medium-sized shrub to 6' tall and 6' wide, with many bright red and yellow flowers in summer to fall. Plant will likely freeze in winter, so best to cut back to ground-level in late fall (November).	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: low (infrequent deep watering)
Heather heathbush *Carlowrightia linearifolia*	Small deciduous shrub to 3' tall and 3' wide. Small purple flowers from spring through summer.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Fairy duster *Calliandra eriophylla*	Semi-evergreen shrub, to 3' high and 4' wide. Red to purple-ish feathery flowers.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low

Spiny hackberry, Desert hackberry *Celtis pallida*	Densely branched evergreen shrub, 4-15' tall. Small, spring flowers, greenish white, attract pollinators, and fruits attract birds.	Cold hardiness: to 10F Soil type: adaptable Light: full sun Water: moderate to low
Winterfat *Ceratoides lanata* *(Krascheninnikovia lanata, Eurotia lanata)*	Evergreen shrub, to 4' tall and 3' wide. Foliage is greyish-green, with seeds having dense cottony appearance at ends of branches in fall.	Cold hardiness: to 20F Soil type: well drained Light: full sun to partial shade Water: low
Fernbush *Chamaebatiaria millefolium*	Deciduous shrub, 4' to 6' in height and 5' wide. Olive-green fern-like foliage with showy white blooms in mid-summer.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Damianita *Chrysactinia mexicana*	Low growing evergreen shrub to 2' tall, 2' spread. Showy yellow flowers.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: low
Rabbitbrush, Chamisa *Chrysothamnus nauseosus* *(Ericameria nauseosus)*	Low growing evergreen shrub, to 3' tall and 4' wide. Leaves are grey-green with yellow flowers covering entire plant in fall.	Cold hardiness: to –10F Soil type: well drained Light: full sun Water: low to none
Warnock condalia, Javelina bush *Condalia warnockii var. warnockii*	Meidum –sized evergreen shrub to 5' tall and 5' wide. Inconspicuous flowers followed by small black fruits.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low

Texas olive *Cordia boissieri*	Deciduous shrub, to 10' tall and 10' wide. Large showy white flowers.	Cold hardiness: to 18F Soil type: well drained Light: full sun Water: low
Little leaf cordia *Cordia parvifolia*	Deciduous shrub, to 6' tall and 6' wide. Showy white flowers in spring and fall.	Cold hardiness: to 18 F Soil type: well drained Light: full sun Water: low
Rock cotoneaster *Cotoneaster horizontalis*	Low growing evergreen to semi-deciduous shrub, to 2' tall and 15' spread. Light pinkish white flowers followed by red fruits.	Cold hardiness: to -10F Soil type: well drained Light: full sun Water: low
Cliffrose *Cowania mexicana, Purshia stansburiana*	Large shrub, to 8' tall and 6' wide. Fragrant yellow blooms during summer. Feathery plumes form after flowering and persist into winter. Tolerant of reflected light and heat.	Cold hardiness: to -10F Soil type: well drained Light: full sun Water: low
Feather indigo bush *Dalea formosa*	Low growing, semi-evergreen shrub, 3' high and 3' wide. Small violet flowers with yellow throats, Mar through Sept.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Black dalea *Dalea frutescens*	Mostly deciduous shrub, 3' tall and 4' wide. Brilliant rose-purple flowers late summer to fall. Attracts butterflies.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low

Indigo Bush *Dalea pulchra*	Evergreen shrub, to 5' tall and 5' wide. Clusters of purple, pea-shaped flowers in spring.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Indigobush *Dalea versicolor*	Perennial, mostly evergreen shrub, to 3' tall and 4' wide. Purple flowers in spring.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low to moderate
Dicliptera, Hummingbird plant *Dicliptera resupinata* *(Justicia resupinata)*	Perennial subshrub, to 2' tall and 4' wide. Shade-loving, with lavender colored flowers all summer.	Cold hardiness: to 20F Soil type: well drained Light: full shade to partial shade Water: moderate
Florida hopbush *Dodonaea viscosa*	Erect evergreen shrub to 10' tall and 6' wide. Leaves are bright green, with ornamental winged fruits in late summer.	Cold hardiness: to 15F Soil type: adaptable Light: full sun to partial shade Water: low
Joint-fir, Mormon tea *Ephedra sp.*	Medium-size, evergreen shrubs, usually from 3' to 5' tall, and similar width.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low
Turpentine bush *Ericameria laricifolia*	Low growing evergreen shrub, to 2' tall and 3' wide. Covered in yellow flowers in fall.	Cold hardiness: to 5F Soil Type: well drained Light: full sun Water: low to none

Texas kidneywood, Spiny kidneywood *Eysenhardtia texana, E. spinosa*	Medium or small deciduous shrub, 3' to 8 tall and 2' to 8' wide. Clusters of cream colored flowers from spring through fall.	Cold hardiness: to 10F Soil type: adaptable Light: sun to partial sun Water: low to moderate
Apache plume *Fallugia paradoxa*	Clump forming shrub to 8' tall. White flowers in spring and summer, with showy plumes following flowers through fall. Leaves turn yellow in fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Cliff fendler-bush *Fendlera rupicola*	Deciduous to semi-evergreen shrub to 6' tall. Showy white flowers.	Cold hardiness: to –10F Soil type: well drained Light: sun to partial shade Water: moderate
Tarbush *Flourensia cernua*	Densely branched, evergreen shrub, to 3' tall and 3' wide. Flowers from September through December. Stems often appear blackish.	Cold hardiness: to 10F Soil type: adaptable Light: full sun Water: low
New Mexico olive, New Mexico privet *Forestiera neomexicana*	Deciduous shrub 6-8' tall and 8' wide. Fast growing and low maintenance once established.	Cold hardiness: to 0F Soil type: adaptable Alkaline tolerant Light: partial sun to full sun Water: low
California buckthorn, Beech-leaf buckthorn, Sawleaf buckthorn F*rangula (Rhamnus) californica, Frangula (Rhamnus) betulifolia,* *Rhamnus serrata*	Evergreen shrubs, to 10' tall and similar spread. Clusters of small greenish-white flowers late spring and early summer.	Cold hardiness: to 15F Soil type: adaptable Light: partial sun to full sun Water: moderate to low

Mexican silktassel, wright silktassel *Garrya ovata, G. wrightii*	Evergreen shrub, 5-11' tall and 6' wide. Dark green leathery leaves. Showy catkins on male and female plants. Mature plants can be dense and wide.	Cold hardiness: to 10F Soil type: well drained Light: sun to partial shade Water: moderate
Soapbush, Guayacan, Texas lignumvitae *Guaiacum angustifolium, G. coulteri*	Evergreen shrub or small tree, to 15' tall and 10' wide. Branches tend to have a gnarled appearance. Flowers are blue-purple and fragrant.	Cold hardiness: to 25F Soil type: well drained Light: full sun to partial sun Water: low to moderate
Snakeweed *Gutierrezia sarothrae*	Semi-evergreen subshrub, to 18" tall and 2' wide. Bright green resinous leaves and clusters of tiny yellow flowers covering the plant June through October.	Cold hardiness: to 0F Soil type: adaptable Light: full sun Water: low to none
Rose of Sharon *Hibiscus syriacus*	Deciduous shrub, to 10' tall and 6' wide. Showy flowers, available in many colors.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate
Jimmyweed *Isocoma wrightii, I. pluriflora*	Subshrub, to 18" tall and 18" wide. Clusters of yellow flowers in summer.	Cold hardiness: to -10F Soil type: alkaline Light: full sun Water: moderate
Leatherstem *Jatropha dioica*	Low growing deciduous shrub to 3' tall and 6' wide. Small white to pink flowers in spring and summer.	Cold hardiness: to 15F Soil type: alkaline Light: full sun Water: moderate to low

Coyotillo *Karwinskia humboldtiana*	Evergreen shrub, to 3' tall and 3' wide. Suitable for rock garden settings. Do not plant in residential or child care facility locations.	Cold hardiness: to 10F Soil type: alkaline Light: full sun Water: moderate
Crucifixion thorn *Koeberlinia spinosa*	Deciduous shrub, to 10' tall and 10' wide. Plant is very spiny, and very suitable for security plantings.	Cold hardiness: to 0F Soil type: alkaline Light: full sun Water: low
Desert lantana, Texas lantana *Lantana achyranthifolia, L. urticoides*	Deciduous shrub, to 3' tall and 3' wide. Clusters of flowers in summer and fall. Many flower colors available.	Cold hardiness: to 5F Soil type: adaptable Light: full sun Water: low to moderate
Creosote bush *Larrea tridentata*	Spindly evergreen shrub, to 8' tall, and 6' wide. Small yellow flowers spring through fall. Pleasant scent, especially after rainfall.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Chihuahuan sage *Leucophyllum laevigatum*	Evergreen shrub, to 6' tall and 5' wide. Covered with ½-1" purple flowers summer through fall.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low
Texas sage, Texas ranger, silver cloud, green cloud *Leucophyllum sp.*	Evergreen shrub, 4-6' tall and 5' wide. Foliage green to grey-green in color. Showy magenta, blue, or purple flowers all summer and fall.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low

Wolfberry, thornbush *Lycium sp.*	Deciduous shrubs, 6' to 10' in height and 5' to 8' wide. Purple to white flowers in spring. Some species densely spinose.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial shade Water: low
Sandpaper bush, Saddlebush *Mortonia scabrella*	Small evergreen shrub, to 5' tall and 3' wide. Small cream flowers spring through fall.	Cold hardiness: to 10F Soil type: well drained Light: full sun] Water: low
Mariola, Guayule *Parthenium incanum, P. argentatum*	Low growing evergreen shrub, to 3' tall and 4' wide. The leaves are grey-green, with small pale-yellow flowers.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial sun Water: low
Little-leaf mock-orange, *Philadelphus microphyllus*	Deciduous shrub to 4' tall and 3' wide. Small white flowers in spring.	Cold hardiness: 0F Soil type: alkaline Light: sun to partial sun Water: low to moderate
Desert rosemary mint, Mexican rosemary mint *Poliomintha incana, Poliomintha sp.*	Semi-evergreen shrub, to 3' tall and 4' wide. Small, fragrant, purple flowers spikes.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low to moderate
Western Sand Cherry *Prunus besseyi*	Deciduous shrub, 3' to 6' in height, and equal spread. White flowers in spring followed by edible purple-black fruits.	Cold hardiness: to -20F Soil type: well drained Light: part shade to full sun Water: moderate to low

Desert scrub oak *Quercus turbinella*	Slow-growing evergreen shrub, to 8' tall and 12' wide. Leaves are leathery grey-green.	Cold hardiness: to 12F Soil type: adaptable Light: full sun Water: low to moderate
Littleleaf sumac *Rhus microphylla*	Heavily branched shrub, 3-10' tall. Leaves deciduous. Can be grown into a hedge.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate to low
Sugar bush *Rhus ovata*	Large evergreen shrub, to 15' tall and 15' wide. Large white flower clusters in spring. Excellent attractant for birds and butterflies.	Cold hardiness: -10F Soil type: adaptable Light: full sun Water: moderate
Skunkbush sumac *Rhus trilobata*	A deciduous shrub, to 6' tall. Nice fall foliage (red, copper, and yellow).	Cold hardiness: to –20F Soil type: well drained Light: full sun Water: moderate to low
Autumn amber/Grow low sumac *Rhus trilobata 'Autumn Amber'* *R. trilobata 'Grow Low'*	Deciduous, low-growing shrub, to 3' tall and 10' wide. Nice fall foliage colors, can be utilized as a shrubby ground cover.	Cold hardiness: to –20F Soil type: well drained Light: full sun Water: moderate to low
Evergreen sumac, Chihuahuan leather-leaf sumac *Rhus virens (Rhus choriophylla)*	Spreading shrub, 10-12' tall, 15' wide. Leaves turn maroon in winter, then drop right before new leaves grow again.	Cold hardiness: to 10F Soil type: well drained Light: partial shade Water: moderate to low

Bladder-sage *Salazaria mexicana*	Low growing deciduous shrub, to 3' tall and 3' wide. Small pink and purple flowers in summer and fall, followed by reddish inflated bladders.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: moderate
Mexican blue sage *Salvia chamaedryoides*	Low growing perennial, to 18" tall and 18" wide. Blue flowers early summer through November.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate
Desert sage *Salvia dorrii var. dorrii*	Perennial shrub to 3' tall and 3' wide. Flowers purple, nice contrast with foliage.	Cold hardiness: -10F Soil type: well drained Light: full sun Water: moderate to low
Mealy cup sage *Salvia farinacea*	Low growing perennial, to 18" tall and 18" wide. Blue flowers early summer to November. Can be grown as an annual.	Cold hardiness: to 24F Soil type: well drained Light: full sun Water: moderate
Autumn sage *Salvia greggii*	Low growing perennial, to 3' tall. Reddish to magenta flowers spring and fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate
Desert Yaupon *Schaefferia cuneifolia*	Small evergreen shrub to 4' tall and 3' wide. Inconspicuous flowers in spring and summer followed by red fruits. Ideal for low-growing hedge.	Cold hardiness: to 10F Soil type: well drained Light: Full sun Water: moderate to low

Threadleaf groundsel *Senecio flaccidus, S. douglassii*	Evergreen perennial subshrub, to 3' tall and 2' wide. Foliage is silvery in color, covered with yellow daisy-like flowers April to October.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Velvet leaf senna, Desert sensitive plant *Senna lindheimeriana, (Cassia lindheimeriana)*	Perennial, 3' to 6' in height and 2' to 5' in width. Flowers are yellow-orange and blooms from July to October.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: moderate to low
Shrubby senna *Senna wislizeni, (Cassia wislizeni)*	Large shrub, 8' tall by 8' wide. Showy yellow flowers in spring.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: moderate to low
Buffaloberry *Shepherdia argentea*	Deciduous shrub to 3' tall and 4' wide. Bright red edible berries in fall.	Cold hardiness: to -20 Soil type: well drained Light: full sun to part sun Water: low
Jojoba *Simmondsia chinensis*	Medium sized evergreen shrub, to 5' tall and 5' wide. This shrub must be planted in a sheltered location.	Cold hardiness: to 18F Soil type: well drained Light: full sun Water: low
Garrocha, Argentine tecoma *Tecoma garrocha*	Large shrub, 10' tall and 6' wide. Semi-deciduous light green leaves with orange, trumpet shaped flowers from summer to fall. Trim stems to ground in winter.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: moderate to low

Yellow trumpet flower *Tecoma stans*	Semi-deciduous shrub, to 12' tall and 6' wide. Very showy yellow flowers all season. Also an orange cultivar available. Trim stems to ground in winter.	Cold hardiness: to 10F Soil type: well drained Light: sun to partial shade Water: moderate to low
Arizona rosewood, Chisos rosewood, Narrowleaf rosewood *Vauquelinia californica, V. corymbosa*	Large evergreen shrub, to 20' tall and 15' wide. Clusters of small, creamy flowers. Attractive foliage.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate to low
Slimleaf goldeneye, Skeletonleaf goldeneye *Viguiera stenoloba*	Evergreen shrub to 3' tall and 3' spread. Bright green thread-like foliage with yellow daisy-like flowers from spring through fall.	Cold hardiness: to 10F Soil type: well drained, adaptable Light: full sun Water: low
Chaste tree *Vitex agnus-castus*	Large shrub or small tree, to 15' tall and similar spread. Lilac or white flowered varieties available.	Cold hardiness: to 5 F Soil type: well drained Light: full sun Water: low to moderate
Lotebush *Ziziphus obtusifolia*	Many branched deciduous shrub, to 6' tall and 8' spread. Stems appear greyish with a waxy coating, and the leaves are grey-green. Small black fruits in late fall are excellent food for birds.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
GRASSES		
Sideoats grama *Bouteloua curtipendula*	Perennial bunchgrass, to 2' high, and 1 ½' wide. Blooms from April to October. Bluish green foliage dries to tan in fall. Rejuvenate by cutting after dried in fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: moderate to low

Blue grama *Bouteloua gracilis*	Perennial shortgrass, 10-20" high. Forms a light turf grass and is drought tolerant.	Cold hardiness: to –20F Soil type: well drained Light: full sun to partial sun Water: low
Buffalo grass *Buchloe dactyloides*	A warm-season grass, forming a uniform and attractive turf (sodgrass). Grows 8-10" high, but maintains a short appearance. Only cut 2-3 times per year, don't over fertilize.	Cold hardiness: to –10F Soil type: adaptable Light: full sun Water: low
Plains lovegrass *Eragrostis intermedia*	Perennial bunchgrass, to 2' high. Delicate looking seedheads bloom from June to October. Plant has a grey-green to purple-tinged appearance.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate to low
"Regal Mist" muhly *Muhlenbergia capillaris*	Perennial bunchgrass to 3' tall and 3' wide. Flowering panicles have a pinkish-red, feathery appearance. Plants should be cut to base in late winter (Jan or early Feb).	Cold hardiness: to 0F Soil type: well drained, adaptable Light: full sun Water: low to moderate
Bush muhly *Muhlenbergia porteri*	Perennial bunchgrass, to 3' high and 4' wide. Flowers summer to fall.	Cold hardiness: 10F Soil type: well drained Light: full sun to partial shade Water: moderate to low
Deer grass *Muhlenbergia rigens*	Perennial bunchgrass, to 3' high and 4' wide. Has showy, 1-foot long, flowering spikes from July to October. Cut at ground level to rejuvenate clumps.	Cold hardiness: 10F Soil type: well drained Light: full sun Water: moderate to low

Indian ricegrass *Oryzopsis hymenoides*	Perennial bunchgrass, 1-2' high and 1' wide. Light-green leaf blades fade to straw color in fall. Nice accent plant.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial shade Water: low
Little bluestem *Schizachyrium scoparium*	Perennial bunchgrass to 2' tall, and less than 1' wide. Leaf blades and dark blue-green, fall flower stems are reddish. Entire plant turns to rust color in fall.	Cold hardiness: to –15F Soil type: well drained Light: full sun Water: moderate to low
Alkali sacaton *Sporobolus airoides*	Perennial bunch grass to 3' high and 1 ½' wide. Pale-green leaf blades taper to a long slender tip. Open seedhead panicle from May through October.	Cold hardiness: -10F Soil type: heavy, silty or clayey soils are preferred Alkaline tolerant Light: full sun Water: moderate to low
New Mexico feathergrass *Stipa neomexicana*	Perennial bunchgrass to 30" tall and 1' wide. Silky awns on seeds are very attractive accents.	Cold hardiness: to –15F Soil type: well drained Light: sun to partial shade Water: moderate to low
GROUNDCOVERS		
Fringed sage *Artemisia frigida*	Low growing groundcover, to 2' high. Leaves are grey-green with a pleasant fragrance.	Cold hardiness: to -20F Soil type: well drained Light: full sun Water: moderate
'Centennial' desert broom *Baccharis pilularisXsarothroides*	Low growing grey-green shrub, 3' high to 5' wide. Evergreen.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: moderate to low

Winecups *Callirhoe involucrata*	Low growing herbaceous perennial, to 2' tall and 2' wide. Flowers are a rich-pinkish red color with a white center. Re-seeds itself and will slowly fill in an area as groundcover.	Cold hardiness: to 10F Soil type: adaptable to most soils Light: full sun, can take some reflected light Water: low
Trailing yellow dalea, Trailing indigo bush *Dalea capitata, D. greggii*	Low growing shrub, 6" to 1' tall and 3' to 4' wide. Yellow, lemon-scented flowers in late spring and fall.	Cold hardiness: to 5F Soil type: well drained Light: full sun Water: low
Creeping juniper *Juniperus horizontalis*	Low growing shrub 6" to 12" in height, with a spreading habit. Evergreen.	Cold hardiness: to -20 Soil type: well drained Light: full sun Water: low
Drooping lobelia, Loose-flower lobelia *Lobelia laxiflora*	Perennial low growing shrub, to 2' tall, spreading by underground runners. Red flowers in spring.	Cold hardiness: to 20F Soil type: Well drained Light: full sun Water: low to moderate
Desert four o'clock *Mirabilis multiflora* .	Low growing herbaceous perennial, to 2' high. Showy, fragrant magenta flowers in summer. Takes on shrub-like appearance. Attracts birds, bees, and butterflies.	Cold hardiness: to –10F Soil type: adaptable Light: sun to partial shade Water: moderate to low
Evening primrose species *Oenothera sp.*	Low growing herbaceous perennial, to 1-2' high. Multiple colors of flowers, spring through summer. Attractive to birds, bees, and butterflies.	Cold hardiness: to –10F Soil type: well drained Light: full sun (some partial shade) Water: moderate

Texas Betony *Stachys coccinea*	Low growing herbaceous perennial, to 12" to 18" tall, forming 2' wide mats. Flowers are red to coral in color.	Cold hardiness: to 10F Soil Type: well drained Light: full sun to partial shade Water: moderate
Orange zexmenia, Shortleaf jefea, San Pedro daisy *Zexmenia sp., Jefea sp., Wedelia sp., Lasianthaea sp.*	Low growing shrubby perennial, to 2' high and 3' wide. Yellow to sunflower-like blossoms from spring to fall.	Cold hardiness: to 20F Soil type: well drained Light: full sun to partial shade Water: low to moderate
VINES		
Coral vine *Antigonon leptopus*	Fast-growing vine, grows to 25' length and 25' width. Leaves are heart-shaped, with pink, red or white flowers midsummer to fall. Can be planted as a fence cover, but do not plant so it will climb buildings nor other plants.	Cold hardiness: to 20F Soil type: adaptable Light: full sun to partial sun Water: moderate to low
Trumpet creeper *Campsis radicans*	Vigorous growers, to 30' length and width. Showy red-orange flowers are very attractive to hummingbirds.	Cold hardiness: to -10F Soil type: adaptable Light: full sun to shade Water: moderate
Western virgin's bower, old man's beard, Bigelow's leather flower *Clematis ligusticifolia, C. drummondii, C. bigelovii*	Native vine, to 20' length and 10' width. White flowers in summer and plumose showy fruits late summer to fall. Can be planted as a fence cover, but do not plant so it will climb buildings or other plants.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Western white honeysuckle, Evergreen honeysuckle *Lonicera albiflora var. albiflora, L. sempervirens*	Semi-evergreen trailing shrub or twining vine, to 10' long and wide. White or coral colored flowers in spring.	Cold hardiness: to 0F Soil type: well drained adaptable Light: partial sun Water: moderate to low

Purple orchid vine, yellow orchid vine *Mascagnia lilacina, M. macroptera (Callaeum lilacina, C. macroptera)*	Vine growing from 6' to 30' length and similar width. Purple flowers or yellow flowers in late spring. Plant as a fence cover, but should not plant so it will climb buildings nor other plants.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low to moderate
Little snapdragon vine *Maurandya antirrhiniflora (Maurandella antirrhiniflora)*	Delicate vine growing 6' to 10' in length. Small light green leaves with magenta to deep violet snapdragon flowers in summer. Does best when provided a trellis to grow upon.	Cold hardiness: to 15F Soil type: well drained, adaptable Light: full sun to partial shade Water: low to moderate
Virginia creeper *Parthenocissus quinquefolia*	Large native vine, to 25' in length and 25' in width. Lush green leaves, with fall foliage a deep red color. May need be trimmed regularly. Plant as fence cover, not where it will climb buildings or other plants.	Cold hardiness: to –30F Soil type: well drained Light: partial shade to full sun Water: low
American wisteria, Texas wisteria *Wisteria frutescens*	Small to medium native vine, 8' to 20' length. Clusters of light purple to violet flowers in spring. May need some regular trimming, plant where it can climb.	Cold hardiness: to -10F Soil Type: well drained Light: partial shade to full sun Water: moderate
OTHER FLOWERS		
Moonshine yarrow, western yarrow (many cultivars) *Achillea millefolia*	Distinctive silver grey foliage on this low growing plant, to 18" to 3' tall and 18" wide. Flowers vary in color from cream to yellow to pink.	Cold hardiness: to –20F Soil type: well drained Light: full sun to partial shade Water: moderate
Giant hyssop *Agastache cana*	Low growing plant to 2' tall and 2' wide. Rose-pink flower spikes from July through September, with fragrant leaves. Attracts hummingbirds.	Cold hardiness: to –20F Soil type: well drained Light: full sun to partial sun Water: moderate to low

Licorice mint hyssop *Agastache rupestris*	Low growing plant to 2' tall and 2' wide. Orange flower spikes from July through September, with fragrant threadlike grey-green leaves.	Cold hardiness: to –10F Soil type: well drained Light: full sun to partial sun Water: moderate to low
Flattop ageratum, Butterfly mist *Ageratum corymbosum*	Low growing perennial, to 18" tall and 4' spread. Blue to lilac flowers that attract butterflies.	Cold hardiness: to 15F Soil type: well drained Light: Full sun to partial shade Water: Moderate
Columbine *Aquilegia sp.*	Attractive fern-like foliage. Showy flowers, many colors available. Grows to 3' tall and 18" wide.	Cold hardiness: to –30F Soil type: well drained Light: partial shade Water: moderate to high
Prickly-poppy *Argemone sp.*	Short-lived perennial, to 3' tall and 2' wide. Showy white or yellow flowers with crepe paper-like petals. Foliage and stems are covered with yellow stems.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
Milkweed, Butterfly milkweed *Asclepias sp., A. tuberosa*	Perennial, to 2' tall. Clusters of orange, yellow or pink flowers at the top of the plant from spring to fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: moderate to low
Bahia *Bahia absinthifolia*	Perennial, to 1' tall and 18" wide. Yellow flowers above silvery foliage. Blooms in spring and fall.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low

Desert marigold *Baileya multiradiata*	Short lived perennial, to 12" tall. Bright yellow flowers, spring and summer, with greyish foliage.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low to none
Chocolate flower *Berlandiera lyrata*	Attractive perennial, to 20" tall. Yellow flowers with brown centers, scent similar to chocolate.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial shade Water: moderate to low
Sundrops *Calylophus sp.*	Perennial wildflower to 18" tall and 18" wide. Profuse bloomer, with yellow flowers spring through summer. Foliage is grey-green. Shear tops of plants off before growing season starts (Feb or Mar).	Cold hardiness: to 10F Soil type: well drained, adaptable Light: partial sun to full sun Water: low
Coreopsis, Calliopsis *Coreopsis tinctoria*	Upright annual, 2-3' tall. Red and yellow flowers in spring.	Cold hardiness: n/a Soil type: well drained Light: full sun Water: moderate to low
Shrubby dogweed, dogweed *Dyssodia sp.* *(Thymophylla sp.)*	Herbaceous perennial or subshrub, 6" tall and about 1' wide. Yellow daisy-like flowers from April through October.	Cold hardiness: 10F Soil type: adaptable Light: full sun Water: low
Purple coneflower *Echinacea purpurea*	Upright perennial, to 3' tall. Purple to white flowers.	Cold hardiness: to –20F Soil type: well drained Light: partial shade to full sun Water: moderate

Mexican gold poppy *Eschscholzia mexicana*	Low growing perennial or annual. Yellow and cream colored flowers, with grey-green foliage.	Cold hardiness: n/a Soil type: well drained Light: full sun Water: moderate
Wright buckwheat, Desert buckwheat *Eriogonum wrightii*	Herbaceous perennial, to 3' tall and 3' wide. Leaves are grey, with pale pink flowers summer to fall. Good for rock gardens.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: low
Coral-bean *Erythrina herbacea*	Herbaceous perennial, to 5' tall and wide. Red flowers in spring. Excellent hummingbird plant.	Cold hardiness: to 5F Soil type: adaptable Light: sun to partial shade Water: moderate to low
Fragrant mist flower, Boneset *Eupatorium sp.*	Low growing deciduous perennial, to 2' tall and 3' wide. Many showy white flowers in fall.	Cold hardiness: to 10F Soil type: alkaline Light: sun to partial sun Water: low to moderate
Blanketflower *Gaillardia sp.*	Perennial. Red or orange flower petals with yellow tips, or yellow petals.	Cold hardiness: to –20F Soil type: well drained Light: full sun Water: moderate
Gaura *Gaura lindheimeri*	Herbaceous perennial, 2' to 4' in height, with 2' to 4' width. White or pink flowers from June through September.	Cold hardiness: to –10F Soil type: well drained Light: full sun Water: moderate

Purple verbena, Sand verbena *Glandularia wrightii* *Glandularia sp.* *Verbena sp.*	Low growing perennial. Purple to magenta flowers clusters in summer.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
Maximillian sunflower *Helianthus maximilianus*	Tall plant, to 8' tall, for placement along hedges or edges of yards. Twenty to thirty spikes of 30 or more yellow, daisy-like flowers	Cold hardiness: to –20F Soil type: well drained Light: full sun Water: moderate
Halberd-leaved hibiscus, Neches River hibiscus *Hibiscus militaris, H. dasycalyx*	Herbaceous perennial, 3-5' tall. Best for areas	
Angelita daisy *Hymenoxys acaulis*	Low growing shrub, to 1' tall. Yellow flowers in summer.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: moderate
Perky sue, four-nerve daisy *Hymenoxys argentea,* *Tetraneuris scaposa*	Low growing perennial, to1' tall. Yellow flowers from April through August.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial shade Water: low
Dotted gayfeather *Liatris punctata*	Perennial plant to 2 ½' tall. Rose-purple flowers on a spike summer to fall.	Cold hardiness: to –10F Soil type: well drained Light: full sun Water: moderate to low
Blue flax *Linum lewisii*	Perennial, to 3' tall. Blue flowers late spring to summer. Trim back each winter.	Cold hardiness: to –20F Soil type: well drained Light: full sun to partial shade Water: moderate

Tansy aster *Machaeranthera bigelovii*	Low growing plant, 1-3' tall. Bright purple to deep magenta flowers late summer to fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun Water: moderate
Blackfoot daisy *Melampodium leucanthum*	Short-lived perennial to 1 ½' tall and 2' wide, mound shape. Has fragrant white flowers, March to November.	Cold hardiness: to 0F Soil type: well drained Light: partial shade to full sun Water: moderate to low
Rough menodora, Showy menodora *Menodora scabra, M. longiflora*	Low growing deciduous perennial, with small yellow flowers in summer.	Cold hardiness: to 10F Soil type: well drained Light: full sun Water: low
Rock rose, Texas rock rose *Pavonia lasiopetala*	Short-lived, deciduous to semi-evergreen, perennial to 3' tall and 3' spread. Rosy pink flower from April to October. Should be cut back annually (to ~4" of base) in late winter (February). Can be allowed to self-seed. Attractive to butterflies.	Cold hardiness: to 5F Soil type: well drained Light: full sun to partial shade Water: low to moderate
Beardtongue, Penstemon *Penstemon sp.*	Perennial plants, 1-3' tall. Many varieties and flower colors available. Most are showy and add good color.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate to low Needs to be heat tolerant.
Wooly paperflower, Paperflower *Psilostrophe tagetina, P. cooperi*	Low growing perennial, to 1' tall and 18" spread. Covered with bright yellow flowers March through September.	Cold hardiness: 15F Soil type: well drained Light: full sun Water: low

Mexican hat *Ratibida columnaris*	Perennial to 2' tall. Brown-orange flower petals with yellow tips late spring to early fall. Cut stems to ground each winter.	Cold hardiness: -30F Soil type: well drained Light: full sun Water: moderate to low
Black-eyed susan *Rudbeckia hirta*	Biennial or annual plant to 3' tall. Red-orange flower petals with yellow tips summer to fall.	Cold hardiness: to –10F Soil type: well drained Light: partial sun Water: moderate
Salvia, Sage *Salvia sp.*	Low growing perennial or annual, to varying heights. Most have showy flowers either spring, summer, or fall.	Cold hardiness: to 0F Soil type: well drained Light: full sun to partial shade Water: moderate
Narrowleaf monopod *Selinocarpus angustifolius*	Low growing, deciduous, to 3' tall and 2' wide. Brownish-green flowers, spring through fall, followed by decorative brownish-orange fruits.	Cold hardiness: to 10F Soil type: well drained Light: full sun to partial sun Water: low
Globe-mallow *Sphaeralcea sp.*	Shrubby perennial to 3' tall and 3' wide. Flowers can be shades of orange, red, yellow, or pink.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate to low
Mt. Lemmon marigold, Copper Canyon daisy *Tagetes lemmonii*	Upright perennial shrub, to 3' tall and 4' wide. Golden yellow daisy-like flowers in spring and fall. Very fragrant foliage. Dies back to ground in winter.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate

Dutchman's breeches, Turpentine broom *Thamnosma sp.*	Woody perennial to 12" tall and 18" spread. Yellow urn-shaped petals March through May.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: low
California trixis, American threefold *Trixis californica*	Evergreen subshrub, to 2' tall and 3' wide. Bright green lance-shaped leaves with yellow flowers in spring and fall. Plant can be trimmed to base to rejuvenate in spring or summer, but not fall.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: low to moderate
Goodding verbena *Verbena gooddingii*	Fast growing perennial to 2' and 4' wide. Purple blossoms from spring to fall. After flowers fade, cut those stems off to keep from looking straggly.	Cold hardiness: to 15F Soil type: well drained Light: full sun Water: moderate
Golden Eye *Viguiera deltoidea*	Evergreen shrub to 3' tall and 3' wide. Pale yellow to white flowers with yellow centers.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate to low
Rain lily *Zephyranthes sp.*	Perennial lily, 8" tall and 20" wide. White, pink, peach or yellow flowers that emerge in summer following rainfall.	Cold hardiness: to 5F Soil type: well drained Light: full sun to part shade Water: moderate to low
Desert zinnia *Zinnia acerosa*	Perennial to 10" tall and 2' wide. White flowers in spring.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: low

Prairie zinnia *Zinnia grandiflora*	Perennial to 1' tall. Many bright yellow flowers from late spring to early fall.	Cold hardiness: to 20F Soil type: well drained Light: full sun Water: moderate to low

Links
Go to Appendix P
Go to Table of Contents

Appendix P

P

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.

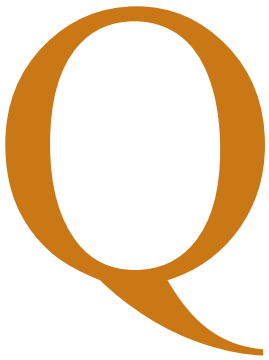
P.2 Specific Contact Information. For more specific contact information, such as POC with email address and telephone number, refer to the IDS Newsletter (https://secureapp2.hqda.pentagon.mil/acsimnews/) under the heading "Standardization Program POCs". An Army Knowledge Online (AKO) account will be 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**	Army Chapel
	Chapel Family Life Center
	Religious Education Facility
	Small Site Chapel

Army Facilities Standardization Program Centers of Standardization	
Assigned Center	**Facility Type**
Telephone: 402-221-4552/443	Access Control Points
	Airfields, Railroads, Pavements, Bridges, & Dams
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

Links
Go to Appendix Q
Go to Table of Contents

Appendix Q



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) 200-1, *Environmental Protection and Enhancement*
- 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.1.1.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.1.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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
- UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003.
- 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.1.2.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.2.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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*
- 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".
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

Q.1.3.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.

- WSMR Regulation 385-18 Command Safety Program.

Q.1.3.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

Q.1.4.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.

- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.4.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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)
- UFC 3-120-01, Air Force Sign Standard, 6 Feb 2003.
- 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
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

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.1.5.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.5.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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) 4-010-02, *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

- AR 525-13, Antiterrorism

- TM 5-853-1,2,3,4 Security Engineering

- Interim Guidance for Access Control Points, May 2004

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).

- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

Q.1.6.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.6.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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

- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

Q.1.7.3 Safety Standards

- Occupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.7.4 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

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
- Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*

- Q.1.8.3 Safety StandardsOccupational Safety and Health Administration (OSHA) Standards for the General Industry 29 CFR 1910.
- OSHA Standards for the Construction Industry 29 CFR 1926.
- Army Regulation (AR) 385-10, Army Safety Program.
- U.S. Army Corps of Engineers, Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual.
- WSMR Hazard Communications Program Handbook.
- WSMR Regulation 385-18 Command Safety Program.

Q.1.8.3 Environmental Standards

- U.S. Environmental Protection Agency (EPA) Standards 40 CFR Parts 50 to 1068.
- New Mexico Environment Department, Environmental Protection Standards, Title 20, Parts 20.1 to 20.20.
- WSMR Regulation 200-1 Environmental Compliance Handbook

Links
Go to Appendix R
Go to Table of Contents

Appendix R

R

Links
Go to Index
Go to Table of Contents

U.S. Army White Sands Missile Range

Commander's Guidance

CG-02-02

JAN 24 2002

THE MIGRATORY BIRD TREATY ACT AND THE BALD AND GOLDEN EAGLE PROTECTION ACT - CONSERVATION

1. Environmental stewardship is vitally important to the accomplishment of the White Sands Missile Range (WSMR) test and evaluation mission. "America's Range" fully supports and implements the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Many actions taking place on WSMR have the potential to "take" migratory birds, including raptors (birds of prey, such as hawks, eagles, and owls). All directors, tenants, Range customers, civilian employees, military personnel, and contractors must ensure that actions which may result in the "taking" of a migratory bird are properly identified and addressed in the environmental coordination document associated with project planning, execution, and follow up. Addressing bird protection measures in this manner is not only consistent with the Commander's Guidance on National Environmental Policy Act (NEPA) Compliance, but will ensure they become part of the administrative record for all proposed actions, are properly coordinated with the U.S. Fish and Wildlife Service, and appropriate permits are obtained.

2. All but three species of wild birds are protected in the United States under federal and/or state laws. Pursuant to the MBTA it is illegal to "take" any migratory bird without a federal permit, excluding only three non-native species: the rock dove (pigeon), English (house) sparrow, and starling. The BGEPA extends additional protections to bald and golden eagles.

3. Under both the MBTA and BGEPA, "take" includes "pursue, shoot, shoot at, wound, kill, capture, collect, molest, or disturb...," or to attempt any of these actions. Additionally, these acts make it illegal to "take," transport, or possess any part of a protected bird without a permit, including the feathers, feet, beak, nest, eggs, etc. Any action at WSMR that may "take" birds must be coordinated with the U.S. Fish and Wildlife Service prior to implementation. The White Sands Environment and Safety Directorate is responsible for assisting activities in accomplishing this coordination.

4. Among the most preventable potential sources of "take" are improperly designed power lines and poles that electrocute large birds and the intentional, unpermitted nest destruction to remedy nuisance bird concerns. To alleviate these problems, it is White Sands policy to:

- Design all new power lines, poles, and other power distribution facilities in accordance with the guidance provided in the publication entitled, Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996 (Avian Power Line Committee (APLIC), Edison Electric Institute/Raptor Research Foundation, Washington, D.C.). Any

exception to this guidance must be coordinated through the Environment and Safety Directorate with the U.S. Fish and Wildlife Service which may delay project execution.

- Promptly report and remediate any power lines and poles found to electrocute birds in accordance with the above standards. Plans for these actions will be coordinated with the Environment and Safety Directorate prior to implementation.

- Incorporate the above standards in all proposed actions involving power lines, including line and pole modifications, maintenance and repair activities, and pole removal. Plans for these actions will be coordinated with the Environment and Safety Directorate prior to implementation.

- Identify power lines and poles that have or are suspected to have electrocuted birds to the Environment and Safety Directorate for record-keeping and reporting purposes in accordance with Army policy. Also, report the location of carcasses of birds suspected of having been electrocuted to the Environment and Safety Directorate for action.

- Refrain from any action involving the removal or disturbance of bird nests until the Environment and Safety Directorate has been consulted to determine if a federal permit is required.

5. The Environment and Safety Directorate has copies of the cited publication for reference and can provide the source information for those who wish to obtain individual copies. Where permits are required, the proponent of the action applying for the permit will provide the necessary information to the Environment and Safety Directorate. The proponent is responsible for ensuring compliance with all permit conditions.

6. For additional information regarding this guidance or for further assistance in integrating environmental stewardship in your activities, contact the Directorate of Environment and Safety, at 678-2224/8731.

WILLIAM F. ENGEL
Brigadier General, USA
Commanding

DISTRIBUTION:
D, E, F, G, L

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Z

Links
Go to Comment Form
Go to Table of Contents

COMMENT FORM

Comment Form

TO: Department of the Army Facilities Policy Division Assistant Chief of Staff for Installation Management 600 Army Pentagon (DAIM-FD) Washington, DC 20310-0600 E-mail to vincent.kam.w@hqda.army.mil or fax (703) 428-6197 DSN 328-6197	**FROM:**

TITLE	VERSION NO. / DATE	DATE OF SUBMISSION
ARMY INSTALLATION DESIGN STANDARDS		

ITEM #	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Press Enter to insert a new line) (Press Tab at end of last item to insert next Item #)

Links

Go to Table of Contents